Agricultural Environmental Management

Packet of the Tier 1 Inventory Worksheet and all Tier 2 Environmental Assessment Worksheets (2022)

Note: each worksheet is bookmarked within this PDF file for improved navigation.

AGRICULTURAL ENVIRONMENTAL MANAGEMENT

Tier 1

AEM Identification Number:

_____ County SWCD

Date: ____/____/____

Evaluator Name:	Evaluating Agency:
Watershed Identification:	
Farm Name:	
Owner's Name:	Operator's Name:
Address:	Address:
Phone: Fax:	Phone: Fax:
Email:	Email:

Preferred Contact Point? (please check only one)

☐ Owner ☐ Operator

1) **Future Status of the Farm**

A) Do you anticipate any major modifications on your farm within the next 5 years? ☐ **Yes** ☐ **No**

If yes, please check the condition(s) that best describes the modification(s):

☐ Business Structure ☐ Expansion ☐ Retirement

☐ Operation Type ☐ Diversification of Farm Business ☐ Sale of Farm

B) Do you plan to subdivide any portion of your farm in the next 5 years? ☐ **Yes** ☐ **No**

2) **Basic Farm Information**

A) What **Primary** Farm Enterprise best describes your operation?

☐ Dairy ☐ Beef ☐ Horses ☐ Fruit/Vegetables

☐ Poultry ☐ Swine ☐ Vineyard ☐ Greenhouse

☐ Cash Crop: (**Please Define**) _____ ☐ Sheep/Goats

☐ Other: (**Please Define**) _____

B) Please indicate the following number of acres:

	Owned	**Rented**
Cropland Acres		
Grazed Land Acres		
Permanent Hay Land Acres		
Woodland Acres		
Wildlife Land Acres		
Farmstead Acres		
Other Acres:		
Total Acres	_____	_____

C) Does your operation qualify for Ag Value Assessment? ☐ **Yes** ☐ **No**

3) **Animal Numbers for your <u>Primary</u> Farm Type**

Average Weight: _____ Number: _____ Average Weight: _____ Number: _____

Average Weight: _____ Number: _____ Average Weight: _____ Number: _____

Average Weight: _____ Number: _____ Average Weight: _____ Number: _____

4) **Management Questions** (Please check Yes or No)	**Yes**	**No**
Do you spread manure?	☐	☐
Do you have a manure storage facility?	☐	☐
Do you generate process washwater from the cleaning of product or facilities? (for example, milkcenter, egg wash, washing of produce)	☐	☐
Is there a barnyard or outdoor feedlot on your farm?	☐	☐
Do you store silage or other high moisture feeds on the farm?	☐	☐
Do you utilize pastureland on your farm?	☐	☐
Do you use commercial fertilizer?	☐	☐
Do you use pesticides (herbicides, insecticides, fungicides) on your farm?	☐	☐
Do you store and/or mix pesticides (herbicides, insecticides, fungicides) on your farm?	☐	☐
Does your operation utilize cropland for row crop production?	☐	☐
Is the water supply on your farm from a well or a spring?	☐	☐
Is there a waterbody within or adjacent to your farm?	☐	☐
Do you presently or do you plan to harvest timber on your farm?	☐	☐
Do you store fuel or other bulk petroleum products on your farm?	☐	☐
Have you received odor complaints or do you believe your farm has an odor concern?	☐	☐

Other Agricultural Conservation Interests – check all that are of interest

☐ Adapting to Extreme Weather (storms, drought, heat)	☐ Integrated Pest Management
☐ Agricultural Tax Relief	☐ Irrigation Management
☐ Agri-Tourism	☐ Manure Treatment Options
☐ Air Quality	☐ Neighbor-Farm Relations
☐ Biofuels	☐ Nuisance Wildlife Control
☐ Biosecurity	☐ NYS Grown and Certified Program
☐ Conservation Easements	☐ Organic Farming
☐ Energy Conservation/Generation	☐ Pollution Credit Trading
☐ Farmland Protection	☐ Right-to-Farm
☐ Feed Management	☐ Stream Management/Buffers
☐ Fisheries Habitat Management	☐ Water Conservation/Management
☐ Forest Management/Timber Harvest	☐ Wellhead Protection
☐ Grasslands Farming	☐ Wetland Conservation
☐ Greenhouse Gases	☐ Wildlife Habitat Improvement

Would you like to receive a copy of the AEM Guide to Conservation Funding? ☐ Yes ☐ No
This document is also online at www.nys-soilandwater.org/aem/aemoutreach.html

(***OPTIONAL***)

Producer Questions & Comments (for example, if the farm has done work with the District or NRCS on conservation practices; if any land is in a conservation easement; if the farm has any certifications, such as organic; or any additional questions or info on answers in the Tier 1, above):

Agricultural
Environmental
Management

AEM

"MAKING THE CONNECTION"

(Linking Tier 1 to Tier 2)

TIER I QUESTIONNAIRE	RESPONSE	TIER II WORKSHEET
Farm Type	All	Watershed Site Evaluation
Farm Type	All	Agriculture and the Community
Farm Type	All	Greenhouse Gas Mitigation Opportunities
Farm Type	All	Waste Disposal
Farm Type	Any Livestock	Water-borne Pathogens
Farm Type	Dairy	Management of Feed Nutrients
Farm Type	Horse Vineyard Greenhouse Fruit/Vegetable	Utilize specialized Worksheets, as well as those indicated as needed below.
Do you spread manure?	Yes	Manure Management
Do you have a manure storage facility	Yes	Manure Management
Is there a barnyard or feedlot on your farm?	Yes	Barnyards
Do you store silage on the farm?	Yes	Silage Storage
Do you generate process wash water from the cleaning of product or facilities? (i.e. milkcenter, egg wash, washing of produce)	Yes	Process Wash Water
Do you utilize pastureland on your farm?	Yes	Pasture Management
Do you use fertilizer?	Yes	Fertilizer Management
Do you use pesticides (herbicides, insecticides, fungicides) on your farm?	Yes	Pesticide Use
Do you store and/or mix pesticides (herbicides, insecticides, fungicides) on your farm?	Yes	Pesticide Storage, Mixing and Loading
Does your operation utilize cropland?	Yes	Soil Management
Is the water supply on your farm from a well or a spring?	Yes	Farmstead Water Supply Evaluation
Is there a defined stream within or adjacent to your farm?	Yes	Stream & Floodplain Management
Do you presently or do you plan to harvest timberon your farm?	Yes	Forest Management
Do you store petroleum products on your farm?	Yes	Petroleum Product Storage
Have you received odor complaints or do you believe you have an odor concern?	Yes	Livestock Odor Management

AEM TIER 2 WORKSHEETS – 3/2018
Access Worksheets at www.nys-soilandwater.org

Core Worksheets
1. Watershed Site Evaluation
2. Agriculture and the Community
3. Greenhouse Gas Mitigation Opportunities
4. Soil Management
5. Nutrient Mgmt: Manure & Fertilizer
6. Manure & Fertilizer Storage
7. Waste Disposal
8. Pesticide Use
9. Pesticide Storage, Mixing, & Loading
10. Farmstead Water Supply Evaluation
11. Stream and Flood Plain Management
12. Petroleum & Oil Products Storage
13. Forest Management
14. Irrigation Water Management

Dairy/Livestock
1. Heavy Use Area Protection
2. Silage Storage
3. Process Wash Water
4. Management of Feed Nutrients
5. Water-Borne Pathogens
6. Pasture Management
7. Livestock Odor Management

Vineyards (VineBALANCE)
1. Vineyard Management
2. Irrigation Management
3. Nutrient Management
4. Soil Management
5. Weed Management
6. Pest Management
7. Pesticide Management
8. Continuing Education

Vegetables & Fruit
1. Tree Fruit
2. Vegetables & Small Fruit

Horse
1. Wash Rack/Stall & Trailer Wash Area
2. Manure Management for Horses: Nutrient Management, Storage, Field Application &/or Off-farm Disposal
3. Horse Farm – Outdoor Paddock & Arena Management
4. Horse Farm - Waterborne Pathogen Management

Greenhouse
1. Greenhouse Maintenance
2. Pest Management
3. Fertilizer Storage

Long Island
1. Nutrient Management
    a. Greenhouse Irrigation Systems
    b. Grapes
    c. Vegetables
    d. Tree Fruit
    e. Sod/Turf
    f. Field Grown Nursery Crops
2. Pest Management
    a. Grapes
3. Irrigation, Well, & Water Management
4. Soil Management
5. Petroleum Products Storage
6. Waste Management

County
Agricultural Environmental Management (AEM)
Program Team

AEM Tier 2 Summary Report

AEM Project

Farm Name			
Contact Name			
Address			
Phone			
Evaluator			**Phone:**
Date Prepared		**Date Delivered**	

Worksheet Name and Number	Level of Concern (1-4)	Items of Concern	Evaluation & Recommendations
1. Watershed Site Evaluation			**Details Captured on Tier 2 Worksheet**
2.			
3.			
4.			
5.			

Worksheet Name and Number	Level of Concern (1-4)	Items of Concern	Evaluation & Recommendations

AEM Tier 2 Worksheet
Watershed Site Evaluation

Background

What happens on the land effects the water. The type of farm activities occurring, along with a farm's soil, topography, and location within a watershed, affect the farm's risk for pollution of ground and surface water. This worksheet helps farmers know their watershed, and the associated water quality issues and opportunities within the watershed their farm may be impacting at the local, state, and national levels.

Every surface waterbody in New York State has been classified by the Department of Environmental Conservation (DEC) according to its "best use." Best use categories include: drinking water supply, public bathing, recreation, aquatic life support, fish consumption, shell fishing, natural resources habitat/hydrologic use, and aesthetics. Each use has a set of standards associated with it that limit the concentrations of various contaminates that can be present in the water.

A water quality problem exists where a classified best use is negatively impacted. The effects can range from precluding a use to situations where a waterbody's best use is threatened as defined below:

Precluded: Frequent/persistent water quality or quantity conditions and/or associated habitat degradation prevents all aspects of the waterbody use

Impaired: Water quality and/or habitat characteristics frequently impair a classified use. Also applied when the classified use is supported, but at a level significantly less than what would be expected. Natural ecosystem functions may be disrupted. These waters have severe impacts.

Stressed: Waterbody uses aren't significantly limited or restricted, but occasional water quality, or quantity conditions and/or associated habitat degradation periodically discourage the use of the waterbody.

Threatened: Water quality presently supporting best use and ecosystem experiencing no obvious signs of stress; however, existing or changing land use patterns may result in restricted use or ecosystem disruption. These waters are the least impacted.

The primary pollutants impacting best uses can result from land use activities within a watershed and include nutrients (phosphorus and nitrogen), sediment, toxic substances (pesticides and petroleum products), pathogens, oxygen-demanding substances (organics such as manure and whey) and elevated water temperatures (thermal stress). In any given watershed there are a number of potential sources of these pollutants such as: agriculture, timber harvesting, construction activities, land disposal of waste, and modifications to streambanks or stream channels.

In many areas of the state there are watershed management plans or aquifer/wellhead protection plans that identify pollutants of concern and land uses or activities that pose a potential risk to water quality. Agricultural Environmental Management (AEM) Strategic Plans at the County level address agricultural sources of pollution that may impact water quality.

Glossary

Aquifer: Water bearing soil or rock formation that is capable of yielding usable amounts of water.

Best Management Practice (BMP): Methods, measures or practices determined to be the most practical and effective in preventing or reducing the impact of pollutants generated by nonpoint sources.

Concentrated Flow: The rapid flow of water through a field that may result in the formation of gullies.

Contamination: Alteration of a water resource by the introduction of a chemical or other substance or the raising of water temperature so that the water resource is unfit for a specified use.

Erosion: Detachment and movement of soil caused by rain or surface water runoff.

Hardpan: Also referred to as fragipan, is a dense and brittle layer in soils that owe their hardness mainly to extreme density or compactness rather than high clay content or cementation. This layer is so dense that roots cannot penetrate and water moves through it very slowly.

Highly Erodible Land (HEL): Land containing soils with a high susceptibility to erosion when cultivated based on soil erodibily, slope, slope length and rainfall factors.

Hydrologic Soil Group: Refers to soils grouped according to their runoff and leaching characteristics.

Hydrologic Unit Code (HUC): A numerical designation for cataloging watersheds nationwide used by the U.S. Geological Service and the USDA Natural Resources Conservation Service.

Land Capability Class: Shows in a general way suitability of soils for growing crops. Capability classes are designated by Roman numerals I – VIII. The numerals indicate progressively greater limitations. The subclass "w" indicates that water in or near the soil interferes with plant growth or cultivation.

Leaching Potential: Estimate of the possibility for the downward movement, through the soil, of chemical substances dissolved in water.

Pathogens: Any microorganism that causes disease, such as a bacterium or virus.

Primary Aquifer: Highly productive aquifers (yields greater than 50 gallons per minute, thickness of saturated deposit greater than 20 feet, or area of aquifer 5 to 10 square miles).

Principal Aquifers: Potential sources of public drinking water with yields greater than 10 gallons per minute that are not presently being used intensively as a water source by a major municipal system.

Runoff: That portion of precipitation; such as rain, snowmelt or irrigation water; that flows over the land surface.

Sinkhole: A natural depression in a land surface that connects with a subterranean passage. Sinkholes usually occur in limestone regions and are formed by solution or collapse of a cavern roof.

Soil Map: A map showing where various soil types are distributed in a given area (most often published in a county report).

TMDL: A Total Daily Maximum Load (TMDL) is a regulatory term in the Clean Water Act describing the value of the maximum amount of a pollutant that a waterbody can receive while still meeting water quality standards. Alternatively, TMDL is an allocation of that water pollutant deemed acceptable to the subject receiving waters.

Waterbody: A lake, pond, stream, river, reservoir, wetland or bay.

Watercourse: Water flowing over a non-vegetated channel to a waterbody.

Watershed: The geographic region within which water drains to a particular river, stream, or body of water. Large watersheds may be composed of several sub-watersheds.

Tools and References

The following tools and references may be helpful when filling out this worksheet:

- Your county's AEM Strategic Plan
- USDA Natural Resource Conservation Service (NRCS) County Soil Survey Report, Soil and Water Features Table; http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm
- NRCS Field Office Technical Guide, Sections I and II; http://efotg.sc.egov.usda.gov/efotg_locator.aspx
- 7.5 minute U.S. Geological Survey (USGS) Topographic Map;
- GIS based aquifer maps for NYS: http://www.nysgis.state.ny.us/inventories/health.htm
- Regional scale surficial & bedrock geology maps for NYS: http://www.nysm.nysed.gov/gis/

AEM ID: _____ Date: _____

Part 1: Potential Water Resource Concerns for the Farm

A. Potential Farm Groundwater Issues

Has there been groundwater contamination or concerns about groundwater issues on or near the farm? Yes ____ No_____

If yes, explain_____

Is the farm, including crop fields, adjacent to homes that rely on wells or spring developments for drinking water? Yes _____ No _____

Is the farmstead or any of the crop fields within 300 feet upslope or at grade with the wellheads or springs? Yes _____ No_____

If yes, describe locations: _____
_____
_____

Does the farm sit atop a primary or principal aquifer? Yes ____ No _____ Identify: _____

B. Potential Farm Surface Water Issues

In which watersheds and sub watersheds is the farm located? *Note: the farm may be in more than one watershed, if so list all watersheds.*

Name of Twelve Digit HUC Watershed(s) _____ _____

Name of stream(s) _____ _____

Name of river(s) _____ _____

Name of lake/reservoir, bay or estuary _____ _____

Do any of the watersheds/sub watersheds above have a TMDL designation? Yes _____ No _____

Which ones _____

What are the pollutants of concern for the TMDL _____

C. NYSDEC Waterbody Inventory & Priority Waterbodies List

In order to fulfill certain requirements of the Federal Clean Water Act the New York State Department of Environmental Conservation must provide regular, periodic assessments of the quality of the water resources of the state. This information has been compiled into an inventory data base used to record current water quality information, characterize known or suspected water quality problems and issues, and track progress toward their resolution. www.dec.ny.gov/chemical/36730.html

Are any of the waterbody(s) listed in Section B of this worksheet included on NYSDEC's Waterbody Inventory/Priority Waterbody List (WI/PWL)? Yes _____ No _____.

If yes, summarize information available from the Waterbody Inventory Data Sheet in the table below:

Waterbody Name	Classified Use	Use Impairment	Severity (level of impact – threatened, stressed, impaired, precluded)	Pollutants of Concern	Known or Suspected Sources (circle if primary)

D. Identification of Public Drinking Water Sources – NYSDOH Source Water Assessment Report

The New York State Department of Health (NYSDOH) has conducted a susceptibility analysis of each source of water that is used to supply drinking water to the public. *Note: assessment reports were provided to Conservation Districts by the NYSDOH in February 2005 containing assessments for all the public water systems in the county. Since the information used to create these reports is now over 10 years old, Districts may add or delete information related to the "Contaminants of Concern" to reflex current conditions as appropriate.*

Use the table below to summarize the potential sources of contamination for those public water supply sources such as rivers, lakes or reservoirs downstream from the farm or public wells within one mile of the farm that are at risk from agricultural activities.

Source Water Assessment Summary of Significant Findings **Name of public drinking water supply_____** **Water Source (e.g. spring, well, river, lake, reservoir)_____**			
Potential Sources of Contamination	**Potential Impacts to Water Source**	**Contaminates of Concern**	**Description**

AEM ID: _____ Date: _____

Part 2: Farm Soils/Topography

Soils on a farm vary in their ability to transmit water to surface and groundwater sources. The potential for runoff and leaching can be assessed for different soil types by referring to the County Soil Survey/Web Soil Survey http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

If potential ground water concerns were identified in Part 1 of this worksheet there may be a heightened risk of groundwater pollution if soils are farmed that (check below):

___ Are glacial outwash or well drained alluvial soils over sand or gravel deposits.

___ Are less than 20" to fractured bedrock.

___ Contain sinkholes, or are less than 40" deep over limestone.

___ Adjacent to/or above the farm's water supply (well or spring).

Or, if surface water concerns were identified in Part 1 there may be a heightened risk of polluting nearby waterbodies if soils are farmed that (check below):

___ Have slopes greater than 8 percent, or are highly erodible (HEL) that lack best management practices for controlling surface runoff.

___ Are predominately clay soils, or shallow soils over hardpan or unfractured bedrock.

___ Have seasonal concentrated flows or conservation practices such as subsurface drainage tile that directly outlet into a waterbody.

___ Are seasonally saturated (land capability class 2w or wetter).

___ Are within 100 feet of a waterbody.

___ Flood frequently (once every 2 years).

Those areas checked above are considered hydrologically active areas. These are areas that can have a high potential for transporting pollutants to surface and groundwater depending on their location (proximity to a waterbody) and type of farming conducted on them.

AEM ID: _____ Date: _____

List areas of the farm to be assessed further based on the results of Part 2 of this worksheet, as these areas of the farm may be hydrologically active and should be a priority for Tier 3 planning: _____

_____

Part 3: Other Natural Resource Concerns/Opportunities

Are there programmatic or additional natural resource concerns or opportunities identified for the watershed or the farm: *(please check or identify)*

Threatened or endangered species _____
Invasive species _____
Air quality non-attainment area _____
Farmland protection participant _____
Concentrated Animal Feeding Operation _____
State or Federally regulated wetland _____
Certified Organic farm _____
Other: _____

_____

AEM Tier 2 Worksheet
Agriculture & the Community

Purpose of this Worksheet

1. **Document the economic, social, recreational and environmental benefits** of a farm to the community in which it is located.

2. Identify opportunities for a farm to **improve neighbor and community relations**.

This worksheet should be completed when **neighbor relations** have been identified as a concern in the Tier I questionnaire, or if a farm will be part of a watershed protection effort.

This worksheet should also be completed if a municipality (town or county) is undertaking **farmland preservation** efforts and wants to document the multiple public benefits of retaining a viable agricultural industry within the community.

1. Value to the Local Tax Base

For every dollar paid in taxes, residential areas require $1.11 in public services compared to only .33 cents in services required by farmers*.

This information can be used to calculate how farms keep the tax base low in a community by requiring much less in public services than residential land.

For example:

Farmland:

A 100 acre farm pays $12,000 per year in taxes:

$12,000 (taxes) x .33 (cost of services) = $3,960 in public services annually.

This farmland provides a **savings** to the town of $8,040 per year.

Residential Property:

The same 100 acre farm is developed where zoning allows for 1/2 acre lots and average taxes are $2000 per year:

> 200 (1/2 acre lots) x $2000 (tax) x 1.11 (cost of services) = $444,000 in public services annually ($2,220 per lot)
>
> $2,220 (cost per lot) – $2000 (tax) = $220 per residence x 200 = $44,000 per year more in the cost of services than generated by taxes.

The development of this farm into residential lots **costs** the town $44,000 per year more to provide public services than what is generated by taxes.

* Source: American Farmland Trust

2. Farm's Contribution to Local Food Supply

- Farm products locally grown and sold (list products) _____

  _____

- Marketing Mechanism (check those that apply):

  Cooperative: ____ Producer/Grower ____ Food

  Direct: ____ Restaurant ____ Store ____ Roadside Stand ____ Farmers' Market ____ Supermarket Chain

  ____ Other (list) _____

3. Contribution to Local Economy

Economic activity generated by the agricultural sector tends to have a larger impact on the local economy than dollars produced by other industries. Farmers typically spend more locally than other businesses, since they rely on a variety of local businesses such as feed and seed dealers, fertilizer and fuel companies, machinery dealerships and repair shops, veterinarians, grain haulers, etc.

- Local Businesses Utilized: _____

  _____

- Families Supported : _____

- Farm's Gross Sales (circle one) <$10,000 $10,000 - $99,000 $100,000 - $500,000 >$500,000

The economic multipliers listed below can be used with gross sales data to determine the local contribution of an individual farm and compiled to reflect the economic contribution of farms in your county or watershed:

Gross Sales _____ x _____ (Income Economic Multiplier *****) = _____

Jobs Provided _____ x _____ (Employment Economic Multiplier ******) = _____

* **Total Income Economic Multipliers:** Dairy 2.29, Crops 2.28, Nursery 1.78, Poultry and Livestock 1.64

** **Employment Economic Multipliers:** Dairy 1.52, Crops 1.51, Nursery 1.39, Poultry and Livestock 1.37

(Source: *NYS Dept. of Labor* and *CALS/Cornell University*)

4. Public Recreational Benefit

- Public Access Allowed ____ Yes ____ No

- Recreational Opportunities Available (check those that apply):

  _____ Hiking _____ Hunting

  _____ Cross country skiing _____ Swimming

  _____ Snowmobiling _____ Picnicking

  _____ Fishing _____ Other (list) _____

- Comments:
  _____

5. Tourism Benefits

- Farm is part of a desired view shed _____ Yes _____No

  …that promotes tourism _____ Yes _____No

  …that adds to the quality of life in the community _____ Yes _____No

6. Farm Location

Additional opportunities and considerations can be determined based on farm location.

- Proximity of farm relative to: Nearby or Distant Comments

  Recreational or wilderness areas _____ _____

  Agricultural businesses _____ _____

  Nonagricultural businesses _____ _____

  Residential housing _____ _____

  Public buildings _____ _____

  Tourist areas _____ _____

7. Farmland Preservation

- Does this farm contain a conservation easement? _____ Yes _____ No
- Is this farm part of an Agricultural District? _____ Yes _____ No
- Does this farm have a conservation (CNMP) plan that is being followed? _____ Yes _____ No
- Acres of prime and important farmland soils: _____
- Recent capital improvements to farm (list):

  _____

- Historical significance of farm (explain):

  _____

8. Drinking Water Supply Protection Benefits

- Is the farm located within the:

  recharge area of public well? _____ Yes _____No

  watershed of reservoir, river etc. that provides public drinking water? _____ Yes _____No

If yes, are conservation (best management) practices being installed to protect a down gradient drinking water supply? ___ Yes ___No

Identify practices: _____

9. Archeological Sites & Other Protected Cultural Resources

- Have archeological sites and other cultural resources been identified? _____ Yes _____No
- Are these sites and resources adequately preserved? _____ Yes _____No

10. Rural Fire Protection Benefits

- Does the farm contain a pond or other water source that local fire departments have year-round access to when fighting fires in the area?

  _____ Yes _____No

11. Natural Resource Protection & Enhancement Benefits

- **Stream Corridor Management:**

  length of streambank _____ feet

  length of riparian buffers being maintained _____ feet

  length of riparian buffers being installed _____ feet

  acres of floodplain not being encroached upon _____ acres

  stream bank and shoreline protection measures installed _____ feet; type _____

  fish stream improvement measures installed _____ feet; type _____

  spawning areas maintained for (type of fish) _____

- **Woodland Management:**

  Acres _____ Forest type _____

  Do you have a forest management plan? _____ Yes _____No

  If yes, have you implemented erosion and sediment control practices when conducting timber harvesting activities? ___ Yes ___No

  Have you planted trees? _____ Yes _____No

  If yes, purpose: reforestation _____ acres windbreak _____ feet other (list) _____

- **Wildlife Management:**

  Types of game species present _____

  Wildlife upland habitat management _____ acres

  Species being managed for _____

  Threatened and/or endangered species habitat: _____ Yes _____No

- **Wetlands Protection/Restoration:**

  Total acres _____ Types _____

  _____ Acres protected _____ Acres restored _____ Acres constructed _____ Acres enhanced

  Objectives of wetlands improvement:

  _____ Flood protection _____ Water quality protection _____ Aquatic wildlife habitat management

- **Erosion and Sediment Control:**

  Does the farm contain Highly Erodible Land (HEL) acres? _____ Yes _____No

  If yes: HEL acreage _____

  Are these HEL acres adequately protected from erosion? _____ Yes _____No

12. Environmental Protection

- Are you implementing practices to control:

  erosion? _____ Yes _____No

  nutrient runoff/leaching? _____ Yes _____No

  pesticide leaching/runoff? _____ Yes _____No

  odors? _____ Yes _____No

  dust? _____ Yes _____No

  mud/manure on roads? _____ Yes _____No

  noise? _____ Yes _____No

  flies? _____ Yes _____No

- Comments:

  _____

  _____

13. Environmental Impact Monitoring

- Do you consider how your farm activities affect:

  Water quality _____ Yes _____No

  Air quality _____ Yes _____No

  Soil quality _____ Yes _____No

- Do you regularly inspect and maintain your conservation practices to ensure they are operating effectively? _____ Yes _____No
- Comments:

_____

_____

14. Neighbor Relations

- **Do you:**

pay attention to the appearance of your farm and farm equipment? _____ Yes _____No

have an information sheet about the farm operation listing contact information for questions and concerns? _____ Yes _____No

consider neighbor concerns regarding issues such as pesticide application, manure storage and spreading? _____ Yes _____No

hold an open house on the farm? _____ Yes _____No

host a community picnic? _____ Yes _____No

provide sample farm products? _____ Yes _____No

provide labor or equipment assistance for emergencies? _____ Yes _____No

provide information/remediation for any spills? _____ Yes _____No

allow use of your farm for educational and/or research purposes? ***If yes***, list groups below: _____ Yes _____No

_____

other: _____

_____

15. Practices in Consideration of Neighbor Concerns

- Management practices implemented or modified in consideration of neighbor concerns:

  manure incorporation _____ Yes _____No

  timing of manure spreading _____ Yes _____No

  timing of pesticide application _____ Yes _____No

  timing of roadway use _____ Yes _____No

  timing of field work _____ Yes _____No

  other: _____

  _____

  _____

- Comments: _____

_____

AEM Tier 2 Worksheet
Greenhouse Gas Mitigation Opportunities

Glossary

Adaptation: Management changes to reduce risk and/or realize opportunities presented by climate change.

Anaerobic: Absence of oxygen.

Best Management Practices (BMPs): Conservation practices to control pollution.

Carbon Cycle: The global exchange of carbon among the atmosphere, oceans, vegetation, soils, and geologic deposits.

Carbon Dioxide (CO_2): The dominant greenhouse gas (GHG). It is emitted primarily from fossil fuel combustion, but also loss of soil organic matter and deforestation.

Carbon Sequestration: Storage of carbon in a biological or geological sink. Biological sinks are soil, trees, and oceans.

Climate Change: A significant change from one climate pattern to another. During recent decades human-induced climate change has occurred much faster than most previous natural climate changes.

Concentrated Animal Feeding Operation (CAFO): Animal feeding operation that (a) confines animals for more than 45 days during a growing season, (b) is in an area without vegetation, and (c) meets certain size thresholds.

Global Warming Potential: The potency of a particular greenhouse gas. The common unit is a carbon dioxide equivalent or CO2e. Methane (CH4) and nitrous oxide (N2O) have global warming potentials of 34 and 298 CO2e, respectively.

(Continued Page 2)

Background

Climate change caused by increased emission of greenhouse gases (GHG) to the atmosphere is an important issue that affects agriculture. Some agricultural practices emit GHG, while others reduce GHG emissions. Globally, agriculture is responsible for approximately 20% of annual GHG emissions (IPCC). In the United States, agriculture is responsible for roughly 8% of GHG emissions (US EPA). New York State accounts for 1% of the global total emissions, but agriculture only contributes an estimated 2% of the State emissions because of high emissions of GHG from non-agricultural activities. Nonetheless, agriculture in New York State can continue to advance management for reduced greenhouse gas emissions as a part of the global effort to curb climate change. For example, improving dairy diets has reduced enteric (methane-based) GHG emissions from dairy cows, and improved management of nitrogen fertilizer has reduced nitrous oxide emissions (a very potent GHG). Additionally, some agricultural practices have the potential to reduce GHG emissions from other sectors, such as bioenergy reducing emissions from electric generating stations.

Agricultural GHG emissions come primarily from three gases: methane (CH_4), nitrous oxide (N_2O), and carbon dioxide (CO_2). While CH_4 and N_2O emissions are much lower in volume than CO_2, these GHGs have a much greater ability to trap heat in the atmosphere. To simplify GHG accounting, each gas is assigned a value called the **Global Warming Potential** (GWP) that shows its ability to trap heat in the atmosphere compared to CO_2. The unit for GWP is the **carbon dioxide equivalent** (CO_2e). Over a 100-year period, methane and nitrous oxide are 34 and 298 times more potent than CO_2, so they have GWP values of 34 and 298, respectively.

AEM Principle:

Agricultural practices can reduce greenhouse gas (GHG) emissions while maintaining other valued services from farms, such as inexpensive food, scenic landscapes, habitat, stormwater management, economic development, and clean air and water.

Glossary continued …

Greenhouse Gas (GHG): Any gas that absorbs infra-red radiation in the atmosphere. Greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxide, halogenated fluorocarbons, ozone, perfluorinated carbons and hydrofluorocarbons.

Greenhouse Effect: Greenhouse gases allow radiation from the sun to pass through the Earth's atmosphere, but prevent most of the heat from the Earth's surface from escaping into outer space. Humans have increased greenhouse gases in the atmosphere and increased the greenhouse effect.

Intergovernmental Panel on Climate Change (IPCC): The IPCC summarizes the latest scientific, technical, and socio-economic information related to human-induced climate change, its observed and projected impacts, and options for adaptation and mitigation.

Methane (CH_4): A potent greenhouse gas that has a Global Warming Potential of 34.

Methane Destruction: Combustion destroys methane by turning it into CO_2 and water. Because methane has a GWP of 34, methane destruction decreases its GHG impact 34-fold. A covered earthen manure storage unit that flares biogas is an example of methane destruction.

Mitigation: Efforts to reduce or prevent emission of GHG.

Nitrous oxide (N_2O): An extremely potent greenhouse gas that has a global warming potential of 298.

Regional Greenhouse Gas Initiative (RGGI): An agreement made by 10 Northeastern States to cap emissions of GHG from electricity generation using a cap-and-trade program.

Weather versus Climate: Weather describes atmospheric conditions for a specific place and time (often short-term, like a day), while climate is the average of those weather conditions over long periods of time.

Background Continued…

In 2008, NYS expanded AEM by including greenhouse gases, air quality, and energy in its management and outreach scope. "There is hereby established within the Department an Agricultural Environmental Management program to assist farmers in maintaining the economic viability of their farm operations while addressing environmental impacts from those operations, including, but not limited to, soil, air and water pollution and greenhouse gas emissions." Sometimes managing for one resource is detrimental to another resource. This worksheet is aimed at identifying opportunities and tradeoffs when considering farm GHG emissions in the context of broader stewardship goals.

Topics Included

This worksheet is an introduction to key GHG mitigation opportunities on farms, but does not include all agricultural sources and sinks of GHG. It highlights six management areas that provide important opportunities to reduce GHG emissions using existing agricultural practices. Management areas include:

Dairy Feed Management
Manure Storage
Manure and Fertilizer Nitrogen Management
Forest Management
Soil Organic Matter Management
Energy Efficiency

The worksheet also indicates potential effects of management on other resources, including financial, water quality, air quality, habitat, etc., as well as a farm's ability to adapt to climate change. To use the worksheet, compare the water quality assessment rating taken from the referenced AEM Tier 2 worksheet with the rating generated for GHG mitigation in this worksheet and with potential impacts on adaptation to climate change and other areas of farm management.

Links to Tools and References

NRCS Climate Change Resource Page:
www.nrcs.usda.gov/wps/portal/nrcs/main/national/climatechange/

Cornell Institute for Climate Smart Solutions (CICSS): http://climateinstitute.cals.cornell.edu/

Climate Smart Farming: http://climatesmartfarming.org/

Carbon Trading: www.agcarbontrading.org

Animal Agriculture and Climate Change: https://animalagclimatechange.org

NY State Bill S8148/A10685:
http://assembly.state.ny.us/leg/?default_fld=&bn=S08148&term=2007&Summary=Y&Text=Y

AEM Tier 2 Worksheet:

Dairy Feed Management

Greenhouse Gas Mitigation Opportunities

Potential Opportunity

General Note: Improved dairy feed management increases nitrogen use efficiency and decreases enteric methane emissions. Additionally, the greater the feed efficiency, the less manure is produced per unit milk. With less manure there are fewer volatile solids and therefore less methane production and emission from manure management. There is also less nitrogen and therefore less nitrous oxide emission from manure.

WATER				
Overall Rating from Management of Dairy Feed Nutrients Tier 2	**Beneficial 1**	**2**	**3**	**Detrimental 4**
Water Quality Effect	Beneficial. The more efficiently the cow utilizes nitrogen and phosphorus in the feed, the less that ends up in the watershed.			Detrimental. Inefficient dairy feeding leads to lower milk production per unit feed and may increase nitrogen and phosphorus imports and losses to the watershed.
GREENHOUSE GASES				
Are animals fed in groups?	High producing cows, low producing cows, dry cows, transition cows, and multiple heifer groups are each fed separately or distinct rations as individuals.		Lactating, dry cows and heifer groups are each fed separately or distinct rations as individuals	No.
How often are feed rations balanced?	Rations are balanced monthly or more often as feed quality changes.	Rations are balanced at least 4 times a year or more often if forages change.		No regular ration balancing is done.
How often are forages tested for quality?	Forages are analyzed for nutrient content monthly or more often if forages change.	Forages are analyzed for nutrient content at least 4 times a year or more often if forages change.		Forages are not regularly analyzed.

How closely are the nutritionist's recommendations followed?	Very Closely.	Closely.	Somewhat Closely.	Do not interact with a nutritionist on a regular basis.
Are the Milk Urea Nitrogen (MUN) values within the normal range of 8-12?	Yes.			No.
Greenhouse Gas Mitigation Effect	Beneficial. Feed management often reduces nitrogen imports to farms, and improves nitrogen cycling between a farm's herd and crop fields. More efficient use of feed means less nitrogen and volatile solids available for production of N_2O and CH_4 in manure management (See Nitrogen Management and Manure Storage sections) as well as reduced enteric CH4. Additionally improved feed efficiency reduces the amount of feed per unit of milk – which reduces emissions from growing, harvesting, and transporting feed.			Detrimental. Excess nitrogen in the diet increases N in manure. Nitrogen not taken up by plants is lost to the ecosystem including increased N_2O emissions.
Overall GHG Rating	**Beneficial** **1**	**2**	**3**	**Detrimental** **4**
Adaptation to Climate Change	As agricultural land becomes more active to produce bioenergy to reduce fossil fuels and/or as crop yields are affected by extreme weather, more efficient use of feed will help farms manage risk. More intensive herd			Inefficient dairy feeding may reduce a farm's ability to cost-effectively produce enough feed in an environment with increased competition for land and year-to-year variability in crop quality and yield. Herds may be more susceptible to stress from extreme heat, cold,

	management may also help herds adapt to extreme weather patterns/climate change.			etc. from changing climate patterns.
Other Impacts	Well-managed diet may increase milk production per unit of feed, reduce costs, and increase profits. Air quality may improve due to lower particulate matter emissions.			Herd productivity and profitability may suffer. Increased nitrogen emissions can contribute to airborne particulates.

Summary Note: Precision dairy feed management often reduces nitrogen imports to farms, increases feed and land-use efficiency (milk production per unit of feed as well as per acre), decreases enteric methane production, and improves nitrogen cycling between a farm's herd and crop fields. More efficient use of nitrogen leads to less surplus nitrogen in the soil and reduced nitrous oxide emissions. Improved milk production per acre decreases production and supply chain GHG emissions (e.g., from fertilizers, tractors, transportation) associated with growing and transporting the grain and forage crops. If a farm uses anaerobic storage, precision dairy feed management also reduces the volatile solids that produce methane from stored manure, therefore reducing methane emissions.

AEM Tier 2 Worksheet:

Dairy Manure Storage

Greenhouse Gas Mitigation Opportunities

Potential Opportunity

General Note: Anaerobic (lacking oxygen) storage systems produce methane, more in the warm summer, less in cool and cold periods. The deep pit storage units commonly used in NYS are mainly anaerobic. While deep pit manure storage helps improve manure management from a water quality standpoint, it can increase greenhouse gas emissions as compared to daily spreading.

WATER				
Overall Water Rating Manure and Fertilizer Storage Tier 2	**Beneficial 1**	**2**	**3**	**Detrimental 4**
Water Quality Effect	Beneficial when used to enhance management of manure and fertilizer nutrients in crop fields.			Detrimental. Runoff and/or leaching of manure and/or fertilizer nutrients poses higher risk to surface and/or ground water quality.
GREENHOUSE GASES				
Does your farm store manure? If yes, how many months of storage capacity exists? What type and number of animals contribute to the storage?				
How is most manure stored on your farm?	Storage of liquid manure under a cover with methane gas metered and consistently flared or combusted for generation of electricity/ heat or cleaned & compressed natural gas for multiple purpose.	Storage of solid manure under a roof or cover. OR Manure is applied to fields roughly on a daily basis.	Covered storage has a leaky cover, but flare (or electric generator) consistently combust methane.	Anaerobic storage of liquid manure in open air earthen pits or tanks. The meter and flare (or electric generator) with the covered storage does not work reliably.
Greenhouse Gas Mitigation Effect	Beneficial. Methane produced in the anaerobic storage is captured and combusted creating carbon dioxide and water vapor emissions.	Beneficial. Some methane losses from solid manure stored under a roof. Some indirect losses of nitrous oxide from daily applied manure.		Detrimental. Anaerobic storage of manure generates higher methane emissions and if not captured and combusted, increases GHG emissions.
Overall GHG Rating	**Beneficial 1**	**2**	**3**	**Detrimental 4**

Adaptation to Climate Change	Covering storage units can reduce the amount of water from extreme precipitation events from causing overflow.			Uncovered storages are more susceptible to overflow from extreme rain events.
Other Impacts	Covered liquid storage can reduce odor problems. Reduces rainwater hauling. Reduces overflow events. Liquid storage increases flexibility in spring months when intensive field crop workload exists. Liquid storage conserves ammonia-N. Confined spaces and gases (H_2S, CO_2, CH_4, CO) demand more safety management. Can concentrate labor and equipment needs around intensive application periods, requiring efficient nutrient management plans and transfer and application systems.			Uncovered liquid storage can cause odor problems. Can collect rainwater that can overflow or increase hauling costs. Confined spaces and gases (H_2S, CO_2, CH_4, CO) demand more safety management. Can concentrate labor and equipment needs around intensive application periods, requiring efficient nutrient management plans and transfer and application systems. Liquid storage can require more landbase to meet CNMP due to conserving ammonia-N.
Summary Note: Some management practices, such as long-term liquid storage, are beneficial for water quality but detrimental to the atmosphere due to greenhouse gas emissions (for example increasing methane emissions). Because methane is a potent greenhouse gas, mechanisms to capture and flare methane are of the highest priority on dairy farms interested in GHG mitigation, and with such mechanisms, liquid manure storage does not have to increase methane emissions.				

AEM Tier 2 Worksheet:

Manure and Fertilizer Nitrogen Management

Greenhouse Gas Mitigation Opportunities

Potential Opportunity

General Note: Improved crop nitrogen use efficiency reduces loss of nitrogen to surface and groundwater due to processes such as leaching and volatilization and also reduces nitrous oxide emissions. Additionally, significant fossil fuel inputs (and associated CO_2 emissions) are currently required to manufacture synthetic nitrogen fertilizers, so any reduction in synthetic N fertilizer rates represents fewer GHG emissions from their production.

WATER				
Overall Water Rating from Nutrient Management: Manure and Fertilizer Management Tier 2	**Beneficial 1**	**2**	**3**	**Detrimental 4**
Water Quality Effect	Beneficial. Efficient nutrient recycling by crops is achieved through applications based on the right timing, source, rate, and method.			Detrimental. Unused N may enter ground and surface waters. Opportunities exist to improve manure and fertilizer use for both crop production and water quality.
GREENHOUSE GASES				
Do you keep records of nutrient applications to fields?	Records are kept for each field of the amount applied, source, timing, application method, crop yield, and rotation.		Records are kept only of the amount applied.	No records of amount N applied, crop yields, or rotations for each field.
How often do you test manure for nutrient content?	There is a history of manure testing that characterizes variability throughout the year. **AND** Manure is tested every year.		Manure is tested at least every other year.	Manure is rarely or never tested.
How is nitrogen application rate determined?	Account for past and current manure application rates, soil N supply potential, crop history, and yield records. **AND**		Some consideration of previous manure application rates, soil nitrogen supply	No accounting of previous manure application rates, soil nitrogen supply potential, crop history, or yield records.

	Routinely conduct field nitrogen management tests. **AND** Only enough N is applied to provide crop needs.		potential, crop history, or yield records.	
What is the timing of synthetic and manure N application?	Applied as close to the period of maximum crop nitrogen uptake as possible, often as a split application.			Fertilizer and/or manure is applied outside the growing season.
Greenhouse Gas Mitigation Effect	Beneficial. Efficient nitrogen use by crops leads to less direct and indirect N_2O emissions.			Detrimental. Surplus nitrogen not taken up by crops may be emitted from the soil as N_2O.
Overall GHG Rating	**Beneficial** **1**	**2**	**3**	**Detrimental** **4**
Adaptation to Climate Change	High levels of nutrient management will help maintain and/or improve crop yield and quality during changing climate patterns as well as make the most of expensive cropland.			Inefficient nutrient management may further jeopardize crop yield and quality during adverse conditions brought on by climate change.
Other Impacts	Reduced synthetic fertilizer N use reduces both costs and GHG emissions from fertilizer manufacturing. Air quality may improve due to lower particulate matter emissions.			Synthetic N is both very costly and very energy intensive making it both a high GHG emitter and expensive for the farm. Increased nitrogen emissions can contribute to airborne particulates.

Summary Note: Improved timing of field application coupled with more accurate N rates result in increased crop nitrogen use efficiency, decreased potential for negative effects on water quality, and reduced GHG emissions. Potentially higher or sustained yields with lower fertilizer N inputs represent reduced costs and increased profits, along with reduced supply chain emissions from avoided fertilizer purchases.

AEM Tier 2 Worksheet:

Forest Management

Greenhouse Gas Mitigation Opportunities

Potential Opportunity

General Note: Twenty percent of farm land in New York is forested. Forests provide many benefits including improved water quality and climate change mitigation. Forests store carbon in trees and in soil and also in long-lived wood products after harvest. Forests can provide renewable fuel by means of bioenergy which if used efficiently can reduce fossil fuel use and GHG emissions. Forests also provide habitat for many species of plants and animals. Forests in riparian areas next to streams can remove excess nutrients and provide shade to maintain habitat and cool water temperatures needed by some fish species. Perennial cropland provides many of these same benefits including reduced erosion, increased soil carbon sequestration, and habitat.

WATER				
Overall Rating from Forest Management Tier 2	**Beneficial 1**	**2**	**3**	**Detrimental 4**
Water Quality Effect	Healthy, well-managed forests and forest road systems help protect soil and water resources.			Loss of canopy to soften rainfall impact as well as poorly managed forest roads increase soil erosion and nutrient loss.
GREENHOUSE GASES				
Does the landowner have a forest management plan?	Forest management plan is prepared by a professional forester and is being followed. The plan is less than 10 years old.	No forest management plan. OR Plan is not being followed.	Not using best management practices for harvest.	Conversion of forestland to development or cropland.
Greenhouse Gas Mitigation Effect	Managing a forest sustainably for long-lived timber products or bioenergy will increase the carbon sequestration per acre.	An unmanaged forest does not have maximal growth potential, reducing its ability to sequester carbon.	Detrimental. Poor management can increase erosion and decrease water quality. Poor management can also reduce growth rates and increase undesirable species.	Detrimental. Significant loss of soil carbon. Loss of timber product carbon sequestration potential.
Overall GHG Rating	**Beneficial 1**	**2**	**3**	**Detrimental 4**

Adaptation to Climate Change	Healthy forests are less susceptible to damage from diseases, pests and climate change.			
Other Impacts	Improved long-term profits, greater forest health, greater animal and plant species diversity.	Animal and plant habitat maintained.	Short term profits, but sustained income from forest may be in jeopardy.	Loss of forest habitat. If converted to residential or commercial development, issues with stormwater management, neighbor relations, and availability of cropland may arise.
Summary Note: Well-managed forests can reduce GHG emissions, improve water quality, and provide short and long-term financial benefit from sustainable harvesting.				

AEM Tier 2 Worksheet:

Soil Management

Greenhouse Gas Mitigation Opportunities

Potential Opportunity

General Note: It takes decades to build up (sequester) soil carbon, but only months or a few years to lose it due to tillage and other practices. Soil carbon (closely related to soil organic matter) is beneficial for soil health for many reasons, including improved water infiltration, improved water retention, reduced erosion, improved tilth, improved biological activity, and improved nutrient cycling. Increasing the amount of carbon stored in soils has multiple benefits, including reducing carbon dioxide in the atmosphere.

WATER				
Overall Rating from Soil Management Tier 2	**Beneficial 1**	**2**	**3**	**Detrimental 4**
Water Quality Effect	Adequate soil organic carbon is important for soil health (the capacity of a soil to function) which has a direct impact on crop production and an indirect impact on water quality. Healthy soils are able to absorb and supply water, retain nutrients, suppress pests and weeds, and produce high crop yields.			Unhealthy soils with less soil carbon are more likely to erode, have a higher potential for runoff during storm events, and make crops more vulnerable during droughts. Soil erosion can carry sediments, nutrients and pesticides to surface water bodies degrading water quality.
GREENHOUSE GASES				
Roughly what portion of your land is in each of these categories	Conversion of annual cropland to perennial cropland or forestland _____%	Conservation Tillage _____%	Conventional Tillage _____%	Conversion of perennial cropland or forestland to annual cropland _____%
Greenhouse Gas Mitigation Effect	Beneficial. Perennial crops, pasture, and forest root systems sequester soil carbon and use nutrients more efficiently, reducing GHG emissions.	Over many years, carbon can be sequestered in soil but this process can be quickly reversed if tillage is later increased making it difficult to qualify as 'permanent' mitigation of GHG.	Conventional tillage reduces soil organic carbon and increases CO_2 emissions.	Detrimental. Conversion of forest to cropland results in large release of carbon, relatively quickly.

Overall GHG Rating	Beneficial 1	2	3	Detrimental 4
Adaptation to Climate Change	Compared to annual crops, the root systems of perennial crops can greatly reduce erosion from extreme rain events.	Healthy soils are more able to absorb and store water in both dry and wet climatic conditions.		Additional acres for annual crops may help manage risk for the livestock herd and farm business. However, annual crops may be more vulnerable to extreme weather events than perennials.
Other Impacts	If maintained as forest, a great deal of carbon is sequestered in trees and in soil.	Improving soil health improves crop yield.		Loss of forest means loss of forest plants and animals as well as reduced ability to remove nutrients from groundwater and surface water. Loss of forests next to streams also increases stream water temperatures which reduces habitat quality.

Summary Note: There is significant opportunity to store carbon in soil for long periods of time, especially with perennial vegetation such as forests and permanent hay or pastureland. However, soil carbon can be lost quickly with tillage, and GHG mitigation benefits are quickly lost if a long term sod is plowed. Increased soil carbon also increases soil health, benefiting crop productivity and water quality. The highest potential for carbon sequestration on agricultural land comes from active management of recently abandoned pastures and fields toward afforestation with optimal woody plant compositions. Although not impossible, changing the make-up of woody plant species on unmanaged fallows or abandoned fields will be much more expensive than active management at the outset.

AEM Tier 2 Worksheet:

Energy Conservation and Efficiency

Greenhouse Gas Mitigation Opportunities

Potential Opportunity

General Note: Nearly all farms use fossil fuels. When fossil fuels are mined and combusted, carbon is moved from very long-term geologic storage into the atmosphere as CO_2 increasing the amount of greenhouse gases in the atmosphere. Eighty percent of human-induced greenhouse gases come from combustion of fossil fuels, so increased energy efficiency can reduce these emissions.

WATER				
Water Quality Effect	There is no Tier II worksheet for energy efficiency impacts on water. However, reduced energy use indirectly impacts water as water is often used for energy generation (hydroelectric dams) and processing (use of river water for industrial cooling, or in mining).			
GREENHOUSE GASES				
Have you had an energy audit to find ways to improve efficiency and reduce use?	Yes, and we have implemented all recommended changes.	Yes, and we have begun to implement changes that are most cost effective.	Yes, but we have not implemented any changes.	No.
Do you track your energy use?	Yes and we look for ways to reduce our consumption.	Yes, but only to track monthly fluctuations in energy use.		No.
Overall GHG Rating	**Beneficial 1**	**2**	**3**	**Detrimental 4**
Adaptation to Climate Change	Farms may need to increase energy use for irrigation, barn cooling, etc. to adapt to changing climate patterns. Energy efficient systems will help control costs.			Potentially higher energy costs could limit a farm's ability to invest in irrigation, barn cooling, and other systems necessary to remain profitable under changing climate patterns.
Other Impacts	Improved energy efficiency often reduces costs and increases profits. Energy efficiency can also improve air quality by reducing emission of pollutants. Energy conservation and improved efficiency reduce GHG emissions to the atmosphere and help mitigate climate change.			Generally more costly. Fossil fuels combusted for energy account for 80% of the global GHG emissions.

Summary Note: Bioenergy can reduce GHG emissions, but does not always do so. Inefficient bioenergy systems such as low-efficiency outdoor wood boilers can reduce air quality and increase GHG emissions. In general, improved energy conservation and energy efficiency provide the greatest opportunities to reduce fossil-fuel based GHG emissions, while reducing costs and saving labor.

SUMMARY:

Working to improve one natural resource may benefit or have detrimental effects on others. Taking stock of how existing and future management affect **soil, water, air, plants, animals, energy, greenhouse gases, people, and economics** can result in more effective plans and additional benefits to farms and communities both now and into the future.

Additional Comments:

As mitigation of greenhouse gases is of value to society at large, there is often interest in quantifying both the GHG emissions from a process and the GHG mitigated by a process. This way, different processes within a sector (a natural gas and a coal electric generating plant can be compared) or across different sectors (emissions from the energy sector can be compared to emissions from transportation or agricultural sectors) can be evaluated for opportunities for mitigation. For example, under the Regional Greenhouse Gas Initiative (RGGI), only the electric sector is regulated for emissions, but they can purchase offsets to achieve their mitigation goals. Offsets are GHG emission reductions achieved by non-regulated parties (e.g., farms). EPA Climate Leaders define credible offsets to have all of the following qualities.

1. REAL: The quantified GHG emission reduction must represent actual emission reductions that have already occurred.
2. ADDITIONAL: The project-based GHG emission reductions must be beyond what would have happened anyway or in a business-as-usual scenario.
3. PERMANENT: The GHG emission reductions must be permanent and must be backed by guarantees in the event that they are reversed (e.g., re-emitted into the atmosphere).
4. VERIFIABLE: The GHG emission reductions must result from projects whose performance can be readily and accurately quantified, monitored, and verified.

For instance, a manure storage with a cover and flare is a good example of a credible mitigation system.

1. REAL: Methane captured and destroyed with a manure storage cover and flare is real, because a meter can measure the amount of methane captured and destroyed. It will not measure the methane that it does not capture, but it will measure the volume of methane that is actually captured and destroyed at the flare.
2. ADDITIONAL: Farms are installing storage to protect water quality. While there are other benefits to covering a manure storage (reducing odors, reduces manure hauling, etc.), there is no 'reason' to cover and flare a storage given the cost of the cover and the relative minor benefits of covering. Thus, it is an additional project.
3. PERMANENT: The carbon in CH_4 that is flared to CO_2 is permanent. Once CH_4 has been oxidized to CO_2, it is 34 times less potent a GHG than CH_4.
4. VERIFIABLE: Manure covers with flare are equipped with meters both for measuring the amount of methane produced and the amount flared. That which is not captured and flared will not show up in the meter and therefore will not count as mitigation.

In the matrix below, the topics included in this worksheet are compared for meeting the standard for obtaining credit as a GHG offset. This ranking is not intended to favor one practice over another. One may choose to do a practice for many reasons other than obtaining credits for a GHG offset. For example, many of these practices will reduce GHG emissions, but they may also be cost-effective. Such practices would be recommended both to improve profits and to reduce GHG emissions, but because they have financial benefits they may not qualify as "additional", and thus may not qualify as GHG offsets.

PRACTICE	REAL	ADDITIONAL	PERMANENT	VERIFIABLE	Comment
Dairy Feed Management	It is highly likely that the benefits are real.	NO. Because feed efficiency is financially beneficial, it is not considered additional.	Likely the benefits are permanent.	It is very difficult to directly measure the benefits, so models must be used, which introduces substantial uncertainty.	
Manure Storage Cover with Flare	YES	YES	YES	YES	
Manure and Fertilizer Nitrogen Management	Reduced N fertilizer use has real benefits.	Probably not. Reducing N fertilizer use is likely to be financially beneficial so may not be additional.	Likely the benefits are permanent.	At this time, it is probably very difficult or expensive to prove the mitigation is verifiable.	
Forest Management	YES	Perhaps not. Good forest management generates high quality wood products which are financially beneficial so may not be additional.			
Afforestation	Perhaps not. For example, converting crop land to forested land does not mean real benefits occur if it requires the equivalent acres of forestland to become deforested in a	YES	YES	YES	

PRACTICE	REAL	ADDITIONAL	PERMANENT	VERIFIABLE	Comment
	different location to produce the crop.				
Soil Carbon Sequestration in Forestland	Likely the benefits are real.	Not likely because existing forest is already sequestering carbon.	If kept in conservation easement as a forest, then yes.	YES.	
Soil Carbon Sequestration in Cropland	Likely the benefits are real.	Perhaps yes, though increases in soil fertility and resulting crop productivity may provide financial benefits so it is not entirely additional.	NO. It takes many more years to build up soil carbon than it takes to lose it.	At this time, it is probably very difficult or expensive to prove the mitigation is verifiable.	
Energy Efficiency	YES	Perhaps not. There would likely be financial benefits so it is not entirely additional.	YES	YES	

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AEM Tier 2 Worksheet
Soil Management

Glossary

Comprehensive Nutrient Management Plan (CNMP): A grouping of conservation practices and management activities that when implemented as part of a conservation management system, will help to ensure that both production and natural resource protection goals are achieved. It addresses natural resource concerns on livestock farms from farmstead, production areas, and fields; including soil erosion, manure, and organic by-products (and their potential impacts on water quality).

Cover Crop: Crops, including grass, legumes and other species, grown for seasonal cover and other conservation purposes.

Crop Residue: Plant material left on the soil surface after harvest. High crop residue crops include hay, small grains, soybeans, and grain corn. Low crop residue crops include corn for silage and most vegetable crops.

(Continued on Page 2)

Background

Soil health indicates the capacity of a soil to function, which has a direct impact on crop production and an indirect impact on water quality. Healthy soils are able to infiltrate water, cycle nutrients, suppress pests and weeds, and produce high yields. Unhealthy soils have fewer of these qualities or require costly inputs to achieve crop yield potentials. Unhealthy soils are also less stable, more likely to erode and have a higher potential for runoff during storm events. This means, less available water for plant growth.

Preventing erosion and enhancing soil quality should be a priority on every farm. It makes good economic and environmental sense. A systems approach to soil conservation provides multiple barriers against soil erosion and water quality degradation. Crop rotations, strip cropping, conservation tillage, and cover crops help protect soil from erosion by wind and water and help maintain or increase soil organic matter. Soil organic matter improves soil tilth, reduces susceptibility to compaction, increases nutrient and water holding capacity, slows the movement of pesticides through the soil, and can protect against erosion. Diversions, waterways, water and sediment control basins, and terraces capture and provide stable flow paths and outlets for runoff. Vegetative filter strips and riparian buffers capture sediments and the nutrients and pesticides attached to them, before they reach watercourses.

(Continued on Page 2)

AEM Principle:

Good soil health improves soil functioning leading to improved crop production and reduced off-site impacts from erosion and runoff.

Glossary Continued…

Ephemeral Erosion: Small rills that concentrate into a defined channel, which are often removed by tillage operations, but may reform each year.

Full-width Tillage: A tillage system that disturbs 100% of the soil surface.

Gully Erosion: Gullies are channels too deep for normal tillage operations to erase. They may grow or enlarge from year to year by head-cutting and lateral widening. Gullies usually occur in depressions and natural drainage ways.

Highly Erodible Land (HEL): Fields defined as highly erodible by the Food Security Act of 1985.

Mulch Tillage: A non-inversion, full-width tillage system that maximizes soil residue levels.

No-till/Strip-till: A one or two pass tillage system that disturbs less than 40% of the soil surface.

Sheet and Rill Erosion: Sheet erosion is the process by which transportation of soil particles begins. Rill erosion occurs as runoff begins to form small concentrated channels, generally less than 4 inches deep, that appear at different locations on the landscape from year to year. Deposition of sediment usually occurs at the end of a rill.

Whole Farm Plan: A grouping of conservation practices and management activities which, when implemented as part of a conservation management system, will help ensure that both production and natural resource protection goals are achieved. It addresses all natural resource concerns, including soil, water, air, plants, animals, and human considerations.

Effective management of soil resources on a farm is a key component to the profitability of the enterprise and the impact the operation has on the environment. Soil erosion can carry sediments, nutrients and pesticides to surface water bodies, degrading water quality. At the same time, soil erosion removes organic matter, nutrients, and topsoil, decreasing soil fertility, tilth, water holding capacity, and other beneficial soil characteristics. In turn, this causes reduced crop growth and inefficient use of crop inputs. Sediment from erosion fills drainage ditches, road ditches, culverts, stream channels, and shortens the life of lakes, reservoirs, and ponds. Excessive tillage, weight and traffic can increase runoff potentials by compacting soil. Protecting soil from compaction can enhance water availability to crops and root growth, resulting in increased yields and less runoff.

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Soil Management		Potential Concern		
Factors Needing Assessment:	**Lower 1**	**2**	**3**	**Higher 4**
Is there a current conservation plan in place that addresses soil management?	There is a Whole Farm Plan or Comprehensive Nutrient Management Plan in place **AND** The plan is up to date and being followed.		Highly Erodible Land (HEL) fields have a plan **AND** The plan is being followed **AND** Non-HEL fields have not been assessed.	There is no plan in place to address erosion **OR** Plan is not being followed **OR** Plan is out of date.
If there is a plan, when was it last updated?				
Is there visible erosion occurring in any fields?	Sheet and rill erosion appear to be under control. AND There is no evidence of ephemeral or gully erosion occurring on the farm and/or evidence of soil deposition.		Minor amounts of sheet and rill erosion are visible.	There is evidence of both ephemeral and gully erosion.
Does sediment from crop fields reach a water course?	Fields have at least a 35 ft. buffer, **AND** Upland erosion is controlled.		Fields have less than a 35 ft. buffer, **AND** Fields slope towards the water course.	Sediment is entering the watercourse.
List fields with erosion concerns:				

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Soil Management	Potential Concern			
Factors Needing Assessment:	**Lower 1**	**2**	**3**	**Higher 4**
What type of tillage practice(s) is used on the farm?	Only continuous no-till or strip till is used, with the exception of periodic incorporation of soil amendments.	A mulch tillage system is used, **OR** Mulch tillage in combination with no-till.		Full width tillage with little to no crop residue at planting.
How is crop rotation used on your farm?	Crop rotation is used and includes rotations of at least 3 years of hay crops, small grains and/or legumes.	Crop rotation is used and includes rotations of at least 1 or 2 years of hay crops, small grains and/or legumes.	Crop rotations are used but do not always include hay, small grains, or legumes.	Crops are not rotated.
What is the minimum level of crop residue cover during the rotation?	A crop residue of 50% or greater is left after planting.	A crop residue of 30% to 50% is left after planting.	A crop residue of 10% to 30% or greater is left after planting.	A crop residue of less than 10% is left after harvest.
How are cover crops managed on an average year?	Proper cover crop rates and timing are used, **AND** Seeding includes a diverse mix, including legumes.	Proper cover crop rates and timing are used, **AND** A single species seeding is used.	Cover crops are used when time and weather permits.	Cover crops are not used.

AEM Tier 2 Worksheet: Soil Management		Potential Concern		
Factors Needing Assessment:	**Lower 1**	**2**	**3**	**Higher 4**
How does your farm manage soil organic matter?	Manure and/or compost are added regularly, **AND** Crop rotations include high residue and/or perennial crops **AND** Cover crops are used regularly, **AND** Reduced tillage practices are used to increase soil organic matter.	Two (2) or three (3) of the practices listed under #1 are part of the farms' management practices.	Only one (1) of the practices listed under #1 are part of the farms' management practices.	Soil organic matter is not a consideration in the farms management.
Are there existing soil and/or water control practices in place in the farm fields (e.g. diversions, WASCOB, waterways, terraces, strip cropping, and buffers)**?** **If yes, complete table on page 7.**				
Are there subsurface drainage concerns on the farm?				
Are the location and/or stability of any water control outlet, surface or subsurface, a concern?				
Are you satisfied with crop yields on an average year?				

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Soil Management		Potential Concern		
Factors Needing Assessment:	**Lower 1**	**2**	**3**	**Higher 4**
How is soil compaction managed on the farm?	Traffic on wet soil is avoided, **AND** Traffic on fields is controlled, **AND** Equipment loads are reduced to minimize weight, **AND** Tillage and crops are selected to manage compaction.	Two (2) or three (3) of the practices listed under #1 are part of the farms' management practices.	Only one (1) of the practices listed under #1 are part of the farms' management practices.	Soil compaction is not actively managed.
Do you know the level of soil organic matter content in farm fields?				
Has the Cornell Soil Health Test been used to manage soils? **If no, would the farm be interested in more information?**				
Is wind erosion a concern on the farm?				
Does erosion occur from irrigation runoff? **(Farms that answer yes should complete the irrigation water management worksheet)**				

AEM ID: _____ Date: _____

Existing Soil and/or Water Control Practices in Place in Farm Fields

Practice	Location (field # or name)	When was it installed?	Is it still functioning?

Benefits to other resources can also be possible while working toward improved water quality. Taking stock of how existing and future management affect **soil, water, air, plants, animals, energy, greenhouse gases, people, and economics** can result in more effective plans and additional benefits to farms and communities both now and into the future.

Additional Comments:

AEM Tier 2 Worksheet
Nutrient Management: Manure and Fertilizer

Glossary

Animal Unit: One animal unit equals 1,000 lbs. of live animal body weight, and correlates to the amount of manure produced.

Concentrated Flow: Flow of water, greater than ½ inch that carries potential pollutants across a vegetative buffer.

Field Runoff Potential: Measurement of risk derived from soil characteristics and topography that estimates the potential for surface loss of nutrients.

Eutrophication: The process of nutrient enrichment and excess algae or plant growth in a waterbody.

Nitrogen Management Tests: Soil and plant tests such as the Pre-Sidedress Nitrate Test (PSNT), Corn Stalk Nitrate Test (CSNT), Illinois Soil Nitrogen Test (ISNT), etc.

Vegetative Buffer: A permanent strip of dense, vigorous perennial vegetation of at least 35 feet in width established and maintained along a watercourse or stream. See NRCS Standards NY 393 (Filter Strip), NY 390 (Riparian Herbaceous Buffer), and NY 391 (Riparian Forest Buffer).

Watercourse: Water flowing over a non-vegetated channel to a waterbody.

Background

Nutrient management using soil tests, crop needs based on realistic yields, and effective application of manure and fertilizer can enhance crop productivity and farm profitability while decreasing farm operating costs. Proper application method, rate, and timing optimize the uptake of nutrients by the crop and minimize nutrient loss to the environment.

If used properly, manure is an excellent crop nutrient source and soil conditioner. Bacterial and protozoan pathogens in manure can pose a human health risk when found in drinking and recreational waters. Nitrate can leach to groundwater, creating potential human and animal health risks. Nitrate, ammonia and phosphorus can also reach surface waters, stimulating undesirable algae and plant growth, and consequently damaging recreational and drinking water uses. Phosphorus is usually the limiting nutrient for plant growth in fresh water and regardless of source can accelerate eutrophication.

Nutrients in fertilizers can also leach to groundwater or be carried by runoff into surface water, degrading water quality. Excessive nitrate concentrations in drinking water can negatively affect human and animal health. In addition to the concerns associated with phosphorus, excess potassium in feed or water can cause animal health problems.

A sound and comprehensive nutrient management plan should account for nutrients from all sources, including prior nutrient applications, soil and crops; incorporate conservation practices that control erosion and manage runoff; and deliver recommendations to minimize losses to the environment through efficient nutrient use by crops.

AEM Principle

Nutrients for crop production used by farms should be applied to land in a manner that optimizes the nutrient value and soil conditioning benefits while protecting surface and ground water resources.

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: **Manure and Fertilizer Management** **Table 1: General**		**Potential Concern**		
Factors Needing Assessment	**Lower** **1**	**2**	**3**	**Higher** **4**
Do you follow an up to date nutrient management plan based on soil tests, crop needs and nutrient sources?				
How many acres typically receive manure application?				
How many animal units do you have? (Complete calculation on page 4)				
If manure is exported off the farm, what percentage is exported?				
Based on the above information, how many animal units do you have per acre of land to which manure is applied?				
How often do you soil test?	All fields are soil tested at least every 1 or 2 years.	All fields are soil tested at least every 3 years.	Fields are soil tested regularly, but less often than every 3 years.	Soil testing is not done regularly on fields.
Does your farm manage soils for optimum pH levels?	Soils are tested for pH and amended with lime to maintain optimum pH.		Lime is applied, but not based on soil test results.	Soils are not amended with consideration of pH levels.
How often do you test manure for nutrient content?	There is a history of manure testing that characterizes variability throughout the year. **AND** Manure is tested every year.		Manure is tested at least every other year.	

AEM Tier 2 Worksheet: **Manure and Fertilizer Management** **Table 1: General**		**Potential Concern**		
Factors Needing Assessment	**Lower** **1**	**2**	**3**	**Higher** **4**
Does your farm regularly use nitrogen management tests (e.g. PSNT, CSNT, ISNT) to adjust nitrogen rates?				
Do you keep records of nutrient applications to fields?	Records are kept indicating the amount applied, source, yields, rotations, and fertilizer applications for each field.		Records are kept indicating the amount applied, only.	No records of amount applied, yields, and rotations for each field.
Do you calibrate manure and fertilizer application equipment?	All nutrient application equipment is calibrated yearly to determine the amount applied per acre.		Nutrient application equipment is calibrated occasionally to determine the amount applied per acre.	Nutrient application equipment is not calibrated.
How is the rate of manure and fertilizer application determined?	Nutrients are applied based on land grant guidelines. **AND** Commercial fertilizer applications are adjusted in order to meet crop needs.	Manure is applied based on crop needs, with nitrogen as the priority nutrient. **AND** Commercial fertilizer applications are adjusted in order to meet crop needs.	Manure is occasionally applied in rates that exceed the nitrogen needs of the crop. **OR** Commercial fertilizer applications only partially take into account nutrients in manure.	Manure is often applied at rates that exceed the nitrogen needs of the crop. **OR** Commercial fertilizer applications do not take into account nutrients in manure.
How is nitrogen application determined?	Account for past and current manure application rates, soil nitrogen supply potential, and crop history. **AND** Routinely conduct field by field nitrogen management tests.		Some consideration of previous manure application rates, soil nitrogen supply potential, or crop history.	No accounting of previous manure application rates, soil nitrogen supply potential, or crop history.

Formula for Calculating Animal Units

Animal Type	Number (from Tier 1)	×	Average Weight (lbs; from Tier 1)	=	Total Weight (lbs)	÷	1000 lbs/Animal Unit	=	Number of Animal Units
		×		=		÷	1000 lbs/AU	=	
		×		=		÷	1000 lbs/AU	=	
		×		=		÷	1000 lbs/AU	=	
		×		=		÷	1000 lbs/AU	=	
		×		=		÷	1000 lbs/AU	=	
								+	
								Total Animal Units for the Farm	

AEM Tier 2 Worksheet: Manure and Fertilizer Management Table 2: Manure Application		**Potential Concern**		
Factors Needing Assessment	**Lower 1**	**2**	**3**	**Higher 4**
Have there been any concerns about manure contamination of wells on or near the farm?				
Are field runoff potentials considered in scheduling manure applications?	Manure is never spread when fields: -- are saturated or frozen -- are prone to flood; or -- when runoff risk is high **AND** Manure is applied just prior to planting or to a growing crop.	Manure is never spread when fields: -- are saturated or frozen -- are prone to flood; or -- when runoff risk is high **AND** Manure is applied during the growing season to fields with the highest runoff potential and outside the growing season to fields with the lowest runoff potential.	Manure is sometimes spread on fields that: -- are saturated or frozen -- are prone to flood; or -- when runoff risk is high **AND** Manure is applied outside the growing season to fields with the lowest runoff potential.	Manure is sometimes spread on fields that: -- are saturated or frozen -- are prone to flood; or -- when runoff risk is high **AND** Fields are not prioritized based on runoff potential.
How close is manure spread to wellheads or springs?	Manure is not spread within 200 ft. from any wellhead or spring.	Manure is not spread within 100 ft. from any wellhead or spring.	Manure is not spread within 50 ft. from any wellhead or spring.	Manure is spread less than 50 ft. from any wellhead or spring.
Are vegetative buffers maintained along watercourses in fields receiving manure?	A vegetative buffer that meets NRCS Standards is maintained along water courses in fields receiving manure.	A naturally occurring buffer of at least 35ft. exists along watercourses adjacent to fields.	A naturally occurring buffer of at least 10ft. exists along watercourses adjacent to fields.	Little or no vegetation exists along watercourses in fields receiving manure.
How close is manure spread to surface waters?	Manure is not spread within 100ft. of surface water. **OR** Manure is not spread within 35ft. of surface water where a vegetative buffer meeting NRCS Standards exists.	Manure is not spread within 35ft. of surface water where a vegetative buffer meeting NRCS Standards exists.	Manure is spread less than 100ft. from surface water where no vegetative buffer exists.	No manure spreading setbacks are used.

AEM Tier 2 Worksheet: **Manure and Fertilizer Management** **Table 2: Manure Application**		**Potential Concern**		
Factors Needing Assessment	**Lower** **1**	**2**	**3**	**Higher** **4**
How is manure incorporated after spreading?				
If the farm has soils shallow to bedrock or with a high leaching potential, how is manure spread?	Manure is never spread when fields: - are saturated or frozen or, - when runoff risk is high **AND** Manure is applied just prior to planting or to a growing crop.	Manure is never spread when fields: - are saturated or frozen or, - when runoff risk is high **AND** Manure is applied during the growing season to fields with the highest leaching risk and outside the growing season to fields with the lowest leaching risk.	Manure is never spread when fields: - are saturated or frozen or, - when runoff risk is high **AND** Manure is applied outside the growing season to fields with the lowest leaching risk.	Manure is never spread when fields: - are saturated or frozen or, - when runoff risk is high **AND** Fields are not prioritized based on leaching risks.

AEM Tier 2 Worksheet: **Manure and Fertilizer Management** **Table 3: Fertilizer Application**		**Potential Concern**		
Factors Needing Assessment	**Lower** **1**	**2**	**3**	**Higher** **4**
How is the rate of fertilizer application determined?	Fertilizer rate is based on land grant university guidance and, for P and K, by an appropriate soil test lab. **AND** Soil tests are within the past 3 years. All other nutrient sources are accounted for (e.g. crop residues and manure). **AND** Proper soil pH is maintained.			Fertilizer rate is not based on soil tests. **OR** Other nutrient sources are unaccounted for. **OR** Proper pH is not maintained.
What is the timing of application?	Nutrients are applied as close to the period of maximum nutrient uptake as possible.			Fertilizer is applied outside the growing season.
Is fertilizer spread on soils shallow to bedrock or with a high leaching potential?				
Does your farm import other sources of nutrients (e.g. manure, poultry litter, whey, or other food waste, bio solids) and are they accounted for in your applications to fields?				
Benefits to other resources can also be possible while working toward improved water quality. Taking stock of how existing and future management affect **soil, water, air, plants, animals, energy, greenhouse gases, people, and economics** can result in more effective plans and additional benefits to farms and communities both now and into the future. **Additional Comments:**				

AEM Tier 2 Worksheet
Manure and Fertilizer Storage

Glossary

Cathodic Protection: Corrosion protection for a metal tank or pipe made possible by a continuous electric current flowing from one or more electrodes or a sacrificial anode to the protected structure.

Emergency Action Plan: A farm-specific response plan for manure/fertilizer storage, transport, and application spills. It includes response protocols, emergency numbers, available equipment, employee training, and other information necessary for effective spill response.

Freeboard: The distance from the maximum operating level of manure to the top of the storage structure.

Staff gauge: A measuring device for quick visual measurements of surface level.

Temporary Manure Pile: A specific location identified and used by farms without storage facilities to pile manure when field spreading is not appropriate or possible.

Vegetated Flow Distance: The length runoff water can flow over a vegetated surface to a waterbody, excluding any length water flows over a non-vegetated surface.

25 year, 24 hour storm: The amount of rainfall in a 24-hour period with a probable recurrence interval of once in 25 years. See Northeast Regional Climate Center for amounts - http://www.nrcc.cornell.edu/pptext/isomaps.html

Background

Properly designed and constructed manure storage facilities can minimize risks associated with stored manure and manure applications. Properly sized storage allows flexibility in land application to maximize crop utilization of nutrients and minimize applications at times of high losses. However, the risk of pollution to ground and surface water increases if the storage is improperly-designed, constructed or managed facility.

Likewise, properly stored fertilizers pose little threat to the environment. However, fertilizers that are not properly stored can quickly contaminate water resources, particularly groundwater. If allowed to enter drinking water sources, high levels of nitrates from fertilizers can cause health risks to both humans and animals. Although short-term storage is common, risks can be reduced by limiting the quantity and duration of fertilizer storage on the farm.

Storage and application of nutrients requires a critical balance to meet crop needs and minimize the risk to the environment. Properly designed storage facilities provide the farmer with the flexibility to retain nutrients until weather and crop needs are most favorable for application.

AEM Principle

Manure and fertilizer storage should be designed, constructed and managed so as to protect surface and groundwater resources.

AEM Tier 2 Worksheet: **Manure and Fertilizer Storage** **Table 1: Manure Storage**		**Potential Concern**		
Factors Needing Assessment	**Lower** **1**	**2**	**3**	**Higher** **4**
Does your farm store manure?				
How many months of manure storage capacity does your farm have (including temporary manure piles)?				
Has your manure storage system been certified by a professional engineer? If yes, when was it certified? Are as-built plans on file?				
What is the approximate distance from and relative location of the storage facility to water wells or springs?				
Is the manure storage located in a floodplain?				
Have your wells or springs tested high for nitrates (greater than 10ppm)?				
Does your manure storage have a staff gauge?				
How is freeboard managed?	Freeboard is maintained as per design **AND** Suitable additional freeboard is maintained for the 25 year, 24 hour rainfall.		Freeboard is normally maintained but occasionally field conditions require temporary infringement into the freeboard area.	No free board of any kind is maintained. Evidence of overtopping is present.

AEM Tier 2 Worksheet: **Manure and Fertilizer Storage** **Table 1: Manure Storage**		**Potential Concern**		
Factors Needing Assessment	**Lower** **1**	**2**	**3**	**Higher** **4**
How is manure storage operated and maintained?	Berms on earthen storages are mowed yearly, metal storages have required maintenance of cathodic protection, concrete systems are free of any visible defects and perimeter drains are monitored regularly. Inspection records are available.			Berms on earthen storages are not mowed, contains woody vegetation and/or rodent damage; OR Metal storage show signs of rust, and concrete storages show signs of decay.
Does your manure storage receive silage juice and milking center waste?				
Does human waste enter the manure storage unit?				
Is your long-term storage adequately protected from outside water entry?	Storage has surface water diversions to prevent runoff from entering the storage; **AND** Perimeter drainage systems to prevent groundwater entry. **AND** Located outside the 100 year flood zone.	Storage has surface water diversions to prevent runoff from entering the storage; **AND** Perimeter drainage systems to prevent groundwater entry. **AND** Protected from inundation from a 100 year flood.		Little or no control exists over the amount of roof water, surface runoff water, or groundwater entering storage.
Do you have an emergency action plan? **If yes, is it posted in a visible place?** **Have employees been trained?**				

AEM Tier 2 Worksheet: **Manure and Fertilizer Storage** **Table 1: Manure Storage**		**Potential Concern**		
Factors Needing Assessment	**Lower** **1**	**2**	**3**	**Higher** **4**
If you utilize temporary manure pile areas, how are they designated and managed?	Earthen areas with medium or fine-textured soils (not shallow to bedrock or with seasonally high water table) are identified for manure pile areas. **AND** Clean water is excluded from the manure pile area. **AND** Manure pile area has at least a 300 foot flow path to a watercourse. **AND** Manure pile areas are not located in a flood plain. **AND** Manure pile is spread as soon as conditions are appropriate.			Earthen area with coarse-textured soils and/or soils shallow to bedrock and/or with a seasonally high water table are identified for manure pile areas. **OR** Clean water is not excluded from the manure pile area. **OR** No grass filter area for runoff control exists. **OR** The manure pile areas are located less than a 300 foot flow path to a watercourse, where it frequently floods; or within a spring recharge area. **OR** Manure pile is left unspread.
Is there engineering documentation of all permanent transfer structures?	All tanks, pipelines, pumps, etc utilized for transfer of waste have a signed PE design and as-builts.	Major components of the waste transfer structures have a PE design and as-built.	Minor components of the transfer structures have a PE design and as-built.	There is no PE design or as-built of any waste transfer structure.
What is the approximate distance from the storage unloading facility to the nearest surface waterbody?	Greater than 500 ft.	200 – 500 ft.	100 – 199 ft.	Less than 100 ft.

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: **Manure and Fertilizer Storage** **Table 2: Waste Transfer – Temporary and Permanent Structures**		**Potential Concern**		
Factors Needing Assessment	**Lower** **1**	**2**	**3**	**Higher** **4**
When manure is being transferred, are adequate safeguards in place?	Automatic high and low pressure shut-offs are in place; **AND** Pipeline is regularly inspected; **AND** Communication system is in place.			No safeguards are in place.
Do loading and unloading areas contain all spills without contamination or discharge?				
Are perimeter drains protected from spills?				
Do you have two independent valves for gravity outlet system and/or pumped inlet system?				
Do valves leak?				
Do spreaders adequately contain manure while traveling from the farmstead to fields?				

AEM Tier 2 Worksheet: **Manure and Fertilizer Storage** **Table 3: Fertilizer Storage**		**Potential Concern**		
Factors Needing Assessment	**Lower** **1**	**2**	**3**	**Higher** **4**
Is fertilizer stored on the farm?				
What is the vegetated flow distance from fertilizer storage to the nearest watercourse or water well?	Greater than 500 ft.	200 – 500 ft.	100 – 199 ft.	Less than 100 ft.
Is fertilizer stored within a 100 yr. floodplain?				
What type of fertilizer storage facility is used for dry formulations?	Weatherproof storage on impermeable floor (i.e. – sealed concrete).			Non-weatherproof storage on a permeable floor (i.e. – gravel or dirt).
What type of fertilizer storage facility is used for liquid formulations?	Impermeable secondary containment (i.e. – curbs or dikes present to contain leaks).	Secondary earthen containment exists. Most of spill can be recovered.		No secondary containment exists. Spills cannot be contained.
What precautions are taken when loading fertilizers into field equipment (e.g., planters/drills in the field) to minimize losses to surface- or groundwater?				

Benefits to other resources can also be possible while working toward improved water quality. Taking stock of how existing and future management affect **soil, water, air, plants, animals, energy, greenhouse gases, people, and economics** can result in more effective plans and additional benefits to farms and communities both now and into the future.

Additional Comments:

AEM Tier 2 Worksheet
Waste Disposal

Glossary

Compost: Composting is a biological process in which microorganisms convert organic materials into a soil-like material. As a method of dead animal disposal, a properly-sited and constructed compost pile offers an environmentally sound and easily managed way of handling this issue on farms.

Secondary Containment: A back-up containment area in the event of a leak or spill. For example, a structure with a concrete floor and curbs in which containers of a material are stored.

Waterbody: A lake, reservoir, pond, river, continuously-flowing stream, continuously-flowing spring, wetland, estuary or bay.

Watercourse: Water flowing over a non-vegetated channel to a waterbody.

Background

Numerous products such as pesticides, cleaners, solvents, oils, batteries, plastics, tires, etc. are used on farms. Proper reuse, recycling or disposal of these items is necessary to ensure a clean and healthy environment and a safe drinking water supply for the farm, neighbors and community. Improper disposal may be detrimental to the quality of surface and groundwater, soil and air resources, neighbor relations, in addition to being illegal.

Proper disposal of normal animal mortality is also critical to reducing contamination risks to surface and ground water, and avoiding biosecurity risks.

Proper reuse, recycling and disposal practices used on the farm can save landfill space, reduce costs, and protect fish, wildlife and human health.

AEM Principle:

Farmers should take precautions to prevent chemical leaks and spills, and properly recycle or reuse wastes on the farm. In addition, they should ensure that waste products which cannot be recycled, such as chemical containers, are properly disposed of off the farm.

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Waste Disposal		**Potential Concern**		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
How are dead animals disposed of? * **Non catastrophic mortalities only.**	Picked up by rendering company within 48 hours after death.	Properly composted on the farm in an appropriate location.	Buried 6 ft. deep in appropriate soils. **AND** Buried more than 200 ft. from a waterbody, watercourse, well or spring.	Carcasses left outside for scavengers, or to decay. **OR** Inappropriate composting **OR** Inappropriate burial
Where is the location of the mortality management area in relation to: • **Waterbodies?** • **Floodplain?** • **Groundwater resources?** • **Neighbors?**				
Is there clean water exclusion from the management area?				
If composting mortalities, is leachate produced?				
Are there odors or visual concerns from the composting site? • **If yes, is there at least 2ft. of clearance between dead animals? Are proper materials (high carbon, old silage, dry sawdust, or dry stall bedding) used in adequate amounts (2ft. or more surrounding animal)?**				
Is there a shop drain? **What has the potential to go in it?** **Where does it outlet?**				

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Waste Disposal		**Potential Concern**		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
What is done with waste lubricants?	Stored in protected area on impervious surface with secondary containment until recycled off the farm.	Stored in protected area on impervious surface with secondary containment and properly reused on farm.		Disposed of on farm or stored indefinitely.
How are unwanted or banned pesticides disposed of? (See Pesticide Storage, Mixing, and Loading Worksheet)				
How are plastic containers from oil products handled?	Products are used up and containers recycled. **OR** Empty containers are taken to a licensed landfill or municipal incinerator.		Mixed with regular trash and sent to a municipal landfill.	Empty or partially-filled containers are disposed of on the farm.
What is done with old lead acid batteries?	Exchanged when new batteries are purchased.		Mixed with regular trash and sent to a municipal landfill.	Disposal or stockpiled on farm.
What is done with old farm tires?	Cut and re-used on farm; **OR** Taken to a recycling depot; **OR** Disposed of at a licensed landfill site; **OR** Exchanged when replaced.	Re-used on farm.		Dumped or burned on farm.
What is done with used ag plastics? (e.g bale wrap, silage bags, plastic mulch)	Baled and taken to a recycling facility.	Taken to a licensed landfill.		Dumped, buried or burned on the farm.

Are products such as veterinary/medical waste, fertilizer bags, paints and solvents a problem on the farm?	
Is there a farm dump or an historic farm dump? • **If so, where is it located?** • **Is it active or historical?** • **What has been put into it?**	
Is open burning practiced on the farm? • **What is burned?**	
Benefits to other resources can also be possible while working toward improved water quality. Taking stock of how existing and future management affect **soil, water, air, plants, animals, energy, greenhouse gases, people, and economics** can result in more effective plans and additional benefits to farms and communities both now and into the future. **Additional Comments:**	

AEM Tier 2 Worksheet
Pesticide Use

Glossary

Biological Control: Biological control involves an active human management role in the control of pests using other organisms. Pests are controlled by predation, parasitism, antagonism, herbivory, and other natural mechanisms.

Certified Applicator: A commercial or private pesticide applicator who is certified by the NYS Department of Environmental Conservation (DEC) to use, supervise the use of, or train another individual in the use of any pesticide for agricultural use; or any individual who is certified to sell restricted- use pesticide.

Certified Commercial Pesticide Applicator: A certified applicator who is certified by the NYS Department of Environmental Conservation to use or supervise the use of any commercial application of pesticides, or to sell or supervise the sale of a restricted-use pesticide.

Certified Private Pesticide Applicator: A certified applicator at least 17 years old and uses or supervises the private application of restricted-use pesticides for purposes of producing any agricultural commodity.

Commercial Application of Pesticides: Any application of any pesticide except as defined in "Residential or Private Application of Pesticides (see "Private Application of Pesticides," below).

(Continued on Page 2)

Background

Pesticides play an important role in the management of crop and livestock pests. Although many producers use a combination of practices, including Integrated Pest Management (IPM), to manage pests, pesticides may be needed to keep pests below acceptable levels to maintain crop quality and profitability. However, if pesticides are not carefully selected and properly applied, they have the potential to contaminate surface and groundwater.

IPM strategies should include prevention, avoidance, monitoring and suppression. These strategies should be employed to identify alternative crop production and crop protection practices which help minimize or avoid pest problems, reduce or eliminate pesticide use and costs, and maximize potential net profitability of crop production. These practices include, but are not limited to, crop rotation, use of disease-resistant varieties, cultivation, timing of planting or harvest, appropriate soil pH and fertility, biological control and pest monitoring and forecasting.

AEM Principle:

IPM elements are employed on the farm to minimize the use of pesticides. When pesticides are needed methods and procedures for the selection and application of pesticides should ensure that their potential discharge to surface and groundwater is prevented to the greatest practical extent. In addition, farm operations must be in compliance with state and federal laws and regulations, and with the applicable label requirements.

Glossary Continued…

Cultural Practices: Control of pests through tillage or cultivation.

Direct Supervision: The act or process in which the application of a pesticide is made by an individual acting under the instruction and control of a certified private pesticide applicator who is responsible for the actions of that individual. Direct supervision may be off-site (applicator must be able to contact the certified private applicator within a reasonable time) when a farm employee applies a pesticide that does not require on-site supervision on the label. Direct supervision must be on-site (within voice contact of the applicator) when so specified by the pesticide label, or whenever a farm employee applies a federally restricted -use pesticide.

Integrated Pest Management (IPM): A systematic approach to managing pests which focuses on long-term prevention or suppression with minimal impact on human health, the environment and non-target organisms. IPM incorporates all reasonable measures to prevent pest problems by properly identifying pests, monitoring population dynamics and utilizing cultural, physical, biological or chemical pest control methods to reduce pests to acceptable levels.

Leaching Potential: The possibility of downward movement through the soil of chemical substances dissolved in water.

Pesticide: Any substance or mixture of substances intended for preventing, destroying, repelling or mitigating any insects, rodents, fungi, weeds or other forms of plant life, animal life or viruses, which the NYS Department of Environmental Conservation has declared to be a pest; and any substance or mixture of substances intended as a plant regulator, defoliant or desiccant.

Private Application of Pesticides: The application of a restricted-use pesticide for the purpose of producing an agricultural commodity: (1) on property owned or rented by the applicator or the applicator's employer, or (2) if applied without compensation other than the barter of personal services between producers of agricultural commodities, on property owned or rented by a party to such a barter transaction.

Recharge Area: Land area where water readily seeps into a water-bearing soil or rock formation (aquifer).

Restricted-Use Pesticide: A pesticide that is classified for restricted use under the provisions of Article 33 of the Environmental Conservation Law, or under Section 3(d)(1)(C) of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended. A confirmation of a DEC-restricted pesticide may be obtained by referencing the NYS Pesticide Registration Data Base at http:/ / pims.psur.cornell.edu/ .

Runoff Potential: The possibility for substances to move from a field in runoff water.

Setback Zone: Distances from a waterbody or other environmentally-sensitive area within which pesticides should not be applied.

U.S. EPA Worker Protection Standard (WPS): A regulation issued by the U.S. Environmental Protection Agency (EPA) under the authority of the 1992 Federal Worker Protection Standard (40CFR, Part 170) covering pesticides that are used in the production of agricultural plants on farms, forests, nurseries and greenhouses. The WPS requires producers to take steps to reduce the risk of pesticide-related illness and injury if they: (1) use pesticides with WPS requirements on the label, or (2) employ workers or pesticide handlers who are exposed to such pesticides.

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: **Pesticide Use**		**Potential Concern**		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
Does the farm have a written IPM plan? **If so, when was it last updated?** **How closely is it followed?**				
What criteria are used in decisions to apply pesticides?	Pests are identified and levels/severity is monitored or forecasted for need. **AND** Lowest hazard rating chemical is used.			Pesticides are applied without regard to site-specific needs.
What types of non chemical practices are used for pest prevention (e.g. crop rotation, insect/disease resistant plant varieties)?				
Have practices been scored for level of IPM adoption (e.g. Cornell IPM Elements, NRCS or other industry accepted method)?				
Is the owner/operator a Certified Pesticide Applicator? **If so, Private or Commercial?**				

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Pesticide Use		**Potential Concern**		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
What is the level of training of the owner/operator and the pesticide applicator?	The applicator is appropriately certified as a pesticide applicator **AND** Pesticide labels are followed.	The owner is a commercial certified applicator and meets all supervision training requirements for employees doing the application. **OR** The owner is a private certified pesticide applicator and provides direct supervision to appropriately-trained employees doing the application. **AND** Pesticide labels are followed.	The owner is a certified pesticide applicator with appropriately-trained employees doing the application. **AND** Pesticide labels are followed.	No one involved in application is certified **AND** Pesticide labels are not always followed.
Is the EPA Worker Protection Standard followed?	Owner and employees are familiar with and fully complies with the U.S. EPA Worker Protection Standard program.		Owner and employees are aware of the US EPA Worker Protection Standard program but needs additional information.	Owner and employees do not know about the U.S. EPA Worker Protection Standard program.
Are weather conditions considered before applying pesticides?	Weather conditions are considered. Wind, storms, humidity and temperature are at levels favorable for spraying.			Pesticides are sprayed according to a pre-set schedule. Weather conditions are not considered.

AEM Tier 2 Worksheet: Pesticide Use		**Potential Concern**		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
What criteria are used for pesticide selection?	Pesticide selections are made with consideration of efficacy, environmental risk (assessed by a resource professional using WIN-PST), restricted re-entry interval, and preservation of the natural enemies of the specified pest and days to harvest.	Pesticide selections are made with consideration of efficacy, consultation with a trade professional on environmental risk, restricted re-entry interval, and preservation of the natural enemies of the specified pest and days to harvest.	Pesticide cost and efficacy are considered when making pesticide selections.	Only product cost is considered when making pesticide selections.
Is application equipment properly and regularly calibrated?	Spray equipment is calibrated before each application.	Spray equipment is calibrated after changes of products, target pests, crop, and change in application equipment.	Spray equipment is calibrated at the beginning of each season only.	Regular calibration of equipment is not practiced.
Are well and springs in and near cropped fields identified?	All wells and springs are noted on field maps. **AND** Are visibly marked in the fields. **AND** Applicator is aware of presence and location of neighbor wells.	All wells and springs are noted on field maps **AND** Applicator has field maps while applying pesticides. **AND** Applicator is aware of presence of neighbor wells.	All wells and springs are noted on field maps **AND** Applicator knows all locations. **AND** Applicator is aware of presence of neighbor wells.	Wells and springs are not noted on field maps **AND/OR** Possibly unknown wells or springs exist on owned or rented fields.
What is the distance of applications from a well, spring or surface watercourse?	Applications are not made within the recharge area of a well or spring **OR** Applications exceed label restriction setbacks of a surface watercourse.	All geographic use restrictions and label precautions regarding groundwater and surface water are followed including minimum setback zones.		Applications are made adjacent to or over a well or spring. **OR** Setback requirements are not followed.

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Pesticide Use		**Potential Concern**		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
What pesticide use records are kept?	Pesticide use records include: -restricted pesticides purchased -crops treated -product name -EPA Reg. Number -address of application -place of application -date applied -quantity applied -rates applied -method of application -applicator's name -target pests -pest monitoring records -weather conditions -stage of crop growth -stage of pest growth -apparent effectiveness **AND** Records are kept for at least 3 years.	Pesticide use records include: -restricted pesticides purchased -crops treated -product name -EPA Reg. Number -address of application -place of application -date applied -quantity applied -rates applied -method of application -applicator's name -target pests **AND** Records are kept for at least 3 years.	Pesticide use records include: -restricted pesticides purchased -crops treated - product name -EPA Reg. Number -address of application -place of application -date applied -quantity applied -rates applied -method of application -applicator's name -target pests **AND** Records of unrestricted pesticides are not retained (not acceptable for commercial certified applicators).	No records are kept. Chemicals used are known by memory and invoices only. **OR** Records for restricted pesticides are not kept for the required time period.
Are the pesticides used on the farm currently registered for use in New York State?				
Are pesticide drift and odor considered during application?				
Are neighboring crop fields considered during application?				

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: **Pesticide Use**		**Potential Concern**		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
Is there a history of pesticides in wells of nearby properties or nearby waterbodies?				
Have neighbors ever asked about the farms pesticide use?				

Benefits to other resources can also be possible while working toward improved water quality. Taking stock of how existing and future management affect **soil, water, air, plants, animals, energy, greenhouse gases, people, and economics** can result in more effective plans and additional benefits to farms and communities both now and into the future.

Additional Comments:

AEM Tier 2 Worksheet
Pesticide Storage, Mixing & Loading

Glossary

Anti-Siphoning Device: a mechanism to prevent pesticide contamination of water, which can occur when a loss of pressure in the main water line creates a backflow of contaminated water into the water supply system.

Aquifer: A water-bearing soil or rock formation that is capable of yielding usable amounts of water.

Aquifer Recharge Area: Land area where water readily seeps into the aquifer.

Back-flow Protection: Use of a device, such as a reduced pressure zone device or an air gap separation between a water source and the overflow of a receptacle (i.e. -- spray tank, mixing tank, etc.) containing pesticides, to prevent contaminated water from siphoning back into a water supply.

Emergency Action Plan: A farm-specific response plan for pesticide storage, transport, and application. It includes response and discharge reporting protocols, emergency numbers, available equipment, employee training, and other information necessary for effective response.

(Continued on Page 2)

Background

Handling pesticides around the farmstead should meet or exceed label instructions. If not, leaks or spills can result in pesticides seeping into groundwater or potentially runoff into surface waters. Pesticides can also enter a well directly during mixing and loading if proper precautions are not taken. The federal government and the state of New York regulate all agricultural pesticides to protect farmers, their employees, the environment and the health of the public. The water quality on and around your farm is better protected if appropriate management procedures are followed. Also, proper disposal of containers and unused pesticides are essential to avoid risking contamination that could affect water supplies, human health, livestock health and wildlife.

All pesticides used in the United States must be registered by the US Environmental Protection Agency (EPA), assuring that they will be properly labeled and that they will not result in any unreasonable adverse effects on humans, the environment or non-target species. In New York State, pesticides must also be registered with the Department of Environmental Conservation, who oversee Pesticide Applicator Certification. These regulations ensure that pesticides used and stored in New York are properly labeled and responsibly applied. In addition, farms that store and mix pesticides are encouraged to have and follow an Integrated Pest Management (IPM) Plan as a means to help them make the best choices for their crops, livestock and the environment.

AEM Principle:

Methods and procedures for the storage, mixing and loading of pesticides in farming operations should ensure that their discharge to surface and groundwater is prevented to the greatest practical extent. In addition, farm operations must be in compliance with state and federal laws and regulations, and with the applicable label requirements.

Glossary Continued…

Integrated Pest Management (IPM): A comprehensive approach to pest control that uses combined means to reduce the status of pests to tolerable levels while maintaining a quality environment. Each employed pest control technique must be economically sound, and compatible with production and user objectives. IPM incorporates all reasonable measures to prevent pest problems by properly identifying pests, monitoring population dynamics and utilizing cultural, physical, biological or chemical pest control methods to reduce pests to acceptable levels.

Material Safety Data Sheet (MSDS): a document that contains information on the potential hazards (health, fire, reactivity and environmental) and how to work safely with the specific chemical product. It also contains information on the use, storage, handling and emergency procedures all related to the hazards of the material.

Pesticide: Any substance or mixture of substances intended for preventing, destroying, repelling or mitigating any insects, rodents, fungi, weeds or other forms of plant life, animal life or viruses which the NYS Department of Environmental Conservation has declared to be a pest; and any substance or mixture of substances intended as a plant regulator, defoliant or desiccant.

Rinsate: Water or the pesticide carrier that is used to rinse out the application equipment and pesticide containers after a particular pesticide or mixture of pesticides has been applied.

Tub-stored: Pesticide containers are stored inside an impermeable tub.

Background Continued…

The harmful nature of misused or spilled pesticides requires all handlers to comply with State and Federal laws. Depending on the quantity and use intention of these products, the farm operation may be required to adhere to additional storage and containment protocols.

If a farm business falls into any of the following categories, it may need to comply with the US EPA's Pesticide Container and Containment Rule:

You handle agricultural pesticides and are:

- A refilling establishment whose principal business is retail sale, and/or
- A commercial pesticide applicator, and/or
- A custom blender.

Information on this Rule can be found at:

- ***Pesticide Container and Containment Rule*:**
  http://www.epa.gov/opp00001/regulating/containers.htm

- ***A Snapshot of the***
  EPA Pesticide Container and Containment Rule
  http://www.epa.gov/opp00001/regulating/ccrule-brochure.pdf

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Pesticide Storage, Mixing & Loading		**Potential Concern**		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
Is there a designated pesticide storage area on the farm?	Pesticides are stored in a dedicated building, separated by type of pesticide and according to label instructions.	Pesticides are stored in a multiple-use building, separated by type of pesticide and according to label instructions.		Pesticides are stored in an insecure area. **OR** Insecticide, fungicides and herbicides are stored together. **OR** Pesticides are not stored according to label instructions.
Where are pesticides stored?				
What is the structural integrity of the pesticide storage structure (e.g.. roof condition, floor condition, security of door, etc)?				
What is the condition of pesticide storage containers?	Pesticides kept in original containers in good condition with original readable labels.		Pesticides are not stored in original containers, but are stored in appropriate containers with proper, legible labels.	Pesticides are kept in original containers in poor condition or with unreadable or missing labels. **OR** Pesticides are not stored in original containers and labels are unreadable or missing.
If stored pesticides are no longer used, are the pesticide containers or drums in stable condition?				
What security measures are taken at the storage area?	Area is locked, fenced, and properly posted for pesticides.	Area is locked and posted for pesticides.		Area is not secured. **OR** Area is not posted for pesticides.

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Pesticide Storage, Mixing & Loading		**Potential Concern**		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
What is the condition of the floor in the pesticide storage/mixing area?	Pesticides are stored and mixed on impermeable floor (e.g.-sealed concrete) with curbs or dikes that would contain the larger of 250 gallons or 125% of the largest pesticide holding tank		Pesticides are stored and mixed on impermeable floor, with no curbs or dikes to contain leaks. **AND** Pesticides are tub-stored in containers.	Pesticides are stored and mixed on permeable floor, e.g. – gravel, dirt or wood.
Is there a floor drain in the storage/mixing area?	No floor drain, **AND/OR** Floor sumps to a collection area integral to the floor for proper disposal or usage.	Sealed floor drain leads to a holding tank 125% of the largest pesticide containing tank by gravity	Floor drain or sump is pumped to a holding tank sized 125% of largest pesticide holding tank	The floor drain does not lead to an acceptable holding tank.
What is done with unwanted or banned pesticides?	Disposed of through a hazardous waste collection event or service. **OR** Unused pesticide returned to dealer.			Unwanted pesticides are disposed of on the farm, **OR** Are stored on the farm.
How is the water supply protected during mixing?	Appropriate anti-siphoning device is used. **AND** Water is taken away from the water source before mixing with pesticides.	Appropriate anti-siphoning device is used.		No anti-siphoning device. **AND** Water is taken directly from a well, pond or stream.

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Pesticide Storage, Mixing & Loading		**Potential Concern**		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
What is the proximity of the in-field mixing/loading area to wells, springs and watercourses? ***(Skip if no in-field mixing or loading is practiced.)***	Mixing/loading area is not sited in an aquifer recharge area of a well or spring. **AND** Mixing and loading is done at least 200 ft. from any watercourse, in a specified area designed to NRCS Standard NY309 – Agrichemical Handling Facility and according to label instructions. **OR** Mixing and loading is done using a manufactured portable mixing facility and according to label instructions.		Mixing/loading area is not sited in an aquifer recharge area of a well or spring. **AND** Mixing and loading is done further than 100 ft. from any watercourse and according to label instructions.	Mixing and loading is not done using a manufactured portable mixing facility and according to label instructions. AND Mixing/loading area is sited in an aquifer recharge area. **OR** Mixing and loading is done within 100 ft. of a watercourse. **OR** Mixing and loading is not done according to label instructions.
How are pesticide products transported to fields (e.g. pre-mixed in a sprayer of good condition, in concentrate in vehicle, etc.)?				
Are all transported pesticides properly labeled?				
How is sprayer rinse water disposed?	Sprayer rinsate is properly stored and labeled for use in later applications to crops labeled for the pesticide.	Rinsate is not stored and sprayed back on a crop labeled for the pesticide.		Sprayer rinsate is disposed of on the farm in some other way. (e.g. sprayed along fence lines).

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Pesticide Storage, Mixing & Loading		**Potential Concern**		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
What is the quantity of pesticides usually stored between growing seasons?				
How and where are pesticide containers disposed?	Properly rinsed containers are returned to dealers. **OR** Appropriate hazardous waste recycling service is used.		Properly rinsed containers or empty bags are disposed of at a licensed solid waste management facility.	Unrinsed or partially-filled plastic or paper containers are burned or disposed of in other ways on the farm. **OR** Stockpiled on the farm.
Have you considered purchasing pesticides in mini-bulk or returnable containers to reduce the number of containers requiring disposal?				
Has an emergency action plan been developed should a pesticide spill/major leak, fire or natural disaster occur? **If yes, does it include an up to date inventory of all pesticides stored or being transported?** **Are all employees aware of the plan?**				
Are Material Safety Data Sheets (MSDS) and labels printed and kept on file?				
Benefits to other resources can also be possible while working toward improved water quality. Taking stock of how existing and future management affect **soil, water, air, plants, animals, energy, greenhouse gases, people, and economics** can result in more effective plans and additional benefits to farms and communities both now and into the future. **Additional Comments:**				

AEM Tier 2 Worksheet
Farmstead Water Supply Evaluation

Glossary

Casing: Steel or plastic pipe installed while drilling a well, to prevent collapse of the well bore hole and the entrance of contaminants, and to allow placement of a pump or pumping equipment.

Drilled wells: Wells constructed by a combination of jetting or driving. These wells are normally 4 to 8 inches in diameter.

Driven-Point (sand point) Wells: Wells constructed by driving assembled lengths of pipe into the ground with percussion equipment or by hand. These wells are usually smaller in diameter (2 in. or less), less than 50 feet deep, and can be installed in areas of relatively loose soils, such as sand.

Dug wells: Large-diameter wells often constructed by hand.

Grout: Slurry of cement or clay used to seal the space between the outside of the well casing and the bore hole, or to seal an abandoned well.

Hydro-Geological: Geology as it related to the occurrence, distribution and use of groundwater.

(Continued on Page 2)

Background

Preventing well water and spring development contamination should be a priority concern for every farm. Health impacts to people and animals can be serious and treatment methods can be costly. Once the groundwater that supplies a well or spring is contaminated, it can be very difficult to clean up. The only options may be to treat the water or obtain water from another source. If farm related contamination affects a neighbors' well, the farm may be responsible for clean-up costs.

The condition of a well or spring and its proximity to potential sources of contamination determine the risk posed to the quality of the water. For example, a cracked well casing allows pathogens, nitrates, oil and pesticides to enter the well more easily. Pesticide spills near a well while mixing or loading can result in contamination of nearby wells, including those of neighbors depending on proximity and hydro-geological conditions. Feedlots, barnyards and septic systems are potential sources of pathogens and nitrates. Manure and fertilizer applications and waste storage areas can also be sources of nitrates. Both pathogens and nitrates pose serious health hazards if they get into drinking water supplies.

NYS Department of Health has regulations pertaining to locations of new wells in relation to agricultural pollutant sources. The USDA Natural Resource Conservation Service standards also contain recommended setback distances for manure application or storage in relation to existing wells. Farmers should be aware of these distances before siting a new well or applying nutrients near wells.

AEM Principle:

Agricultural operations should be carried out so as to prevent potential agricultural pollutants from impacting drinking water sources.

Glossary Continued…

Minimum Separation Distances: The minimum distance between an existing water supply system and a potential pollution source. See recommendations below. Requirements for new wells can be found at: http://www.health.ny.gov/regulations/nycrr/title_10/part_5/appendix_5b.htm#table1

Nitrates: A chemical derived from nitrogen-containing substances such as animal wastes, fertilizers and septic system leachate. Nitrates are soluble in water, and if they get into drinking water supplies at elevated rates, they pose serious health risks to fetuses and young children.

Pathogen: Any microorganism that causes disease, such as a bacterium, viruses or protozoan.

Pitless Adapter: A sanitary, watertight connection to the well casing using either a prefabricated unit or by welding. The adapter allows water from the well to be diverted horizontally below the frost line into underground water lines.

Recharge Area: The natural process of infiltration and percolation of rainwater from land areas or streams through permeable soils into water-holding rocks or unconsolidated materials (such as sands and gravels) that provide underground storage.

Sanitary Well (Cap) Seal: Watertight connection (usually rubber gasket) used to seal the well where pump lines and electric cables pass out the top of the well casing.

Recommended Minimum Separation Distances to Protect Water Wells from Farm Related Contamination*

Contamination Source	Distance (Feet) from existing well
Manure spreading (new wells should be installed 200 feet from manure spread fields)	100
Engineered and properly maintained waste storages	100
Manure pile areas	200
Vegetated Treatment Areas*	100
Barnyard, silo, barn gutters and animal pens*	100
Fertilizer and/or pesticide mixing and/or clean up areas	100
Petroleum Storage	100 down gradient
Mortality Management Site*	200

*Taken from NRCS Standards and Cornell Guidelines

AEM Tier 2 Worksheet: **Farmstead Water Supply Evaluation**		**Potential Concern**		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
What is the type of water supply?	Public or community water supply	Drilled well		Driven-point (sand point), dug well or spring development or surface water (i.e. ponds, streams) should not be used for human drinking water unless treated.
How many water supplies exist at the farmstead? **Complete chart on page 7**				
Is the water supply adequate for intended use? **Has your water supply ever gone dry?**				
Do you know what your average daily water usage is? **Do you keep records?**				
What is the position of the water supply in relation to potential pollution sources?	Upslope from all potential pollution sources. All surface water is diverted from water supply **AND** Water supply not subject to flooding.	At grade with potential pollution sources. No surface water runoff reaches water supply **AND/OR** Water supply rarely floods.	Down slope from potential pollution sources. Some polluted runoff may reach water supply **OR** Water supply floods occasionally.	Settling or depression near well casing, allowing potentially polluted runoff to reach water supply. **OR** Supply is subject to frequent flooding.
What is the separation distance* between the water supply and potential farmstead contamination sources? ***See table in background section.**	Meets or exceeds all state and local minimum required separation distances **AND** There is a separate water supply for livestock and household use.	Meets or exceeds all minimum separation distances. **AND** Connections, such as livestock watering facilities, contain backflow prevention.	Meets minimum separation distances.	Does not meet minimum separation distances for one or more potential pollution sources.

AEM Tier 2 Worksheet: **Farmstead Water Supply Evaluation**		**Potential Concern**		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
What is the soil texture in the recharge area impacting the well or spring?	Fine-textured soils (clay, silty clay, sandy clay).	Medium-textured soils (silt, silt loam, loam).	Moderately course-textured soils (fine sandy loam, sandy loam)	Coarse-textured soils (sandy, loamy sands, gravel). **OR** Soils shallow to fractured bedrock.
Is the area subject to a high water table?				
Does the farmer have a copy of the well driller's log and report?				
What is the condition of the casing and well cap (seal)?	Casing clean steel, plastic or wrought iron at least 6 in. diameter. No holes or cracks. Cap tightly secured. Screened vent that faces the ground. Pitless adapter or sanitary well seal for pump lines or electric cables.	Casing at least 4 in. in diameter and no defects visible. Well has vent without screen. There is a pitless adapter or sanitary well seal.	Casing consists of 4 in. fiberglass and has no holes or cracks visible. Cap loose. No pitless adapter or sanitary well seal.	Holes and/or cracks in casing are visible. Cap loose or missing. Can hear water running.
What is the casing depth?				
What is the casing height above the land surface?	More than 18 in. above grade. **AND** Outside any flood-prone area.	Above grade **AND** At least 2 ft. above highest known water level in flood-prone areas.		Below grade or in pit or basement.

AEM Tier 2 Worksheet: **Farmstead Water Supply Evaluation**		**Potential Concern**		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
What is the condition of the surface material around the well casing?	Casing surrounded at the ground surface by a 4 in. thick concrete slab extending at least 2 ft. in all directions and sloping away from casing.	No settling of the surface material around well casing and ground sloped away from well casing. No space between well casing and surrounding surface material.	Can see settling of surface material around well casing.	Can see settling of surface material around well casing and visible space between well casing and surrounding surface material.
Has the well been grouted? **If so, what is the condition?**				
How often is the water tested?	Water tested at least twice each year (spring and fall) for presence of bacteria and nitrates.	Water tested every year for presence of bacteria and nitrates.	Water tested every 3 years for bacteria and nitrates.	No recent water tests done for bacteria and nitrates.
Have wells tested positive for any contaminants? **If so, please list type, date and treatment:**				
How often is the plumbing system inspected?				
Are there unused or abandoned wells on the farm?	No abandoned wells.	Unused wells capped and protected. Abandoned wells have been filled and plugged according to NYSDEC Standards.		Unused wells not capped or plugged.
For dug or driven point wells: **Is the catchment area fenced or inaccessible to livestock?** **Is surface water diverted from the area?** **If a dug well, is it covered?** **If not, how often is it visually inspected?**				

AEM Tier 2 Worksheet: **Farmstead Water Supply Evaluation**		**Potential Concern**		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
For a spring: **Is the catchment area fenced or inaccessible to livestock?** **Is the spring covered?** **If not, how often is it visually inspected?** **Are overflow pipes and vent openings screened?**				
Have any wells in the neighborhood or adjacent area tested positive for contamination?				
Comments:				
Benefits to other resources can also be possible while working toward improved water quality. Taking stock of how existing and future management affect soil, water, air, plants, animals, energy, greenhouse gases, people, and economics can result in more effective plans and additional benefits to farms and communities both now and into the future. **Additional Comments:**				

Farmstead Water Supply Inventory

Water Supply No.	Location	Type	Intended Use	Comments/Condition

AEM Tier 2 Worksheet
Stream & Floodplain Management

Glossary

Bankfull Stage: The stage at which water starts to flow over the flood plain; the elevation of the water surface at bankfull discharge. (This discharge often occurs once every few years on average.)

Braided Stream: Stream with three or more smaller channels. These smaller channels are extremely unstable, rarely have woody vegetation along their banks, and provide poor habitat for stream biota (plant and animal life).

Baseflow: Average stream discharge during low flow conditions that is fed by subsurface discharges.

Downcutting: Process by which a stream bottom is lowered in elevation due to the net loss of substrate material through erosion.

Floodplain: The flat area of land adjacent to a stream that is formed by current flood processes.

(Continued on Page 2)

Background

A stream is a complex and dynamic system. Even healthy streams will gradually change course as some bank erosion and sedimentation is natural. Maintaining stream health requires recognizing and accommodating the stream's natural processes, and making complex decisions on the best ways for restoring past damage and minimizing the potential negative effects of current and future activities.

Healthy streams are a valuable environmental and economic resource to farms and their community. Healthy streams have stable, well vegetated banks, clear water with some natural debris and a diverse community of aquatic plants and animals. A functional and balanced stream system will also have undisturbed overflow areas (floodplains) that allow seasonally high water to rise above the typical water level and slowly infiltrate back into the stream. A healthy stream system will provide a variety of benefits to both humans and wildlife, including:

- Economic benefits by moderating the impacts of floods and droughts;
- Vital breeding, resting, and feeding areas for fish and wildlife;
- The scenic beauty and recreational benefits of flowing water increase the value of stream-side real estate.

(Continued on Page 2)

AEM Principle: Streams are complex systems that should be protected and managed to ensure that on-farm practices contribute to the maintenance and enhancement of healthy stream systems.

Glossary Continued…

Incised Channel: A channel with a streambed lower in elevation than its historic elevation in relation to the flood plain.

Natural Vegetation: For riparian buffers, natural vegetation refers to plant communities that contain the following structural components: aquatic plants, sedges or rushes, grasses, forbs, shrubs, under story and over story trees. Species should be appropriate for the area.

Reach: A section of stream (defined in a variety of ways, such as the section between tributaries or a section with consistent characteristics).

Riparian: The zone adjacent to a stream or any other water body (from the Latin word *ripa* -- pertaining to the bank of a river, pond, or lake).

Protected (Classified) Stream: Certain waters of the state are classified and protected on the basis of existing or expected best usage of these waters. If your project affects waters of the state that are referred to as "protected streams" or "protected waters," you are subject to the stream protection restrictions under the Protection of Waters regulations.

Perennial Stream: A stream that flows continuously throughout the year.

Background Continued…

Bank full flows and periodic flooding are healthy stream functions. A stream at bank full flow is at its full carrying capacity, just before its waters flow onto the floodplain. Bank full conditions cause most changes to stream shape and overall condition. Floodplains are also an integral part of a natural stream system and a stream functions best when bank full flows are not isolated from the adjacent floodplain. Floodplains reduce the impacts of flooding by slowing the movement of water and improve water quality by allowing sediment and other pollutants to slowly filter out of flood waters before the water returns to the stream. Stream banks and floodplains that are stable and undisturbed provide important habitat for many plant and animal species.

There is a tendency to view flooding and erosion problems on streams as a local issue related to stream characteristics or adjacent land use. But, these issues occur within the context of the watershed that drains into the stream and the flow patterns downstream and therefore should be considered on a watershed basis. Many human activities alter the hydrology of a watershed and the hydraulics of a stream channel. When this occurs it should come as no surprise when the stream channel adapts and impacts local land uses.

The health of our streams depends on the stewardship of landowners and users throughout the watershed. An individual landowner can facilitate positive changes in conserving, protecting and using land to help maintain a healthy stream function.

This worksheet should be used to assess the condition of perennial stream reaches and floodplains. It can also be helpful in determining the need for restoring riparian buffers.

AEM Tier 2 Worksheet: **Stream and Floodplain Management**		**Potential Concern**		
Factors Needing Assessment:	**Lower** **1**	**2**	**3**	**Higher** **4**
How often do your fields or pastures flood?	Never	Rarely	Occasionally	Frequently (more than once in 2 years)
Do flood waters cause erosion on fields?				
Is fertilizer or manure applied in the floodplain?	No nutrients (fertilizer or manure) are applied in the floodplain. **OR** Nutrients are applied and incorporated only after the risk of flooding is low in accordance with a Nutrient Management Plan.	Nutrients are applied according to a Nutrient Management Plan. **AND** Nutrients are applied after the high risk of seasonal flooding has passed.		A Nutrient Management Plan is not being followed.
Is your farmstead located within a floodplain?				
Is manure or fertilizer stored or stockpiled in the floodplain?				
Does livestock have access to the stream?	Livestock have no access to the stream.	Livestock have limited and controlled access to the stream.	Livestock have limited, uncontrolled access to the stream.	Livestock have full uncontrolled access to the stream.
How close to the stream do you normally till?				
What is the predominant width of the naturally occurring stream side vegetation?	Stream sides are well-vegetated for 100 or more ft. on both sides of the stream.	Stream sides are well vegetated for at least 35 ft. on each side of the stream.	Stream sides are well vegetated (at least 35 ft.) on one side of the stream.	Both sides of the stream are sparsely vegetated (less than 35 ft).

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Stream Management		**Potential Concern**		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
What is the condition of the stream bank vegetation?	Banks are fully vegetated, **AND** Vegetation shades 50% of the stream width during most of the day, **AND** Vegetation over-hangs the stream.	Banks are fully vegetated with low-growing woody plants.	Banks are well vegetated with only herbaceous species.	Banks lack vegetation that provides shade.
Does field tile or other drains (e.g. outlets, ponds, WASCOBs, shop/barn drain) empty into a stream?				
What is the condition of the stream channel?	Stream appears healthy and has no structures or dikes. No evidence of excess deposition, down-cutting or stream widening.			Stream is actively down cutting or widening or causing bank slides. **OR** Stream has been excessively channelized **OR** Dikes or levees prevent access to the floodplain **OR** Excessive sediment deposition is causing flooding or braiding of the stream channel.

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Stream Management Continued		**Potential Concern**		
Factors Needing Assessment:	**Lower 1**	**2**	**3**	**Higher 4**
What indicators of good water quality are present?	Water appears clear **AND** A diverse aquatic plant community exists, **AND** There is no noticeable film on submerged objects or rocks.	Water appears slightly cloudy or greenish; **AND** Aquatic plants are present, **AND** Some algal growth is present on submerged objects/rocks.	Water appears cloudy **AND** A monoculture of excessive plant growth is present; **AND** Submerged objects/rocks are covered with algal growth.	Water appears pea green, gray or brown. **OR** Severe plant or algal blooms are apparent, **OR** Submerged objects/rocks are completely buried in a layer of sediment.
Have any fish kills occurred in the past 5 years?				
How often does the stream run dry?				
How often does out of bank flow occur?				
Are water withdrawals taken from the stream?				
Are invasive species a concern along the stream reach?				
How good is the fishing?				
Is public access to the stream permitted?				

Benefits to other resources can also be possible while working toward improved water quality. Taking stock of how existing and future management affect **soil, water, air, plants, animals, energy, greenhouse gases, people, and economics** can result in more effective plans and additional benefits to farms and communities both now and into the future.

Additional Comments:

AEM Tier 2 Worksheet
Petroleum and Oil Product Storage

Glossary

Cathodically Protected: Corrosion protection for an underground metal tank or pipe by causing a continuous electric current to flow from one or more electrodes or a sacrificial anode to the protected structure.

Corrosive Soils: Soil which can induce a chemical reaction that dissolves or weakens uncoated steel. The rate of corrosion is related to such factors as soil moisture, acidity and electrical conductivity of the soil. Information on the risk of corrosion posed by a particular soil type can be found in your County Soil Survey Report.

Inventory Control: Measuring and comparing the volume of tank contents regularly with product delivery and withdrawal records to help detect leaks before major problems develop.

Corrosion Resistant: Tanks and piping systems constructed of fiberglass-reinforced-plastic (FRP), steel protected by fiberglass (FRP) coatings, or steel that was installed with sacrificial anodes, or impressed current systems (cathodically protected).

(Continued on Page 2)

Background

According to the US Environmental Protection Agency (EPA), nearly one out of four underground storage tanks in the United States may be leaking. Both above and below- ground containers of petroleum products have the potential to damage public health and the environment, should leaks occur. Older underground petroleum tanks, especially those 15 years old or more, are more likely to leak.

Minor petroleum leaks can have major environmental impacts. For example, a few quarts of gasoline can contaminate an entire farmstead's drinking water supply. Human health is threatened with even low levels of petroleum contamination that are undetectable by taste or smell. Petroleum products contain numerous potentially toxic compounds, as well as carcinogens.

This worksheet applies to all on-farm petroleum and oil product storages (including waste/used oil), regardless of amount, as a loss from any storage has the potential to impact surface waters and groundwater. In addition, farms with certain types and capacities of petroleum or oil product storages are required to comply with the NYS Department of Environmental Conservation's (DEC) Petroleum Bulk Storage (PBS) regulation and/or the US EPA's Spill Prevention, Control, and Countermeasure (SPCC) regulation. The basic information in the table on the following page provides an introduction of the regulatory requirements.

Agricultural Water Quality Principle:

Care should be exercised in the storage of petroleum and oil products on the farm in order to prevent contamination of surface or groundwater resources.

Glossary Continued…

Oil Product: Oil of any kind or in any form, including, but not limited to: fats, oils, or greases of animal, fish, or marine mammal origin; vegetable oils, including oils from seeds, nuts, fruits, or kernels; and, other oils and greases, including petroleum, fuel oil, sludge, synthetic oils, mineral oils, oil refuse, or oil mixed with wastes other than dredged spoil. Note, US EPA SPCC Regulations focus on oils of any kind, while NYS DEC PBS Regulations pertain to petroleum-based oils.

Secondary Containment: Containment which prevents any materials spilled or leaked from reaching the land or water outside the containment area before cleanup occurs.

Soil Permeability: Ability of water to flow through a soil.

Stationary Tank All underground tanks or any aboveground tank which is not mobile. Examples of stationary above ground tanks include tanks which may rest on the ground or may be fixed or permanently in place on foundations, racks, cradles, or stilts.

Tightness Test: A test which will detect a tank or piping leak as small as five hundredths (0.05) of a gallon in one hour, which is approximately one gallon per day.

Wellhead Area: The pumping of a well draws down (lowers) the water table around the well, creating a "cone of depression." The land surface area over the cone of depression is often termed the "area of influence." The water which is recharged through the land surface within this area may eventually reach the well.

Background continued…

Is a farm likely to be directly regulated under NYS DEC PBS and/or US EPA SPCC?

NOTE: To absolutely determine whether a farm is regulated under PBS and/or SPCC and the regulatory requirements of each, please visit the websites for details and agency contacts.

Topic	NYS DEC PBS Regulation	US EPA SPCC Regulation
Website	www.dec.ny.gov/chemical/287.html	www.epa.gov/ceppo/web/content/spcc/
A farm is likely regulated and required to comply if …	... it has at least one underground storage tank greater than 110 gallons (not storing heating oil or non-retail motor fuel) or at least one petroleum storage tank with a capacity greater than 1,100 gallons (regardless of petroleum product stored). Note, if the farm has any tanks described above, then any heating oil and non-retail motor fuel tanks that do exist on the farm would also be included in the regulatory requirements. Note, all tanks storing used oil, regardless of capacity or type (above- or under-ground) must be registered. Other tanks on the farm would only need to be registered if their capacities exceeded the thresholds described, above.	…total above ground oil storage capacity is greater than 1,320 gallons, excluding home heating oil tanks, OR the total storage capacity of completely buried tanks is greater than 42,000 gallons, also excluding buried home heating oil tanks. Note, count containers with a storage capacity of 55 gallons or more, but do not count motive power containers (e.g., automotive or truck fuel tanks).Also, if the farm exceeds the volume thresholds, above, then home heating oil tanks would be included in the regulatory requirements.
What is considered petroleum (PBS) or oil (SPCC)?	Petroleum is crude oil and any mixture made from or containing crude oil; synthetic forms of lubricating oil, dielectric oils, insulating oils, hydraulic oils and cutting oils. Also includes used/waste oils meeting the preceding definition. **Note:** petroleum does not include animal or vegetable oils that do not contain crude oil or any fraction thereof, or products that are gases at 68º Fahrenheit and one atmosphere pressure (e.g., liquid propane), so these are not regulated by PBS.	Oil of any kind or in any form, including, but not limited to: fats, oils, or greases of animal, fish, or marine mammal origin; vegetable oils, including oils from seeds, nuts, fruits, or kernels; and, other oils and greases, including petroleum, fuel oil, sludge, synthetic oils, mineral oils, oil refuse, or oil mixed with wastes other than dredged spoil.

AEM ID: _____ Date: _____

Tank Inventory

Appropriate section of this worksheet should be completed for each tank listed below.

Tank No.	Size (gal.)	Above or Below Ground	Description*	Contents	Comments/Condition**

*Age, physical dimensions, above/underground, containment, protective coating, type of support/anchoring
** Rusted, painted, dented, resting directly on the ground, secondary containment

AEM Tier 2 Worksheet: Petroleum Product Storage		**Potential Concern**		
Factors Needing Assessment:	**Lower 1**	**2**	**3**	**Higher 4**
Above-Ground Storage Tanks:				
Is tank above a primary aquifer?	No			Yes
How far is petroleum stored from surface water sources?	More than 500 ft.	Between 200 and 500 ft.	Between 100 and 199 ft.	Less than 100 ft.
How far is the tank from water well?	Tank is outside wellhead area.	Tank is down slope more than 100 ft. from a well.	Tank is upslope more than 100 ft. from a well.	Tank is at grade or upslope less than 100 ft. from a well.
If tank is located in a floodplain, is the tank anchored to avoid flotation or lateral movement?	Tank is outside the floodplain.		Tank is within the floodplain but is anchored.	Tank is within the floodplain and is not anchored.
What is the soil permeability?	Slowly permeable	Slightly permeable soils	Moderately permeable soils.	Rapidly permeable soils.
What is the depth to the water table?	Always greater than 6ft. below the ground surface.	Never less than two feet below the ground surface.	Seasonable high water table.	Soil are often saturated.
What type of material is the tank constructed from, and is it corrosion resistant?	Painted steel tank, less than 15 years old with no visible rust or damage.	Painted steel tank, older than 15 years with no visible rust or damage.	Painted steel tank (any age) showing slight surface rust and/or minor damage to tank.	Steel tank (any age), showing extensive or pitted rust and/or damage to tank.

AEM Tier 2 Worksheet: Petroleum Product Storage Above Ground		**Potential Concern**		
Factors Needing Assessment:	**Lower 1**	**2**	**3**	**Higher 4**
Above-Ground Storage Tanks Continued:				
What type of material are tank supports constructed of, and is there corrosion?	Painted steel or other non-flammable material, less than 15 years old with no visible rust or damage. **AND** An impermeable barrier under the tank.	Painted steel or other non-flammable material, older than 15 years with no visible rust or damage. **AND** An impermeable barrier under the tank.	Painted steel or other non-flammable material (any age) showing slight surface rust and/or minor damage. **AND** An impermeable barrier under the tank.	Steel or other non-flammable material (any age) showing extensive or pitted rust and/or damage **OR** Supports made from flammable material **OR** Tank is not stable. **OR** No impermeable barrier under the tank.
Was tank installed to Manufacturer's Standards?				
Are monthly inspections performed on the storage and dispensing systems, and are records kept of dates and types of inspections performed, and leaks detected?				
What type of tank overfill protection exists?	Automatic shutoff and fill port is within secondary containment.	Overfill alarm or gauge and impermeable overflow spill catchment basins installed around fill port.	Impermeable overflow spill catchment basin installed around fill port.	No protection.
How do you monitor for leaks?	Ability to monitor for leaks beneath the tank and daily visual inspection with records.	Ability to monitor for leaks beneath the tank and daily visual inspection but not recorded.		No ability to monitor beneath the tank **AND/OR** Less frequent or no visual inspection

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Petroleum Product Storage Above Ground		**Potential Concern**		
Factors Needing Assessment:	**Lower 1**	**2**	**3**	**Higher 4**
What type of secondary containment do you have?	Double wall tank with ability to visually monitor for leaks of the inner tank.	Single wall tank placed within a fabricated (steel or concrete) containment with roof or diked containment with roof. **AND** Secondary containment valve is closed and locked.	Tank placed within a diked or bermed area capable of holding 100% of tank capacity plus precipitation. **AND** Secondary containment dike valve is closed and locked	No secondary containment. **OR** Secondary containment dike valve is not closed and locked.
Are fill ports painted with the proper American Petroleum Institute (API) color paint code?			**YES/NO**	
Are tanks labeled with Tank Number, Design Capacity and Working Capacity?			**YES/NO**	
Is all piping connected to the top of the tank to prevent leaks?			**YES/NO**	
Are all tank controls locked or in a remote locked location? Secure/lock loading & unloading connections?			**YES/NO**	
Is security lighting available around tanks?			**YES/NO**	
Does each tank have a liquid level gauge?			**YES/NO**	
Is tank(s) vented and clear of blockages?			**YES/NO**	
Are tank top sumps, dispenser sumps, and fill port catch basins kept clean and dry?			**YES/NO**	
Are fill port catch basins and vapor recovery systems checked after every delivery?			**YES/NO**	

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: **Petroleum Product Storage** **Above Ground**	**Potential Concern**
Is area around tanks free of debris and unrelated flammable materials?	**YES/NO**
Is tank in a location not normally accessible to traffic, or is it protected by bollards or walls?	**YES/NO**
Is it vulnerable to snow, ice, or rain coming off of roofs?	**YES/NO**
Do you have a written emergency response plan that shows action to be taken in case of spill, leak, fire or explosion?	**YES/NO**
Are your employees aware of the plan?	**YES/NO**
Is a list of contacts and phone numbers, including the DEC Spills Hotline, posted and visible?	**YES/NO**
Are cleanup equipment and absorptive material available at the site?	**YES/NO**
Comments:	

AEM Tier 2 Worksheet: Petroleum Product Storage Underground		**Potential Concern**		
Factors Needing Assessment:	**Lower 1**	**2**	**3**	**Higher 4**
Underground Storage Tanks:				
Is tank above a primary aquifer?	No			Yes
How far is petroleum stored from surface water sources?	More than 500 ft.	Between 200 and 500 ft.	Between 100 and 199 ft.	Less than 100 ft.
How far is the tank from a drinking water well?	Tank is outside wellhead area.	Tank is down slope more than 100 ft. from a well.	Tank is upslope more than 100 ft. from a well.	Tank is at grade or upslope less than 100 ft. from a well.
What is the soil permeability?	Slowly permeable.	Slightly permeable soils.	Moderately permeable soils.	Rapidly permeable soils.
What is the depth to the water table?	Always below the tank bottom.			Seasonable high water table **OR** In a floodplain.
What are the tank and piping characteristics?	Tank and all associated piping and connections are corrosion resistant **AND** Secondary containment on tank.	Steel tank and piping is newer than 15 years that is corrosion resistant. **AND** There is an annual cathodic protection test on the tank and piping.	Steel tank newer than 15 years coated with paint or asphalt and piping is coated.	Steel tank and piping over 15 years old.
Was tank installed to Manufacturer's Standards?				

AEM Tier 2 Worksheet: **Petroleum Product Storage** **Underground**		**Potential Concern**		
Factors Needing Assessment:	**Lower** **1**	**2**	**3**	**Higher** **4**
Are monthly inspections performed on the storage and dispensing systems, and are records kept of dates and types of inspections performed, and leaks detected?				
What type of tank overfill protection exists?	Automatic shutoff and impermeable overflow spill catchment basins installed around fill port.	Overfill alarm or gauge and impermeable overflow spill catchment basins installed around fill port.	Impermeable overflow spill catchment basin installed around fill port.	No protection.
How do you monitor for leaks?	Leak monitoring system for tank and piping with records for: • Weekly leak monitoring for tanks • Monthly verification of operability of leak monitoring system • Monthly leak monitoring for lines • Annual pressurized line leak detector tests (if applicable) • 5-year tightness testing for tanks over 15 yrs old	No leak detection system, but there are records of annual pressurized line leak detector tests (if applicable), and appropriate tank tightness testing available.	No leak detection system, but there is appropriate tightness testing	No monitoring or tightness testing.
What is the inventory control protocol?	Records of daily inventory monitoring and 10-day inventory reconciliation with deliveries and usage.	10-day inventory reconciliation	Occasional inventory monitoring.	No inventory control

AEM Tier 2 Worksheet: **Petroleum Product Storage** **Underground**		**Potential Concern**		
Factors Needing Assessment:	**Lower** **1**	**2**	**3**	**Higher** **4**
Is there an unused underground tank or a history of underground tanks at the farm?	No **OR** Tank taken from ground and excavation was checked for evidence of contamination.		Tank completely emptied and filled with inert material. Soil was not checked for contamination.	Unused tank was left as is in the ground.
Are fill ports painted with the proper American Petroleum Institute (API) color paint code?			**YES/NO**	
Are tanks labeled with Tank Number, Design Capacity and Working Capacity?			**YES/NO**	
Are all tank controls locked or in a remote locked location? Secure/lock loading & unloading connections?			**YES/NO**	
Is security lighting available around tanks?			**YES/NO**	
Does each tank have a liquid level gauge?			**YES/NO**	
Is tank(s) vented and clear of blockages?			**YES/NO**	
Are tank top sumps, dispenser sumps, and fill port catch basins kept clean and dry?			**YES/NO**	
Are fill port catch basins and vapor recovery systems checked after every delivery?			**YES/NO**	
Is area around tanks free of debris and unrelated flammable materials?			**YES/NO**	

AEM Tier 2 Worksheet: **Petroleum Product Storage** **Underground**	**Potential Concern**
Are there as-built plans and fill port labels?	**YES/NO**
Do you have a written emergency response plan that shows action to be taken in case of spill, leak, fire or explosion?	**YES/NO**
Are your employees aware of the plan?	**YES/NO**
Is a list of contacts and phone numbers, including the DEC Spills Hotline, posted and visible?	**YES/NO**
Are cleanup equipment and absorptive material available at the site?	**YES/NO**
Comments:	
Benefits to other resources can also be possible while working toward improved water quality. Taking stock of how existing and future management affect soil, water, air, plants, animals, energy, greenhouse gases, people, and economics can result in more effective plans and additional benefits to farms and communities both now and into the future. **Additional Comments:**	

AEM Tier 2 Worksheet
Forest Management

Glossary

Erosion Hazard: The probability that erosion will occur from timber harvesting activities if the soil is exposed.

Forest Road: A road passable to log trucks, between a publicly-maintained road and the log landing, to which harvested forest products are brought from the woods. Also known as a haul road, logging road, or access road.

Forest Tax Law: Under Section 480(a) of the Real Property Tax Law, some tax relief is provided to private forest owners enrolling 50 or more contiguous acres. The goal of this program is to encourage long-term ownership and healthy forests.

Landing (also referred to as a processing area)**:** Loading area where logs are gathered, cut to length, sorted and loaded on trucks for transport to a mill.

Skid Trail: Roads or trails upon which logs are dragged from the stump to a landing or processing area. Trail surfaces are rough and may be subject to erosion.

Background

Well-planned, productive uses of healthy forests can provide multiple benefits to the farm and community. These benefits go beyond the trees and include the total forest resource. In addition to timber harvest, forestland can be used in a variety of ways. Some of these include:

- the production of crops (agroforestry) such as mushrooms, berries, nuts and maple products
- silvopasture (practices of grazing animals within a forest area)
- recreation such as hunting, fishing, camping, hiking, horse and all-terrain vehicle trails
- fish and wildlife habitat
- harvest of fire wood
- carbon sequestration

Timber harvesting is the primary revenue for most forest lots. Recent studies show that landowners who use a professional forester in their forest management activities gain 40% more in revenue than those who do not. Poorly planned timber harvesting practices can lead to undesirable impacts on the environment, such as increased soil erosion, surface water pollution, and increased stream flows, to name a few. The planning and use of Best Management Practices can prevent and minimize water quality problems resulting from timber harvesting operations. These simple, often low-cost practices and techniques are described in the pocket guide *New York State Forestry Best Management Practices for Water Quality/ BMP Field Guide,* which is available from the NYS Department of Environmental Conservation (NYSDEC).

AEM Principle: Healthy, well-managed forests help to protect soil and water resources, reduce the impacts of exotic species and can provide valuable economic benefit to a farm operation.

Glossary Continued…

Slope Percent: The angle of a hill expressed in terms of percent. A vertical rise of one foot and a horizontal distance of three feet equal a 33 percent or 18-degree slope.

Streamside Management Zone: Areas next to streams, ponds, lakes, wetlands and other water bodies where forest harvesting activities are modified to protect water quality, fish, and other aquatic resources.

Background Continued…

A professional forester will assist a farmer in developing a plan that, when implemented, will achieve the farmers goal for forest utilization. These plans take into consideration such things as timber sales, species-specific and exotic species management for plants and wildlife, locations and management of roads and other disturbed areas to protect forests' soil and water resources.

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Forest Management		**Potential Concern**		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
Does the landowner have a forest management plan?	Forest management plan prepared by professional forester is being followed and is less than 10 years old.	Forest management plan prepared by a professional forester is being followed and is more than 10 years old.		No forest management plan has been prepared. **OR** Plan is no longer followed.
How is the forest <u>currently</u> being used? ☐ **Timber harvest** ☐ **Firewood** ☐ **Agro forestry/ Maple Products** ☐ **Silvopasture** ☐ **Wildlife/Recreation**			**How will the forest be used in the <u>future</u>?** ☐ **Timber harvest** ☐ **Firewood** ☐ **Agro forestry/ Maple Products** ☐ **Silvopasture** ☐ **Wildlife/Recreation**	
What is the average slope of the woodlot?	0-8%	8-25%	25-35%	Greater than 35%
List the locations where steep slopes exist:				
What is the primary soil drainage class for the woodlot?	Well drained and excessively drained.	Moderately well drained.	Somewhat poorly drained.	Poorly drained and very poorly drained.
What is the erosion hazard for the woodlot?	Slight		Moderate	Severe

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Forest Management		**Potential Concern**		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
Are there any limiting factors to forest use? ☐ **Steep slopes** ☐ **Rock Outcrops** ☐ **Streams** ☐ **Wetlands** ☐ **Other:** _____				
Are there any known exotic or invasive species within the woodlot?				
Are there any existing roads (skid trails, truck roads or landings) in the woodlot? **If so, what is their use?**				
What is the condition of existing roads and landings?	All roads are well planned and stable.		Roads are actively eroding.	Roads are actively eroding **AND** Sediment is reaching a stream or waterbody.
If stream crossings exist, are they properly located, stable and maintained?	Stream crossings are kept to a minimum. They are at grade and streambed is stable. No skidding across permanent streams unless permanent or temporary stream crossing structures are utilized. Stream flow is not impacted.			Stream crossings are poorly planned, with high potential for major damage at crossing sites. **OR** Skidding is done in stream channels.

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Forest Management		**Potential Concern**		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
How are riparian areas managed during timber harvesting?	Streamside management zones are marked. Timber and tops that accidentally fall into streams are removed by winching above the high water mark. Equipment is kept at least 50 ft. away from streams. **AND** Any additional, more restrictive regional or local regulations are met.		Streamside management zones are unmarked. Only limited tree removal is done within 15 feet of streambanks.	Logging slash is left in streams. No buffer is maintained along stream banks.
What is the date of the last timber harvest?				
Do you plan on harvesting timber in the next 5 years?				
Are livestock allowed free access to the woodlot? ***If so, complete Pasture Management Worksheet**				
Is the woodlot enrolled under Forest Tax Law?				

Benefits to other resources can also be possible while working toward improved water quality. Taking stock of how existing and future management affect **soil, water, air, plants, animals, energy, greenhouse gases, people, and economics** can result in more effective plans and additional benefits to farms and communities both now and into the future.

Additional Comments:

AEM Tier II Worksheets
Irrigation Water Management

Glossary

Backflow: the ability of water to gravity flow or siphon back into a well or other source.

Down Slope: at a lower topographic elevation than the source.

Legal Requirements (for backflow prevention): for irrigation systems using a municipal water supply, installation of backflow prevention devices must meet the standards set by local law.

Source Water: a reservoir of water such as an aquifer, surface water body or municipal water.

Tailwater: water applied at a rate that exceeds the soil's infiltration rate and begins to run off.

Up Slope: at a higher elevation than the source.

Water Holding Capacity: the maximum amount of water the soil can hold that is available for plant uptake.

Background

Irrigation Water Management is a planned system that determines and controls the rate, amount, placement and timing of water application. Irrigation can be an important management tool, particularly in areas with sandy or gravelly soils, and soils with limited water-holding capacity. The availability of water plays a crucial role in crop quality and quantity.

The development of an "Irrigation Water Management Plan" that addresses the irrigation scheduling, in both timing and amount, control of runoff, minimizing deep percolation and the uniform application of water is an essential component of this practice. The use of flood irrigation in not a valid practice in an Irrigation Water Management Plan.

Irrigation water management is utilized on cropland to supplement rainfall, and to apply fertilizer and pesticides to target crops. Several irrigation methods exist. Selection of the irrigation system to be used is based on the needs of the crop to be grown, soil type, topography, climate, distance to streams or other water bodies, and the source of water to be used for irrigation. To decrease non-point source pollution of surface and groundwater resources, water application must be at rates that minimize the transport of sediments, nutrients and chemicals to surface waters and that minimize the transport of nutrients and chemicals to groundwater.

Effective use of irrigation water can promote a desired crop response, minimize soil erosion, reduce the leaching of plant nutrients and pesticides and protect surface and groundwater quality. Irrigation water should be applied efficiently, at the proper time and application rate, and the amount of water applied should be based upon crop needs and the soil's moisture holding capacity.

Agricultural Water Quality Principle: Reduce surface water runoff and/or leaching of nutrients and pesticides by applying irrigation water based upon the capacity of the soil to hold water and the needs of the crop. Irrigation water should be applied so that the amount, rate, timing and method of application promote the desired crop response while conserving water and protecting water quality.

AEM for Irrigation Water Management

Factors Needing Assessment	Lower Risk…..1	2	3	Higher Risk…..4
What is the present level of source water protection?	Source water is at least 100 ft. up gradient from farm activities OR a municipal water supply is used	Source water is at least 100ft from farm activities OR Agricultural chemicals or petroleum products adjacent to water source are protected for spill containment.	Source water is down slope of farming activities AND Agricultural chemicals or petroleum products adjacent to water source are protected for spill containment.	Source water is down slope of farming activities AND Agricultural chemicals or petroleum products are used/stored adjacent to well or surface water.
What is the present level of backflow prevention?	Backflow installation meets legal requirements and protects municipal water supply, well-water, and non-crop water supplies OR irrigation water is not mixed with fertilizers or chemicals.	Backflow installation meets legal requirements	A Check Valve is used	No backflow protection equipment installed
Does irrigation result in excess off-site water movement and runoff?	Irrigation practices result in no runoff (i.e. drip irrigation, if applicable). Application rate of irrigation device is lower than soil infiltration rate.	Conservation practices are in place to minimize runoff (e.g. perennial cover crops, subsoiling, buffer/filter strips, diversions, and grass waterways)..	Irrigation practices result in no runoff BUT runoff and erosion occurs during high rainfall events. *AND/OR* Conservation practices need improvement.	Runoff occurs when irrigating and/or during rainfall events. Application rate of irrigation device exceeds soil infiltration rate.

What type of distribution system do you use?	Micro or low volume emitters are used and operated at the correct pressure.	Rotary impact heads with new or matching nozzles OR Center pivot or boom with low flow sprinklers	Rotary impact heads with worn or different nozzles OR big gun; and not operated at the specified pressure	Rotary impact heads with worn or different nozzles OR big gun; and not operated at the specified pressure AND Portable pipe joint seals are leaking
Are monitoring devices used to determine the need to irrigate?	Soil moisture monitoring devices (e.g. neutron gauge, tensiometer or gypsum blocks) are installed and used to track soil moisture depletion.	Soil moisture monitoring is done by bucket auger (judging by feel). *AND* Weather data is recorded and seasonal rainfall amounts are considered when deciding when to irrigate and how much water to apply.	Weather data is recorded and daily rainfall amounts are considered when deciding when to irrigate and how much water to apply.	An irrigation schedule is maintained regardless of soil moisture or weather conditions; and no rain sensor override on automated timers.
Do you check for distribution uniformity?	System is checked throughout the growing season by measuring emitter outflows and/ or pressure differential in each zone.	System is checked at the beginning of each growing season by measuring emitter outflows and/or pressure differential in each zone.	Distribution uniformity is tested irregularly by measuring emitter outflows and/or pressure differential in each zone.	Distribution uniformity is never checked.

Is a flow meter installed?	Flow meter is installed and used to monitor application rates throughout the season.		Flow meter is installed but not regularly used to monitor the system OR flow meter is installed but not working correctly OR proper application rate reference amount for system is not known.	Flow meter is not installed.
How is the amount of water applied determined for each irrigation?	Water is applied according to the water holding capacity of the soil, soil moisture measurement, crop demand and weather conditions at that time. *AND* Application time is calculated according to the application rate of the system and the measured depletion in the root zone.	Water is applied according to the water holding capacity of the soil, crop demand and weather conditions at that time. Soil moisture is not measured. *AND* Application time is calculated according to the application rate of the system.	Irrigation water is applied for a pre-determined time period when conditions are dry.	Irrigation water is applied without regard to weather conditions, or water holding capacity of the soil *AND* Tailwater (runoff) flows from the field.
What level of system maintenance is applied?	System is routinely inspected for operating pressure AND leaks are repaired as soon as noticed.	System is routinely inspected for operating pressure AND leaks are repaired within the season.	Operating pressure is occasionally checked AND leaks are repaired at the beginning of the season.	System is not inspected and only major repairs are performed.

Is routine maintenance performed on the drip irrigation system?	Water filters are inspected and cleaned whenever pressure differences indicate and irrigation lines are flushed at the beginning and end of each season. Flush water is contained and treated. *AND* Chemical treatment of the water is completed if tests show a problem (e.g. to prevent precipitate buildup and kill algae or bacteria present in the system).	Water filters are inspected and cleaned whenever pressure differences indicate and irrigation lines are flushed at the beginning of the irrigation season each year.		Water filters and irrigation lines cleaned only when clogged and rinsate is discharged to water source or downstream.

Comments:

1. Is your pump engine and fuel storage in a sensitive area?
2. Are irrigation ponds treated for algae and/or weed control?
3. What is the source of your irrigation water? Is it tested?

NOTE: You must also complete Farmstead Water Supply Worksheet.

AEM Tier 2 Worksheet
Livestock Heavy Use Areas (HUAs)

Glossary

Livestock Heavy Use Area (HUA): Areas where animals are concentrated, including those that are paved, un-vegetated or result in overgrazed or denuded soil conditions. Also called barnyards, holding areas, sacrifice areas, confinement areas, calf hutch areas, feedlots and winter paddocks.

Vegetated Flow Distance: The length runoff water can flow over a vegetated surface to a waterbody, excluding any length water flows over a non-vegetated surface.

Vegetated Treatment Area (VTA): An area of grass sod, meeting NRCS Standard NY-635, for removing sediment, organic matter, nutrients and other pollutants from HUA runoff or wastewater.

Waterbody: A lake, reservoir, pond, river, continuously-flowing stream, continuously-flowing spring, wetland, estuary or bay.

Watercourse: Water flowing over a non-vegetated channel to a waterbody.

Background

Livestock waste contains high levels of nitrogen, phosphorus, sediments, degradable organic materials and microbes. When livestock waste is concentrated, as it is in barnyards, holding areas, calf hutch areas or feedlots, the danger of pollutants reaching surface water or groundwater increases. Odors from poorly-designed and managed HUAs can also be a cause of problems with neighbors. In addition, wet, manure and mud-laden HUAs can lead to animal health problems.

In general, good HUA management involves three basic principles:

1. Minimize pollutant source (i.e. reduce size and/or reduce the time on the HUA and/or clean often)
2. Divert clean runoff from roofs and the upslope land area away from the HUA
3. Catch and treat contaminated runoff

There is a greater chance of livestock waste affecting surface water if the HUA is located close to a down-slope watercourse or waterbody.

There is a greater risk of the HUA affecting groundwater if:

- the HUA is located over coarse-textured, permeable soils (sand and gravel);
- the water table is at or near the soil surface;
- bedrock is within a few feet of the soil surface;
- polluted runoff from the HUA flows directly onto permeable soil or bedrock;
- the HUA has been abandoned and manure remains.

AEM Principle:

Livestock heavy use areas should be managed in ways to improve water quality, reduce odors and contribute to a healthy environment for livestock.

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: HUAs		**Potential Concern**		
Factors Needing Assessment	**Lower 1**	**2**	**3**	**Higher 4**
What is the Vegetated flow distance from the HUA to the nearest watercourse?	Greater than 300 ft.	Between 200 and 300 ft.	Between 100 and 200 ft.	Less than 100 ft.
What is the characteristic of the vegetation cover that surface water flows through?	Permanent heavy grass sod.	Rotation with continuous cover or woodland.	Row crop growing or with at least 30% residue.	Abused pasture, bare ground, or concentrated flow path.
What is the farmer's main objective for the HUA? (i.e. heat detection, exercise, fresh air, etc.)				
What is the square footage of the HUA?				
Is the HUA sized right for the number of animals?				
How long are animals on the HUA daily?				

HUA Size Guidelines

Purpose	Cows 1400 lbs.	Cows 1,000 lbs.	Heifers 500 lbs.
Holding	15/sq. ft	12/sq. ft	8/sq. ft
Feeding	30/sq. ft	24/sq. ft	18/sq. ft
Resting	50/sq. ft	35/sq. ft	25/sq. ft
Heat Detection & Exercise	70/sq. ft	55/sq. ft	45/sq. ft

Are animals in the HUA over the winter months?				
AEM Tier 2 Worksheet: HUAs		**Potential Concern**		
Factors Needing Assessment	**Lower 1**	**2**	**3**	**Higher 4**
Where are wells in relation to the HUA?				
What are the drainage characteristics of the soil in the HUA and adjacent flow path?	Somewhat poorly drained.			Excessively well drained.
What is the depth to the high water table under unpaved HUAs and adjacent flow paths?	Greater than 6 ft.	4 to 6 ft.	2 to 4 ft.	Less than 2 ft.
What is the depth to bedrock under unpaved HUAs and adjacent flow paths?	Greater than 6 ft.	4 to 6 ft.	2 to 4 ft.	Less than 2 ft.
How often is the HUA cleaned?				
Are there curbs or push walls and are they functioning?				
Are the paved areas in good shape (can be scraped clean and with minimal cracks)?				
Is clean water (including roof water,	All runoff is diverted away from the HUA. Waterers are			There is no control of water from roof tops,

upslope runoff, and animal watering sources) kept separate from manure?	automatic and in good repair.			upslope runoff and animal watering sources from running through the HUA.
AEM Tier 2 Worksheet: HUAs		**Potential Concern**		
Factors Needing Assessment	**Lower 1**	**2**	**3**	**Higher 4**
Are there roof gutters and/or drip trenches and are they functioning?				
Is HUA runoff controlled?	All HUA runoff is collected, held or transferred to a properly designed storage. **OR** HUA is completely covered and protected from precipitation.	Liquids from the HUA are directed to a properly-designed VTA. Solids are contained in a settling basin and removed as needed. Prescribed O&M is carried out.	Liquids are directed to a grass filter area. Minimum O&M is carried out.	Runoff from the HUA is not controlled.
Is there a VTA receiving runoff from the HUA?				
If yes, has Nitrate Leaching Index evaluation and soil phosphorus testing been completed on the VTA?				
Does the HUA lead to a pasture system? Are there gates present to minimize inappropriate congregating?				

Benefits to other resources can also be possible while working toward improved water quality. Taking stock of how existing and future management affect **soil, water, air, plants, animals, energy, greenhouse gases, people, and economics** can result in more effective plans and additional benefits to farms and communities both now and into the future.

Additional Comments:

AEM Tier 2 Worksheet
Silage Storage

Glossary

Biochemical Oxygen Demand (BOD): The decrease in oxygen content of a water sample brought about by the bacterial breakdown of organic matter.

Footer Drain: Sub-surface drainage tubing installed below grade to prevent sub-surface water from entering a silage storage area. It is not meant to convey polluted runoff or seepage (leachate).

Soil permeability: The ability of liquid to flow through soil.

Vegetated Treatment Area (VTA): An area of grass sod, meeting NRCS Standard NY-635, for removing sediment, organic matter, nutrients and other pollutants from storm-related high flow from silage storage areas.

Vegetated Flow Distance: The length runoff water can flow over a vegetated surface to a waterbody, excluding any length water flows over a non-vegetated surface.

Waterbody: A lake, reservoir, pond, river, continuously-flowing stream, continuously-flowing spring, wetland, estuary or bay.

Watercourse: Water flowing over a non-vegetated channel to a waterbody.

25 year, 24 hour storm - the amount of rainfall in a 24-hour period with a probable recurrence interval of once in 25 years. See Northeast Regional Climate Center for amounts - http://www.nrcc.cornell.edu/pptext/isomaps.html

Background

When silage is harvested and stored properly, it should have minimal impact on the environment. However, if silage is not harvested or stored properly, liquid (called seepage or leachate) or runoff carrying silage liquid and/or solids may escape from the silage storage. This leachate contains high concentrations of nutrients, acid, and Biochemical Oxygen Demand (BOD). If it gets into soil or water, it can damage the quality of ground and surface water.

If leachate enters a surface water source, it readily feeds bacteria that can deplete the oxygen in water. Its BOD is approximately 5 times as great as manure and 100 times greater than municipal sewage. This concentrated waste has led to the death of fish and other kinds of aquatic life. Offsite impacts can be dramatic; leachate accounts for approximately half of all reported fish kill incidents in New York State.

Leachate can increase the levels of acid, phosphorus, ammonia and nitrate present in the water. It gives the water an unpleasant smell and can cause health problems for humans and animals.

AEM Principle:

Leachate from silage storages should be properly collected and treated to protect surface and ground water resources, soil and aquatic habitats.

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Silage Storage: Bunker Silos		**Potential Concern**		
Factors Needing Assessment	**Lower 1**	**2**	**3**	**Higher 4**
What is the moisture content (%) of silage stored in horizontal silage storages?	Always below 70%	Mostly below 70%	Frequently above 70%	Always above 70%
Is clean water excluded from the silage storage area?	Footer drains and diversions prevent all clean water from entering the silage storage without collecting dirty water. Footer drains are checked for excessive algae growth or other signs of excessive nutrient loss.	Footer drains collect clean sub-surface water and surface water diversions prevent runoff from the 25 yr, 24hr storm from entering the silage storage without collecting dirty water.		No clean water exclusion. **OR** Footer drain collects silage leachate and it is untreated.
Is there a well-maintained roof or cover that diverts rain water from the silage area?				
Are there noticeable leachate leaks through cracks or holes in silage storage floors, walls, or foundations?				
How is spoiled silage and waste feed dealt with?				
Is leachate production causing kill zones?	There are no kill zones on any side of the silage storage.	Small kill zones appear but are quickly repaired.	There are several small kill zones present.	Significant kill zones are present.
What is the vegetated flow distance from the silage storage to the nearest watercourse?	Greater than 1000 ft.	Between 400 and 1000 ft.	Between 100 and 400 ft.	Less than 100 ft.

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Silage Storage: Bunker Silos		**Potential Concern**		
Factors Needing Assessment	**Lower 1**	**2**	**3**	**Higher 4**
What is the potential of silage storage to contaminate groundwater? • **What is the depth to groundwater and/or bedrock?** • **Is there a potential for groundwater pollution due to the permeability of the soils? What is the soil type?** • **How far is the silage storage from a well and is it up or down slope?** • **What was the result of the most recent water supply nitrate test?**				
What is the potential for silage leachate to reach a tile drainage system (farmstead or field)?				
How is silage leachate and contaminated runoff collected and handled?	There is a designed collection system for all silage leachate and contaminated runoff directed to a properly designed storage structure and land applied according to a nutrient management plan. All O&M is performed as prescribed.	There is a designed collection system for low flow rates of silage leachate for subsequent field application. High flows go to a properly designed vegetated treatment area. Screens are kept clean and O&M is performed as prescribed.	No silage leachate collection system exists. **AND** Leachate drains to a vegetated area and does not appear to reach a watercourse.	No silage leachate collection system exists. **OR** Collected leachate is directed to a ditch, concentrated flow or farmstead drainage system.
Is there a VTA? **If yes, has Nitrate Leaching Index evaluation and soil phosphorus testing been completed?**				

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: **Silage Storage: Bunker Silos**		**Potential Concern**		
Factors Needing Assessment	**Lower** **1**	**2**	**3**	**Higher** **4**
Are any other high-moisture commodities (i.e. brewers' grain) stored? **If yes, is leachate from these storages appropriately collected and treated?**				

Benefits to other resources can also be possible while working toward improved water quality. Taking stock of how existing and future management affect **soil, water, air, plants, animals, energy, greenhouse gases, people, and economics** can result in more effective plans and additional benefits to farms and communities both now and into the future.

Additional Comments:

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Silage Storage: Upright Silos		**Potential Concern**		
Factors Needing Assessment	**Lower 1**	**2**	**3**	**Higher 4**
What is the moisture content of silage stored in tower silos: - 40 ft. and under? - Above 40 ft.?	- Always below 65%	- Mostly below 65% - Always below 65%	- Frequently over 65% - Mostly below 65%	- Always over 65% - Frequently over 65%
Is clean water diverted from the silo loading area?	All outside water from roofs and the surrounding area is diverted from the loading area.	Outside water from roofs and the surrounding area up to the 25 yr, 24 hr storm is diverted from the loading area.		There is no clean water diversion. **OR** Footer drain collects leachate.
Is there a well-maintained roof or cover that diverts rain water from the silage area?				
Are there noticeable leachate leaks through cracks or holes in silage storage floors, walls, or foundations?				
How is spoiled silage and waste feed dealt with?				
What is the potential of silage storage to contaminate groundwater? • **What is the depth to groundwater and/or bedrock?** • **Is there a potential for groundwater pollution due to the permeability of the soils? What is the soil type?** • **How far is the silage storage from a well and is it up or down slope?** • **What was the result of the most recent water supply nitrate test?**				
What is the potential for silage leachate to reach a tile drainage system (farmstead or field)?				

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Silage Storage: Upright Silos		**Potential Concern**		
Factors Needing Assessment	**Lower 1**	**2**	**3**	**Higher 4**
How is silage leachate and contaminated runoff collected and handled?	There is no silage leachate. **OR** There is a designed collection system for all silage leachate and contaminated runoff directed to a properly designed storage structure and land applied according to a nutrient management plan.		No silage leachate collection system exists. **AND** Leachate drains to a vegetated area and does not appear to reach a watercourse.	No silage leachate collection system exists. **OR** Collected leachate is directed to a ditch, concentrated flow or farmstead drainage system.
Are any other high-moisture commodities (i.e. brewers' grain) stored? ***If yes, is leachate from these storages appropriately collected and treated?***				

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Additional Comments:

AEM ID: Date:

AEM Tier 2 Worksheet: Silage Storage: Ag Bags		**Potential Concern**		
Factors Needing Assessment	**Lower 1**	**2**	**3**	**Higher 4**
What is the moisture content of silage stored in ag bags?	Even filling, consistent shape of bag – no leachate bulges.			Bag is noticeably bulging from leachate accumulation.
What is the site condition of the ag bag area?	Surface is graded away from any water course and toward a grassed area. Area is hardened to allow loading and unloading and is kept clean of spoiled or wasted feed.			The surface is muddy and rutted; flows are directed towards a watercourse. Surface is not being maintained.
Is clean water excluded from the silage storage area?	Outside surface water is excluded from the ag bag area.			Outside surface water is not excluded from the ag bag storage area.
How is spoiled silage and waste feed dealt with?				
What is the vegetated flow distance from the silage storage to the nearest watercourse?	Greater than 500 ft.	Between 350 and 500 ft.	Between 100 and 350 ft.	Less than 100 ft.
What is the potential of silage storage to contaminate groundwater? • **What is the depth to groundwater and/or bedrock?** • **Is there a potential for groundwater pollution due to the permeability of the soils? What is the soil type?** • **How far is the silage storage from a well and is it up or down slope?** • **What was the result of the most recent water supply nitrate test?**				

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: **Silage Storage: Ag Bags**		**Potential Concern**		
Factors Needing Assessment	**Lower** **1**	**2**	**3**	**Higher** **4**
What is the potential for silage leachate to reach a tile drainage system (farmstead or field)?				
Are any other high-moisture commodities (i.e. brewers' grain) stored? **If yes, is leachate from these storages appropriately collected and treated?**				

Benefits to other resources can also be possible while working toward improved water quality. Taking stock of how existing and future management affect **soil, water, air, plants, animals, energy, greenhouse gases, people, and economics** can result in more effective plans and additional benefits to farms and communities both now and into the future.

Additional Comments:

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Silage Storage: Temporary Silage Piles		**Potential Concern**		
Factors Needing Assessment	**Lower 1**	**2**	**3**	**Higher 4**
What is the size and type of temporary silage piles?	No piles on bare ground.		Small piles from unexpected high yields. Not created every year and are covered.	Piles occur annually due to inadequate storage facilities.
Is clean water excluded from the silage storage area?	Outside surface water is excluded.			Outside surface water is not excluded.
Is there a well-maintained cover that diverts rain water from the silage area?				
How is spoiled silage and waste feed dealt with?				
What is the vegetated flow distance from the storage piles to the nearest watercourse?	Greater than 1000 ft.	Between 600 and 1000 ft.	Between 200 and 600 ft.	Less than 200 ft.
What is the potential of silage storage to contaminate groundwater? • **What is the depth to groundwater and/or bedrock?** • **Is there a potential for groundwater pollution due to the permeability of the soils? What is the soil type?** • **How far is the silage storage from a well and is it up or down slope?** • **What was the result of the most recent water supply nitrate test?**				
What is the potential for silage leachate to reach a tile drainage system (farmstead or field)?				

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: **Silage Storage: Temporary Silage Piles**		**Potential Concern**		
Factors Needing Assessment	**Lower** **1**	**2**	**3**	**Higher** **4**
Are any other high-moisture commodities (i.e. brewers' grain) stored? **If yes, is leachate from these storages appropriately collected and treated?**				
Benefits to other resources can also be possible while working toward improved water quality. Taking stock of how existing and future management affect **soil, water, air, plants, animals, energy, greenhouse gases, people, and economics** can result in more effective plans and additional benefits to farms and communities both now and into the future. **Additional Comments:**				

AEM Tier 2 Worksheet
Process Wash Water

Glossary

Aerobic Lagoon: A Best Management Practice (BMP) consisting of a shallow impoundment with a large surface area designed for adequate diffusion of oxygen to biologically treat animal and other agricultural wastes.

Biochemical Oxygen Demand (BOD): The decrease in oxygen content of a water sample brought about by the bacterial breakdown of organic matter.

Land Application: The application of process waste water to agricultural land at agronomically acceptable rates and according to USDA Natural Resources Conservation Service (NRCS) Conservation Practice Standard NY-633 for Waste Utilization or NY-590 for Nutrient Management.

Waste Transfer: A method or system to transfer process waste water through a hopper or reception pit, a pump (if applicable), a conduit, or hauling equipment to a manure storage/treatment facility, loading area, and or agricultural land for final utilization.

Vegetative Treatment Area: An area of grass sod, meeting NRCS Standard NY-635, for removing sediment, organic matter, nutrients, and other pollutants from barnyard runoff or waste water. To address process wash water that includes settled solids, the system will include a settling tank and a pipeline leading from the tank to the vegetative filter area with a level cross-section, which allows the effluent to spread evenly over the treatment area.

Background

Process wash water poses a potential for contamination to both groundwater and surface water. Wash water may contain ammonia and nitrate (from agricultural wastes), detergents, cleaning chemicals, phosphorus and microbes. It also may have a high Biochemical Oxygen Demand (BOD), which is harmful to aquatic life. Substantial additions of waste milk (BOD of 100,000 mg/liter) to the wash water will dramatically increase the pollution potential. The characteristics of the process wash water needs to be carefully evaluated to determine the BOD, total solids, volatile solids, N, P, and K along with other chemicals to determine the need for and type of treatment to protect water quality.

If process wash water is not added to manure for proper land application, this worksheet may be valuable in evaluating systems and procedures for treatment. The wash water treatment system must be properly designed and maintained to prevent these contaminants from entering surface water and groundwater resources. To prevent contamination of water:

1. Check the treatment system used for wash water. Make sure it's in good condition and large enough to handle all the wash water produced on the farm.
2. Take measures to reduce the amount of water used in the processing and/or cleanup operation.
3. Remove the first rinse containing the highest concentrated material from the treatment system and limit the amount of organic material dumped into the treatment system. On livestock farms it can be fed or added to a manure storage system. It can also be added to compost piles or land applied.

AEM Principle:

Process wash water should be properly handled and treated to protect surface and groundwater resources that support human health and aquatic habitat.

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Process Wash Water		**Potential Concern**		
Factors Needing Assessment	**Lower 1**	**2**	**3**	**Higher 4**
What sources of processed wash water are present?				
To what level is the process wash water managed (excluding wash water directed to storage for land application)?	Organic matter is removed from tanks, floor, or process lines before wash down. **AND** First rinse is collected to limit organic matter entering the system.		Some debris and organic matter is washed down the drain.	Large amounts of organic matter and other solids are washed down the drain.
How many gallons of water are used for process clean up? **How was that amount determined?** **Can the volume and/or concentration be reduced?**				
What is the method of storage and treatment, of process wash water?	Properly designed, sized, and maintained: Aerobic lagoon; **OR** Transfer to waste storage and land application according to a Nutrient Management Plan.	Daily spread according to a Nutrient Management Plan; **OR** Vegetative treatment area.	Septic system with solid separation or settling, in appropriate soils (not sands or gravels)with no water from the leach field reaching the surface; **OR** Settling basin with outlet to fully vegetated flow path that does not appear to reach a watercourse.	Dry well or stone pit; **OR** Dumped on soil surface; **OR** Disposal in field tile, ditch, or surface water; **OR** Septic system with water coming to the surface; **OR** Septic system in a high water table; **OR** Septic system in very permeable soils (sand or gravel).

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: **Process Wash Water**	**Potential Concern**
Is there a certified design and as-built for the treatment and transfer system on the farm?	
Is water tested/treated for hardness?	
What chemicals are being used and are label recommendations being followed?	
How often is the existing system inspected and maintained?	
Additional Questions for Milking Center Wash Water	
What type and size milking system is present? (dumping station, pipeline, parlor, etc.)	
Is first rinse water collected and fed?	
What is done with waste milk?	
Has milking herd size increased since the system was designed and installed? **If yes, by how much?**	

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Additional Comments:

AEM Tier 2 Worksheet
Management of Dairy Feed Nutrients

Glossary

Component Feeding: Feeding system in which forages and grains are provided separately.

Digestibility: Percentage of feed or a feed nutrient that is absorbed through the digestive tract. It can be calculated as: [(lbs. nutrient intake - lbs. nutrient in manure) ÷ lbs. nutrient intake] X 100%.

Dry Matter Content: Also expressed as Percent (%) Dry Matter. The portion of a feed remaining after all the water is driven off

Dry Matter Intake: Amount of feed dry matter content a cow will eat in a day. The larger the dry matter intake, the lower the concentration of nutrients required to supply a cow's daily requirements.

Dry Period: Period of time in which a cow is not giving milk.

Feed Inventory – A quantification of the amounts and types of feed available on the farm to feed to the herd throughout the year.

(Continued on Page 2)

Background

Effective management of nutrients is a primary goal of Comprehensive Nutrient Management Plans (CNMPs). These plans aim to reduce a livestock farm's risk of releasing nutrients to surface and ground waters. Improving a farm's nutrient mass balance (the amount of nutrients imported compared to the amount of nutrients exported) will reduce the amount of nutrients that have the potential to be lost to the environment. Although feed management is not always a component of CNMPs, changes in the feeding program can have a significant influence on farm nutrient management. Reducing nutrient imports to a farm is a critical way to improve a farm's nutrient mass balance. While it varies widely by farm type and management, a substantial portion of the nutrients annually delivered to livestock farms in the form of purchased (imported) feeds, and to a lesser degree fertilizers, often remains on the farm where they may accumulate in farm soils and may be lost to air and water resources. Farms that intensively manage their feeding program reduce nutrient excretion in the manure, increase feed nutrient utilization, and subsequently improve the farm's mass nutrient balance.

From an environmental perspective, four areas of feed management significantly influence effective feed nutrient use:

1. Digestible nutrient content of homegrown forages produced and fed;
2. Accuracy of estimating feed nutrient intakes, and feed inventory;
3. Employment of scientific standards to determine nutrient requirements and ration levels; and
4. Inclusion level of homegrown feeds (forages and/or grains) in the diet.

(Continued on Page 2)

AEM Principle:

Providing adequate, not excess, nutrients to the animal through the integration of feeding and crop management can reduce nutrient excretion in manure and nutrient accumulation in soil; lowering potential pollution risks to water and air resources and improving farm profitability.

Glossary Continued…

Forages: Feed containing the vegetative parts of a plant. Hay crop forages (e.g. alfalfa and/or grass hay or silage) do not contain any grains, while grain crop forages (e.g. corn silage) contain both vegetative and grain portions of the plant. Cattle feeds are generally classified into forages or concentrates (grains).

Forage Acre per Cow: A rough measure of whether a farm has an adequate land base for more intensive homegrown feed production and feed management. Generally, a farm with 1 to 2 forage acres/cow has the land base for more intensive management.

Forage Quality: A qualitative measure of the nutritive value and digestibility of a forage. **Wet Feeds:** The moisture content of forages, grains, or by-product feeds (generally with less than 87% dry matter) can vary significantly over time or between batches (e.g. ensiled forages, high moisture corn, wet brewer's grains).

Milk Urea Nitrogen (MUN) Values: Milk urea nitrogen reflects the amount of urea found in milk and these values are closely correlated with the concentration of urea found in the blood. MUN values are one tool nutritionists and veterinarians can use to monitor the nutritional status of dairy cows.

Ration Balancing – the process of formulating cattle diets that 1) identifies farm specific animal nutrient requirements and 2) meets those requirements using a mix of homegrown and purchased feeds.

Total Mixed Rations (TMR): Feeding system in which forages, grains, protein, vitamins and minerals are weighed and blended to meet nutritional requirements. Each mouthful is considered to have complete nutritional balance.

Background Continued…

Digestibility of nutrients in a forage is one measure of forage quality, which determines the amount of that forage cattle can consume. Forage quality is largely managed by forage species/variety selection and harvest management. The greater the quality and quantity of homegrown forages produced, properly stored and accurately fed, the less purchased feed nutrients must be imported to achieve production. Maximizing the use of homegrown feeds more effectively recycles nutrients from the crop, to the cow, to the manure, to the soils and back to the crop.

Inaccurate estimates of feed consumption can lead to large imbalances in nutrient intake. Rations regularly balanced to supply required nutrients will result in high production and a smaller proportion of feed nutrients excreted in the manure.

General animal husbandry is also critical to insure effective feed nutrient utilization. A feeding program will best perform when animals are kept healthy, comfortable, and housed in a stress-free environment. Furthermore, clean, fresh feed and water must be readily available to achieve maximum feed intake and the projected level of milk or meat production.

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Management of Feed Nutrients		**Potential Concern**		
Factors Needing Assessment:	**Lower 1**	**2**	**3**	**Higher 4**
In a typical year, when do you start mowing hay in the spring? ***add 5 days if high elevation.**	Grasses* May 15th in Southern NY May 20th in Northern NY Legume* May 25th in Southern NY June 1st in Northern NY (*add 5 days if high elevations)	Grasses* May 20th in Southern NY May 25th in Northern NY Legume* June 1st in Southern NY June 5th in Northern NY (*add 5 days if high elevations)	Grasses* May 25th in Southern NY June 1st in Northern NY Legume* June 5th in Southern NY June 10th in Northern NY (*add 5 days if high elevations)	Grasses* June 1st in Southern NY June 5th in Northern NY Legume* June 10th in Southern NY June 15th in Northern NY (*add 5 days if high elevations)
In a typical year, how many cuttings do you harvest each year?	Hay cropland is cut: More than 4 times per season in Southern NY OR More than 3 times per season in Northern NY	Hay cropland is cut: 4 times per season in Southern NY OR 3 times per season in Northern NY.	Hay cropland is cut 2 times per year.	Hay cropland is cut less than 2 times per year.
What percentage of forages fed do you purchase?	0%	1-25%	25-50%	Greater than 50%
How many acres of grain are grown annually? Is the grain being used on the farm?				
What is the forage acre/cow ratio for the farm? (Complete calculation on page 6)				

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Management of Feed Nutrients		**Potential Concern**		
Factors Needing Assessment:	**Lower 1**	**2**	**3**	**Higher 4**
Is the farm interested in feeding more homegrown feed in the diet?				
Are animals fed in groups?	High producing cows, low producing cows, dry cows, transition cows, and multiple heifer groups are each fed separately or distinct rations as individuals.		Lactating, dry cows and heifer groups are each fed separately or distinct rations as individuals.	No
How closely are the recommendations of the nutritionist followed?	Very closely	Closely	Somewhat closely	Do not interact with a nutritionist on a regular basis.
How often are feed rations balanced?	Rations are balanced monthly or more often as feed quality changes.	Rations are balanced at least 4 times a year or more often if forages change.		No regular ration balancing is done.
How often are forages tested for quality?	Forages are analyzed for nutrient content monthly or more often if forages change.	Forages are analyzed for nutrient content at least 4 times a year or more often if forages change.		Forages are not regularly analyzed.
How much of your stored feed do you typically discard due to quality issues (e.g. mold, spoilage)?	Less than 5%	Less than 10%	Less than 25%	More than 40%

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Management of Feed Nutrients		**Potential Concern**		
Factors Needing Assessment:	**Lower 1**	**2**	**3**	**Higher 4**
How often is dry matter content of wet feeds determined?	Weekly	Every 2 weeks		Not regularly determined.
How often is dry matter intake measured or estimated?	Weekly	Monthly		Not regularly measured.
Are the Milk Urea Nitrogen (MUN) values between the normal range of 8 to 12? **Do you use this information to make management decisions?**				
Do you use a Total Mixed Rations (TMR) or a Component Feeding, system?				
Is grazing used on the farm? **Lactating Cows?** **Dry Cows?** **Heifers?**				
Does your farm have any challenges with: **Herd health and performance issues?** **Cow comfort and stress issues?** **General nutrition and feeding issues?** **Heifer growth issues?**				
Is the farm satisfied with its level of milk production?				
Would you be interested in talking with a feed management specialist?				

Benefits to other resources can also be possible while working toward improved water quality. Taking stock of how existing and future management affect **soil, water, air, plants, animals, energy, greenhouse gases, people, and economics** can result in more effective plans and additional benefits to farms and communities both now and into the future.

Additional Comments:

Formula for Calculating Forage Acre Per Cow

Step 1:

_____	+	_____	+	_____	−	_____	=	_____
Cropland Acres (from Tier 1)		Grazed Land Acres (from Tier 1)		Permanent Hayland Acres (from Tier 1)		Grain Acres (from Page 3)		Forage Acres

Step 2:

_____	÷	_____	=	_____
Forage Acres (from above)		Number of Mature Dairy Cows (from Tier 1)		Forage Acres/Cow

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet
Water-borne Pathogens

Glossary

Coliform: Bacteria whose presence in drinking water is an indicator of the possibility of pathogen contamination.

Cryptosporidiosis: A diarrheal illness of varying severity caused by an intestinal parasitic protozoan, *Cryptosporidium*. It is a common cause of diarrhea worldwide and can be a serious health threat to infants and individuals with immune system deficiencies.

Escherichia coli (E. coli): A bacterial species that lives in the intestinal tract of multiple hosts and is shed in feces. *E. coli 0157* differs from other normal intestinal E. coli strains because it carries several toxin-producing genes capable of affecting humans. It can cause illness ranging from bloody diarrhea to kidney failure in humans. It causes no apparent illness in other host species and is only transiently carried in the intestines of most hosts. *E. coli 0157* may proliferate in the environment under favorable conditions.

Hydrologically Active Area: Land area with a high potential for transporting pollutants to surface or ground waters.

(Continued on Page 2)

Background

Water-borne pathogens can include protozoal parasites such as *Giardia* and *Cryptosporidium parvum (C. parvum)*; and bacteria such as *Listeria, Salmonella, Escherichia coli 0157:H7 (E. Coli 0157:H7) which can be found in animal and human feces that can cause infection and occasionally illness in human, livestock and pets.* Infants and individuals with immune system deficiencies are at greatest risk for both protozoal and bacterial infection. Infection occurs after ingestion of contaminated food or water. Poor hygiene practices following handling of infected individuals (animals or humans) can also result in transmission of these organisms. Those infected with these pathogens can potentially infect others through fecal contact or through contamination of water. Intestinal viruses, which have been strongly implicated in a number of waterborne disease outbreaks, are considered to be host-specific and farms are not considered to be a source of infection for humans unless human sewage is present. Surface water supplies are considered to be most susceptible to contamination by protozoan and bacterial pathogens. Chlorination and other standard water treatment processes are generally ineffective in the control of *C. parvum*, but are effective in killing most bacteria. Approved, micro filtration practices are required to remove *Giardia* cysts and *C. parvum* oocysts from water. Many communities with filtration capabilities rely on unfiltered water sources as their back-up water supply. Poorly-managed filtration operations can result in outbreaks of parasitic illness.

(Continued on Page 2)

AEM Principle:

Farms should use management practices that provide multiple barriers to the introduction, replication and survival of pathogens in domestic livestock and that reduce their transport to surface and groundwater resources.

Glossary continued …

NYSCHAP: New York State Cattle Health Assurance Program. A voluntary cattle health program in which livestock producers, their veterinarians and NYS Field Veterinarians develop farm-specific plans to prevent the introduction and spread of infectious disease through the use of Best Management Practices.

Protozoa: A group of microscopic single-celled parasites which include the *Giardia* and *Cryptosporidium* genera. Infected hosts shed **cysts** (*Giardia*) or **oocysts** (*Cryptosporidium*) into feces. Cysts and oocysts are capable of surviving for months in the environment, especially under cool and moist conditions. Protozoa do not proliferate outside of their hosts.

Vegetated Treatment Area: An area of grass sod, meeting NRCS Standard NY-635, for removing sediment, organic matter, nutrients and other pollutants from calf hutch areas and other heavy use areas.

Watercourse: Water flowing over a non-vegetated channel to a waterbody.

Young Animal: For this worksheet, young animals are defined as follows:

Dairy calves – under 6 months
Beef calves – under 6 months
Horses – under 12 months
Sheep – under 6 months
Pigs – under 3 months

Background Continued…

Private or community wells may not require chlorination, but these wells should be properly built, maintained and tested regularly for coliform and nitrates to avoid health risks. If a water test is positive for coliform, further testing for fecal coliform and *E. coli* will be critical to determine the safety of the well water. Extremely wet conditions can result in rapid contamination of wells. Poorly constructed or neglected wells, wells with a history of contamination, and wells in areas with a direct connection between surface waters and groundwater are most vulnerable to contamination (for example, wells in gravel valleys or in karst landscapes). Under these conditions, wells should be further evaluated for proper installation and maintenance and frequently tested for coliform and nitrates. County health departments or private water testing firms can often provide guidance on evaluating and testing private wells.

On farms, feces from young animals, six months and younger are the most likely source of *C. parvum* and *Giardia*. *C. parvum* is generally limited to animals less than 30 days old. *Giardia* has been detected primarily, but not exclusively, in animals younger than 6 months of age. Young animals can shed *C. parvum* and *Giardia* even when they appear to be healthy. Surface runoff from young animal housing and exercise lots or land receiving manure applications poses a potential risk to water supplies.

Pathogenic bacteria have been found in wildlife, insects, humans, and domestic animals. On-farm pathogen management focuses on preventing fecal contamination of livestock feed and water, preventing gross contamination of surface water by manure, and protection of wellheads, sink holes and other direct links to ground water.

The multiplication and spread of pathogens can be controlled through a **three-barrier approach**. This will also benefit the farm operation through improved calf health and performance.

(Continued on Page 3)

Background Continued…

The **first barrier** involves reducing the potential for pathogens to enter the farm from outside sources by implementing bio-security practices for:

  - incoming animals;
  - transport on clothes, boots or equipment;
- preventing contamination of water sources;
- reducing exposure to pets, rodents, wildlife, and other animals, which can transport contaminated manure from other farms.

The **second barrier** is to minimize cross-contamination among animals and amplification of infection on the farm. Parasite movement and multiplication on the farm can be minimized by:

- keeping young animal housing areas clean;
- separating equipment and driveways used for feeding from those used for manure management;
- maintaining herd health and animal comfort;
- ensuring that all feeds, feeding utensils, and waterers are clean; and
- implementing a herd vaccination program, identification and isolation of sick animals and treatment protocols with your herd vet.

The **third barrier** is to restrict movement of contaminated feces into wells and watercourses by:

- preventing runoff from young housing facilities, exercise lots, and manure storage areas;
- applying manure in accordance with a nutrient management plan; and
- treatment of manure to reduce pathogen numbers.

AEM Tier 2 Worksheet: Water-Borne Pathogens		**Potential Concern**		
Factors Needing Assessment	**Lower 1**	**2**	**3**	**Higher 4**
Is the farm participating in any health/bio-security programs?	Livestock health is managed with consultation from an attending veterinarian for health and vaccination protocols. **AND** The farm utilizes bio-security protocols for farm visitors and newly acquired livestock.	Livestock health is managed with consultation from an attending veterinarian for health and vaccination protocols.	The farm utilizes bio-security protocols for farm visitors and newly acquired livestock.	Health and vaccination protocols with a veterinarian are not regularly implemented. **AND** Bio-security protocols for farm visitors and newly acquired livestock are not followed.
How is young animal housing managed between occupancies?	Young animal housing is steam-cleaned. **AND** Flooring is cleaned and air-dried for 2 weeks between occupancies. **OR** Housing is moved to a location where the base has been exposed to 4 full days of sun drying.	Young animal housing is steam-cleaned. **AND** Flooring is cleaned and air-dried. **OR** New surfaces are applied to gravel-floored calving areas.	Young animal housing is left vacant and allowed to dry for a minimum of two weeks, but not washed or disinfected.	Young animal housing is not washed, rotated or left vacant between animals.
Are young animals and bedding kept clean?	All young animals have clean coats and all bedding is clean and dry. **AND** All bedding is changed between animals.	Most of the young animals have clean coats and most of the bedding is clean and dry. Your knees may get damp if you kneel in the pens. **AND** All bedding is changed between animals.	Some young animals have manure stains or caked manure on their coats and some manure is present in bedding. Your knees get wet if you kneel on the bedding. **OR** Bedding is not changed between animals.	Most young animals have manure stains or caked manure on their coats and manure is present in bedding. Your knees get wet and dirty if you kneel on the bedding. **AND** Bedding is not changed between animals.

AEM Tier 2 Worksheet: Water-Borne Pathogens		**Potential Concern**		
Factors Needing Assessment	**Lower 1**	**2**	**3**	**Higher 4**
Are feeding supplies for young animals clean?	Young are fed individually; all feed and watering buckets are cleaned and dried between feedings. Each animal has its own individual bucket.	Young are fed individually. Feed and watering buckets are rinsed between feedings.	Young are fed in groups, but youngest animals are fed first. **AND** Feed and watering buckets are cleaned between feedings.	Young are fed in groups with no regard to age. **AND** Feed and watering buckets are not cleaned between feedings.
Are young animal housing facilities well ventilated?	Air inside the housing facility is similar to that of the outside air.		Air feels humid and there is a slight smell of ammonia	Air has a heavy ammonia smell.
How is purchased stock handled on the farm?	No livestock from outside sources are added.	Purchased livestock is kept isolated for at least four weeks prior to integrating with other animals.	Purchased livestock is kept isolated for less than four weeks before being integrated with other animals.	Purchased livestock is immediately integrated with other animals.
How is young animal health monitored?	Animals are visually inspected daily and routine vet checks are performed.	Routine vet checks are performed.	Animals are regularly inspected. Vet checks are performed only on sick animals.	Animals are not regularly inspected. Veterinarians are called only for obvious signs of illness.
Are sick calves separated and handled last?				
Is scours a common problem among young animals on the farm?				
Are pets and pests (especially rodents) present in the calf housing area?				
Are pets allowed to move freely around and off the farm?				

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Water-Borne Pathogens		**Potential Concern**		
Factors Needing Assessment	**Lower 1**	**2**	**3**	**Higher 4**
Is surface water allowed to enter or flow through calf housing facilities?	All surface water is diverted away from young animal housing facilities. **AND** Runoff from housing area is contained or diverted to storage.	Outside surface water is diverted. **AND** A Vegetated Treatment Area meeting NRCS standard 635 for calf hutch areas is maintained.	Runoff from calf housing flows more than 100 ft. through permanent sod vegetation and does not appear to reach any watercourse.	Surface water is contaminated with manure. **AND** Less than 100 ft. permanent vegetation is maintained between housing facility and surface watercourse.
How is manure from young animals handled and stored?	Manure is completely composted at an appropriate site. **OR** Manure goes to an anaerobic digester. **AND** Applied according to a nutrient management plan.	Manure is mixed with adult animal manure and stored in an appropriate storage facility. **AND** Applied according to a nutrient management plan.	Manure is mixed with adult animal manure. **AND** Stored in an appropriate storage facility. **OR** Applied according to a nutrient management plan.	No specific management practice applied to young animal manure.
Is untreated young animal manure spread on land that will be used for pasturing or production of hay within one year after spreading?				
Are young animals allowed to graze on land that has had untreated manure applied to it within a year?				
Are young animals allowed to graze on pastures containing septic system leachate?				
Does livestock have access to surface water sources?	Livestock has no access to surface water sources.		Livestock has limited access to surface water sources.	Livestock has unlimited access to surface water sources.

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Water-Borne Pathogens		**Potential Concern**		
Factors Needing Assessment	**Lower 1**	**2**	**3**	**Higher 4**
Additional Questions for Dairy Calves				
Is there any nose-to-nose contact between pre-weaned calves?	No animal to animal contact.	Animals have contact with one to two neighbor animals.		Animals have complete access to other calves. Pre-weaned calves are in group housing.
Is calf feed allowed to mix with manure? **(Through poor colostrums harvesting practices, poor milk/milk replacer harvesting/mixing practices, unclean equipment, feeding overages.)**				

Benefits to other resources can also be possible while working toward improved water quality. Taking stock of how existing and future management affect **soil, water, air, plants, animals, energy, greenhouse gases, people, and economics** can result in more effective plans and additional benefits to farms and communities both now and into the future.

Additional Comments:

AEM Tier 2 Worksheet
Pasture Management

Glossary

Attractant: Supplemental feed, salt, mineral, water source, shade or other item that entices livestock to congregate in a single location.

At-Grade Crossing: A stabilized area that allows livestock to ford a stream in a controlled manner. The structure controls bank and streambed erosion. This practice is subject to the specifications of NRCS Standard 578, Stream Crossing.

Flow Path: Any non-vegetated channel that runs part of the year and is partially fed by base flow (or shallow groundwater) in addition to surface runoff.

Heavy Use Area (also called barnyards, holding areas, sacrifice areas, confinement areas, calf hutch areas, feedlots and winter paddocks): Areas where animals are concentrated that are paved, un-vegetated or result in overgrazed or denuded soil conditions.

(Continued on Page 2)

Background

New York State is located in the center of what is historically considered the hay and pasture region of the United States. Characteristics of the region's climate, soil and topography are extremely favorable for the production and utilization of cool-season grasses and legumes for livestock production**.**

A relatively new practice, silvopasture, combines trees with forage and livestock production. The trees are managed for high-value sawlogs and, at the same time, provide shade and shelter for livestock and forage, reducing stress and sometimes increasing forage production.

Well-managed pasture is an excellent land use, capable of producing a high-quality feed for very cost-effective livestock production. Well-managed pasture can also protect water quality by reducing erosion and runoff and enhancing wildlife habitat. However, overgrazing and unrestricted livestock access to surface water resources leads to environmental concerns. Effective pasture planning and management practices that promote the production of high quality feed and its efficient utilization by livestock will reduce water quality degradation.

(Continued on Page 2)

AEM Principle:

Pastures should be managed to ensure optimum forage production, not only for the economic well-being of the agricultural operation, but for soil health, the prevention of soil erosion and water quality, through controlled access and reduced runoff.

Glossary Continued…

Laneways: A walkway for livestock providing stable passage between farmstead facilities and the pasture system. This practice is subject to NRCS Conservation Practice Standard 575, Animal Trails & Walkways.

Prescribed Grazing Management: The controlled harvest of vegetation by grazing or browsing animals managed with the intent to achieve a specific objective. Often the objective is to maximize livestock production on a per-animal basis or on a per-unit of forage basis.

Silvopasture: The intentional combination of trees, forages and livestock managed as a single integrated practice for the collective benefit of each.

Waterbody: A lake, reservoir, pond, river, continuously-flowing stream, continuously-flowing spring, wetland, estuary or bay.

Background Continued…

Prescribed grazing management is a systematic, site-specific combination of planned practices that can:

- Promote an alternative to the sole use of machinery to manage the quality, quantity and composition of vegetation in a pasture to conserve fossil fuels, reduce air emissions and equipment wear and tear.
- Reduce soil erosion potential by converting annually tilled cropland to year-round vegetative-covered pasture.
- Protect water quality by managing livestock access to streams and other waterbodies.
- Maintain dense vegetative cover providing quality forage, erosion protection, nutrient uptake, improved soil health and reduced runoff.
- Produce quality forage resulting in reduced purchased feed nutrients and improved profitability.

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Pasture Management		**Potential Concern**		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
How long do livestock have access to a single pasture area?	One day or less and then moved to a new area.			Livestock is never moved during the growing season.
What is the average grazing animal per pasture acre ratio for the farm?				
What is the condition of pasture?	All areas are densely vegetated.	Densely vegetated, except in minor areas of heavier animal traffic.	Pasture is over-grazed and includes some bare and weedy areas.	Pasture has large areas with little vegetation and/or shows evidence of runoff and erosion.
If laneways are present, what is their condition?	Laneways are either fully vegetated or well-developed with stone, gravel, etc. There are no visible gullies.		Laneways are not planned, bare of vegetation and have evidence of runoff, erosion or ponding.	Lanes go up and down slopes, have visible gullies or ponding. Water flows along them to watercourses.
Are livestock allowed to congregate in the laneway? **If yes, for how long (hrs/day)?**				
Where are attractants positioned on the pasture?	Attractants are located greater than 100 ft. from waterbodies. **AND** Individual attractants are each located in a separate area.	Attractants are greater than 100 ft. from waterbodies. **AND** Attractants are located together.	Attractants are located greater than 35ft. from waterbodies. **AND** Individual attractants are each located in a separate area.	Attractants are located less than 35ft. from waterbodies.
What is the source(s) of water for the pasture?				

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Pasture Management		**Potential Concern**		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
How are livestock managed around water courses?	The stream is fenced with a 35 ft. buffer. **AND** If livestock need to cross the stream, they do so over a constructed laneway complete with a culvert and gates at both ends (limited access). **OR** Livestock do not cross streams.	The stream is fenced, with limited access for watering. **AND** If livestock need to cross the stream, they do so over at-grade crossing with gates at both ends.		Livestock are not fenced out of the stream. The stream is crossed in many places and is used as a primary water source for livestock.
How are livestock managed around ponds and other persistently wet pasture areas?	Livestock are fenced out of all ponds and persistently wet pasture areas, **OR** These areas do not exist.	Temporary fence is used to exclude livestock from these areas during wet times. **OR** Only limited access is permitted using a planned, stabilized location.		Livestock has unlimited access at all times.
How are seasonal watercourses in the pasture managed?	Flow paths are fully-vegetated and livestock are fenced out.	Livestock have full access during the grazing season. Flow paths are fully-vegetated. **OR** Temporary fence is used to limit livestock access during wet periods.	Livestock have full access to flow paths, which have limited vegetation, but the water flows into a vegetated area before entering a stream or other waterbody.	Livestock have full access to flow paths, which have little or no vegetation, and which outlet into streams or other waterbodies.

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: **Pasture Management**		**Potential Concern**		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
Do Heavy Use Areas exist in the pasture any time during the year?		(If yes, complete HUA Worksheet)		
Do livestock have access to woodlots?		more information can be found at: http://www2.dnr.cornell.edu/ext/info/pubs/MapleAgrofor/SilvopasturingInNY.pdf		
Benefits to other resources can also be possible while working toward improved water quality. Taking stock of how existing and future management affect **soil, water, air, plants, animals, energy, greenhouse gases, people, and economics** can result in more effective plans and additional benefits to farms and communities both now and into the future. **Additional Comments:**				

AEM Tier 2 Worksheet
Livestock Odor Management

Glossary

Airshed: An area of impact downwind from a source that is variable in size and location, depending on conditions. The area generally depends on the direction of prevailing winds, the concentration and characteristics of the source, and the dispersion downwind.

Anaerobic Digestion: An treatment process using bacteria to decompose organic matter to methane in the absence of oxygen. The resulting effluent is vastly reduced in odor.

Covered waste storage: Providing an impermeable cover to waste storages with a flare to incinerate the gases, this reduces odors from storages.

Earth storage basin: A facility to hold animal wastes constructed out of appropriate soil. The sides are sloped, giving a larger surface area to volume ratio.

Heavy Use Area (HUA): Areas where animals are concentrated, including those that are paved, un-vegetated or result in overgrazed or denuded soil conditions. Also called barnyards, holding areas, sacrifice areas, confinement areas, calf hutch areas, feedlots and winter paddocks.

(Continued on Page 2)

Background

Odors: With the trends of larger and more concentrated farms, more nonfarm rural residents unfamiliar with agriculture, and more waste storage systems, farms are coming under increased scrutiny from neighbors regarding odors. Odor is one of the major sources of conflict between livestock producers and the general public. Presently, there is no low cost, complete and easy way to control odors from waste.

Not all people are equally sensitive, nor do they always agree to the severity of an odor once it is detected. People unfamiliar with agriculture who move into rural areas may not tolerate as much odor as a neighboring farmer. Surveys indicate that farmstead appearance can influence how odors are perceived. More attractive farms generate fewer complaints.

The further the odor source is from homes, public use areas, or businesses, the lower the risk of an odor complaint. Neighbors located at lower elevations can be subject to air drainage during still nights and can be surrounded by odiferous air.

The land application of waste from livestock and poultry facilities is the most frequent source of odor complaints from the public. Injecting or incorporating waste, where feasible, will significantly reduce odor emissions from land application. In addition, early morning spreading and consideration of neighbors by avoiding spreading on weekends, holidays, and special events can help reduce the risk of generating neighbor complaints.

(Continued on Page 2)

AEM Principle:

While reducing the potential for water quality problems, it is important that farms consider odor impacts for neighbors or those living in the airshed.

Glossary Continued…

Manure ridges: Manure pushed up from barnyard cleaning operations that escape under the fence, forming lateral piles of decaying solids that potentially will create odors, pollute surface or ground water and provide fly larvae habitat.

Structural waste storage: A facility to hold animal wastes constructed out of metal, concrete, or wood; usually with vertical sides and no roof.

Windbreak: Linear plantings of multiple rows of trees and/or shrubs.

Background Continued…

Gases: Good ventilation of farm buildings and controlled access to confined spaces is critical to avoid discomfort, injury, or death. Outside the farm buildings these gases disperse and become less detectable. The gases in Table 1, while occasionally produced in quantities that can affect the health of people or animals in the barn, rarely affect the health of people or animals outside the barn. Ammonia and hydrogen sulfide are often the ones measured to regulate odor control but seldom are the source of the main odor detected off-site. Over 160 gases have been identified that may be produced from manure. Many of these cause odors even in very low concentrations. There is a growing concern that ammonia produced from agricultural operations can add to smog and acid rain as well as redeposit as a nutrient on water surfaces, adding to eutrophication.

Table 1. Common gases from decomposition of livestock wastes.

Gas	Toxicity	Odor	Density
Hydrogen Sulfide H_2S	Toxic at 500 - 600ppm, causes respiratory paralysis, loss of consciousness, and death.	Rotten egg odor detectable at 100 ppm often deadens sense of smell at higher concentrations	Heavier than air
Methane CH_4	Nontoxic, but high concentration limits oxygen supply, explosive at certain concentrations.	Odorless	Lighter than air
Ammonia NH_3	Mildly toxic, irritates eyes, nose and throat above 25ppm.	Odor of smelling salts	Lighter than air
Carbon Dioxide CO_2	Nontoxic, but high concentration limits oxygen supply.	Odorless	Heavier than air

This worksheet is divided into general questions (page 4) followed by the on-farm areas that potentially can impact neighbors with odor issues: animal housing (page 5), heavy use areas (page 6), land application (page 7), liquid waste storage (page 8), and solid manure storage (page 9).

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Livestock odor management: General		**Potential Concern**		
Factors Needing Assessment:	**Lower 1**	**2**	**3**	**Higher 4**
What are the procedures for neighbor relations and considerations?	Neighbors are made aware of seasonal activities that may produce odors; complaints or inquiries are always addressed in a timely fashion. Farm owner/manager is engaged in the community.	Most neighbors approached about odorous activities; complaints are addressed, but acted upon slowly.	Some neighbors approached about odors; complaints are largely unaddressed, and seldom acted upon.	Neighbors are not notified in advance of odorous activities (applications), neighbor's complaints or inquiries have gone unanswered. Farm owner/manager is not engaged with community.
What is the appearance and public/neighbor perception of the farm and its operation?	Topography and vegetation visually screen the facility. **OR** Appearance of facilities is well maintained. Manure piles are well hidden from view; site is neatly landscaped and well groomed.	Partial screening. **AND** Facilities appear well maintained. Manure piles and other odor sources are generally hidden from public view.	Manure piles and other odor sources are partially hidden from public view.	Facilities do not appear clean and organized. Manure piles or other odor sources are in plain view of the public.
Are windbreaks used to reduce odors and screen views?				
Has a Comprehensive Nutrient Management Plan (CNMP) been developed, implemented and kept up to date?				
How clean are the animals?				

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Livestock odor management: General		**Potential Concern**		
Factors Needing Assessment:	**Lower 1**	**2**	**3**	**Higher 4**
What is the relative odor risk associated with the type of waste handling/ storage/ treatment system used?	Anaerobic digester or other treatment system is included with any waste storage. OR Composted waste storage. OR Waste is stored for less than one week before land applied or exported offsite. OR Properly covered waste storage with an operating flare.		Partially covered waste storage. OR Open lot runoff holding pond. OR Dry waste storage where liquids are separated and drained to separate storage or absorbed by bedding.	Uncovered structural waste storage, or earthen storage basin.
Is waste or spilled feed allowed to accumulate?				
Are mortalities properly composted or disposed?				
Is trash properly disposed of without burning?				
Will expansion, or potential changes create additional odor production, for example, changes from daily spread to storage?				
Is silage spoilage minimized? Does spoiled silage accumulate?				
Does silage leachate pond or is it stored?				

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Livestock Odor Management: Animal Housing		**Potential Concern**		
Factors Needing Assessment:	**Lower 1**	**2**	**3**	**Higher 4**
What are the characteristics of the drainage around animal housing facilities?	A well-drained site.			Poorly drained site. Water ponds for several days after rain.
Are waterers inspected and repaired to control leaks?				
What is the quality of ventilation inside the barn?	Well ventilated			Poorly ventilated
How is manure controlled, collected and handled?	All solid manure is contained within housing and not allowed to collect around animal housing. **AND** Properly composted.	Liquid manure handled and collected with no pools. **OR** Handled as a solid	Some liquid manure occasionally pools or accumulates in and around the animal housing.	Liquid manure regularly pools or accumulates in and around animal housing.
What is the frequency of manure and waste feed removal?	Manure is removed from a facility at least once a day. **OR** Animals are heavily bedded to maintain dry conditions.		Weekly.	Less than once per week.
Is silage leachate low flow added to an under barn storage?				

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Livestock Odor Management: Livestock Heavy Use Area (HUA)		**Potential Concern**		
Factors Needing Assessment:	**Lower 1**	**2**	**3**	**Higher 4**
Is the HUA well-drained?	The HUA is sloped to limit ponding and the surface is smooth.			Ponded liquid exists in barnyard depressions.
Is the barnyard area sized as small as possible? (See Livestock Heavy Use Area Worksheet)				
What is the HUA surface?	HUA surface is concrete.		HUA surface is soil treated with stabilizer, or constructed of firm stable soil.	HUA soil is easily erodible and prone to rills, gullies, and potholes and therefore difficult to clean.
Is the HUA cleaned completely?	HUA condition allows complete manure removal. Curbs are installed to assist clean-up.			HUAs are irregularly shaped and not conducive to complete manure removal.
How often is the HUA cleaned?	Daily.	Periodically during the week.	Weekly.	Monthly.
Are there manure ridges at fence lines or manure piles?	Curbs are installed to assist in scraping. Manure ridges and piles do not form.			Removal of manure ridges or piles is not a priority.

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Livestock Odor Management: Land Application		**Potential Concern**		
Factors Needing Assessment:	**Lower 1**	**2**	**3**	**Higher 4**
Does your waste spreading plan take into account field specific neighbor impacts from odors?				
What is the timing of waste application?	Waste is applied on weekdays in the early morning. Holidays and local special events are avoided.	Waste is applied in the early morning.	Waste is applied in the afternoon.	Waste is applied on weekends and holidays and during the late afternoon when the air is warm and stagnant.
Is spreading equipment kept clean?				
Have you considered application equipment that applies waste closer to the ground?				
Is waste incorporated?	Waste is immediately and completely incorporated.	Tillage, timing, and amount are used to facilitate waste movement into the soil on crop and/or hay fields.		Waste is never incorporated.
Are records of waste spreading kept?				
Do you use a big gun to irrigate waste and if so, do you limit application to when the wind is less than 5 mph?				
Is waste spread evenly and at rates such that it dries quickly?				

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Livestock Odor Management: Liquid Waste Storage		**Potential Concern**		
Factors Needing Assessment:	**Lower 1**	**2**	**3**	**Higher 4**
What are the characteristics of the waste surface in the waste storage?	Waste inlet pipe is below liquid surface **AND** Stored waste forms undisturbed crust over the entire surface, **OR** Waste is held in enclosed waste storage tank **OR** Completely covered year round with crop residue, plastic membrane or other type of cover, **OR** Surface aeration maintains oxygen concentration of 1 mg/liter or greater.	Waste inlet pipe is below liquid surface **AND** Crust forms over only part of storage surface due to regular agitation, wind or other factors, **OR** Crop residue cover is in place at least six months of year during periods of greatest odor concern.		Waste surface is exposed and does not form a crust.
Is the waste storage surface visible by neighbors or from the road?				
What is the amount and timing of agitation during emptying?	No agitation used during storage emptying. *Samples are taken to determine concentrations as waste storage is emptied to ensure proper nutrient application.	Storage is agitated by stream of waste directed below waste surface. **AND** Timing of agitation is done to avoid weekend odors.		Storage is aggressively agitated by stream of waste directed above waste surface **AND** Timing of agitation to avoid weekends is not considered.

AEM ID: _____ Date: _____

AEM Tier 2 Worksheet: Livestock Odor Management: Solid Manure Management		**Potential Concern**		
Factors Needing Assessment:	**Lower 1**	**2**	**3**	**Higher 4**
How are manure pile areas (MPA) managed?	Designated manure pile area is used infrequently.	MPAs are avoided for most of year and collected manure is directly land applied. **OR** MPAs are located in remote areas, away from neighbors. All precipitation and seepage drains away from manure pile. **AND** MPAs are removed at least once a year.		Manure piling often occurs near public roads or neighbors **OR** Precipitation and seepage pools in vicinity of manure pile.
How is composting managed?	Only manure or residues (less than 70% moisture) are stockpiled or composted.			Wet manure or residues (over 70% moisture) are commonly stockpiled or composted.
Benefits to other resources can also be possible while working toward improved water quality. Taking stock of how existing and future management affect **soil, water, air, plants, animals, energy, greenhouse gases, people, and economics** can result in more effective plans and additional benefits to farms and communities both now and into the future. **Additional Comments:**				

AEM Tier II Worksheets
Tree Fruit

Glossary

Groundcover management: systems used to manage weed competition for nutrients and water.

Integrated Pest Management: An ecologically-based pest control strategy designed to keep pest populations below economically injurious levels using a variety of control tactics.

Scouting: Detecting, identifying, and determining the level of pest populations in a timely manner.

Threshold: Pest population level that requires control action.

WIN-PST (Windows Pest Screening Tool): A pesticide environmental risk screening tool that NRCS field office conservations, extension agents, crop consultants, pesticide dealers and producers can use to evaluate the potential for pesticides to move with water and eroded soil/organic matter and affect non-target organisms.

*** Cornell Pest Management Guidelines for Commercial Tree Fruit Production also includes nutrient management recommendations.**

Background

Fruit growing regions are often located on well drained soils and upland slopes near lakes and rivers where there is a substantial risk of soil erosion and runoff or leaching of pesticides and fertilizers into water resources. Therefore, it is important that farming practices protect these water resources by limiting erosion and preventing nutrient and pesticide runoff and leaching.

Fertilization and irrigation programs should minimize offsite nutrient losses and maintain soil nutrients within an optimal range. Applications of nitrogen or phosphorus to orchards should be managed according to crop need following the Cornell Pest Management Guidelines for Commercial Tree Fruit Production*. Cover crops or permanent ground cover should also be used in the orchard to assist in the uptake of excess nitrogen, reduce nutrient runoff, and reduce erosion of soils. The system used to manage weed competition for nutrients and water in orchards influence not only the growth, physiology and yield of trees, but also soil and water quality in the surrounding ecosystem.

Integrated Pest Management (IPM) methods protect the tree and its fruit from weeds, insects and diseases using ecologically and economically sound management practices. This is achieved by careful consideration and implementation of all appropriate pest management options. Practices are chosen that will enhance safeguards to the environment and human health while minimizing the use of agrochemicals. Priority is given to cultural, biological, and genetic management practices.

The New York apple industry is developing an Integrated Fruit Production (IPF) program that has value to be used along with this worksheet. Combined with Good Agricultural Practices (GAP) and IPM, a wealth of informational resources is available to orchardists to produce fruit in both an environmentally friendly and safe manner, and capture markets that seek “most friendly practices.”

Agricultural Water Quality Principle: Practices that reduce the potential of nutrients, sediment and pesticides entering nearby waterbodies should be employed in the production of Tree Fruit.

AEM for Tree Fruit

Management Practices	Lower Risk…..1	2	3	Higher Risk…..4
How is nitrogen applied to established orchards? **(This question applies only to apples for fresh consumption)**	Nitrogen applications are based on soil analysis at least once every three years, leaf tissue analysis and tree growth AND applications do not exceed Cornell Guidelines.	Nitrogen applications are based on soil analysis AND applications generally do not exceed the Cornell Guidelines.	Nitrogen applications are based on soil analysis.	Nitrogen applications are not based on soil analysis.
How is nitrogen applied to established orchards? **(This question applies to apples for process and other tree fruits)**	All soil N is applied before or at bud break. Split applications are used.		More than half of N is applied in fall with remainder applied in spring.	All N applied in fall.
How is nitrogen applied to new orchards?	Nitrogen applications are based on soil analysis AND do not exceed Cornell Guidelines of four ounces of Calcium Nitrate (or equivalent of nitrogen) per tree.			Nitrogen applications are not based on soil analysis AND may exceed Cornell Guidelines.
What method of nitrogen application is used?	Nitrogen is directed into the herbicide strip.			Nitrogen is broadcast onto herbicide and sod strips.

How is phosphorus applied to new orchards? **(Phosphorus is not needed on established orchards)**	Phosphorus applications are based on pre-plant soil analysis AND applied and incorporated into the soil the year before planting	Phosphorus applications are based on pre-plant soil analysis AND incorporated into the soil.		Phosphorus applications are not based on soil analysis.
How is ground cover managed?	A dense groundcover of at least 3 varieties of dwarf grasses is established and managed through mowing.		Groundcover is established but is not dense enough to hold wet season equipment traffic.	Ground cover is not established, alleys are tilled throughout the growing season to control weeds.
How do you monitor pest populations in your tree fruit crops?	Scouting for pests is routinely done AND Cornell Pest Management Guidelines for Commercial Tree Fruit Production is used to determine thresholds.	Regional pest alerts are used to monitor population trends of insect pests AND scouting is done to verify.	Scouting is done but established pest thresholds are not followed.	Little or no scouting of pest activity occurs.
Do you keep records of pest monitoring and management activities?	Records are kept of all pest monitoring and management practices, including cultural, biological and chemical controls.	Records are kept only of chemical pest management controls.		Records of pest monitoring and management practices are not kept.

What criteria are used for pesticide selection?	Pesticide selections are made with consideration of efficacy, environmental risk (assessed by a resource professional using WIN-PST), restricted re-entry interval, and preservation of the natural enemies of the specified pest and days to harvest.	Pesticide selections are made with consideration of efficacy, consultation with a crop professional on environmental risk, restricted re-entry interval, and preservation of the natural enemies of the specified pest and days to harvest.	Pesticide cost and efficacy are considered when making pesticide selections.	Only product cost is considered when making pesticide selections.
What type of canopy sprayer is used?	Application equipment is used that increases target deposition (i.e. reduces drift) and allows for a reduction in the amount and/or rate of pesticides used (e.g. tunnel sprayer, sensor sprayer, tower sprayer, directed deposition sprayer).	Application equipment is used that improves deposition and reduces drift (e.g. airblast sprayer with low drift nozzles such as air induction nozzles, modified airblast sprayer with deflectors, nozzle orientation adjusted to improve deposition).		The application equipment does not address drift (e.g. an unmodified airblast sprayer).
Are the selected nozzles appropriate for use? Are they replaced when worn?	Appropriate size nozzles are chosen. For canopy sprays, 150-200 micron nozzles are recommended. This is known as a "fine" spray classification ***AND*** nozzles are replaced when more than 10% inaccurate.	Appropriate size nozzles are chosen. For canopy sprays, 150-200 micron nozzles are recommended. This is known as a "fine" spray classification, ***BUT*** nozzles are not replaced when more than 10% inaccurate.		Nozzle size is not appropriate for canopy sprays. *AND* Nozzles are not replaced when worn or damaged.

Is the canopy sprayer calibrated properly to ensure good coverage without over application?	Sprayer is serviced and calibrated before the start of each season. *AND* Sprayer is recalibrated for major growth stages. *AND* Application is monitored electronically to measure proper speed and flow rate.	Sprayer is serviced and calibrated before the start of each season. *AND* Sprayer is recalibrated for major growth stages.	Sprayer is serviced and calibrated before the start of each season.	Calibration is done infrequently or not at all.
Are environmental conditions considered before deciding to spray?	No spraying is done if winds are >10 mph unless using a sprayer that is designed/modified to improve deposition and reduce drift.	Most of the time spraying is not done if winds are >10 mph unless using a sprayer that is designed/modified to improve deposition and reduce drift.		Spraying is done in conditions where significant drift will occur.
Is the sprayer tank cleaned after use to remove all pesticides?	Inside and out of sprayer tank is rinsed in situ and is sprayed in the orchard after each spraying.	Sprayer tank is washed occasionally and is sprayed in the orchard.	Sprayer tank is rarely rinsed and it is done in the farmyard.	Sprayer tank is not rinsed.

Is the canopy sprayer and tractor maintained properly?	Sprayer and tractor are serviced annually in addition to necessary repair work. Routine maintenance is conducted after the conclusion of each application.	Sprayer and tractor are serviced annually in addition to necessary repair work.		Sprayer and tractor are not serviced annually. Service occurs only when equipment breaks.
Is pruning done in a way to control disease and increase tree air circulation?	Wood infected by significant amounts of over wintering fungi is pruned off annually to minimize sources of inoculums AND to improve tree air circulation.	Wood infected by significant amounts of over wintering fungi is pruned off every two years to minimize sources of inoculums AND to improve tree air circulation.	Wood infected by significant amounts of over wintering fungi is pruned off every three years to minimize sources of inoculums AND to improve tree air circulation.	Pruning is done without regard to the presence of over wintering inoculums or air circulation.

Comments:

1. Are orchard site selections based on slope, soil type and drainage?

2. Does your post-harvest pest management plan follow Cornell Pest Management Guidelines for Commercial Tree Fruit Production?

3. Is Phosphorus applied to established orchards?
   If yes, under what conditions is it applied?

4. Has someone from your farm been trained in IPM or does the farm use a service employing IPM principles?

5. Do you utilize the NYS Elements of IPM (Integrated Pest Management) to assist with your pest management decision making? http://nysipm.cornell.edu/elements/default.asp

NOTE: You must also complete all applicable Core worksheets (e.g. irrigation water management, pesticide storage and use, soil management, etc)

AEM Tier II Worksheets
Vegetables and Small Fruits

Glossary

Cover crop: Grasses, legumes, small grains or other close-growing crops planted between regular crop production periods for the purpose of protecting and improving the soil.

Action thresholds: The level of pest infestation or damage at which some action must be taken to prevent an economic loss.

WIN-PST (Windows Pest Screening Tool): A pesticide environmental risk screening tool that NRCS field office conservationists, Soil and Water Conservation Districts, extension agents, crop consultants, pesticide dealers and producers can use to evaluate the potential for pesticides to move with water and eroded soil/organic matter and affect non-target organisms.

Zone tillage: A reduced tillage method that limits soil disturbance to the area of the planning row and leaves the areas between the crop rows undisturbed.

Eutrophication: The process of nutrient enrichment and basin-filling of a lake.

Integrated Pest Management: An ecologically-based pest control strategy designed to keep pest populations below economically injurious levels using a variety of control tactics.

Background

Process and fresh-market vegetable and small fruit production occurs on approximately 145,000 acres in New York State and contributes nearly $400 million to the state's economy. As with all types of farming, practices in the production process have the potential to impact nearby surface and ground water and other environmental resources. Primary pollutants that may come from farming practices may include nutrients, sediment, and pesticides.

Fertility and pest management practices should closely follow Cornell Guidelines for each specific and individual crop. Proper fertilizer application method, rate and timing will maximize crop uptake of nutrients and minimize nutrient loss to the environment. Nutrients in fertilizers can leach into groundwater or be carried away in runoff to surface water, degrading the water quality and wasting farm resources. Excess and improper timing of nitrogen fertilization can result in excess nitrate leaching to the ground water. Wells on the farm or in the neighborhood may develop elevated concentrations of nitrates, which has a detrimental impact to human and animal health. Phosphorus, which readily attaches to soil particles, can be transported to surface waters with soil erosion. The additional phosphorus load and increased sediment can result in algae blooms, eutrophication and a reduction in the quality of habitat for fish and other aquatic organisms.

Integrated Pest Management (IPM) strategies should be employed to identify alternative crop protection practices that help minimize or avoid pest problems, reduce or eliminate pesticide use and costs, and maximize potential profitability of crop production. When pesticides are used, they should be carefully selected and properly applied to reduce the potential of contaminating surface and groundwater.

Continued on page 2…

Agricultural Water Quality Principle: Practices that reduce the potential of nutrients, sediment and pesticides entering nearby waterbodies should be employed in the production of vegetables and small fruits.

Glossary Continued…

PSNT: A soil test (widely used in field corn production) that determines how much nitrogen is available in the soil from degradation of organic matter and crop residues. PSNT is done before side dressing a crop to determine if and how much additional nitrogen is needed to make the crop.

Acceptable Soil Loss: An estimate of the maximum annual rate of soil erosion that can occur over a sustained period, without affecting crop productivity. The rate is expressed in tons ("T") of soil loss per acre per year. Generally, rates of 1 to 5 are found, depending on soil properties. See the County Soil Survey for "T" factors for a specific soil type.

Nutrient Management Plan: Planned actions relative to the amount, source, placement, form and timing of the application of nutrients and soil amendments for the production of a crop. UDSA Natural Resource Conservation Service Practice Standard 590 defines the criteria, considerations, specifications and operation and maintain of such plans.

Water control structure: A structure in a water management system that conveys water, controls the direction or rate of flow, maintains a desired water surface elevation or measures water.

Tilth: The physical condition of soil as related to its ease of tillage, fitness as a seedbed, and its impedance to seeding emergence and root penetration.

Background continued…

The use of cover crops and crop rotation offers both environmental and production benefits. Such practices improves soil structure and tilth, supplies nutrients for the next crop, reduces the potential for runoff and erosion, reduces pressure from insect and weed pest and generally improves the productive capacity of fields.

In addition to this worksheet, several other core AEM worksheets will need to be completed for a full assessment of your farm's environmental stewardship.

AEM for Vegetables and Small Fruits

Management Practices	Lower Risk…..1	2	3	Higher Risk…..4
Is soil analysis done on a regular basis to determine the nutrient needs of your crops?	Soil analysis is done at least every other year, more often if problems arise. Results are used in planning fertilization, liming and organic matter amendments.	Soil analysis is done on fields every three years.	Soil analysis is done less than every three years and/or only in problem areas.	Soil analysis is not done.
How are nitrogen fertilizer rates determined?	Rates are based on soil tests, previous crops, cover crop plow down, manure/compost application and are consistent with Cornell Guidelines.	Rates are based on soil tests, previous crops, cover crop plow down and manure/compost application AND do not exceed 125% of Cornell Guidelines.		Rates are based on traditional practices and often exceed Cornell Guidelines.
Are PSNT tests used to determine N application rates where research is available?	PSNT is used to determine N application rates.	Sometimes use PSNT to determine application rates.	Seldom use PSNT to determine application rates.	Never use PSNT to determine application rates.
How are phosphorus application rates determined?	Phosphorus application rates are based on crop needs and soil test results and are consistent with Cornell Guidelines.	Phosphorus applications are based on crop needs only and do not exceed 125% of Cornell Guidelines.		Phosphorus applications are not based on crop needs or soil test results and often exceed Cornell Guidelines.

How often and why are cover crops used?	Cover crops are used annually on the majority of fields to capture residual N and reduce erosion.	Cover crops are used annually on over 50% of the fields to capture residual N and reduce erosion.	Cover crops are used annually on less than 50% of the fields to capture residual N and reduce erosion.	Cover crops are not used.
Is Crop rotation part of your management plan?	Management plan includes rotating crops to optimize pest and/or soil management AND meets acceptable soil loss for predominant soil type.	Management plan includes rotating crops to optimize pest and/or soil management.		Crops are not rotated. (Same crop is grown on the same field for more than 3 consecutive years).
How is crop rotation used on your farm?	Crop rotation is used and includes rotations of at least 3 years of hay crops or legumes.	Crop rotation is used and includes rotations of at least 1 or 2 years of hay crops or legumes.	Crop rotations are used but do not always include hay or legumes.	Crops are not rotated.
When is manure applied to fruit and vegetable fields?	Manure is applied and incorporated into the soil at least 120 days prior to harvest in accordance with a nutrient management plan OR composted manure is applied.		Manure is applied and incorporated into the soil at least 60 days prior to harvest.	Manure is applied and incorporated less than 60 days prior to harvest OR manure is top-dressed or side dressed to crop within 60 days of harvest. This includes animal bedding used as mulch.
Does your crop management plan use pest and disease resistant varieties?	If available, only pest and disease resistant varieties are used.	If available pest and disease resistant varieties are considered and given preference.	If available pest and disease resistant varieties are considered.	Pest and disease resistant varieties are not used.
Which threshold criteria do you use when making pest management decisions?	Scouting is done regularly. All available action thresholds are used when making pest control spray decisions.	Scouting is done regularly AND regional pest alerts are used.	Pest control sprays are applied when pests are present but threshold levels are not always considered.	Pest control sprays are applied on a regular schedule only.

Are non-chemical pest controls, such as cultural, biological, physical and mechanical, considered?	A combination of pest controls is used when available and when economically feasible to minimize environmental impact.		Some cultural, biological, and physical techniques are used for pest control.	Rely only on chemical pest controls.
What criteria are used for pesticide selection?	Pesticide selections are made with consideration of efficacy, environmental risk (assessed by a resource professional using WIN-PST), restricted re-entry interval, and preservation of the natural enemies of the specified pest and days to harvest.	Pesticide selections are made with consideration of efficacy, consultation with a trade professional on environmental risk, restricted re-entry interval, and preservation of the natural enemies of the specified pest and days to harvest.	Pesticide cost and efficacy are considered when making pesticide selections.	Only product cost is considered when making pesticide selections.

Additional Questions:

1. If zone tillage is used, how is nitrogen applied?

2. Are cover crops applied as soon as a crop is removed?

3. Is produce washed on the farm?
   If yes, complete the Process Wash Water Worksheet.

4. Has someone from your farm been trained in IPM or does the farm use a service employing IPM principles?

5. Do you utilize the NYS Elements of IPM (Integrated Pest Management) to assist with your pest management decision making? http://nysipm.cornell.edu/elements/default.asp

NOTE: You must also complete all applicable Core worksheets (e.g. irrigation water management, pesticide storage and use, soil management, etc)

AEM Tier 2 Worksheet
Horse Farm - Wash Rack/Stall & Trailer Wash Area

Glossary

Back Flow Protection: a device designed to prevent water from re-entering the water supply system.

Ground Water Source: Primary or principle aquifer, wellhead or spring.

Leaching Potential: The possibility for downward movement through the soil of chemical substances dissolved in water.

Pathogens: Disease-producing organisms. Examples are E. Coli 0157:H7 and salmonella, which may infect livestock or humans; and Giardia or Cryptosporidium, which are intestinal parasites sometimes found in the feces of young livestock.

Vegetative Filter Area: An area of grass sod, meeting NRCS Standard NY-393a, for removing sediment, organic matter, nutrients, and other pollutants from waste water.

Watercourse: Water flowing over a non-vegetated channel to a waterbody.

Background

Animal wash rack and wash stall waste water represents a potential contaminant to both ground water and surface water. Water from washing of horses, livestock and equipment such as trailers can potentially contain urine, manure, detergents, bacteria, pathogens, and pesticides.

The location of your wash areas must be placed to protect against the potential for contaminated water to enter nearby surface water, ground water, streams, ponds, and wells.

Some suggestions to prevent water contamination on your farm:

1. Ensure that your well, spring, and septic leach field is located up gradient and/or an adequate distance from the wash rack/stall and trailer washing areas.
2. If your wash area has a drain, make sure that it is connected to a designed treatment system.
3. Reducing the amount of wash water used will decrease the volume of contaminated water needing treatment.

Agricultural Water Quality Principle

All wash and other process water should not reach watercourses or other sensitive areas or should be properly treated and disposed of to protect surface and ground water resources.

AEM Tier 2 Worksheet: Animal Wash Rack/Stall and Trailer Wash Area		**Potential Concern**		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
Do you have back flow protection on your water sources?	Yes			No
Where is your animal wash rack/stall area located in relation to your farm's water source?	Located or designed such that seepage from the wash area does not enter wells or springs.	Greater than 200ft. down slope from well or spring.	Less than 200ft. from well or spring.	Located such that seepage from the wash area can enter wells or springs.
If animal wash rack/stall area has a drain, where does it discharge?	Drain is connected to a municipal sewer system or an appropriately designed and maintained separate farm septic system. **OR** Surface discharges to appropriately designed vegetative filter area.			Drain is connected to a household septic system. **OR** Discharge area is unknown. **OR** Discharges to a flow path that leads to a watercourse
If animal wash rack/stall area does not have a drain, where does the runoff water go?	Water goes into a designated vegetative filter area.	Water goes into a well vegetated field with at least 200 feet of flow path before a watercourse.	Water goes into the driveway, parking lot or other non-vegetated area.	Water goes into a watercourse, well recharge area, or household septic system leach field.
Where is your trailer washing area located in relation to your farm's water source?	Located or designed such that seepage from the wash area does not enter wells or springs.	Greater than 200ft. down slope from well or spring.	Less than 200ft. from well or spring.	Located such that seepage from the wash area can enter wells or springs.
If trailer washing area has a drain, where does it discharge?	Drain is connected to a municipal sewer system or a appropriately designed and maintained separate farm septic system. **OR** Surface discharges to appropriately designed vegetative filter area.			Drain is connected to a household septic system. **OR** Discharge area is unknown. **OR** Discharges to a flow path that leads to a watercourse
If trailer washing area does not have a drain, where does the runoff water go?	Water goes into a designated vegetative filter area.	Water goes into a well vegetated field with at least 200 feet of flow path before a watercourse.	Water goes into the driveway, parking lot or other non-vegetated area.	Water goes into a watercourse, well recharge area, or household septic system leach field.

Other:

1. How often do you wash livestock on your farm?
2. What is the maximum number of animals to be washed on any given day?
3. Do you routinely use fly spray or other insecticides on your animals?
4. How often do you wash the trailer, interior and exterior?
5. Do you remove the majority of manure before washing the inside of the trailer?
6. Are there drainage issues with your wash rack/stall or trailer washing areas?
7. When washing animals or the trailer, do you seek ways to reduce the amount of water used?
8. How often do you maintain and inspect your farm septic system?

Comments:

AEM Tier 2 Worksheet
Manure Management for Horses:
Nutrient Management, Storage, Field Application and/or Off-Farm Disposal

Glossary

Compost: Biological degradation of manure and other organic material in an aerobic process, generating heat. With horse manure, regular turning of the pile enhances aerobic conditions.

Defecation Area: The section of a pasture or paddock in which horses will defecate.

Nitrate: A chemical derived from nitrogen-containing substances such as undigested feed protein in manure. Nitrates are soluble in water, and if they get into drinking water supplies at high enough concentrations**,** they can pose health risks to infants and young animals.

Pathogens: Disease-producing organisms. Examples are *E. coli* 0157:H7 and salmonella, which may infect livestock or humans; and Giardia or Cryptosporidium, which are intestinal parasites sometimes found in the feces of young livestock.

(Continued on page 2)

Background

Manure is a mixture of feces, urine, and bedding. The average 1000 lb. horse produces about forty-five pounds of feces and urine a day, or about eight tons a year.

If used properly, horse manure is an excellent crop nutrient source and soil conditioner. If not used properly, the pathogens, nutrients, and organic matter contained in it can contribute to the pollution of surface and groundwater, possibly including your own water supply. Bacterial and protozoan pathogens in manure can pose a human health risk when found in drinking water supplies. Nitrates from manure can leach into groundwater, creating potential human and animal health risks. Nitrates and phosphorus can also reach surface waters stimulating undesirable algae and plant growth. This process called eutrophication, consequently damages recreational and drinking water uses. The decay of this additional organic matter will rob a stream or lake of the oxygen needed to maintain desirable aquatic life.

(Continued on page 2)

Agricultural Water Quality Principle

Manure produced by domestic livestock should be stored and applied to the land in a manner maximizes the nutrient value and soil conditioning benefits to the farm while protecting surface and groundwater resources.

Glossary continued …

Vegetative Buffer – A permanent strip of dense, vigorous perennial vegetation at least 20 feet in width established and maintained along a watercourse or waterbody. See USDA Natural Resources Conservation Service (NRCS) Conservation Practice Standards NY 393s (Filter Strip), NY 390 (Riparian Herbaceous Buffer), and NY 391 (Riparian Forest Buffer).

Vegetative Filter Area – An area of grass sod, meeting USDA Natural Resources Conservation Service's (NRCS) Conservation Practice Standard NY 393a, for removing sediment, organic matter, nutrients, and other pollutants from waste water.

Waterbody – A lake, reservoir, pond, river, continuously-flowing stream, continuously-flowing spring, wetland, estuary, or bay.

Watercourse – Water flowing over a non-vegetated channel to a waterbody.

Background continued …

The risks of pollution of ground and surface water increases when horse manure is stored in an inappropriate location or poorly designed, constructed or managed site. Properly located, designed, and constructed storage sites can minimize risks associated with stored manure.

The land spreading of manure is practiced on many horse farms in New York State. This method of manure management poses a level of potential risk. Manure nutrients, sediment, and pathogens can move from where they are applied and impact water quality. Risk can be reduced by following management techniques, such as, applying manure according to crop need, adhering to setbacks from waterbodies and wells, and not applying manure to saturated or frozen ground. **Never harvest manure laden hay or allow horses access to pastures where manure has been applied before the vegetation has been washed with an adequate rain.**

AEM Tier 2 Worksheet: Horse Farm – Nutrient Management	**Potential Concern**			
Factors Needing Assessment:	Lower 1	2	3	Higher 4
How do you manage your farm's manure?	Stored in a properly located dumpster or other properly designed and located storage system, which is sized for the facility's need, and regularly hauled off the farm.	Piled, allowed to compost and hauled off the farm.	Piled, allowed to compost and spread on the farm.	Removed from the barn and spread, even when the ground is wet or frozen.
If manure is spread on the farm, how many horses do you have per acre of land to which manure is applied?	1.0 horse or less per acre of land used solely for manure spreading and hay production.	1.1 to 2.0 horses per acre.	2.1 to 3.0 horses per acre.	Greater than 3.1 horses per acre.
Do you keep record of manure applications to fields?	Records are kept indicating the number of loads applied per field and any fertilizer applications to each field or pasture.		Records are kept on the number of loads of manure applied to each field **OR** Records are kept on fertilizer applications only.	Records are not kept on the number of loads applied per field.
Do you calibrate your manure spreader?	The average spreader load has been weighted and the area covered by the load has been measured.	An estimate of the weight of the average spreader load has been made and the area covered by the load has been measured.	Weight of the average spreader load and the area covered has been estimated.	No manure spreader calibration or application estimates have been made.
Do you know the nutrient needs of your hayland and pastures?	All fields and pastures are soil tested at least every two years.	All fields and pastures are soil tested at least every three years.	Fields and pastures are soil tested, but less often than every three years.	Soil testing is not done.
Is the fertilizer value (nutrient content) of your manure known?	There is a history of manure testing and manure is tested every year.	There is a history of manure testing and manure is tested every other year.		Manure samples have not been tested.

AEM Tier 2 Worksheet: Horse Farm – Field Application		**Potential Concern**		
Factors Needing Assessment:	Lower 1	2	3	Higher 4
What is the condition of the field when manure is spread?	Soils are dry and fields are well vegetated.	Soils are wet and fields are well vegetated.	Soils are wet and fields are not well vegetated.	Soils are saturated, risk of runoff is high, or the site is prone to flooding.
What times of the year is manure spread?	Manure is spread only during the growing season.	Manure is never spread in late winter; early spring or when soils are frozen or snow covered.		Manure is when soils are frozen or snow covered.
Is the manure completely composted before application to fields?	Manure is piled and regularly turned for more than 6 months.	Manure is piled and lies undisturbed for more than 6 months.	Manure is piled and lies undisturbed for more than 3 months.	Manure is piled and lies undisturbed for less than 3 months.
How is the defecation area of your pastures managed?	Pastures are clipped and dragged several times a year.	Pastures are clipped and dragged once a year.	Pastures are clipped once a year, but not dragged.	Pastures are neither clipped nor dragged.
How far is manure spread from well heads or springs?	Manure is spread at least 200 feet from the nearest well head or spring.	Manure is spread at least 100 feet from the nearest well head or spring.	Manure is spread at least 50 feet from the nearest well head or spring.	Manure is spread less than 50 feet from the nearest well head or spring.
Are vegetative buffers maintained along watercourses in fields on which manure is spread?	A vegetative buffer that meets NRCS standards is maintained along watercourses in fields in which manure is spread **OR** A minimum 100 foot set back for manure spreading is maintained for each field.			Little or no vegetation exists along watercourses and no manure spreading set backs are maintained.

AEM Tier 2 Worksheet: Horse Farm – Manure Storage	**Potential Concern**			
Factors Needing Assessment:	Lower 1	2	3	Higher 4
Where is your manure pile or storage located?	Located on flat ground (0 to 2% slope) and not in a flood plain.	Located on a 3% to 8% slope and not in a flood plain.	Located on a 9% to 15% slope.	Located on ground with a greater than 15% slope **OR** In a flood plain.
What type of soil is under your manure pile or storage site?	Clays or silt soils or the pile sits on concrete with contaminated runoff flowing to a vegetative filter area meeting NRCS standards.	Loam soils.	Sands and gravel soils.	The pile sits on concrete without a vegetative filter area meeting NRCS standards to handle manure contaminated runoff.
How far is your manure pile or storage site from the nearest watercourse?	More than 300 feet of flow path or runoff flows into a vegetative filter area meeting NRCS standards.		Between 100 and 200 feet.	Less than 100 feet.
How far is your manure pile or storage site from wells or springs?	Located or designed such that seepage from the manure pile area does not enter wells or springs.	Greater than 200ft. down slope from well or spring.	Less than 200ft. from well or spring.	Located such that seepage from the manure pile area can enter wells or springs.

Other Considerations:

1. Are there equipment access problems to your manure storage facility?

2. Does clean runoff water (i.e. roof water) flow into your manure pile or storage area?

3. Are wells or springs high in nitrates?

Comments:

AEM Tier 2 Worksheet
Horse Farm – Outdoor Paddock & Arena Management

Glossary

Arena: A constructed area with a solid-surface or oval track for training, riding and exercising horses.

Compaction: The deterioration in soil structure caused by repeated trampling by horses or livestock. The resulting increased soil bulk density, reduced water and air infiltration, and reduced root penetration leads to poor growing conditions for plants and increased water runoff and soil erosion from the compacted area.

Paddock: A small fenced area typically used for turnout and exercise with little vegetation for grazing and high concentrations of manure.

Pasture: A fenced grazing area fully vegetated that provides forage for horses.

Permeable Soils: Soils that are subject to leaching through the profile, thereby creating a possible source of contamination to ground water supplies. Nitrogen, pesticides, or herbicides if applied to these soils are a concern.

25-year/24-hour Rain Event: The amount of rain that falls in 24 hours during a 25 year storm event. In New York it ranges from 3.8 to 4.5 inches.

Background

Paddocks, or turn out areas, are small fenced areas that have little vegetative growth and high concentrations of manure. The soils in these heavily used areas tend to be compacted, allowing for more runoff and less infiltration of water.

Outdoor arenas may have areas that are impermeable and are often drained to allow use in wetter times of the year. Both paddocks and outdoor arenas that are located close to a watercourse or road ditch have potential to discharge sediment, manure and other contaminants to surface water.

There is potential to affect ground water if:

- Paddocks are located on coarse-textured permeable soils (sands and gravels)
- The water table is at or near the surface
- Bedrock is within a few feet of the surface
- Polluted runoff from the paddock flows directly onto permeable soils or bedrock

Agricultural Water Quality Principle

Outdoor livestock containment areas should be managed in ways that minimize the delivery of pollutants from erosion and manure to the surface and groundwater resources.

AEM Tier 2 Worksheet: Horse Farm – Paddock and Outdoor Arena Management		Potential Concern		
Factors Needing Assessment:	**Lower 1**	**2**	**3**	**Higher 4**
What is the condition of the vegetation in the paddock areas?	Maintains a dense vegetation.	Except for minor areas of heavy use, paddock maintains a dense vegetation.	Vegetation is spotty.	No vegetation or only weedy, non grazeable vegetation exists.
How is the manure managed in paddocks?	Manure is regularly cleaned up and removed to storage area or container.		Manure is not regularly cleaned up or removed.	Manure is never cleaned or removed.
Is clean water (including roof water and upslope runoff) kept separate from the paddock and arena areas?	The runoff from up to a 25 year/24 hour rainfall event is diverted away from the paddock and arena.		Some clean water is diverted from the paddock and arena areas.	Clean water is not diverted from the paddock areas.
What is the distance runoff from the paddock and/or arena will flow before entering the nearest watercourse or road ditch?	Greater than 200 feet.	Between 100 and 200 feet.	Between 50 and 100 feet.	Less than 50 feet.
What are the conditions of the flow path for runoff from the paddock and/or arena?	Runoff enters a designed vegetative filter area that meets NRCS standards.	Runoff enters a well-vegetated area with no discernable soil erosion (channeling).		Runoff has created a clear flow path with signs of soil erosion directly to a watercourse or road ditch.

Other:

1. What is the square footage of paddock areas and outdoor arenas?
2. Are the roof gutters of adjacent barns well maintained and adequately sized?
3. Where do downspouts from rain gutters outlet?
4. Is vegetation maintained outside the paddock fence and arena areas to help contain nutrients that may be in runoff?
5. Is there a visible amount of sediment and waste leaving the paddock or arena areas in runoff?
6. Are paddocks and outdoor arenas artificially drained? If so, where do the drains outlet?
7. Can surface water from paddocks or arenas enter the tile drainage system?
8. What is the surface material used in the arenas?
9. Are any surface treatments used in the arenas?

Comments:

AEM Tier 2 Worksheet
Horse Farm – Waterborne Pathogen Management

Glossary

Coliforms: A group of bacterial, usually from animal or human wastes that are used as an indicator of water contamination.

Composting— A biological degradation of manure and other organic material in an aerobic process, generating heat. With horse manure, regular turning of the pile enhances aerobic conditions.

Cyst: Environmentally-resistant stage of Giardia.

E. coli: Bacterial species that live in the intestinal tract of multiple hosts and is shed in feces. *E. coli 0157:H7* differs from other normal intestinal *E. coli* strains because it carries several toxin-producing genes capable of affecting humans. It can cause illness ranging from bloody diarrhea to kidney failure in humans. There is no apparent illness in other host species and is only transiently carried in the intestines of most hosts.

Background

Giardia and *Cryptosporidium parvum* are two protozoa parasites found in animal manure that can cause infection in humans. Bacteria such as *E. coli* 0157:H7, Salmonella, and Campylobacter are also found in manure and also have the potential to cause diarrhea and illness in humans. Infants, the elderly, and individuals with immune system deficiencies are at greatest risk for infection. Infection occurs from ingesting contaminated food or water. Poor hygiene practices while handling animals and drinking from a contaminated source are the major routes of infection.

Unlike these protozoa and bacteria, intestinal viruses from animals do not generally infect humans. Viruses are considered to be host–specific and farm animals are not considered to be a source of infection for humans unless human sewage is present.

Surface water supplies for drinking and recreation are considered to be most susceptible to contamination by protozoan and bacterial pathogens. Chlorination and other standard water treatments are effective in killing bacteria, but do not kill protozoa pathogens. Specific water filtration practices are required to remove Giardia cysts and *C. parvum* oocycst from water.

(Continued on Page 2)

Agricultural Water Quality Principle:
The farm operator should employ management practices to provide multiple barriers to the introduction and spread of pathogens in domestic livestock and their transport to surface and groundwater resources.

Glossary continued…

Hydrologically Sensitive Area: Land area with a high potential for transporting pollutants to surface or ground water.

NYSHHAP: New York State Horse Health Assurance Program. A voluntary certification program designed to promote and to teach a pro-active approach to equine health, care and welfare through the use of certain "Best Management Practices" and to recognize exceptionally managed equine operations.

Oocyst: The environmentally-resistant stages of Cyyptosporidium.

Protozoa: A group of microscopic parasites that include the Giardia and Cryptosporidium genera. Infected hosts shed cysts (Giardia) or oocyst (Cryptosporidium) into feces. Cysts and oocysts are capable of surviving for months in the environment, especially under cool and moist conditions.

Runoff: The portion of rain, snowmelt or irrigation water that leaves the field over the land surface.

Background continued…

Additionally many communities with filtration capabilities rely on unfiltered water sources as their back-up water supply. Poorly-managed filtration operations can result in outbreaks of these parasites

On farms, manure from animals six months and younger are likely source of *C parvum* and Giardia. *C. parvum* is limited to animals less than 30 days old. Giardia has been detected primarily, but not exclusively, in animals younger than six months of age. Foals and young horses can shed *C. parvum* and Giardia even when they appear to be healthy. As a result, surface runoff from animal housing, turn out and exercise areas pose a potential risk to water supplies.

On-farm pathogen management must focus on preventing fecal contamination of livestock feed and water, preventing gross contamination of surface water by manure, and protection of wellheads, sink holes and other direct links to ground water. A **three-barrier approach** should be employed to control pathogens on a farm. These practices may also benefit a farm with improved animal health and performance.

The **first barrier** involves reducing the potential for pathogens to enter the farm from outside sources such as:

- the introduction of infected animals;
- the transportation of infected manure onto the farm on clothing, boots, or equipment; and
- pets, rodents, and other animals transporting contaminated manure from other farms.

The **second barrier** is to minimize cross-contamination among animals on the farm. Pathogen movement and multiplication on the farm can be minimized by:

- keeping animal-raising areas clean; and
- ensuring that all feeds and feeding utensils are clean.

The **third barrier** is to restrict movement of contaminated feces into nearby watercourses by:

- preventing runoff from housing, exercise lots, and manure storage areas; and
- spreading manure on non-hydrologically sensitive areas.

AEM Tier 2 Worksheet: **Horse Farm –** **Waterborne Pathogen Management**		**Potential Concern**		
Factors Needing Assessment:	**Lower** **1**	**2**	**3**	**Higher** **4**
How is manure from horses of 12 months of age and under handled?	Properly composted prior to spreading. **AND** Applied to a non-hydrologically sensitive site when ground is not frozen, snow-covered or saturated.	Mixed with adult horse manure. **AND** Stockpiled for more then 6 months. **AND** Applied to a non-hydrologically sensitive site when ground is not frozen, snow-covered or saturated.	Mixed with adult horse manure. **AND** Stockpiled for less then 6 months. **AND** Applied to a non-hydrologically sensitive site when ground is not frozen, snow-covered or saturated.	Manure is spread daily.
How are foaling stalls managed?	Stalls are stripped, disinfected and rested at least 2 weeks before re-use.	Stalls are stripped, disinfected. **BUT** Not rested at least 2 weeks before re-use.		Stalls not cleaned, disinfected or rested between foalings.

Other:

1. Is the farm participating in the NYS Horse Health Assurance Program?
2. Do you have an overall herd health management plan?
3. Do your horses have access to streams, creeks, rivers, or lakes?

Other Continued…

4. Are non-chlorinated water supplies for your horses regularly tested for coliform bacteria? Are these tests done specifically during droughts or after extreme rainfall?

5. Are young horses allowed to graze land that has had manure (that has not been properly composted) applied within the past six months?

6. Is manure spread on land that will be used for pasturing or production of hay within six months after spreading?

7. Is your barn well ventilated?

8. How often are stalls cleaned and bedded?

9. Are run-in sheds cleaned regularly?

10. How often are feed and water buckets (or waterers) cleaned?

11. Are steps taken to protect feed and water from vermin, flies and other vectors of disease?

Comments:

AEM Tier II Worksheets
Greenhouse Maintenance

Background

Properly constructed greenhouse facilities pose little threat to the environment. Yet, poor operation and maintenance can threaten the integrity of a facility; and if pollutants are allowed to leave the greenhouse, nearby surface and groundwater resources can be threatened. Preventive maintenance minimizes factors that cause deterioration and reduces potential water quality concerns. Timely repair of small problems prevents them from becoming larger issues, and minimizes algae growth and other pest problems. Environmental control is a key component of healthy plants and a healthy environment.

Agricultural Water Quality Principle: Greenhouses should be operated and maintained to prevent pollutants from leaving the greenhouse and entering surface or groundwater resources. Likewise, it is important that clean runoff not be allowed to enter the greenhouse, where it could mix with polluted runoff and exacerbate potential problems.

Glossary

Ambient Temperature: The outdoor temperature surrounding the greenhouse. It determines indoor temperature trends.

Evaporative Cooling: The introduction of moist air which draws heat energy as it evaporates, leaving indoor air cooler; works best when outdoor humidity is low.

Glazing: The single or double layering of plastic film, acrylic or glass that acts as the greenhouse wall or ceiling and is integral to light, temperature, and humidity of the greenhouse.

Shading: The use of fabric or chemical products to reduce solar energy's effect on indoor light levels and temperature.

AEM Tier II Worksheets Greenhouse Maintenance		Potential Concern		
	1-Lower Risk	**Level 2**	**Level 3**	**4-Higher Risk**
Is external water (including roof and upslope runoff) prevented from entering the greenhouse?	All runoff is diverted from entering the greenhouse.			There is no control of water from rooftops, upslope runoff can enter the greenhouse.
How is glazing maintained to prevent excess water entry?	Glazing repairs are made immediately upon discovery of damage or leaks; glazing is inspected weekly	Leaks and glazing are maintained and repairs are made promptly	Leaks and glazing are repaired annually as needed.	Leaks and broken glazing are not repaired.
How is concrete maintained?	Concrete is well maintained and concrete damage is repaired promptly; expansion joints are sealed	Cracking is repaired promptly	Concrete cracking is repaired annually as needed	Concrete is not maintained
How are shading materials selected and applied?	Shade cloth used		Lime-based white wash is used	Paint-based white wash is used.
How are plastic coverings disposed?	Recycled	Sanitary landfill		Buried, burned or piled on property.

AEM Tier II Worksheets Greenhouse Maintenance		Potential Concern		
	1-Lower Risk	**Level 2**	**Level 3**	**4-Higher Risk**
How are irrigation systems maintained?	Systems are periodically inspected; hose couplings and connections are kept tight and leak free; irrigation leaks are repaired immediately;		Irrigation systems do not receive regular inspection; leaks are repaired when noticed	Irrigation systems do not receive regular inspections; only major leaks are repaired.
What are spill cleanup procedures?	Spills are cleaned up promptly; secondary containment is used where appropriate	Spills are cleaned up promptly	Spills are cleaned up as soon as possible	Spills are routinely ignored
How are weeds managed?	Weeds are pulled by hand or mechanically removed.	Weeds are treated with an appropriate herbicide		Weeds are treated with an herbicide not approved for greenhouse use.

Other:

1. Are vermin prevented from tunneling under or around the structure and drainage systems?
2. What treatment methods are used to reduce microbial and algae growth on evaporative cooling pads?
3. Are employees responsible for maintenance activities thoroughly trained in the maintenance activity itself, as well as precautions to prevent personal accidents and environmental releases?
4. Are work areas regularly cleaned and floors kept free of debris to eliminate pest refuges and harborages?
5. Are all mechanical, pump, sump and drain systems and equipment put on recommended preventive maintenance schedules and monitored for problems?
6. Are maintenance concerns sufficiently communicated?

AEM Tier II Worksheet
Greenhouse Pest Management

Glossary

Biological Control: Biological control is the use of a specially chosen living organism to control a specific pest. This chosen organism might be a predator, parasite, or disease that will attack a harmful insect or weed.

Integrated Pest Management (IPM): A systematic approach to managing pests, which focuses on long-term prevention or suppression with minimal impact on human health, the environment and non-target organisms. IPM incorporates all reasonable measures to prevent pest problems by properly identifying pests, monitoring population dynamics and utilizing cultural, physical, biological or chemical pest control methods to reduce pests to acceptable levels.

Scouting: Monitoring for type and frequency of pest occurrence to determine thresholds for treatment.

Worker Protection Standard: A federal regulation intended to reduce the risk of pesticide poisonings and injuries among agricultural workers who are exposed to pesticide residues on plants. The WPS requires greenhouse owners to assure that untrained workers receive basic pesticide information before they work with treated plants.

Background

Pesticides play an important role for pest management in greenhouse crop production. Although many producers use a combination of practices to manage pests, pesticides can help to increase production and plant quality. However, if pesticides are not carefully selected and properly applied, they have the potential to contaminate surface and groundwater.

Integrated Pest Management (IPM) strategies should be employed to identify alternative crop production and crop protection practices, which help minimize or avoid pest problems, reduce or eliminate pesticide use and costs, and maximize potential net profitability of crop production. These practices include, but are not limited to, use of disease-resistant varieties, inspection of all incoming plant materials, and consistent pest scouting.

Agricultural Water Quality Principle:

Pest management is an important part of producing greenhouse crops. Special care needs to be taken to ensure that pesticides do not reach surface or groundwater resources where they can pose a serious threat to water quality and human health.

AEM Tier II Worksheets Pest Management		Potential Concern		
	1-Lower Risk	**Level 2**	**Level 3**	**4 – Higher Risk**
What is the distance of applications from a well or spring?	Greater than 200 ft.	Between 100 and 200 ft.	Between 50 and 100 ft.	Less than 50 ft.
What method of pesticide application is used?	Pesticide applications are done based on scouting results. Spot sprays are used whenever possible.		Pesticide applications are done based on scouting results. Mist sprays are usually used.	Pesticides are applied on a regular schedule.
What monitoring and record keeping is practiced?	Records kept of weekly scouting results, yellow sticky cards used to monitor; staff trained for correct pest identification	Records kept of weekly scouting results, yellow sticky cards used to monitor	Records kept of significant insect pests	Records are not kept. Little to no monitoring is used.
How are pesticide-use records kept?	Pesticide use is recorded immediately after each application and include the target pest, pesticide used, rates, date, method of application and location. Records maintained for a minimum of 3 years		Pesticide use is usually recorded immediately after each application. Chemicals used and rates applied are recorded.	No records are kept. Chemicals used are known by memory and invoices only.

AEM Tier II Worksheets Pest Management		Potential Concern		
	1-Lower Risk	**Level 2**	**Level 3**	**4 – Higher Risk**
Is pest-reducing sanitation practiced?	Bench top, floors, pots & equipment are always disinfected between crops; incoming plants are disease- and insect-free; debris and infected plant material removed weekly		Bench top, floors, pots & equipment are not always disinfected between crops; incoming plants are disease- and insect-free	Pest reducing sanitation is not practiced or done sporadically
What is the level of training of the business owner and the pesticide applicators?	The applicator is appropriately certified as a commercial applicator **AND** pesticide labels are followed.	The owner is appropriately certified as a commercial or private applicator and provides direct supervision to appropriately trained employees doing the application, **AND** pesticide labels are followed.	No one involved in application is certified, but labels are followed.	No one involved in application is certified **AND** Pesticide labels are not always followed.
Is application equipment regularly calibrated?	Spray equipment is calibrated at the beginning of each season **AND** after every 250 hours of spraying **AND** after changes of nozzles or pressure gauges.	Spray equipment is calibrated at the beginning of each season **AND** after changes of nozzles or pressure gauges.	Spray equipment is calibrated at the beginning of each season only.	Regular calibration of equipment is not practiced.

AEM Tier II Worksheets Pest Management		Potential Concern		
	1-Lower Risk	**Level 2**	**Level 3**	**4 – Higher Risk**
Are non-chemical pest controls, such as cultural, biological, physical and mechanical, considered?	A combination of pest controls is used when available and when economically feasible to minimize environmental impact.		Some cultural, biological, and physical techniques are used for pest control.	Rely only on chemical pest controls.
What criteria are used for pesticide selection?	Pesticide selections are made with consideration of efficacy, consultation with a trade professional on environmental risk, restricted re-entry interval, and preservation of the natural enemies of the specified pest and days to harvest.		Pesticide cost and efficacy are considered when making pesticide selections.	Only product cost is considered when making pesticide selections.

Other:

1. Do you feel comfortable that you are in compliance with the Worker Protection Standard?
2. Are incoming plant shipments inspected for pests and quarantined from other plants?
3. Are IPM principles considered in your pest management program?
4. Do you consider environmental impact when selecting a pesticide (i.e. lethal dosage, solubility)?
5. Do you utilize the NYS Elements of IPM (Integrated Pest Management) to assist in your pest management decision making? http://nysipm.cornell.edu/elements/ghouse.asp

AEM Tier II Worksheet
Fertilizer Storage & Handling in the Greenhouse

Glossary

Backflow Protection: Use of a device to prevent contaminated water from siphoning back into a water supply.

Calibration: Determining accuracy of equipment and methods; using standards to maintain accuracy in equipment capacity and volumes delivered. With liquids, the amount applied to a known area must be known and consistent.

Electrical Conductivity: A measurement of the amount of dissolved salts in the plant substrate and water that affects the ability of plants to take up nutrients.

Fertigation: The addition of fertilizers to irrigation water.

Fertilizer Injector: Device that dilutes by a known ratio the amount of fertilizer and water solution into the irrigation line.

Impermeable Flooring: Non-porous flooring constructed to resist absorption.

Leaching: Applying an overabundance of water or solution to wash toxic chemicals and concentrations away from the root zone (out of growing container).

pH: The measure of free hydrogen ions in solution. A pH of less than 5.5 is considered low (acidic), over 6.2 is considered high (basic) in greenhouse situations

Precipitate: The resulting solids that have separated from water in a chemical solution.

Stock Solution: concentrate of liquid fertilizer used to supply the fertilizer injection system.

Background

Greenhouse fertilizer storage areas contain concentrated nutrients that must be stored and managed properly to prevent their potential release, through broken, damaged or leaking containers. When mixed with water, either intentionally or unintentionally, these nutrients can leach into groundwater or be carried away by runoff into surface waters. Excessive nitrate concentrations in drinking water can cause health risks, especially in young children. Phosphorus can be transported to surface waters and cause algae blooms and eutrophication; resulting in poor water quality. Storing fertilizers separate from other chemicals in dry conditions can minimize all these problems. Extra care needs to be given to concentrate stock solutions. Secondary containment should always be used. In addition, it is important to inspect and maintain all irrigation systems, repairing leaks and fittings in a timely manner.

Agricultural Water Quality Principle:

The concentration of chemicals found in fertilizers makes proper storage of utmost importance for the safety of human health and the environment.

AEM Tier II Worksheets Fertilizer Storage		Potential Concern		
	1 - Lower Risk	**Level 2**	**Level 3**	**4 - Higher Risk**
Where are fertilizers stored?	Building dedicated to fertilizer storage; separate from pesticides **AND** protected from extreme heat and flooding.	Area dedicated to fertilizer storage; separate from pesticides **AND** protected from extreme heat and flooding.	Designated work area; stored with pesticides.	No specific area.
How is fertilizer stored and contained?	Stored on impermeable floor with secondary containment, away from plant material and high traffic areas. Clean-up equipment is readily available.	Stored on impermeable floor with secondary containment.	Stored on permeable floor with secondary containment.	Stored on permeable floor.
How are damaged containers dealt with?	Fertilizer is repackaged and labeled **OR** placed in suitable secondary containment that can be sealed.			Damaged containers may go unnoticed; repackaging does not occur consistently.
What type of fertilizer injector is used?	Automatically monitored and controlled injection system.	Positive displacement or metering device injection, manual control.		Inexpensive Venturi-type injector; injector equipment is in need of replacement of overhaul.
How often is equipment inspected?	Injector equipment is inspected weekly; stock tank is inspected weekly for deterioration and cracks.	Injector equipment and stock tank are inspected quarterly.		Injector equipment and stock tank are repaired when problems are noticed.

AEM Tier II Worksheets Fertilizer Storage	Potential Concern			
	1 - Lower Risk	**Level 2**	**Level 3**	**4 - Higher Risk**
Is system calibrated regularly?	Accuracy of fertilizer injector and fertilizer measurement is tested after each preparation of new stock solution.	Accuracy of fertilizer injector and fertilizer measurement is tested monthly.	Accuracy of fertilizer injector and fertilizer measurement is tested annually.	Unlikely to be monitored.
How frequently are nutrients applied?	Automated controls monitor and apply fertilizers at the proper rate at each watering.	Fertilization at regular intervals with the proper dilution ratio and flow rate.	Application of fertilizer is done at irregular intervals when monitoring shows obvious need.	Occasional application of fertilizer at the discretion of the employees.
How frequently are pH and electrical conductivity of the planting mix and water monitored?	Plant mix and water tested before each growing season.		Monitoring occurs when crop health problems arise.	Monitoring is not done.
How often is pH and EC monitoring equipment calibrated and maintained?	Calibrating solutions are refreshed yearly, equipment is calibrated before each use, faulty equipment is repaired or replaced promptly.			Calibrating solutions are not refreshed, equipment is not calibrated.
How are fertilizer use and application records kept?	Inventory kept on amount of fertilizer purchased and location of application; records are updated after each use.	Inventory kept on amount of fertilizer purchased and location of application; records are updated weekly.	Inventory kept on amount of fertilizer purchased. Use records are not consistently kept.	No consistent inventory is taken. Records are not kept.

AEM Tier II Worksheets Fertilizer Storage		Potential Concern		
	1 - Lower Risk	**Level 2**	**Level 3**	**4 - Higher Risk**
How are precipitates discarded?	Fertilizer systems are cleaned; solids and rinsate are added to a compost pile.	When fertilizer systems are cleaned, solids are removed first and discarded as solid waste before rinsate is flushed to sanitary sewer.	Fertilizer systems are cleaned; solids and rinsate are flushed to sanitary sewer.	Fertilizer systems are not cleaned on a regular basis and rinsate is subject to varying disposal methods.
How is irrigation and leaching managed?	Leaching of fertigated water is limited to 10% using trickle tube irrigation, zero effluent systems used whenever possible.	Conscious attempt to limit the amount of leaching of fertigated water to 10%.		Leaching of fertigated water has not been addressed.

Other:

1. How do you dispose of empty fertilizer containers?