Introduction
Pastures are widely used throughout NYS in many types of dairy and livestock production. Depending on the type of livestock and the producer’s goals, pastures can be utilized and managed in a variety of fashions in hopes of providing economic and environmental benefits. Well-managed pasture systems located on appropriate “healthy” soils are capable of producing cost effective high quality feed while also providing livestock the benefits associated with being outside (e.g., exercise, sunlight, fresh air, and hoof health) instead of spending the majority of their time inside a barn. Successful pasture planning and management can result in tremendous benefits to the farm and community while also protecting soil and water resources, as well as, enhancing wildlife habitat. This information sheet will focus on the conditions and practices associated with very basic and general pasture management, not necessarily the details and specifics of varying livestock types, herd sizes, management styles and techniques, or site characteristics.

Environmental Concerns
Pasture management is extremely important because farms utilize many acres of the land base; the condition of the pastures and the practices occurring on these acres greatly influences nearby environmental resources. In general, soil erosion potential is reduced in year-round vegetative-covered pasture as compared to annually tilled and harvested cropland. However, poorly managed, neglected, or abused pastures may result in degraded soil health, air quality, and both surface and ground water. Allowing livestock to overgraze pasture, concentrate in heavy use areas, or have unlimited direct access to wet areas, watercourses, and buffers may lead to soil erosion and nutrient leaching or runoff. Disturbed stream banks, beds, corridors, and floodplains may become unstable as buffering vegetation and root structures are removed. Soil erosion from pastureland can carry sediments, nutrients, and potentially pathogens to surface waterbodies, degrading water quality. Concentrations of nutrients, especially nitrogen and phosphorus, can threaten aquatic habitats and contaminate drinking water supplies. A pasture management system comprised of a well balanced forage/rotation plan and a combination of cultural and structural BMPs may significantly reduce the environmental risks associated with pasturing livestock.
Growing livestock forage and feed is the single largest cost of dairy and livestock production. The underlying goal of a successful pasture management system is to improve profitability by producing high quality forage at a reduced cost compared to “mechanical” harvesting or importing purchased feed nutrients. Livestock feeding processes and minimal equipment are used to manage quality, quantity, and consumption of vegetation in the pasture, thus conserving fossil fuels, reducing air emissions and equipment wear and tear. Areas of the farm not suited to mechanical harvesting due to site constraints can be developed and accessed by livestock. Livestock spread their own manure, reducing the operational costs of manure collection, storage, and land application. As overall herd health improves while out on well-managed pasture, livestock efficiency and productivity may increase while the number of sick animals and Veterinarian bills decrease. Consistent vegetative cover and reduced tillage practices increase soil health and nutrient uptake while decreasing erosion and runoff. Labor, equipment, and time management in general may be improved by developing an efficient pasture management system. In addition, properly managing pastures may “clean” up the farm, improving overall facility and landscape aesthetics, neighbor relations, and value of property.

Summary of Best Management Practices

- Develop a Pasture Management Plan/Nutrient Management Plan to Provide Multiple Barriers Approach to Erosion and Water Contamination. Site specific prescribed grazing plans will inventory and evaluate available resources and infrastructure, environmental risk, and balance livestock with forage demands.
- Restrict and properly control livestock access to watercourses, stream crossings, and wet soils.
- Fence livestock out of watercourses, wells, and highly sensitive areas while maintaining appropriately sized buffer areas.
- Minimize number and size of stream crossings. Stream crossings should be located in stable areas where livestock access can be controlled to protect streambed and banks from erosion, while not impairing water flow are fish access.
- Alternative water supply and distribution system provides adequate quantity and quality for livestock; tanks or troughs shall be portable and rotated to new areas or permanent and properly stabilized and protected. Install float valves to prevent tank overflow.
- Establish and maintain laneways that improve grazing efficiency and distribution while protecting watercourses and highly sensitive areas.
- Livestock attractants are strategically located to promote even grazing distribution and reduce livestock congregation, especially near highly sensitive areas.
- Properly locate supplemental feeding areas; feed wagons and minerals shall be portable and rotated to new areas or permanent and properly stabilized and protected.
- Reduce the size, relocate, eliminate, or stabilize and protect any HUAs that have runoff concerns.
- Establish and maintain forage vegetation to improve infiltration capacity, filtering capacity, and runoff reduction.
- Use Natural Resources Conservation Service Approved Best Management Practices.
  - Best Management Practices (BMPs) are designed to control soil erosion, increase soil health, and reduce nutrient and sediment contamination associated with land management practices and nutrient applications.
- Follow NYS Land Grant University Guidelines – Cornell University Nutrient Guidelines and Soil Health Program Principles and Analyses to Improve Soil Health and Nutrient Recycling.
Summary of Regulations

Local Ordinances
Check your local regulations as they could vary from State and Federal Regulations.

State Regulations
NYS DEC - CAFO Permit
NYS DEC – Environmental Conservation Law (ECL)

Federal Regulations
EPA - General Information on CAFOs
EPA - Clean Water Act, Clean Air Act, and Coastal Zone Management Act

Background Information for Worksheets

How long do livestock have access to a single pasture area?
In general, a pasture system managed without an appropriate livestock or pasture area rotation scheme will struggle to reach potential forage yields and quality. Besides limiting forage production and livestock efficiency, the stress continuous grazing inflicts on pasture vegetation and soils may lead to potential surface and ground water resource concerns. On the other hand, the benefits of intensively managing forage harvest with rotational stock grazing and multiple paddocks can be witnessed throughout a pasture system. The size and number of paddocks depend on many factors (e.g., level of productivity, livestock stocking rates, and paddock residency periods). Individual paddocks are grazed for a residency period long enough to harvest available forage, and are then rotated or “rested” for optimal re-growth. Livestock will return to this paddock for fresh forage after cycling through the rest of the paddock system. Improved forage quality and ground cover reduces risks of erosion and runoff potential. Moving animals through small, square or rectangle sized paddocks result in evenly dispersed grazing and manure allocation, resulting in improved plant utilization and reduced runoff of nutrients. Sensitive areas of a once continuous pasture and be divided into smaller paddocks and intensively managed with shorter residency periods or avoided entirely during hazardous conditions. In some cases, the increase in forage production will allow farms to fence out watercourses and other sensitive areas and still meet or exceed their pasture requirements.

For More Information
NRCS – Prescribed Grazing (528) Standard
What is the average grazing animal per pasture acre ratio for the farm?
There are many types and variations of pasture management grazing systems and techniques (e.g., management intensive grazing, rest rotation, deferred grazing, high intensity – low frequency, tall grass grazing, mob grazing, creep grazing, multi-species or mixed grazing, stock piling, silvopasture, and targeted grazing). Essentially all forms of grazing fall under two categories of grazing: Continuous Stocking – livestock have access to all forage resources all of the time, and Rotational Stocking – livestock are rotated through a series of different areas or paddocks allowing rest periods for forage re-growth. In NYS, the general rule of thumb regarding the average grazing animal per pasture acre ratio in the two basic types of grazing systems for a season long basis are: (Rotational Stocking = 1 au / 1 acre) and (Continuous Stocking = 1 au / 2 acres). Average grazing animal stocking rate values may vary considerably between system locations due to soil type, nutrient, and productivity levels, soil texture, and current season’s growing conditions.

What is the condition of the pasture?
Well managed and efficiently used pastures can supply high-quality, low-cost feed for livestock. Some form of rotational grazing is necessary to control proper plant growth and forage quality. The mix of forage species should suit the characteristics of the soil, kind and class of livestock, and grazing management style. Grass species in a grass-legume mixture tend to fill in spots where legume will not grow and offers protection against livestock bloat. Dense and robust pastures intercept falling rain, slow surface water flow, improve infiltration capacity, and improve filtering capacity. In addition, plant root systems hold soil in place preventing erosion. Pastures that are over-grazed or denude of vegetation lead to poor animal performance and health issues, nutrient runoff and leaching concerns, and soil erosion concerns. Nutrient runoff and erosion concerns may be significant where animals tend to congregate, travel, water, or receive supplemental feed; resource concerns increase if these denude areas are located near watercourses, wells, or other highly sensitive areas. Pastures or areas within them where vegetation is damaged or removed should be limed and/or fertilized, and re-seeded as necessary to maintain forage productivity and protect water quality.

For More Information:
Cornell University – College of Agriculture and Life Sciences – Forages
If laneways are present, what is their condition? Are livestock allowed to congregate in the laneway? If yes, for how long (hrs/day)? Many pasture systems will exhibit consistent traffic patterns where animals travel to and from the barn or handling facilities, forage paddocks, water sources, and other attractants. These areas tend to be lacking vegetation, muddy, show signs of concentrated water flow, water ponding, and soil erosion due to persistent livestock and/or equipment use. Whether supported by infrastructure or not (e.g., fence, gates, and gravel), the intense use of animal trails and walkways (laneways) often results in unstable soils and heavy concentrations of nutrients.

To minimize runoff concerns, laneways facilitating traffic throughout the pasture system should be located away from watercourses, highly sensitive areas, and unsuitable soils. Laneways should be: sufficiently fenced to contain traffic on designated areas, properly sized for both animals and necessary equipment, stabilized with dense vegetation or solid material (e.g., gravel and concrete) depending upon frequency of use, crowned or outsloped to reduce ponding and control surface flows, following the contour of the land if possible, and include appropriate gates to restrict animals from loafing on the laneway. Diversions, water bars, culverts, or other practices may be necessary to control and direct water flows near the laneway. Vegetation that is downslope or adjacent to the laneway, whether it was occurring naturally or planned/implemented, may reduce runoff concerns. Significant manure accumulations on the laneway should be removed and managed according to a Nutrient Management Plan.

For More Information
NRCS – Animal Trails and Walkways (575) Standard

Where are attractants positioned on the pasture?
Attractants are anything which entices animals to spend a disproportionate amount of time in one area relative to the rest of the pasture (e.g., salt block, mineral feeder, shade, feeder wagon, breezy knoll, shelter, water, and gates). Strategic dispersal or positioning of attractants offers many benefits including: less overloading of soil nutrients in one area, more time spent grazing, reduced trampling of sod, and less soil compaction. Distribute water at numerous sites away from other attractants to facilitate grazing dispersal. Provide and/or allow controlled access to shelter, shade, windbreaks, and other attractants that are located away from sensitive areas where runoff concerns are low.
What is the source(s) of water for the pasture?

Livestock, especially dairy cows, require frequent and large quantities of water to survive, maintain good health and comfort, and achieve performance goals. Livestock dietary water intake varies according to livestock animal weight, kind and class, weather conditions, body hair, physiological state and purposes, production levels, and health. The sources, locations, and quality of water supporting the livestock are key factors to the system’s success, failure, and environmental risk level. Pasture system water sources may include any one or combination of the following: (Developed watering facilities such as tanks/troughs supplied by wells at housing, milking, barnyard, and handling facilities, or water wagons) and (Un-developed natural sources such as watercourses/streams, waterbodies/ponds and lakes, or small springs/ground seeps). Animals rotate between feeding and drinking; limited or inadequate water source locations result in heavily disturbed areas and long travel distances for livestock to reach fresh forage. Livestock with unrestricted access to surface water sources may result in water contamination from disturbed soils and manure/urine depositions. Water sources utilized for human or animal consumption should be periodically tested for excessive nutrients, toxic chemicals, and pathogens to insure quality, preserve health, and promote performance.

Characteristics of an effective watering system include: water sources that meet the quantity and quality demands of the livestock, dispensing ability to provide water throughout all pasture areas/paddocks to minimize animal travel distances, and watering facilities that are either permanently stabilized or capable of being rotated around several areas to disperse manure and urine and allow vegetation re-growth. Any waterbody or watercourse utilized as a surface source should have access control practices installed to protect water quality (See Livestock Management Around Watercourses).

Available water tank numbers and their sizes should be able to service multiple animals at once (approximately 10% of group size). Tanks must have either large reserve capacities (large tank/low flow recharge rate) or rapid peak flow recharge rates (small tank/high flow recharge rate). Both systems must withstand heavy draw downs as animals tend to drink very quickly and in groups. Pressurized float valves control water levels and prevent tank overflows which saturate soils resulting in disturbed vegetation, soil compaction, and leaching/runoff concerns. Lactating livestock consume 30-50% of their total daily water intake immediately after being milked so providing ample watering opportunities near the milking center will relieve system water demands further out in the pasture.
How are livestock managed around water courses?
Livestock should be excluded from or have controlled access to all watercourses. Eliminating or controlling livestock access will prevent the direct deposition of nutrients (i.e., manure and urine), organic matter, and potential pathogens into watercourses, waterbodies, and hydrologically active areas. It will also protect the stability of the streambank and streambed from livestock traffic. Livestock that have unlimited access often denude vegetation along stream banks and create fresh scrapes and ruts that roughen the soil profile and destabilize the entire bank. Livestock damage along these areas results in degraded water quality and damage to wildlife habitat due to reduced nutrient, pesticide, and pathogen collection/filtering, increased erosion and sedimentation, and thermal modification and wildlife corridor removal.

Protection of watercourses, waterbodies, and hydrologically active areas can be achieved by implementing an access control system which permanently excludes or limits livestock use of the area. Install fence to exclude animals out of watercourses, establish a vegetated buffer zone (35’ minimum recommendation) between pastures and water, stabilize necessary animal trails and walkways, and install stream crossings where livestock must travel across the water. An alternative water supply may be developed if the watercourse was the sole source of water. In some cases, when a new alternative water system is not feasible, a small area of the watercourse and bank may be stabilized and fenced in to allow a limited number of livestock access to drink at one time.

For More Information
Virginia Department of Conservation and Recreation – Streamside Livestock Exclusion

How are livestock managed around ponds and other persistently wet pasture areas?
Livestock access to ponds should be eliminated due to several water and soil quality concerns. An access control system comprised of exclusion fence and vegetated buffer removes livestock from the water source and establishes a permanent vegetated buffer to stabilize soil and capture and filter contaminants and pathogens in runoff. An alternative water supply may be developed if the watercourse was the sole source of water. In some cases, when a new alternative water system is not feasible, a small area of the watercourse and bank may be stabilized and fenced in to allow a limited number of livestock access to drink at one time.

Vegetation on persistently wet areas or hydric soils within the pasture cannot tolerate the pressure of livestock; physical damage to plants and roots along with soil compaction. The potential for surface and ground water contamination from deposited manure and pathogens is increased on saturated and high leaching soils, especially when existing vegetation is severely damaged. To reduce risk, eliminate livestock access to these areas completely or only provide limited access to them for brief time periods during dry conditions.

How are seasonal watercourses in the pasture managed?
During parts of the year, seasonal watercourses and flow paths share many of the same resource concerns as streams. The same livestock access control and exclusion principles used for watercourses and streams apply to seasonal watercourses. To avoid contamination risks from deposited manure, urine, pathogens and eroded soils, seasonal watercourses and flow paths should remain permanently vegetated. Eliminate livestock access to these areas completely or only provide limited access to them for brief periods during dry conditions.
Do Heavy Use Areas exist in the pasture any time during the year?

Livestock heavy use areas (HUAs) are any outside areas where livestock use or traffic is concentrated over time. Runoff from HUAs may contain high levels of nutrients from accumulated manure and waste feed, eroded soils, and pathogens. Most livestock HUAs are located near the barn and support immediate herd processes at the barn facility (e.g., feedlots, watering facilities, and holding areas for cleaning, handling, heat detection, and exercise). Barnyards or heavy use areas near the barn should have distinct and well managed gate systems to separate the different areas of use and prevent livestock loafing and gradual heavy use area expansion into the laneway or pasture. Pasture watering facilities, supplemental feeding areas, and other livestock attractants that are un-protected tend to develop large heavy use areas around them. Eliminate, minimize size, relocate, control livestock access, or protect any high risk HUAs to reduce runoff concerns. Safely locate long duration winter feeding paddocks on high ground where proper vegetated flow distance and buffers reduce runoff concerns. During winter months, inactive plants have little nutrient uptake capacity, thus potentially increasing nitrate leaching concerns; avoid well-drained and/or coarse textured soils for winter paddocks. After winter paddock use, collect and manage accumulated manure according to a Nutrient Management Plan and repair and re-seed the disturbed area. Lightly used areas may benefit from regular re-seeding with a species that tolerates and persists under heavy use conditions.

For More Information
NRCS – Heavy Use Area Protection (561) Standard

Do livestock have access to woodlots?
In many pasture systems, whether intentional or not, livestock have access to woodlots. The woodlots provide shelter and relief from wind, rain, and sun. Silvopasture, a comprehensive pasture system advanced beyond just simple woodlot access, incorporates livestock into forest lands, early succession areas, and even orchards. The mixed land use provides the benefit of shade and shelter to livestock while maintaining some level of timber harvesting or mast production on the same acres.

For More Information
Cornell Cooperative Extension: Agriculture – Silvopasture

Additional Information
NRCS – National Range and Pasture Handbook
ATTRA. Paddock Design, Fencing, and Watering Systems for Controlled Grazing
SUMMARY
AEM Tier 2 Assessments document environmental stewardship and establish benchmark conditions on the farm. They also identify resource concerns and areas of opportunity. The AEM Tier 2 worksheets also help to further establish baseline data that can be used to prioritize issues for Tier 3 planning.

Tier 2 Assessments should be completed on-site with the farmer. When the initial assessment is completed, appropriate feedback in the form of an AEM Tier 2 Worksheet Summary should be provided to the farmer. The summary should include an overall level of concern for the worksheet, explanation of the overall ranking, a list and description of items of greatest concern, as well as, documentation of what is being done well and what areas need improvement. After the evaluation is complete, the farm should be given a ranking which will determine their priority to advance to the AEM Tier 3 planning phase. Appropriate ranking categories that could be used are: High, Medium, or Low Priority. A ranking procedure that has been approved by your local AEM Team should be used to make the ranking determinations.