UMass Extension

CHECKLIST
SITE PLANNING: STORMWATER AND WASTEWATER

- ✓ Be aware that agricultural activities are subject to the jurisdiction of the Massachusetts Wetland Protection Act (WPA) when they occur within the resource areas (and their 100-foot buffer zones) defined in the Act. Many normal farming activities are exempt from regulations under the WPA. For information on the Massachusetts Wetland Protection Act, contact Massachusetts Department of Environmental Protection: http://www.mass.gov/dep/water/approvals/wmgforms.htm, phone [617]-292-5706).

- ✓ Growers planning to withdraw water from ground or surface sources in excess of an annual average of 100,000 gallons per day or 9 million gallons in any three month period must apply for a Water Management Act permit. Note that municipalities may also have water withdrawl requirements.

- ✓ Allow time for zoning, wetlands and building permits that may be required. Permits usually take several months to obtain due to infrequent meeting schedules and public hearing requirements.

- ✓ Use BMPs to handle wastewater from greenhouse roofs, driveways, parking areas, indoor growing areas, outdoor growing beds, flood floors and benches.

- ✓ Adopt integrated pest management practices and avoid pesticides which are persistent, have high leaching potentials, or move readily on the surface.

- ✓ Reduce pesticide use by properly timing the pesticide application and subsequent evaluation of the resulting level of pest control.

- ✓ Stormwater and wastewater management systems may require an engineer to design handle maximum runoff conditions. Permits may also be required. USDA Natural Resource Conservation Service (NRCS) may be a resource. See “Resources” for contact information. For new construction, contact Massachusetts Department of Agricultural Resources, Division of Technical Assistance for information on current regulations on stormwater and wastewater management.

- ✓ Consider directing rainwater from greenhouses to a retention pond or constructed wetland to allow most sediment to settle out before it reaches a brook or stream.

- ✓ For gutter-connected greenhouses, consider installing a rainwater harvesting system to store some of the water to use for irrigation.

SITE PLANNING: STORMWATER AND WASTEWATER

As greenhouse operations add more growing space, support buildings and vehicle access area, stormwater and wastewater management becomes more important. Good management, including site planning, source controls and pollution prevention can help growers reduce environmental impact and keep water resources clean.

Slope

Sites where greenhouses are located should have a gentle slope to the south for good winter light and protection from northerly winds and to provide drainage of rain and runoff. A fairly level site with a 1% to 2% slope reduces site preparation costs. Greenhouses should be placed on a gravel base, 6" to 12" above grade. Swales between greenhouses are necessary to direct the water from the area.

Wetlands Protection Act and Water Management Act

Wetland and water resources are found on many Massachusetts farms. These resource areas include (but are not limited to) streams, ponds, bogs, marshes, swamps, floodplains, isolated land subject to flooding, wet meadows, salt ponds, salt marshes, and fish runs. Agricultural activities are subject to the jurisdiction of the Massachusetts Wetland Protection Act (WPA) when they occur within the resource areas (and their 100-foot buffer zones) defined in the Act.

Many normal farming activities are exempt from regulations under the WPA. Others require a certain level of review by local Conservation Commissions. For information on the WPA, contact the Massachusetts Department of Environmental Protection http://www.mass.gov/dep/water/waterres.htm, phone [617]-292-5500.

The Water Management Act (WMA) authorizes the Massachusetts Department of Environmental Protection to regulate the quantity of water withdrawn from both surface and groundwater supplies. The WMA consists of a registration program and permit program. Persons planning to withdraw water from ground or surface sources for purposes in excess of an annual average of 100,000 gallons per day or 9 million gallons in any three month period must apply for a WMA permit. For information on the WMA, contact the Massachusetts Department of Environmental Protection http://www.mass.gov/dep/water/approvals/wmgforms.htm, phone [617]-292-5706.

Stormwater and Wastewater Management

Best management practices should be used to handle wastewater from greenhouse roofs, driveways, parking areas, indoor growing areas, outdoor growing beds and flood floors and benches. Stormwater and wastewater management systems may require engineering design to handle maximum runoff conditions. Permits may also be required. USDA Natural Resource Conservation Service (NRCS) may be a resource. See “Resources” for contact information. Flow rates and nutrient/pesticide levels of the different sources should be monitored on a regular basis to have data available if questions arise by regulatory agencies. Collecting and reusing some of this water will reduce the environmental impact. For new construction, contact Massachusetts Department of Agricultural Resources, Division of Technical Assistance (under “Resources”) for current regulations on stormwater and wastewater management.

Rainwater

In most operations, the greatest amount of water comes from building roofs. A one-inch rainfall on an acre of impervious surface such as a greenhouse roof or parking area amounts to about 27,000 gallons. This may come as intermittent rain over a day or two or it could come in as little as a few minutes in a heavy downpour. Good drainage design is required to handle this water without degrading the water with sediment, pollutants or debris.

Rainwater from greenhouses can be kept relatively clean with grass or stone lined swales. Directing this waster to a retention pond or constructed wetland will allow most sediment to settle out before it reaches a brook or stream.

For gutter-connected greenhouses, consideration should be given to installing a rainwater harvesting system to store some of the water for use for irrigation. See sections “Water: Supply and Sources” and “Water Quality for Crop Production”.

Driveways and Parking Areas

This space can add up to a significant amount of impervious area if it is paved. There is a greater impact if some of this is sloped. Non-paved driveways and parking areas should have a minimum of 10” of compacted gravel base with 2” of processed gravel on top. This allows for good drainage underneath. Maintaining a cross slope of 3% from the middle of the driveway to the edges will allow water flow off to a swale. A curtain drain with 6” filter fabric pipe on the uphill side will keep water from getting under the driveway. Where the grade is greater than 10%, the driveway should be paved with a minimum 3” of bituminous concrete laid in two courses. This will prevent erosion of the driveway.

Truck turn-arounds, dock and materials handling equipment areas should have a bituminous paving over a 12” minimum granular base. Adequate natural drainage or culverts should be installed to remove runoff. Drainage from paved areas with considerable vehicular traffic or where vehicles are parked should be filtered through a sediment/oil separator to remove sand, silt, oil and growing media before it is discharged to wetland or brook. For large impervious vehicle areas, it may be desirable to have the water directed to a retention pond for further settling.

Outdoor Growing Areas

If uncovered, the leaching of irrigation water and rainfall from containers can add significant nutrients and pesticides to the runoff. In areas with heavy rains, placing a vinyl liner with drain tile buried in a few inches of gravel will allow runoff to be collected and treated before it reaches a wetland. A holding tank, detention basin or retention pond makes a good storage. Water can be treated for reuse or sent through a constructed wetland.

Constructed Wetlands

The use of constructed wetlands has increased in recent years as an effective method of removing pollutants from wastewater. It is fairly simple consisting of a sediment trap, filter bed, wetland and retention pond.

The sediment trap removes the solid matter (growing media, sand, leave, etc). A tank or pond can act as a sediment trap. This has to be cleaned when the solids build up in the bottom and are disposed of by spreading on agricultural land or by disposing in a landfill.

The wastewater is then distributed over a filter bed. This is an area of soil, grass and a vinyl liner. The fine sediment which contains phosphates and nitrogen is removed. The grass is mowed occasionally and the clippings which contain nutrients are taken out of the system. They could be used for compost.

The constructed wetland is a vinyl lined area with a gravel growing media that supports water plants. These need to be selected for your zone but frequently include water lilies, sedges, cattails and wild rice. This removes the remaining nutrients leaving water that is 99% clean.

A retention pond can be added to hold the clean liquid for several days to complete the process. Water from this pond can be released to a stream or drainage area.

Constructed ponds and wetlands can eventually obtain all the regulatory protection that a natural wetland possesses.

Pesticides and Fertilizers

Pesticides and fertilizers used in the normal course of growing plants are potential environmental hazards if they enter groundwater or surface water by runoff or leaching. Gasoline and fuel oil, leachate and other materials are also serious threats, but regulations and methods of reducing their threat are largely in place.

Pesticides having high leaching potentials, high surface loss potentials, or which are persistent in soil are of greatest concern. Method of application, pesticide formulation, soil type, and microbial activity in the soil are other factors which affect how much chemical may reach the groundwater. Adopt integrated pest management practices and avoid pesticides which are persistent, have high leaching potentials, or move readily on the surface. Proper timing of application and subsequent evaluation of the resulting level of pest control are important steps in reducing pesticide use. See sections on “Pesticides and Groundwater Protection” and “Integrated Pest Management”.

Nitrates and phosphates from fertilizer are potential environmental hazards if they enter groundwater or surface water by runoff or leaching. Careful selection of fertilizer and application that meets the nutrient needs as the plant grows can help to reduce environmental impact. If the floor is concrete, drains can be installed to collect and treat this runoff. Recirculating flood floor and bench systems eliminate runoff as irrigation water is returned to holding tanks. See sections on “Nutrient Management” and “Irrigation” for information. Provision has to be made to dispose of the water from cleaning the holding tanks several times a year.

References

Bartok, J.W., Jr. 2010. *Stormwater and Wastewater Management for Greenhouses.* Fact Sheet

Cox, D.A 1993. *Groundwater and Your Greenhouse*.
http://www.umass.edu/umext/floriculture/fact_sheets/greenhouse_management/water.html