UMass Extension

CHECKLIST
BMPs for FIELD NURSERIES
REGULATIONS, SITE SELECTION, WATER MANAGEMENT

Regulations

- ✓ For information on the Wetlands Protection Act or the Water Management Act, contact the Massachusetts Department of Environmental Protection (http://www.mass.gov/dep/water/approvals/wmgforms.htm).

Site Selection

- ✓ Before a field is used, collect the history of the field, including previous crops grown and types of herbicides and pesticides previously applied.
- ✓ Choose a site with well drained soils, free from flooding, high water table, and rocks.

Soil Types

- ✓ Test soils for pH, phosphorus (P), potassium (K) and certain micronutrients. Soil pH should range from 6.0 to 6.5 for most plants, and lower (5.0 to 6.0) for acid-loving plants like rhododendrons and azaleas.
- ✓ Check soil survey maps for data on soil texture for your site; these are available from the Natural Resources Conservation Service (NRCS) (http://www.ma.nrcs.usda.gov/technical/soils/index.html).

Slope

- ✓ Avoid steep slopes to prevent erosion and low areas which are prone to cold pockets. Gently sloping land is best.

Runoff Water Management

- ✓ Lay out and plant fields across slopes and on contours.
- ✓ Provide grassed roadways and vegetative aisles between rows when topography creates erosive conditions.
- ✓ Install field border strips to reduce movement of sediment from a field.
- ✓ Seed the areas between rows of trees with a green manure crop, such as winter rye, or a more permanent crop, such as a turf grass mix, to prevent erosion.
- ✓ For information on conservation practices to prevent erosion contact your local NRCS office (http://www.ma.nrcs.usda.gov).

Irrigation

- ✓ Plan for an adequate water supply for irrigated field nurseries. Growing nursery stock may require 1 to 2 applications of an inch of irrigation per week.
- ✓ Design an irrigation system as part of the plan for field layout and planting strategy.
- ✓ Use drip irrigation when possible. Drip irrigation conserves water and fertilizer and reduces weed competition.

Drip Irrigation Tips

- ✓ Be sure that the drip system is installed correctly and operated properly.
- ✓ Be sure that the water supply is very clean and free of sediment and minerals. Use filters to remove particulate matter.

ESTABLISHING FIELD NURSERIES

Site Selection Considerations

Field grown nursery crops are grown in the ground in three- to five-year production cycles. Before a field is used, collect information about the field's history, including previous crops grown and types of herbicides and pesticides previously applied.

Field grown nursery crops require well-drained soils that are free from flooding and do not have a high water table during winter months. Soils should be relatively free of rocks to facilitate digging when planting, as well as deep enough to allow digging of root balls. Field grown nursery crops can be hand-dug and balled and burlapped, but are usually harvested with mechanical tree spades and placed in burlap lined wire baskets. Mechanical digging has allowed nursery crops to be successfully grown in a wide range of soil types. Hand-digging causes more soil disturbance and makes it difficult to keep sandy soil around plant roots. Most nurseries use mechanical digging equipment.

Site Selection Considerations:
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).

Soil Types for Field Nurseries

The ideal soil type depends on the type of nursery crop grown. An important consideration is soil texture. Soil texture measures the relative amounts of sand, silt, and clay in the soil. These amounts, in conjunction with the amount of organic matter, will strongly affect the drainage and the fertility of the soil. Check soil survey maps, available from the Natural Resources Conservation Service (NRCS), for data on soil texture for your site

(http://www.ma.nrcs.usda.gov/technical/soils/index.html). Sandy loam soils are desirable for trees harvested bare root, which are then sold as is, or containerized for sale. Heavier soils, loam to clay loam, are more suited to trees that will be B&B harvested.

Trees generally do not grow well in very sandy soils due to rapid nutrient leaching or in heavy clay soils due to poor drainage. However, heavy soils can be improved by adding organic matter or growing green manure crops for several years. Subsurface drain tiles can be used to increase the percolation of clay soils. For information, contact NRCS (http://www.nrcs.usda.gov/technical/ENG/).

Soil pH should range from 6.0 to 6.5 for most plants, and lower (5.0 to 6.0) for acid-loving plants like rhododendrons and azaleas. Soils should be tested for pH; phosphorus (P), potassium (K), and certain micronutrients; and possible herbicide residues, depending on prior uses of the site.

Slope

Gently sloping land promotes air movement and surface water drainage, yet still allows uniform crop development and efficient operation of equipment and irrigation systems. Steep slopes are subject to erosion, can produce irregular crops, and limit layout options. Low areas can be cold spots prone to frost, and may not drain properly during periods of high rainfall, thereby increasing the potential for appearance of soilborne diseases like *Phytophthora*.

Runoff Water Management

Field nurseries should be managed to avoid sheet and rill erosion and formation of gullies. Fields should be planted across slopes and on contours. Grassed roadways and vegetative aisles between rows are preferred when topography creates erosive conditions. To prevent soil erosion and reduce pest problems, the areas between rows of trees may be seeded with a green manure crop like annual rye, or a more permanent crop like a turf grass mix. There should be about a 3-foot clean strip around the tree. Field border strips can also be installed to reduce movement of sediment from the field. For information on conservation practices to prevent erosion contact your local NRCS office (http://www.ma.nrcs.usda.gov).

Irrigation for Field Nurseries

Some field nurseries are not irrigated, but irrigation capability should be considered when choosing land for field production. Over time, irrigated crops outgrow non-irrigated crops, have less dieback, and can result in a production cycle shortened by one to two years. As a consequence, most growers conclude that irrigation equipment pays for itself quickly.

An irrigation system is best designed during the planning for field layout and planting strategy. The main irrigation trunk lines will need to be buried in the field, usually along roads, with the valves located at convenient intervals. Plan for a method of draining irrigation lines to avoid damage caused by winter freezing. If a traveling gun will be used for irrigation, consider this in the plan as well.

Hose reel or gun types of irrigation are designed to apply large volumes of water. For optimal growth, nursery stock may require 1 to 2 inches of water per week. Generally, 1 acre inch is equal to approximately 27,000 gallons of water. Overhead irrigation provides water to large areas causing weed seeds to germinate which increases weed competition. Other disadvantages

of using overhead irrigation are water waste due to evaporation, the potential for erosion and runoff, and increased foliar diseases. Drip irrigation is a better choice for irrigating field grown nursery stock. PIP stock is almost exclusively irrigated by drip, trickle, or spray-stake irrigation.

Drip Irrigation

Drip irrigation is very efficient and since it remains in place, can be used as frequently as needed to keep crops growing. Since water is placed only in a band down the crop row, less weed competition occurs, especially during dry years. In drip irrigation, water is applied directly to the soil surface gradually over extended periods of time (for example 1.0, 2.0, or 5.0 gallons per hour), which results in less water lost to evaporation or runoff. Because drip irrigation applies water only to the root zone of the nursery crop, roots tend to concentrate within the wet area. Less fertilizer is needed when applied through drip irrigation because of improved efficiency in fertilizer delivery and use. In addition to a reduction in fertilizer use (and costs), other advantages of drip irrigation include reduced water consumption and reduced potential of environmental impacts of erosion and nutrient runoff. Another benefit of drip irrigation is the high concentration of roots in the rootball; when drip irrigated plants are harvested and shipped to market, they are potentially better able to survive than plants with sparser rootballs.

Jeff Vanuga, USDA NRCS

Drip irrigation requires regular maintenance since emitters are prone to damage by animals. A drip irrigation system also requires very clean water, free of sediment and minerals. Well water generally needs only minimal filtration for drip irrigation use, but surface water from rivers or ponds usually calls for sand media filters so that it does not plug drip emitters.

Drip Irrigation Considerations

Water source: Organic materials like plant materials, algae, and small living organisms as well as inorganic sand, silt, and clay are likely to be of concern in surface water like a pond or stream. Well water is likely to have some sand, silt, or clay particles, although not as much as most surface supplies. These particles can clog the small diameter emitters in a drip system. Surface water might have contaminants from runoff, including diseases like *Phytophthora*, which can enter fields through irrigation water. Filters are used to remove particulate matter.

Soil: The soil type determines the soil wetting patterns. Soil wetting patterns in turn influence depth of the drip tape and the distance between emitters. The duration and frequency of irrigation are also determined by the soil type. Over-watering can move fertilizer away from the root zone. In sandy soils, water goes primarily downward rather than horizontally so emitters should be at relatively close spacing. Spacing between emitters can be greater in heavier soils as there is considerable lateral movement of water. In sandy soils, irrigate more frequently but for shorter periods of time. In heavier soils, irrigate less often but for longer periods of time. In both cases, this should lessen the chance of leaching fertilizers away from the root zone.

Installation and operation of a trickle system requires expertise. Consult with a knowledgeable professional. A poorly designed system can result in over-or under-watering and clogged lines. Any or all of these problems can completely offset the potential cost savings from using drip.