Site Selection and Layout Considerations for New and Expanding Plant Nurseries

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Two approaches to getting in to the nursery business may be: [1)] choose a nursery site and investigate what type of nursery and what crops can best be grown at the site or [2)] choose the crops you want to produce and find a location where those crops can best be grown.

Matching an appropriate type of nursery production and business plan with the attributes of a particular property plays a large role in succeeding in the nursery business. Selling crops is highly influenced by the location of the nursery. The nursery business is unique in agriculture, since crops are independently marketed and not sold at commodity prices at an elevator or warehouse. If a nursery is located near an urban area or on a busy highway, direct retail sales to customers may be a possible choice for selling crops. However, most nurseries that grow crops prefer to be wholesale only, which means they sell their crops to other businesses that sell to the final consumer. Wholesale nurseries are considered to be agricultural businesses if they produce more than 50% of the crops they sell. (See section 9 in the: North Carolina Department of Revenue Sales Tax and Use Division (http://www.dor.state.nc.us/practitioner/sales/bulletins/toc.html)

Wholesale nurseries frequently ship and serve customers within a radius of 500 miles of the production site. Most wholesale nurseries, particularly those that sell to garden centers and mass merchandise businesses, must arrange for shipping, therefore they usually have their own trucks and drivers. Nurseries that primarily target landscape customers may need to be located within 50 miles of major urban areas to be accessible for professional landscape customers to pick up orders. Locating your nursery near other wholesale nurseries benefits your business because buyers like to visit an area with several nurseries and frequently place orders from more than one nursery to fill a truckload shipment.

Items to know before you choose a nursery site:

1. What type of farming activities/businesses are located in close proximity to the nursery? For example, aerial spray defoliants used on cotton can severely damage nursery stock. Irrigation water withdrawn from a stream contaminated with herbicides washed from corn fields can damage nursery crops. The nursery should be free of industrial or metropolitan air and water pollutants. Are there effluents or runoff flowing from offsite properties on to the potential nursery site?
2. Where will you find employees? Labor is always one of the largest concerns for nurseries and is the first item that nurseries owners indicate is a limiting factor to expansion of the nursery.

3. Convenient large volumes of good quality water are required. What sources of water are available? Can a large irrigation retention structure be developed on the property? How deep and what volume of water is expected for deep wells in the area? Ask neighbors and well drillers that serve the area. Well water is highly preferred for propagation facilities and any low volume irrigation such as field drip or Pot in Pot spray stakes.
4. What type of electrical service and other utilities are available? Three phase electricity is preferred for irrigation pumps for even moderate sized container nurseries. Does a county drinking water line run
adjacent to the property? County water may be affordable for propagation or low volume irrigation systems such as field drip irrigation or spray stakes for Pot in Pot nursery areas. County water may be an important emergency backup water supply.
5. What are the load limits and restrictions on bridges and local highways leading to the nursery ? How far away are major highways and interstates?
6. What types of plant or pest quarantines are in effect in the county or region where the nursery is to be located? The imported fire ant quarantine zone moves farther North through North Carolina, each year. Shipping out of quarantine zones requires treatment of the nursery and nursery stock which increase costs of producing nursery plants. Japanese beetle quarantines exist for much of North Carolina.
7. What topographical or unique characteristics does the property possess? Avoid locating the nursery in a frost pocket, in a flood plain or high on a hilltop. Low flat land usually has poor air and water drainage and favors high humidity which can result in undue disease problems, flooding, early fall frosts and late spring frosts. Can micro-climates be created on the site. Use of a tree line on west sides of growing beds create shadows which provide shade during summer afternoons. Variegated crops which need full sun for best color but “brown out” under hot, direct, afternoon, summer sun can be grown more efficiently in such areas.
8. Are there significant environmental restrictions on the property? For decades, nurseries were located on streams and rivers to provide irrigation resources. Locating a nursery adjacent to a river or stream today comes with responsibilities of not impacting public watersheds. If riparian buffers exist adjacent to public watersheds, they must be maintained. Runoff from nursery growing beds should be contained on the nursery, however most stormwater should be directed off site.
9. How will the nursery beds and facilities be layed out on the property? Typical layouts for nurseries are curvilinear, concentric and linear. Curvilinear layouts are usually considered the most efficient design and the least duplication of facilities for nurseries. Will this configuration fit on the property?
10. Does the nursery site have possibilities for future expansion? Nearly all successful nursery businesses need to expand. Land locked nurseries, with little possibility of purchasing additional adjacent land often have difficulty in meeting their customers future needs. Expanding to a second location, frequently requires considerable duplication in facilities, equipment, supervisors and labor costs.
11. Are the local county / municipal property taxes, business and building permits reasonable? Are there any restrictions that would affect nursery facilities or production activities? Urban areas increasingly have stringent requirements. Some counties and municipalities are hard to convince that overwintering quonset houses are temporary

structures and should not be required to have construction permits or be taxed as permanent structures. Local governments may view nurseries as industrial properties and require storm water handling structures.

12. How will the area around the nursery change over the next decade? Nursery properties frequently increase in value over time as local towns and cities grow around the nursery. In some cases, selling the property for development brings a welcome financial gain. However, practices such as pest management and plant protection become a concern as neighborhoods develop around nurseries. Anticipating what changes may occur over the next decade, gives insight as to how the nursery should be layed out and where screens and windbreaks might be planned.

What type of a nursery are you interested in starting?

Four broad category choices would be: (1) field grown nursery; (2) container plant production; (3) pot in pot container production; or (4) propagation nursery. A location of each of these types of nurseries should have specific characteristics.

Site Selection Considerations for Field Nurseries

Field grown nursery crops are grown in the ground with 3 to 5 year cycles of production. Therefore, knowing the history of the field, previous crops grown and types of herbicides and pesticides previously applied can affect the growth of nursery stock. If you have questions about the use of any chemicals previously used on the property to grow crops, contact your local county extension agent. The county agent has resources and contacts which can provide answers to your questions.

Since field grown nursery crops are perennial crops and are in the field all year round, they require well drained soils, possibly even better drainage than fields used to produce tobacco, corn, or cotton. A field nursery above all other requirements should be land that is well drained, free from flooding and does not have a high water table during winter months.

Except on steep slopes in Western North Carolina, field grown nursery crops are now usually harvested with mechanical tree spades and placed in burlap lined wire baskets. Mechanical digging has made growing nursery crops in sandy soils successful compared to when hand digging was the standard practice. Hand dug plants required more soil disturbance and made it difficult to keep sandy soil around the roots.

Field nurseries should be managed to avoid erosion and formation of ditches. Fields should be layout and planted across slopes and on contours. Grassed waterways should be installed in areas too steep to grow plants without washing, sediment catch basins can be installed when erosive conditions are severe. Grassed roadways and vegetative aisles between rows are preferred when topography creates erosive conditions. Field border strips can also be installed to reduce movement of sediment from the field.

Some field nurseries are not irrigated, but in choosing land for field production, the potential to irrigate crops should be a major consideration. Nursery liners are expensive. Many crops produced are named cultivars, for example 'Red Sunset' maple liners may cost $17.00 for a 6 foot plant. Mortality during the first year after planting can be considerably higher in non irrigated field nurseries compared to irrigated nursery fields. In subsequent years, irrigated crops out grow non-irrigated crops, have less dieback, requiring less pruning and can shorten the production cycle by 1 to 2 years. Therefore, most growers conclude that irrigation equipment pays for itself quickly.

Irrigating field crops requires a water supply. The type of irrigation determines the quality of water needed for irrigation. Some new growers already have large irrigation guns or hose reel irrigation equipment. Although this equipment uses large amounts of water, it can be used to irrigate field grown nursery crops. However, if the system is shared with other agricultural crops, irrigation may not be applied before nursery plants have already stopped growing and possibly lost terminal leaders. The irrigation may keep them from dying, but growth has stopped. Since the value per acre of field grown nursery stock is higher than other agronomic crops, not irrigating in time is another expensive choice. Hose reel or gun types of irrigation are designed to apply large volumes of water. To keep nursery stock growing may require 1 to 2 applications of an inch of irrigation per week. Another draw back of overhead irrigation is that everything is irrigated, so weed competition in field nurseries is also greater. Drip irrigation is a second choice for irrigating field grown nursery stock. Drip irrigation is very efficient and since it remains in place, can be used when ever and as frequently as needed to keep crops growing. Since water is placed only in a band down the crop row, less weed competition occurs. Drip irrigation does require very clean water, free of sediment and minerals. Well water generally requires only minimal filtration for drip irrigation. County water supplies if available may prove to be affordable and are also a clean water source requiring only minimal filtration. Surface water from rivers or ponds generally require sand media filters which may cost as much as $5000 to filter irrigation water so that it does not plug drip emitters.
In summary, important characteristics for land used for field growing nursery crops are: history, drainage, topography, and quantity and quality of irrigation supplies

Site Selection Considerations for Container Nurseries

WATER is the most important consideration for growing nursery crops in containers. Most container nurseries irrigate daily or every other day during the growing season. Having access to enough water for irrigating crops and expanding production in the future is becoming uncertain in North Carolina. Traditionally, agriculture has had a 1,000,000 gallon per day exemption for withdrawal of water from surface or ground water. Withdrawals over one million gallons requires registration with the Department of Environment and Natural Resources, Water Quality Division. However, in watersheds

such as the Cape Fear and in Eastern North Carolina, current and future water supplies are expected to require careful management. In Eastern North Carolina, 15 counties are in a capacity use area, where water in deep aquifers is being withdrawn more rapidly than they are being recharged. This large area of Eastern North Carolina requires permits for withdrawal of 100,000 gallons of water in a 24 hour period from deep aquifers. A quantity of 100,000 gallons of water may seem to be a lot of water, however, a 4 acre container nursery could use that much water in one day. For more information please see:
http://www.ncwater.org/Permits_and_Registration/Capacity_Use/Capacity_Use_Area_1/

Professionals who design irrigation systems for container nurseries suggest that no less than 1 acre inch (approximately 27,000 gallons) of irrigation storage per acre of nursery stock per day be used for planning irrigation supplies. Nurseries should be developed to have storage capacity for at least a 30 day irrigation supply.

High quality water free of sediment and mineral deposits such as iron and calcium bicarbonate is necessary to avoid coating growing beds, irrigation equipment, pots and plants or plugging drip, spray stake or mist nozzles. Water treatment to remove or sequester such elements may be expensive. Ground water from deep wells usually provides the best cleanest irrigation water. Water may be available from shallow ground water in Eastern NC, however this water frequently has moderate levels of iron which stains plants and nursery growing areas. Treatment can be expensive. Surface impoundment to increase water supplies is the most practical means to store water. Capture, containment, and recycling of irrigation water has been implemented in many nurseries in the NC as a means to provide adequate water supplies. As environmental concern about runoff has increased in recent years, this practice has increased. The goal for container plant production operators, particularly for new areas of production should be for no irrigation water to leave their property. To the maximum extent possible, all irrigation runoff should be recirculated with no discharge to public waters.

Flow of runoff from nursery growing areas must be engineered to slow velocity, filter and contain effluent. Strategies are site specific. A variety of structures, storage facilities and landscape features can be used to direct and manage water movement around nurseries. Several Best Management Practices (BMP'S) related to handling and recycling runoff are most effective for reducing environmental impacts. In areas with sandy soils, some nurseries have developed closed systems where drainage channels and collection structures are lined to prevent nitrogen movement from runoff into shallow groundwater.

Grassed waterways are channel-shaped or graded areas where vegetation serves as a stable conveyance for runoff. One of the primary functions of a grassed waterway is to reduce the velocity of runoff water. Grassed waterways are frequently located between growing areas or between growing areas and capture basins. These waterways should be designed so water enters and leaves in a sheet flow or so drainage channels contain

adequate vegetation to decrease development of erosion ditches. The vegetation in the waterway may also serve as a filter, removing some of the sediment contained in runoff. Like filter strips, grassed waterways should not be used as travel lanes. (More information is available on the Natural Resources Conservation Service; National Handbook of Conservation Practices website.

The most effective BMP for protecting water quality in all watersheds in North Carolina has been identified as maintenance or development of 50 ft (15-m) riparian buffers along all natural conveyances including streams, rivers and estuaries. City storm water, new construction, and agricultural operations, are required to maintain existing buffers

Nurseries have large areas of impervious surfaces which create unique challenges for handling storm water. Most nurseries are designed to recapture irrigation runoff for recharging irrigation supplies. Therefore nurseries must develop plans for management of storm water runoff immediately following a rainstorm. Whenever possible, a storm water management system should take advantage of the contour and topography of a site. Storm water should be routed over long distances and grading should be developed to reduce water velocity, directing water through grassed waterways, constructed wetlands, vegetative buffers, or other areas designed for overland flow.

The Natural Resources Conservation Service; National Handbook of Conservation Practices website provides standards for at least three types of irrigation, water and sediment and tailwater structures. A irrigation storage structure is a water storage facility made by constructing a dam. For container nurseries, a minimum of a 30 day supply of 1 acre inch per acre of production (27,154 gallons per acre/ day) should be planned. If rainwater is allowed to discharge from the property, this fact must be considered in the design of the retention structure. In planning storage capacities, growers should allow for storage of about 90% of the water applied. A water and sediment control basin is an earth embankment constructed across a slope and minor watercourse to form a sediment trap and water detention basin. The primary purpose of a water and sediment control basin is to reduce gully erosion and trap sediment. Nurseries frequently use a water and sediment control structure to intercept runoff coming from beds before it reaches a water supply/ irrigation retention structure. Storm water requirements specify that the basin must be large enough to control the runoff during a 10 year, 24 hour frequency storm without overtopping. An irrigation system, tailwater recovery facility is constructed to collect, store and transport irrigation tailwater (runoff) for reuse in the farm irrigation distribution system. The purpose is to conserve irrigation water supplies for reuse. More information is available on the Natural Resources Conservation Service; National Handbook of Conservation Practices website.

Growing beds and drainage channels in sandy soil areas with seasonal or perennial shallow water tables can be lined with plastic or covered with plastic to prevent runoff and nutrient loss to shallow groundwater. In clay soils, impervious bed preparation and lined drainage returns reduces silt and increases the percentage of water returned to capture structures from irrigation events. Concrete or plastic lined waterways or drainage channels reduce erosion adjacent to growing areas but can increase the velocity of runoff water. Where lined sections are not on steep slopes, use of rip-rap or vegetation in channels can slow water movement, allowing sediment and dissolved substances to settle or be filtered out of returning water. Drainage channels can be established with permanent vegetation such as fescue grass or even aquatic plants. Permanent vegetation in drainage channels slows water velocity, reduces erosion, and reduces sediment and nutrients in runoff water. Permanent vegetation located at outlets of drainage channels also traps organic material, solids, soil, nutrients and other dissolved pollutants in runoff before the water returns to irrigation supplies.

Site Selection Considerations for a Pot in Pot Nursery

Three very important characteristics for a P in P nursery are: 1) availability of high quality irrigation water; 2) level or slightly sloped land; and 3) rock free, well drained soils with no seasonal high water table.

Irrigation for P in P productions is supplied by individual spray stakes in each container. Since spray stakes have small orifices, irrigation water must be free of sediment and minerals to avoid plugging the nozzle. Ground water from deep wells or county / municipal water supplies generally provide the cleanest water without expensive filtration systems. Iron may be a problem in deep well irrigation water. Chlorine or sequestering agents can be injected into water supplies to reduce plugging of nozzles. Sediment can be a problem if surface water from ponds or streams is used. Depending on nozzles selected, disc filters and/or sand separators may filter the water adequately without investing in sand media filtration.

A P in P nursery location would be easiest to develop and maintain on level ground. Trenching equipment, augers and other equipment are easiest to operate, keeping rows and diagonals straight if the land is level. On level ground, expensive pressure compensating irrigation nozzles would not be required. If field soil is maintained around the P in P production area, some type of vegetation may be required to avoid erosion and off site movement of soil. When P in P containers are installed on slopes, erosion channels can develop across aisles washing socket pots out of the ground. Vegetation planted to hold the soil requires maintenance including fertilizing and mowing. Some types of vegetation including grass can serve as an alternate habitat for pests that damage nursery crops. If the surface area around the P in P nursery is covered with plastic and fabric, any holes or breaks in the plastic may allow water underneath the surface which

will wash gullies across the growing area. Hidden gullies under plastic and fabric are dangerous and can cause injury to employees maintaining or moving plants.

Good drainage of soils is very important for P in P production. Saturated roots systems quickly weaken plant health. Root death can occur with in 30 minutes of being saturated. Roots then dieback and root rot diseases and nutritional disorders result. Therefore, most P in P nurseries will need to install drain lines under the pot rows to carry storm water away from the pots. If soils have characteristics of high seasonal water tables, risks of saturation of roots is high and growers will always be faced with more problems than if a better site had been selected.

Site Selection Considerations for a Propagation Nursery

A propagation nursery business provides incentives to a new start up nursery operation. A lot of plants can be propagated in a small area, therefore a large amount of property is not required. Rooting nursery crops, followed by pruning and fertilizing can develop liners ready to sell in 10 to 12 weeks. Three crops a year from the same production space provides cash flow that most start up nurseries desperately need. However, to be a successful propagation nursery, attention to detail during selection and preparation of cuttings and constant observation of environmental conditions in propagation areas is mandatory. Being intuitive and having a broad knowledge of plants and plant growth characteristics is necessary particularly when problems develop. Propagation nurseries are intense businesses.

The first Important resource for a propagation nursery property would be availability of high quality irrigation water. Since mist nozzles have tiny orifices, clean well water or a public drinking water supply would be preferred. The water needs to be free of iron, sodium chloride or calcium bicarbonate which are found in some ground water supplies in NC.

Environmental effects associated with the prospective site for the propagation nursery is also important. The site should not be in a frost pocket or a particularly windy location. Propagation facilities are frequently heated so locating the nursery in a low area may increase heating costs. Many nurseries construct outdoor propagation facilities, however extremely windy locations would limit the usefulness of outdoor propagation areas.

Final thoughts on choosing a suitable site for a nursery

Before a decision is made to begin developing a nursery, be sure you have identified who or what type of market you intend to sell your crops. What crops you grow, what size

you sell, how they are pruned and what level of symmetry, color and perfection required is determined by your customers. Your marketing and selling plan dictates how you develop your nursery site. If you have thoroughly investigated what to sell and to whom, your marketing plan may influence where your business needs to be located.