

# Nursery Management

Kim M. Wilkinson

# 16

This handbook provides an overview of the factors that go into starting and operating a native plant nursery. Management includes all aspects of working with plants in all their phases of growth as described in Chapter 3, *Crop Planning and Developing Propagation Protocols*. Management also includes working with the community; organizing materials and infrastructure; planning educational activities and outreach; maintenance activities, such as watering and pest management; and much more (figure 16.1). Each of these elements will become part of the day-to-day and year-to-year aspects of managing the nursery. At the outset, the variety and complexity of tasks may seem overwhelming. This chapter provides a broad overview of the essential aspects of managing a native plant nursery.

## WHO IS RESPONSIBLE?

For small nurseries, one person may be the sole operator who takes care of everything. In these cases, it is essential to have at least one backup person who understands crop status, knows everything that needs to be done, and knows how to do these things. The backup person can keep the nursery running and the plants healthy in case the primary person becomes unavailable.

Personalities and management styles vary widely among effective nursery managers. Some general characteristics, however, are important to good nursery management. If you are contemplating becoming a nursery manager, look at how to cultivate the following attributes in yourself:

*Joanie Hall and Marie Crawford of the Confederated Tribes of the Umatilla Indian Reservation and James Randall of the Yakima Nation by Tara Luna.*



**Figure 16.1**—Managing a nursery, such as the Southern Ute Forestry Nursery in Colorado shown here, involves more than producing plants. It includes working with the community; organizing materials, time, and infrastructure; carrying out trials and experiments; and relating with customers and the public. Photo by Thomas D. Landis.



**Figure 16.2**—Keen observation skills and the ability to “think like a plant” are key attributes of an effective nursery manager, such as Roy Tyler. Photo by Charles Matheine.



**Figure 16.3**—Effective managers focus on plant production but never lose sight of the bigger picture. Joy Hosokawa of the USDI National Park Service checks her seed supply. Photo by Kim M. Wilkinson.

- Keen observation skills.
- Flexible management style (scheduling must not be rigid but rather adaptable to the shifting needs of living, growing plants).
- Ability to “think like a plant” (managing plants effectively is an art as well as a science; someone who has a “feel” for the crops will likely do better as a manager than someone who approaches crops strictly from an engineering perspective).
- Willingness to be responsible for plants in the nursery.

As the nursery grows in size, the manager may oversee the same tasks but delegate many of them to other staff members. Naturally, all staff should be committed to the success of the nursery. The manager understands both the “how” and the “why” of tasks to be done, and each person on staff should gain that knowledge as well. Every staff member is an important part of the team, and they should be clear about how their role fits into the big picture. Even for large nurseries, however, just one person, the manager, needs to take responsibility for the crop and understand the requirements for its management (figure 16.2). Nursery operations cannot be conducted “by committee” because too many variables are involved in working with a living, growing crop to risk confusion or irresponsibility.

### WHAT NEEDS TO BE DONE?

At first, the number and complexity of tasks involved in operating a nursery may seem daunting. A checklist can provide an overview of what needs to be done. No blueprint or schedule will apply to all nurseries. Many tasks, however, are applicable to most nurseries. The example overview checklist in appendix 16.A can be modified and customized to a specific nursery’s management needs. As determined by the nursery’s situation, activities may be divided into daily, weekly, monthly, and seasonal tasks (figure 16.3).

Each of the tasks in appendix 16.A is discussed in this chapter. Only a few required tasks must happen each day; these are the “essential” tasks that keep the crop alive and healthy and the nursery functioning on a daily basis. These essential tasks include watering, keeping daily records, and monitoring and managing crops as they go through the establishment, rapid growth, and hardening phases. See Chapter 3, *Crop*

*Planning and Developing Propagation Protocols*, for more detail on crop production activities. It is important, however, not to get so caught up in these daily activities that other essential but less pressing tasks go undone. The other tasks must be prioritized and scheduled as well.

## PLANNING

Schedule an overview and planning session on a weekly basis to take a “bird’s-eye view” of the nursery, pressing activities, and long-term goals. This is an opportunity to decide priority tasks for the coming week and month. The needs of the plants, environmental conditions, and many other factors require flexibility and responsiveness in management style. Crops usually will conform poorly to an exact schedule and may perform differently in different years, which is why weekly assessment and planning is so important. Attempting to make rigid schedules (such as “weed every Tuesday”) are often far less effective than planning the week to respond to the observed needs and conditions of the crop.

The observation skills of the nursery manager and staff are the greatest assets to effective planning. Taking time on a weekly basis to review the daily log, plant development record, and other observations by the manager and staff will help with prioritizing the work to be done. What is happening with the crop? What growth phase is it in: establishment, rapid growth, or hardening? Is it on schedule? What needs to be done next: transplanting, moving to a new structure, altering fertilization rates? Are we observing anything that might indicate a potential problem, such as the presence of a potential pest? Do clients need to be updated on the progress of their crop and the schedule? Is a new crop ready to be sown? Once the list is complete, prioritize the list from most to least important activities, assigning roles and tasks to the appropriate staff members.

Some planning time should also be spent in a proactive state of mind, focusing not just on what is urgent or most pressing. Planning should include scheduling some activities that are important to the nursery’s larger mission but may fall by the wayside if the manager gets too engrossed in the day-to-day details of running the nursery. Updating plant protocols is an essential activity that should take place after each crop has been shipped, based on information in the daily log and

plant development records. Other important but seemingly less pressing activities include public relations or educational activities, deciding what trials or experiments to conduct, and making time to attend a conference or training. These valuable activities should be put in the schedule so they are not neglected.

## ROUTINE DAY-TO-DAY TASKS

Daily activities include the essentials of keeping the plants alive and healthy. At a minimum, these activities usually include daily watering of some portion of the crop. Other tasks, such as weeding, monitoring the atmospheric environment, fertilizing, or pest management, are carried out as necessary.

Daily observation of the crop and the nursery environment is an essential part of good nursery management. Crops in the nursery are living, growing plants, and observing them is an important way to relate with them and understand their needs. Keeping simple but systematic written records on a daily basis facilitates this process and also hones good observational skills. Writing down observations also creates valuable records that can be used in the future. Two daily records are used: a daily log or journal and, for each crop, a plant development record.

Keeping a **daily log** is an essential nursery practice. The log does not need to be elaborate. To begin with, the log can be as simple as writing the day’s date and jotting down some details in a notebook about observations and activities at the end of each day. Keep this notebook easily accessible at the manager’s workstation and make a habit of entering something in it each day, even if the observations seem unimportant at the time. What was done today? Were any supplies purchased? How many hours of labor were spent on which crop? How much time was spent on management activities (for example, watering)? What crops are coming up? What observations can be made about the crop or the nursery environment? What plants were sold and for how much? As the nursery grows in size and complexity, entering this information into a computer (even simple spreadsheets) will make the information easier to track. Events each day create small amounts of vital information that will contribute immeasurably to improving nursery management and productivity over time (figure 16.4). This information is invaluable for making many decisions, including the following:

- Budgeting funds.
- Estimating schedules to produce future crops.
- Determining what labor-saving equipment might give the most benefit for the cost.
- Analyzing nursery expenses.
- Improving profits or production.
- Replicating successful crops.

The **plant development record** is another key recordkeeping tool that heightens awareness and hones good observation skills. It is a simple form; an example is provided in this chapter and is discussed in Chapter 3, *Crop Planning and Developing Propagation Protocols*. Again, the plant development record should be kept in an easily accessible place and a few notes should be jotted down as changes occur with the crop.

The manager or a designated “crop monitor” should observe the crop every day (figure 16.5). This task can be done once daily as a formal practice and can also be integrated into quick “walk-throughs” at other times of the day. Sometimes the observations are casual; occasionally measurements will be taken. The person monitoring the crop should understand what “normal” should look like for that crop and the environment (based on experiences reflected in the protocol and crop schedule) and be highly sensitive to any deviations from that norm. Experience and the use of all five senses will make this job easier with time. A checklist can be developed for the primary crop monitor and all the nursery staff to train them in what to look for. These observations can catch potential problems long before they become emergencies. Observations may include the following.

**Appearance.** How does the crop look? Is the shoot-to-root ratio proper for the stage of growth? Are signs of nutrition or disease problems visible on the roots or foliage? Inspect closely for any insect pests. If diagnosed early, pest problems can be handled quickly and effectively. Are beneficial microsymbionts visible on the root systems? Is the crop developing as predicted and is it on schedule for outplanting?

**Smells.** Some problems such as gray mold may be discernable to the experienced grower, and a major outbreak can be averted if it is caught early enough. Overheating motors, broken fans, furnace problems, and other factors can also be detected by the sense of smell.



**Figure 16.4**—The timing of routine tasks, such as thinning pine seedlings at the nursery operated by the Confederated Tribes of the Colville Reservation in Washington State, should be recorded in a daily log. These records will help you plan, budget, and schedule for future crops. Photo by Kim Wilkinson.



**Figure 16.5**—Making regular observations of the crop, and staying alert and aware are key to avoiding problems. Photo by Tara Luna.

**Noises.** Does a motor need oiling? Is an engine pulsating when it should be running steadily? Is water running when or where it shouldn’t?

**Feel.** Is the temperature and humidity in the proper range? Are fans running and is the air moving through the nursery as it should? Are plant root systems moist but not overly wet?

Although one designated crop monitor is responsible for this task, all staff should understand that observation and being alert and aware are key to heading off problems. Staff should be given every opportunity to

share their observations with the nursery manager. Depending on the personality of the staff member, this information may be more comfortable to record in a written staff log that the manager reads daily or it may be easier to share verbally. The manager should welcome and encourage staff to share their observations, as this practice builds observation skills and greater crop awareness.

Observations and notes made in the daily journal and plant development records will later be used to improve and develop propagation protocols (see “Recordkeeping” in the following paragraphs).

### **CROP PLANNING AND PRODUCTION TASKS**

The details of planning crops are discussed in Chapter 3, *Crop Planning and Developing Propagation Protocols*. The process of crop production includes:

- Understanding the three growth phases crops go through (establishment, rapid growth, and hardening) and the distinct requirements for each phase.
- Making growing schedules for crop production from seed procurement through outplanting and detailing changes as the growing cycle progresses.
- Listing space, labor, equipment, and supplies required to support the crop during the three stages of growth.
- Keeping written records, including a daily log and plant development record.
- Developing accurate propagation protocols so the successes of this crop can be replicated next time.

The work to produce a crop consists of managing the plants through each phase of development so that plants receive what they need and are as strong and healthy as possible for outplanting. Once a schedule has been made showing what plants need to be sown and by when, the tasks of preparing growing media, filling containers, and sowing can be scheduled accordingly (figure 16.6). In the establishment phase, plants begin to germinate, and thinning, transplanting, and inoculation with microsymbionts will take place. As the plants move from the germinant phase to the rapid growth phase and later to the hardening phase, their needs will change.

For some nurseries, plants will be physically moved from a germination or rooting area to a more open

environment (figure 16.7). For other nurseries, climate control might produce the same effect. Fertilization and watering regimes are changed for each of the three phases. When the crop is ready, it will be harvested and shipped as described in Chapter 13, *Harvesting, Storing, and Shipping*. Again, daily observations and weekly assessment and planning will enable the manager to schedule appropriately and produce a successful crop.

### **RECORDKEEPING**

Two main kinds of records are kept for nurseries: horticultural and financial.

#### **Horticultural Records**

Good horticultural records are essential to keeping production on track and precluding serious problems. Horticultural records include the following:

- A daily log.
- Plant development records for each crop.
- Crop-growing schedules and facilities schedules.
- Plant protocols (regularly updated and revised).
- Inventory assessment (so you know what crops will be ready when).

The daily log and plant development records provide the ability to update and revise propagation protocols, records that show how to produce that crop successfully in your nursery. The protocols provide guidance for each new crop in developing the production plan and listing needed materials and supplies. The schedules are essential to meet targets and serve clients.

Keeping an inventory enables crops to be tracked, particularly by seed source, client, and date of availability. A crop inventory should include:

- All plants in the nursery by bench or structure number.
- Current developmental stage of the crop.
- Details of delivery (site, name of client, seed source, and anticipated delivery date).

Having these facts on hand is an important part of working with clients. Records of inventories and supplies can be kept in the computer and updated weekly or as stock changes.

## Financial Records

Keeping financial records is a key activity if the nursery is to thrive in the long term. The daily journal and other records should track labor spent on various activities, money spent for materials, and overhead costs such as rent and utilities. These numbers can be factored in to accurately estimate the cost of each crop, allowing the manager to correctly budget time and funds to produce crops. It also is essential in determining what the manager must charge for various plant materials sold.

In keeping financial records, be sure to note the following factors:

- Size of stock.
- Time to grow.
- Labor (in person-hours) required through all phases.
- Materials required and their cost (for example, seeds, growing media).
- Need for custom culture (for example, special containers, extra labor).
- Overhead costs (for example, utilities).
- Cost inflation over time.
- Typical losses (percentage of crop discarded).

To keep up with maintenance and production, a manager must have the necessary materials on hand when they are needed. These materials include supplies for production such as seeds, growing media, containers, and so forth. For nurseries in remote areas, obtaining some supplies such as specialized containers or spare parts for equipment may require a lot of waiting time. In these cases, extras of essential items should be kept on hand. If spare parts are used for repairs, they should be replaced right away.

## SEASONAL CLEANUP

Usually, some time is available between crops or at the end of each season that lends itself to some “deep cleaning” and maintenance. Cleanliness is essential to avoid disease problems and also to maintain a professional, appealing image for the nursery. A clean environment builds customer confidence and staff morale. Every 2 to 6 months, just after shipping out a large order, or at the end of each season, is an opportunity to perform the following tasks:



**Figure 16.6**—The management of nurseries, such as the native plant nursery operated by the Confederated Salish and Kootenai Tribes in Montana, involves planning the timing of essential production tasks, such as filling containers, as well as ensuring that all the necessary supplies (for example, containers, growing media, seeds, and so on) are available. Photo by Dawn Thomas.



**Figure 16.7**—At the Santa Ana Pueblo Nursery in New Mexico, plants are moved from one structure to another as they go through their three phases of growth. (A) Good planning and management maintains open paths and an easy flow of work between structures and (B) between sections of plants separated and identified by seed source. Photos by Tara Luna.

- Dispose of any holdover stock.
- Clean and hose down the floors and tables (applying dilute bleach or other cleanser if no plants are present).
- Clean and sterilize containers (see Chapter 6, *Containers*).
- Flush out irrigation system and run a cup test. See Chapter 10, *Water Quality and Irrigation*, for more details.
- Conduct other equipment checks and make any repairs.
- Replace roof plastic, if necessary.

This is also a good time to step back from the nursery activities and reassess long-term goals and strategies. A staff meeting and some “big picture” planning is valuable to make sure the nursery stays on track with its mission.

### TRAINING, DISCOVERY, AND PROBLEMSOLVING

Working with plants and nature is an ongoing educational process. There is always more to learn. Exchanging information with other growers in person or through reading is a great way to increase knowledge, as is learning directly from the plants through observation, research, and experimentation. Problem solving is also an essential aspect of running a nursery and leads to a better understanding of the plants and their needs.

#### Training

Training and ongoing education is of great value to the nursery and staff. The more growers understand their work and the effects of their activities, the more they will be able to relate to the crop. Attending training sessions and conferences and reading published literature on topics of interest are important investments in the nursery’s growth (figure 16.8). A chance to learn from other growers has no substitute. Visiting other nurseries and hosting field days, at which growers can visit your nursery, can be an important part of cultivating supportive, informative relationships (figure 16.9). These events can be wonderful times to step out of the world of your nursery and gain a broader perspective. It is also an opportunity to cultivate relationships with other growers with whom information can be shared later.

#### Discovery

Daily observations, keeping records in the daily journal, maintaining plant development records, and up-



**Figure 16.8**—Exchanging information with other growers through associations such as the Intertribal Nursery Council (shown here at the 2003 meeting) is a very fruitful way to learn more about plants and nursery management. Photo by Kim Wilkinson.

dating protocols are the foundation for understanding how crops grow and develop in your nursery environment. Inevitably, more information will be sought. Goals in research include improving productivity and health, increasing survival rates, or experimenting with growing new species yet to be cultivated in your nursery. For native plant growers, making discoveries through simple trials and experimentation is often a key aspect of successful nursery development, because this is the best way to learn how to cultivate a species. On a monthly or seasonal basis, the nursery staff might meet to determine some of the most pressing questions facing the nursery. These questions will shape priorities for trials and study. For example, at the very beginning stages of nursery development, when production levels are small, the nursery may decide to try different kinds of containers to determine the best ones for the crops grown or to experiment with different seed treatment techniques for a new species. Later in nursery development, other pressing questions will arise. What problems are recurring that might be preventable with better understanding? What could improve efficiency? What could produce a stronger crop? The nursery might decide to test improved seed sources and assess their performance in the nursery and the field to improve target plant objectives. Ways to design, carry out, and assess these experiments and trials are detailed in Chapter 17, *Discovering Ways to Improve Crop Production and Plant Quality*.

#### Problemsolving

Good management, staff training, monitoring, and planning will minimize emergency situations in the

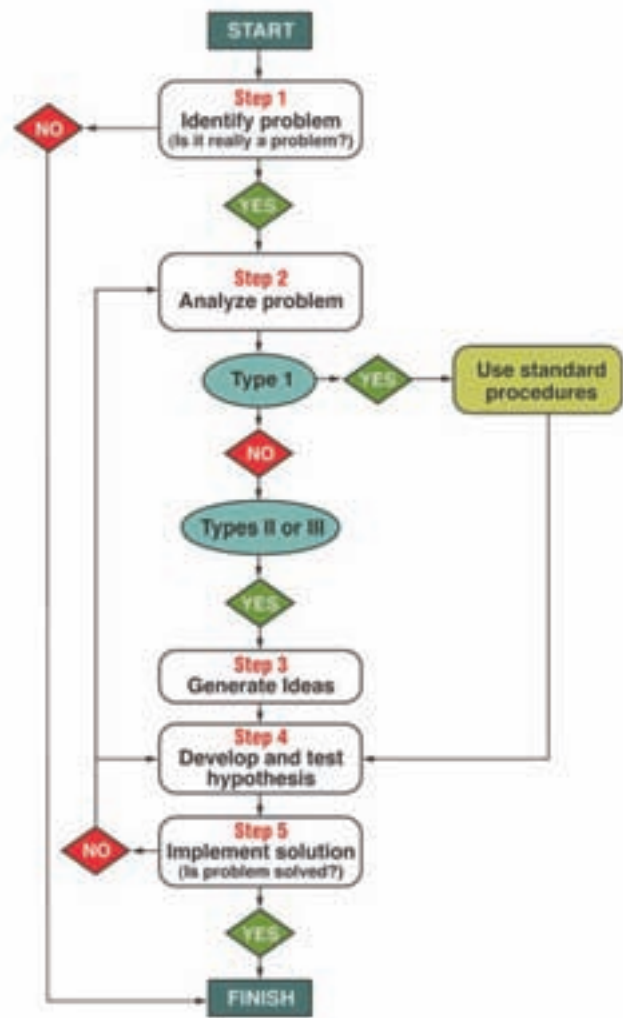


**Figure 16.9**—Hosting visits to your nursery and attending tours of other native plant nurseries is a great way to cultivate supportive relationships. Photo by Kim M. Wilkinson.

nursery. Even the best manager, however, cannot avoid problems entirely. Perhaps a crop does not develop as expected, or an unknown pest problem arises. Some problems, such as difficulties with the irrigation system, appear suddenly and must be handled instantly. Others require a longer term approach. With experience, troubleshooting problems may become easier. This five-step systematic approach can be helpful when approaching long-term challenges (figure 16.10):

- **Identify Problem.** Is it really a problem? What seems to be wrong?
- **Analyze Problem.** What happened exactly? When did it start?
- **Generate Ideas.** Identify potential sources of the problem. Consulting literature, other nurseries, staff members, or outside sources of help such as extension agents or specialists can aid in gathering information.
- **Develop and Test Hypothesis.** At some point, a conclusion about the source of the problem must be decided and acted upon.
- **Implement a Solution.** Decide on a way to solve the problem. Observe the results. If the problem is not solved, start again with step 2.

Do not be reluctant to reach out to colleagues, other nursery managers, or other professionals. Everyone faces obstacles once in a while, and we can all help each other learn more about plants as we share our experiences.



**Figure 16.10**—Problem-solving matrix. Illustration by Jim Marin based on Landis (1984).

## WORKING WITH STAFF

Working with staff requires special skills. All staff should be trained to relate to the crops, observe and detect potential problems, and understand and carry out their direct responsibilities. Each staff member should understand the important role he or she plays in the big picture of the nursery's success. Some education in horticulture is very helpful to allow staff to “think like a plant.” Training in safety is also essential for staff members. Be sure everyone knows how to properly use all equipment on the premises. Staff should be encouraged to stay curious and learn more about the plants and their production.

The manager's task in working with staff is to assign roles, goals, and tasks and then follow up to make sure tasks were completed. The manager should be open to





**Figure 16.11**—Sharing knowledge of native plants and their uses to future generations is a goal shared by many native plant nurseries, including (A) the Browning High School on the Blackfeet Reservation in Montana and (B) Moencopi Day School on the Hopi Reservation in Arizona. Photo A by Tara Luna, B by Thomas D. Landis.



**Figure 16.12**—Customers and the public benefit from learning more about how to plant native species. The Santa Ana Pueblo Nursery in New Mexico uses signs to educate visitors about native plants, empowering clients to cultivate them successfully. Photo by Tara Luna.

receiving feedback from staff about how to make their work more efficient, and the manager should also provide feedback so staff members can optimize the value of their work. Sharing the nursery’s mission and overall goals fosters a greater sense of purpose among staff—improving morale and avoiding the “it’s-just-a-job” attitudes.

Clear communication is a central part of good relations among managers and staff. Although meetings can seem to be an inconvenience, brief staff sessions are invaluable in linking the day-to-day tasks with the big picture for the nursery. Meetings can be scheduled on Monday morning to do some strategic planning and prioritize activities for the week. At the end of the week, another brief meeting can be held to assess and evaluate progress, and to identify priorities for the coming week.

### COMMUNITY EDUCATION AND OUTREACH

Community education is an important activity for many native plant nurseries (figure 16.11). The perpetuation of native plants and cultural traditions are often a central part of the nursery’s mission, and the nursery’s efforts are lost if the community is not ready, willing, and able to accept plants the nursery will produce. Hosting workshops or field days, writing educational materials or articles, and attending local fairs or trade shows can

educate the community about the nursery's mission and the plant materials being produced (figure 16.12).

Many native plant nurseries work with school groups and environmental or cultural education activities. Connecting with living, growing plants can be a wonderful activity for school and youth groups and a meaningful way to pass on the knowledge of plants and their cultural uses to younger generations.

## INTERACTING WITH CLIENTS AND THE PUBLIC

Although generating new clients is essential, keeping and building the trust of existing clients is even more crucial. Word-of-mouth referrals are a very important part of a thriving nursery practice. For contract growing, create a clear agreement in writing. In some circumstances, such as growing for neighbors or close community members, a written agreement may seem unnecessary; however, the written agreement is invaluable for creating clear expectations, enhancing communication, and making everything go more smoothly for everyone concerned. It is far better to experience a little awkwardness up front than have a major miscommunication on your hands at delivery time! Both the client and a nursery representative should sign the agreement, and each should keep a signed copy. The terms of the agreement should include the following:

- A description of the plant materials to be provided (for example, species, container type, plant size).
- The anticipated schedule.
- The quantity of plant materials to be provided.
- The price per unit and the total price for the order.
- When and how payment will be made
- What will happen in certain situations, such as the following:
  - If a payment from the client is late.
  - If the client picks up their plants late or fails to pick them up.
  - If the nursery is unable to deliver the plants as described.

The sample contract in appendix 16.B is for demonstration purposes only. It should be tailored to meet the needs of specific nurseries. Underlines indicate fill-in-the-blank parts. It is best to consult with a legal expert to make sure the contract protects the nursery and conforms to local legal statutes.

Aside from clear agreements up front, another way to build good relationships with existing clients is to maintain frequent communication during the development of their crop. Customers appreciate, and often enjoy, staying informed about their crop's progress. Sending e-mail updates (perhaps including digital photos) or occasionally having a phone conversation or inviting the client up to visit their crop can go a long way in keeping customers involved in crop production and committed to the schedule (figure 16.13). Here are a few suggestions for interacting with customers.

If the client is an organization with several staff members, ask them to assign one sole contact person for the crop. In turn, the nursery should have just one contact person for that client. This one-on-one arrangement precludes many kinds of potential misunderstandings and also helps to develop long-term relationships and trust.

The Target Plant Concept (see Chapter 2) is a useful way to communicate expectations. No one enjoys an unpleasant surprise at plant delivery time. Clients should be clear on what size plants they will receive before they place an order.

Crop production may vary slightly from year to year. If possible, when the order is placed, agree on a window of time for plant delivery that spans a few weeks rather than setting an exact date. Based on the state of the crop, the exact date for delivery can be determined closer to the tentative delivery date.

See things from the client's point of view. Often, tremendous effort and expense go into planning a project and preparing land for outplanting. Acquiring plants is a central part of this process but, in terms of expense, may be a small percentage of the total project cost. Nursery staff should do everything in their power to meet set schedules. If any problems or delays are anticipated with the crop, clients must be updated immediately so they can modify their plans accordingly.

Set up a feedback system with customers after the order is complete. Give the client an opportunity to communicate about their experience in obtaining plants from the nursery. The nursery should also follow up about plant performance. Ideally the nursery contact person can visit the outplanting site and check on the progress of the crop over time. Observations can be used to improve target plant specifications for that outplanting environment. Feedback from the client can also be used to improve customer service in the future.

---

**Re:** Update on your order for 500 *Arctostaphylos uva-ursi*

**Date:** May 10, 2005

Dear Jane, I hope this note finds you well. I'm writing to let you know your 500 bearberry are doing great—we moved them into the final hardening stage of production last week, so they are getting toughened up for outplanting! We're right on schedule, delivery should be in three weeks, definitely not later than June 1. Let's arrange a pick-up day for that week. Please write back to confirm you got this message when you get a chance. Look forward to hearing from you!

—Gloria, Manager, New Meadows Nursery

---

## SUMMARY

Expensive equipment, a big nursery, and a large staff are no guarantee of a successful nursery. On the contrary, a small nursery that is well planned and well managed can produce excellent plant materials and serve many community needs (figure 16.14). Management involves an understanding of scientific, technical, interpersonal, and economic aspects of the nursery. Managing a nursery, however, is an art as well as a science. The art aspect will be learned through experience. Observational skills, a flexible management style, and a willingness to be responsible for the crops are key attributes of a successful manager.

An essential aspect of good management is to have a structured organization with clearly defined responsibilities and one manager willing to assume responsibility for the crop. Feedback from clients and staff, information gathered from trials and daily records, and continuing research and education will consistently build on understanding and improving plant production over time. A strong desire to better understand nature and plants makes the work meaningful, productive, and satisfying for all concerned. As vital information is gathered, it should be recorded in plant protocols so this valuable knowledge may be passed on for the future.

## LITERATURE CITED

Landis, T.D. 1984. Problem solving in forest-tree nurseries with emphasis on site problems. In: Duryea, M.L., Landis, T.D., eds. Forest nursery manual: production of bareroot seedlings. Martinus Nijhoff/ Dr W. Junk Publishers. p.307-314.



**Figure 16.13**—Having clients visit the nursery is an important part of building good relationships. Photo by Tara Luna.



**Figure 16.14**—Well-planned, well-managed facilities, such as the Santa Ana Pueblo Nursery and Garden Center in New Mexico, can produce excellent plant materials and serve many community needs. Photo by Tara Luna.

## APPENDIX 16.A. ACTIVITIES

---

### Planning (Weekly)

Strategic planning for the week and upcoming months includes the following tasks:

- Get an overview of what needs to be done.*
- Look at crop growing schedules, facilities schedules, and deadlines.*
- Assess crop development and maintenance required.*
- Assess potential problems.*
- Make a schedule for the week and month.*
- Prioritize tasks.*
- Delegate tasks.*
- Follow up to make sure tasks were done.*
- Get another overview to plan next action items.*
- Conduct long-term planning (vision and goals for future and their steps).*

### Routine Tasks (Daily)

- Watering.
- Maintenance (for example, weed or pest control, fertilizing).
- Monitoring and observing the crops.
- Noting crop progress on a plant development record (daily or weekly).
- Recording general observations and activities in daily journal.

### Crop Production Tasks (Weekly or seasonal)

- Consulting growth schedules and facilities schedules of what needs to be sown, moved, fertilized, shipped, and so on.
- Establishment tasks (for example, making growing media, sowing seeds, inoculating with microsymbionts).
- Rapid early growth phase tasks (for example, fertilizing, monitoring).
- Hardening phase tasks (for example, changing fertilization and light regimes).
- Updating clients about crop development.
- Packing and shipping.
- Culling and purging.

### Recordkeeping

Horticultural records

- Maintaining daily log (for example, environmental conditions, labor, activities for the day).*
- Making notes in the plant development records for each crop.*
- Creating and updating crop growing schedules and facilities schedules.*
- Updating and revising plant protocols.*
- Conducting crop inventory assessment and updating.*

Financial records

- Labor and time spent.*
- Money for materials.*
- Overhead costs (for example, utilities).*
- Cost estimating (so can budget and/or charge appropriately).*
- Income monitoring.*
- Inventory of supplies for production and maintenance (for example, growing media, fertilizers, containers and trays, irrigation parts).*

### Seasonal Cleanup (Seasonal, or between crops)

- Purge holdover stock.
- Clean floors, tables, and so on.
- Clean and sterilize containers.
- Check and repair equipment and infrastructure.

### Learning More, Researching, and Problemsolving

Learning more

- Attend trainings and conferences.*
- Learn from other nurseries; host and attend field days and visits.*
- Read published literature (for example, Native Plants Journal).*

Research

- Determine the most pressing questions to prioritize trials and research.*
- Design and conduct experiments and trials.*
- Assess findings from data and records.*
- Pursue troubleshooting and problemsolving:*
  - Approach problems systematically.
  - Identify problem.
  - Analyze problem.
  - Know who to call for help (for example, another nursery, soil scientist, pest person, irrigation specialist).
  - Generate ideas.
  - Develop and test hypothesis.
  - Implement a solution.

### Working with Staff

- Provide staff education and training.
- Assign roles, goals, and tasks.
- Follow-up on tasks.
- Give and receive feedback and input (observations and improvement suggestions).
- Plan meetings, safety awareness, and so on.

### Working with Clients and Potential Customers

- Update clients about crop development.
- Get feedback from existing and former clients.
- Follow up on field performance of plants.
- Offer public education and outreach.

## APPENDIX 16.B. SAMPLE CONTRACT

---

### CONTRACT

#### With New Meadows Nursery

This agreement, entered into this \_\_\_\_\_ day of \_\_\_\_\_ (month), \_\_\_\_\_ (year), by and between New Meadows Nursery and \_\_\_\_\_ (hereinafter referred to as "Client") witnesses as follows:

Whereas New Meadows Nursery is organized to provide plant materials for outplanting; whereas Client is interested in purchasing plant materials from New Meadows Nursery, it is agreed between the parties as follows:

#### I. Plant Materials Provided by New Meadows Nursery

In time for the spring planting window (May 1-June 30) New Meadows Nursery will provide 500 plants grown in Ray Leach 98 Cone-tainers™, with stems 8 to 10 inches long and having firm root plugs of the following species:

*Arctostaphylos uva-ursi* (kinnikinnick) Price: \$3.00 ea

#### II. Fees

Client agrees to pay New Meadows Nursery \$1500 for the 500 plants listed above. Payment shall be made in the following way: an initial fee of \$750 (50% of the total for plant materials) is required to begin propagation, with the balance of \$750 to be paid prior to dispatch of the plant materials. Other fees, such as shipping/delivery charges if applicable, will be billed separately and are also to be paid in full prior to dispatch of the plant materials.

If any payment as per the above schedule remains overdue for more than 60 days, Client acknowledges that New Meadows Nursery may take legal action to collect the overdue amount. In such event, Client will be responsible for all reasonable litigation expenses incurred by New Meadows Nursery, including, but not limited to, court costs and attorney fees.

#### III. General Conditions

- a) New Meadows Nursery agrees to use its best efforts to provide the plant materials listed in Section I above;
- b) Client understands and acknowledges that New Meadows Nursery shall in no way bear liability for results produced in use of plant materials. New Meadow's maximum liability is limited in amount to the amount paid by Client to New Meadows Nursery for the purchase of the plant materials under all circumstances and regardless of the nature, cause, or extent of any loss.
- c) In the event that Client cancels the order for plant materials in whole or in part, Client agrees to pay the balance due for the full amount for plant materials as listed in Section I.
- d) New Meadows Nursery reserves the right to prorate or cancel any order, in whole or in part, because of natural disaster, disease, casualty, or other circumstances beyond our control. In the event that New Meadows Nursery is unable to provide the plant materials listed in Section I above by June 30, the initial fee paid by Client may be applied to another purchase, credited to a future order, or refunded, as requested by Client. In any other event, the initial fee is nonrefundable and the entire balance is due.
- e) Client agrees that all plant materials ordered must be dispatched (picked up, shipped, or delivered) within 30 days of notification of readiness as determined by New Meadows Nursery. Plant materials not dispatched within 30 days are subject to a storage fee of \$0.01 cents per plant per day; plant materials not claimed within 45 days of notification of readiness are forfeit.

#### IV. Conclusion

This agreement, executed in duplicate, sets forth the entire contract between the parties and may be canceled, modified, or amended only by a written instrument executed by each of the parties thereto.

This agreement shall be construed as a State of \_\_\_\_\_ contract.

Witness the hands and seals of the parties hereto, each duly authorized, the day and year first written above.

\_\_\_\_\_  
Client, Tall Mountain Wildlife Sanctuary

\_\_\_\_\_  
Date

\_\_\_\_\_  
Gloria Greenthumb, New Meadows Nursery

\_\_\_\_\_  
Date

