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Planning a Native Plant Nursery

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Every nursery is unique. The environmental, social, and economic context is different for each nursery. A wide variety of species and outplanting environments contributes to nursery diversity (figure 1.1). In addition, each nursery has a distinct vision and purpose. The methods a nursery will use to bring people together, produce high-quality plants for the community, and share knowledge about those plants will also be unique. With so many diverse factors to consider, no standard blueprint for how to design a particular nursery exists. On the contrary, the very best nursery design will be matched to a particular situation, resources, and objectives. Although outside resources may be consulted during the planning phase, ultimately it is the nursery team that best understands the place, the plants, and the community.

Planning involves both strategic and tactical thinking. Strategic planning addresses questions about why, what, when, and where. Why start (or expand) a nursery? What kind of nursery will best reach the goals? When and where will be best to perform certain tasks? This kind of strategic thinking is introduced in this chapter and expanded on in the first six chapters of this handbook. The rest of the handbook will help with tactical planning, addressing questions of who, how, and how much. How will plants be propagated and the nursery managed? When are goals met?

Ideally, read this chapter, browse through this entire handbook, and read relevant sections before making any big decisions or investments in a nursery.

Wilbert Fish of the Blackfeet Nation in Montana by Terry McGrath Photography.

Why? A nursery is a web of interrelated factors. Each aspect of the nursery affects every other aspect. For example, consider the seemingly simple act of choosing what kind of containers to use for growing plants. Containers come in many sizes and shapes, but, hopefully, container selection will be based on which containers will yield the best plant size and type to meet needs on the outplanting sites. Container type will dictate what kinds of nursery layout and benches will be needed, what types of irrigation systems and growing media will be used, how seeds will be sown, and so on. Container type and size will also impact scheduling, fertilization practices, product costs, and so forth. These factors are only some examples of the interconnectedness involved in planning a nursery. Imagine how other single factors can affect other aspects. Interrelated factors also include management aspects, such as relating with customers and the public, budgeting, and scheduling timelines for plant production.

OVERVIEW OF THE PLANNING PROCESS

The start-up phase of many successful nurseries involves thoughtfulness, research, discussion, and careful planning on paper. Too often, this crucial planning phase is rushed to "get things done" and begin development on the ground. Sometimes people involved in planning or funding the nursery have a preconceived idea of how a nursery should look (for example, "All nurseries should have a big greenhouse") or what the nursery should do (for example, "We need to grow conifer seedlings for reforestation"). It would be a mistake to rush into making these tactical decisions without investing in some strategic planning first. Making tactical decisions prematurely would impose predetermined ideas on the nursery before the goals are clarified and the actual situation is assessed. The initial planning phase is an opportunity to step back and clarify the vision and goals of the nursery and strategically coordinate all components that will affect the nursery. For example, the first idea may be to build a large propagation structure, such as a big greenhouse with a very controlled climate. Assessment of the nursery's goals and the actual needs of the species grown, however, may lead to a site-appropriate design that instead creates several different, smaller scale environments that are ultimately more economical, efficient, and effective for producing plants.

One good way to work through the planning phase is to begin by clarifying the vision and objectives for the nursery. Objectives likely include producing plants that will survive and thrive on a client's outplanting sites; therefore, background research into the best kinds of plants to meet the needs of clients and outplanting sites will be part of this process (figure 1.2). After the vision and objectives are defined, the practical considerations for reaching the objectives are assessed. Are these practical considerations economically possible? Are necessary resources available? Starting a small pilot nursery can be an excellent way to gain an overall, holistic understanding of what will be involved in nursery development and management while minimizing risk. After goals and financial realities are understood, additional factors are assessed to see if starting the nursery is a realistic and achievable undertaking. The planning phase then moves into practicalities: selecting a nursery site, determining species and stock types to grow, designing structures and facilities, purchasing containers and growing media supplies, and so forth, as detailed in other chapters in this handbook. Figure 1.3 illustrates many of the factors that go into nursery design.

DEFINE NURSERY VISION AND OBJECTIVES

Most nurseries are founded on the vision of a person or group of people. The vision may involve an intuitive sense of how the landscape and community could be 10, 50, or more than 100 years from now as a result of efforts expended today. This vision of the nursery will be a guiding force that adapts to meet the needs of the community and environment, and translates into practical objectives (figure 1.4). Some community and ecology objectives of the nursery might include the following:

- Bringing people together.
- Perpetuating local heritage.
- Making culturally important plants more available.
- Providing employment and economic opportunities.
- Filling a community need for native plants for landscaping.
- Renewing resources for important food plants or other useful species.
- Educating children to pass on traditional ecological knowledge about plants to future generations.
- Restoring degraded land.
- Propagating rare species.

Visions are translated into practical objectives through interactions with the community. The nursery may have a vision, for example, of perpetuating native plants throughout the landscape. The ultimate hope may be to see many kinds of people using a wide diversity of native and culturally important plants provided by the nursery. This hope, however, must be tempered by reality. An approach that says, "If we grow it, they will plant it" may result in wasted initial effort if the community has little desire or knowledge about how to use the nursery's plants. To help bridge the gap between a vision and practical objectives, the nursery may start by asking questions such as:

- What is truly needed and wanted in our community?
- Who are the potential clients of our plant materials at this time?
- Who might be potential clients in the future (if we engage in outreach and education)?
- What are the needs and priorities of the potential clients?

Community needs and priorities can be assessed in many ways. Formal and informal avenues should be used to gather as much information as possible. Existing trade groups, guilds, elders, and instructors that work with the products of various plant materials are often tremendous sources of key information. Politics may also play a large role in shaping the nursery. Holding a public gathering, discussing hopes for the future of the local environment and community, interviewing people, publishing an article in the local newspaper and asking for responses, or conducting formal market research can be invaluable in this phase (figure 1.5).

In cases in which a high demand for certain species clearly exists, this step of end-user assessment is key to helping a nursery determine not only what species to grow but also the stock type and size clients might prefer. For plants used for land restoration or forestry, the planting sites determine the optimal specifications. With culturally important plants, particularly those used for medicine, clients often have very exacting specifications. It is essential to assess these expectations during the planning phase to ensure that the nursery will provide what clients actually need and want (figure 1.6). In addition, an assessment will help determine how long the existing demand is likely to

Figure 1.1—*Native plant nurseries have many unique characteristics, including growing a wide diversity of species.* Photo by R. Kasten Dumroese.

Figure 1.2—*Understanding the challenges of outplanting sites, such as those on this project near the Flathead River by the Confederated Salish and Kootenai Tribes in Montana, helps determine the optimal sizes and types of plant materials to grow, which affects all aspects of a nursery's design.* Photo by Dawn Thomas.

Figure 1.3—*Getting a good overview of direct and indirect factors for plant production in any situation will help design the best nursery to meet local needs.* Illustration by Jim Marin.

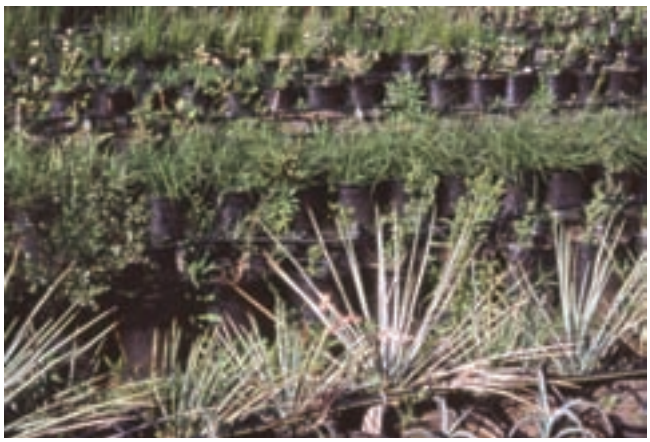

Figure 1.4—*The perpetuation of culturally important plant materials is a key objective for the Pechanga Band of the Luiseno Indians native plant nursery in California, which is cultivating many native plant species to provide basketry materials.* Photo by Tara Luna.

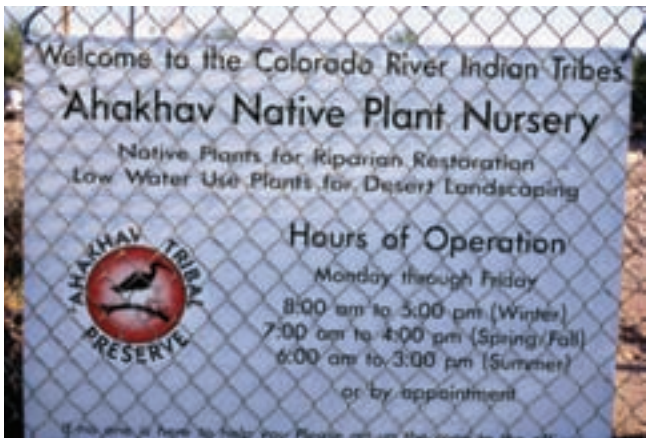

Figure 1.5—*Gathering information about the needs of the community and local ecosystems helps clarify the nursery's purpose. At the Colorado River Indian Tribes Reservation in Arizona, the 'Ahakhav Native Plant Nursery sign clearly communicates the nursery's objectives: to provide native plants for riparian restoration and low-water-use plants for desert landscaping.* Photo by Tara Luna.

last, which may indicate whether the nursery will be viable in the long term. On the other hand, the nursery may also use its own vision to avoid being swept up into meeting the short-term demands of a changing market. For example, if public interest in planting a certain exotic ornamental species becomes high, a nursery might expect financial gain from meeting this demand. Would meeting that demand, however, fulfill the mission of the nursery? Perhaps it would and perhaps not; deciding whether to meet a certain demand depends on the circumstances and the nursery's objectives.

Some topics to think about when assessing community needs include the following:

- The species the nursery is capable of growing.
- The types of environments in which plants will be outplanted.
- Specific end-user requirements for species (for example, seed source, special properties).
- The size and age of stock preferred.
- The season during which people prefer to plant.
- The quantities of species people may plant.
- The distance people are willing to travel to obtain the plant materials.

This information is invaluable in designing the nursery. It helps determine the species to grow and the "target plant" (optimal size, age, and type to thrive on your client's various outplanting sites) for each of those species. See Chapter 2, *The Target Plant Concept*, for more discussion about this topic. The target criteria will be different for each species and will vary by outplanting site. The production of target plants will shape all other aspects of nursery design: location, structures, container types, species grown, scheduling, management practices, propagule collection, and so forth. The needs assessment responses can help the nursery identify its unique market niche and develop tactics to produce the best quality plant materials effectively and efficiently.

Keep in mind that nursery–client communication goes both ways. Although the nursery must listen to the stated needs and wants of its community, it can also share the visions and goals of the nursery with the community and potential clients. The nursery can engage in education and outreach to share information with clients and the community about the benefits and attributes of its plant materials (figure 1.7). For example, if the community thinks only a certain ornamental plant works well as a boundary hedge, it may be because people are unaware of a native species that can be planted for the same purpose. A good understanding of local ecology, environmental issues, history, soil types, and site needs for outplanting materials is important for good nursery design and will facilitate the production of high-quality, site-adapted plants that have high survival rates after outplanting. A little outreach to the community by the nursery can go a long way to overcome preconceived ideas (figure 1.8).

ASSESS RESOURCES AND COSTS

Nurseries differ greatly in terms of their financial objectives. Some nurseries may be funded through grants or government programs. Some may have startup money but are expected to be financially self-sufficient in the future. Private, for-profit nurseries must earn enough income from the sale of plants to at least pay for development, infrastructure, production costs, and staff time. Whatever the circumstances, finance is a key part of nursery planning. It determines:

- How much money can be invested in the nursery at the outset.
- What staff can be hired.
- In what timeframe the nursery can start to produce plants for sale.
- How many plants can be produced.
- What price can be charged for the plant materials.

Even if plants are to be distributed freely and not sold, it is still essential to know the cost to produce each kind of plant. Knowing production costs is crucial for planning, assessing feasibility, and ensuring the financial viability of the nursery. Will the nursery be able to meet its production expenses? Is the price the nursery will need to charge for plant materials a cost that the market can bear? For a new nursery, predicting the cost of plants is complicated; predicting costs depends a great deal on infrastructure, nursery size, staff skills, knowledge base, and many other factors. Nurseries that have gone through a pilot phase probably have a good grasp of the costs involved in producing plants (figure 1.9). These costs can be revised to reflect production on a larger scale. Without a pilot phase, estimating product costs prior to production is difficult to do accurately, and high crop losses may be expected during the first few seasons as successful propagation methods are developed.

Visiting other nurseries to get an idea of similar production processes can be very helpful as resources and finances are assessed. Government nurseries are a great source of information because staff members usually share production details openly, and their production costs are public information. Visiting private nurseries is also useful in assessing all the stages that go into plant production, although financial disclosures cannot be expected from private nurseries.

Figure 1.6—*Bringing people together to gather information about community needs is a key aspect of starting a nursery.* Photo by Thomas D. Landis.

Figure 1.7—*Community outreach and education is often an important part of working with native plants. This demonstration garden, part of the Santa Ana Pueblo Garden Center in New Mexico, helps visitors understand the beauty and the applications of plants grown in the tribe's nursery.* Photo by Tara Luna.

Figure 1.8—*The educational component of a native plant nursery can help connect people with traditional uses of plants, such as these ancestral structures made from native plant materials at the Pechanga Band of the Luiseno Indians native plant nursery in California.* Photo by Tara Luna.

Figure 1.9—*Starting with a smaller scale pilot phase reduces the number of unknown factors and risks and is a key part of developing a successful nursery.* Photo by Dawn Thomas.

STARTING WITH A SMALL PILOT NURSERY

Because of the enormous value of understanding the full range of processes that go into successful native plant production, it is often wise to start with a small pilot nursery. Instead of developing on a large scale, a pilot phase allows you to try out production on a smaller scale with less risk. The design of the pilot nursery is essentially your "best educated guess" on what type of set-up would be optimal to produce plants, based on this handbook and personal experiences. A few seasons of growth and observation in a pilot nursery can eliminate many of the unknowns regarding plant production and provide enough detailed information to effectively plan a larger facility.

Many unknowns are associated with nurseries growing native or culturally important plants. Therefore, a very large learning curve should be expected as production methods are developed for new species. High crop losses may occur during the first few seasons, and more losses may take place for the sake of experimentation. Starting with a small pilot nursery can be an effective strategy to decrease risks, preclude unnecessary expenditures, and develop viable propagation strategies. A pilot nursery can also be invaluable in estimating costs and making a more accurate feasibility assessment when the time comes to expand.

A small-scale pilot nursery can help accurately assess:

- What infrastructure is truly necessary for production (for example, perhaps a big greenhouse isn't needed at all).
- Which container types and propagation strategies are optimal for the plants.
- How to take crops through all phases of development, from germination through storage and distribution.
- What labor and material costs are involved.
- How clients respond to the plants produced.
- How to develop realistic timelines and budgets for future production.
- What aspects of the nursery vision are feasible to carry out at this time.

Many ideas are tested during the pilot phase of nursery development. The smaller-scale phase may last a few seasons or even a few years. Keep in mind that no one who works with plants will ever feel as if they have learned everything they need to know; even very established nurseries are always learning more and refining their propagation techniques. At some point, however, you will be confident that it is time to expand on the successes of the pilot nursery and continue development on a larger scale.

These production details can then be used to estimate costs in the planned nursery.

Estimate crop production costs by considering all phases of production, from seed procurement to delivery (figure 1.10). To improve the accuracy of the estimated costs, consider the timeframe for growing the crop, the size of the stock, the labor and materials required, and the fact that some crop losses will take place during production. Remember to account for the following factors:

- Material production costs (for example, growing media, water, fertilizer, seeds, pest control).
- Labor costs for production, maintenance, and delivery.
- Labor for customer relations (for example, answering e-mail messages and phone calls, handling correspondence, bookkeeping).
- Inventory required (for example, the time, space, and materials each crop will require, such as greenhouse benches, containers, trays).
- Structures (for example, greenhouse, shadehouse, storage).
- Overhead costs (for example, rent, insurance, water, utilities).
- Taxes.
- Time and funds for outreach, advertising, or educational programs.

It might be wise to estimate a range of best-case (most economical) and worst-case production scenarios. After production is under way and actual numbers are available, it is imperative to revisit the price structure of the plants to ensure they are in line with actual costs. In some cases, the costs of producing plants on a larger scale will be lower per plant than during the smaller-scale pilot phase. But it is also possible that costs related to rent, utilities, labor, and so on may be higher. Once the costs for crop production are understood, it is time to assess the feasibility of the overall nursery plan.

ASSESS FEASIBILITY

After assessing resources and costs that will be involved in carrying out the nursery's vision and objectives, it is time to take a good hard look at whether starting the nursery is a realistic and achievable undertaking. Again,

starting with a small pilot phase is a good way to determine the feasibility of starting a nursery. The feasibility assessment should look at the species potentially available for the nursery to grow and match those species with the nursery site, goals, client needs, and nursery capabilities. Of course, the cost of plant materials and market price also must be considered. Will the emphasis be on growing plants from seeds or cuttings? How long does it take to grow these species to target specifications? What size plants should be produced? Several scenarios should be examined, including a variety of facility designs, sizes, and locations, so that the best conditions to meet projected needs are identified.

Necessary questions that should also be asked include, "Can the vision and objectives be fulfilled without starting a new nursery? Do alternatives exist? Can existing suppliers provide the desired plants that the nursery team could distribute for local outplanting needs?" Acting as a distributor instead of as a producer may be an economical alternative to starting a new nursery, but this has its benefits and drawbacks (table 1.1).

The final decision about whether to proceed with nursery development is ultimately in the hands of the people who had the vision for the nursery in the first place. Many nurseries have been developed to meet unique needs despite evidence that it would not be

Figure 1.10—*To accurately estimate the time and expenses required for growing plant materials in a nursery, examine all aspects of plant production, including seed collecting and processing. Here Michael Keefer and Pete McCoy of Ktnuaxa-Kinbasket First Nation, British Columbia, gather seeds.* Photo by Bev Hills.

Table 1.1—The benefits and drawbacks of either starting a nursery or distributing plants from another supplier (after Landis and others 1994)

Purchase Plants

Benefits

—Time and capital available for other uses
—No nursery staff needed
—More long-term flexibility
—Plants grown by supplier in large quantities may be less expensive than plants grown in small, local nurseries
—Short-term or no commitment required

Drawbacks

—No control over growing process
—Less control over plant quality and availability
—Plants may not be adapted to local environment
—Unique needs of local clients may not be met

Start Own Nursery

Benefits

—High control over quality and availability of plants
—Can develop local expertise on plant growing and handling
—Can use traditional or culturally appropriate methods if applicable
—Plants will be adapted to local environment
—No reliance on other individuals or organizations
—Create job opportunities
—Others?

Drawbacks

—Large initial investment, capital, and time
—Long-term professional and economic commitment
—Must hire and maintain staff
—Native plant markets are notorious for year-to-year fluctuations
—Others?

practical to do so. If the decision is made to proceed, it is time to select a nursery site and think about nursery infrastructure.

SELECT A SITE FOR THE NURSERY

After the decision has been made to develop a container nursery, an appropriate site must be selected. This is a chance to be observant and think about working with nature, rather than against it, for the most effective, efficient, and economical design. The less the natural environment has to be modified to produce high-quality plants, the less expense the nursery will have to incur to create optimal crop conditions. Again, an understanding of the target plants to produce, as described in the following chapter, will help match the site to the needs of the crops. Careful observation of site conditions and an assessment of past and present climatic records are important.

Critical nursery site selection factors include the following:

- Access to good-quality, affordable, abundant water.
- Unobstructed solar access.
- Inexpensive and reliable energy.
- Easy access by staff.
- Adequate land area.
- Freedom from problematic ecological concerns (for example, free from neighboring chemical pollution, unmanageable noxious weeds, and so on).
- Freedom from problematic political concerns (for example, zoning restrictions, historical land use issues).

Climatic and biological attributes top the list for importance in site selection; an abundance of good-quality, reliable, affordable water is the number one factor, and water quality should always be tested when a site is being considered for nursery construction. See Chapter 10, *Water Quality and Irrigation*, for more information about this topic. Unobstructed solar access is also essential. Access to affordable electricity is very important. At least one person should have quick access to the nursery in case of emergency; if the nursery site will be far away from human dwellings, it may be advisable to construct a caretaker residence on site. The amount of land selected for the nursery must be large enough for the production areas and support buildings and also allow for the efficient movement of equipment and materials. In addition to immediate needs, potential nursery sites should be evaluated on the basis of available space for possible expansion. Ecopolitical site selection factors, notably land use zoning and concerns about pesticide use and potential groundwater contamination, have severely reduced the number of sites suitable for nursery development.

Desirable attributes include those site selection criteria that are not absolutely necessary but will increase the efficiency of the nursery operation. If possible, choose a site with these desirable attributes:

- Protected microclimate.
- Gentle topography.
- Good labor supply.
- Easy access for staff and customers.
- Close proximity to markets.

Protected microclimate can make dramatic improvements in nursery productivity and reduce cost expenditures. A site with an equitable and sheltered climate and gentle topography is ideal. Access to the nursery by staff and clients is also important for economical nursery production.

Sometimes one or two factors are so important that the choice of site is obvious, but more commonly each site has good and bad attributes. If desired, make a list of potential nursery sites and compare them using a decision matrix. The decision matrix (table 1.2) is constructed by listing the potential nursery sites across the top and the significant site selection criteria down the left side. The next step is to assign each site selection criterion an importance value or weight on a scale from 1 to 10, with the most critical factors receiving the highest scores and the less important ones receiving progressively lower scores. Next, the suitability of each potential nursery location is evaluated and rated, again on a scale of 1 to 10, based on the information that has been gathered. After this task is accomplished, the score for each cell in the matrix is calculated by multiplying the weights for each site selection factor by the rating for each site. Finally, the weighted scores are totaled for each site, and, if the weights and rankings have been objectively assigned, then the potential nursery site with the highest total ranking should be the best choice. If all the potential sites are close in score, then the process should be repeated

Table 1.2—Decision matrix for evaluating potential container nursery sites. In this example, Site A received the highest score and is therefore considered the best choice for a nursery site (Landis and others 1994)

Site Selection Criteria	Weight	Site A		Site B		Site C	
	Value*	Rating	Weighted Score	Rating	Weighted Score	Rating	Weighted Score
Critical Factors							
Good solar access	10	9	90	7	70	9	90
Water quality	9	9	81	7	63	4	36
Water quantity	8	10	80	8	64	9	72
Available energy	8	9	72	9	72	10	80
Adequate land area	7	8	56	8	56	10	70
Zoning restrictions	7	10	70	6	42	8	56
Pollution concerns	6	9	54	7	42	9	54
Secondary Factors							
Microclimate	6	9	54	8	48	9	54
Topography	5	10	50	9	45	10	50
Labor supply	4	9	36	8	32	10	40
Accessibility	4	8	32	6	24	8	32
Shipping distances	3	9	27	7	21	10	30
Totals			**702**		**579**		**664**
Site Suitability			**#1**		**#3**		**#2**

* Weights are relative importance values from 1 to 10, with 10 being highest

and careful attention paid to the relative weights and the ratings of the factors. If the scores are still close, the sites are probably equally good.

PLAN STRUCTURES AND FLOW OF WORK AROUND THE TARGET PLANT CONCEPT

All nursery planning pivots on producing target plant materials that match nursery stock type with the characteristics of the outplanting site to ensure plant survival and growth. See Chapter 2, *The Target Plant Concept,* for more discussion about this topic. The target plant must also meet the needs of clients; plants should produce the materials or products (medicine, wood, food, and so on) that clients expect. These needs dictate the plant's target size, age, seed source, container type, and management in the nursery. The requirements to produce target plants then guide all other aspects of nursery design. What propagation environments are best to produce these stock types efficiently? Good site selection and a sound knowledge of the plants and their needs as they go through the three phases of growth are important for creating the most appropriate structures for the crop's needs (figure 1.11). See Chapter 3, *Planning Crops and Developing Propagation Protocols*, for more information about plant growth phases. Commonly, rather than a single, large structure, a diversity of smaller structures is used and is tailored to meet the needs of the crops as they go through their development. See Chapter 4, *Propagation Environments*, for more details about this topic. Structural design is also affected by container types (chapter 6) and growing media (chapter 5). For example, bench layout must be planned to accommodate the container sizes. In turn, container type, growing media, and bench layout impact the design of the irrigation system. All these elements then come into play for management practices: fertilizing and watering, working with beneficial microorganisms and pests, and managing the overall flow of work in the nursery.

Although crop production is the core of nursery activities, it is only part of the whole picture. Preparation, cleanup, and storage must also be well planned. Where will seeds be cleaned, stored, treated, and tested? Where will containers be cleaned, sterilized, and stored when

Figure 1.11—*Good site assessment and an understanding of your crop's needs will help you determine the best structures for your nursery. Shown here is the greenhouse at the Browning High School on the Blackfeet Reservation in Montana.* Photo by Tara Luna.

Figure 1.12—*Good planning examines the flow of work and sets up effective workstations for efficient and enjoyable plant production during all phases of growth.* Photo by Tara Luna.

not in use? If crops are to be stored during winter, it is essential they are in an appropriate environment to ensure their survival. As nursery activities are planned, think about the flow of work and the design structures that facilitate the movement of people and plants in an efficient and safe way.

Good planning takes place in time and space (figure 1.12) and examines the flow of work and materials through all seasons and phases of growth. Time must be allotted for important activities such as outreach and educational programs; conducting trials and experiments to improve plant quality; and learning more through attending field days, meetings, and other events. See Chapter 16, *Nursery Management*, and Chapter 17, *Discovering Ways to Improve Crop Production and Plant Quality*, for more discussion about these topics.

Other environmental issues and risks should be considered. For example, the design should look at not just where good-quality water will come from for irrigation, but where the water will go after nursery use. The water may contain fertilizers and be a potential source of pollution, possibly creating legal issues for the nursery. With good planning, that same water may be used as a resource, directed to other crops (figure 1.13), or recycled. Thoughtful irrigation design and application minimizes the amount of water used, provides for the needs of plants, and deals with runoff appropriately, as discussed in Chapter 10, *Water Quality and Irrigation*. What other risks can be precluded by good design? In areas at risk of high winds, making use of a natural windbreak (figure 1.14) or having the ability to quickly remove the plastic from the roof of a greenhouse may save a structure in a bad storm. A backup water supply ensures crop survival through periods of drought or uncertainty. Firebreaks or a site selected to minimize fire risks can preclude disaster. Knowing the site and thinking far into the future will help in planning for contingencies and increase the likelihood of long-term success. In short, think about the "big picture" during the planning process and build a strong foundation for producing high-quality plants efficiently.

PLANNING AS AN ONGOING PROCESS

The initial planning phase is a crucial part of successful nursery development, but the planning process does not stop after the nursery is operational. Instead, planning is an ongoing process. See Chapter 16, *Nursery Management*, for more discussion about this topic. The vision of the nursery should be revisited regularly. Time should be set aside to assess the progress the nursery is making in fulfilling its objectives, visualizing new possibilities, and adapting to changing circumstances. Following up with clients and revising the target plant specifications are essential steps for building a good nursery.

SUMMARY

No standard blueprint for designing a native plant nursery exists. On the contrary, each nursery will have a unique design based on distinct needs, resources, and requirements. Many factors go into the planning process, from defining the nursery vision and objec-

tives to determining the kinds of outplanting materials that best meet the needs of the community and the outplanting sites. Strategic and tactical planning is necessary to develop a successful nursery efficiently. Starting with a small pilot nursery is a valuable step toward gaining a good grasp of all phases of plant production and delivery. The successes of the pilot phase can then be expanded as the nursery grows in size. A levelheaded assessment of the feasibility of running a nursery is important to carry out before launching into full-scale production.

The importance of the planning phase cannot be overemphasized. Resist the urge to start development on the ground until the big-picture strategy of the nursery operation is understood. A nursery is a web of interrelated factors, and every aspect of the nursery will affect everything else. Nursery development will be centered on the production of target plant materials. Proper site selection; design of propagation structures; and choice of containers, benches, growing media, irrigation systems, and so on will all be guided by target plant criteria. All these factors will be combined to produce the best quality plants in the least time at an acceptable cost. After production is under way, management practices, such as fertilization and scheduling, are also shaped by target plant criteria.

It is important, however, not to become so focused on planning crop production that other key aspects of nursery design are neglected. Space and time for "before" and "after" crop production must be planned: storage for seeds and propagation materials, overwintering and storage for crops, cleaning and sterilizing containers, shipping and delivery practices, and so forth. Equally important, time for training and education for nursery staff, outreach and education to clients and the public, and in-house research and trials to improve plant productivity should be planned.

The chapters in this handbook discuss each of these aspects of nursery design to give you an overview of the factors to consider when planning your nursery. Ultimately, the design of a nursery is personal, because you are the person who can best understand the unique needs and resources of your nursery and its crops, your community, and the environment around you.

Figure 1.13—*Good planning means making efficient use of resources and space. This small greenhouse at the Blackfeet High School in Browning, Montana, saves water and labor by growing sedges and wetland grasses on benches beneath those for dryland prairie forbs.* Photo by Tara Luna.

Figure 1.14—*The Santa Ana Pueblo nursery uses natural windbreaks to reduce water use and add protection to the nursery site. Planning for local environmental conditions and for risk is essential during the process of nursery design.* Photo by R. Kasten Dumroese.

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