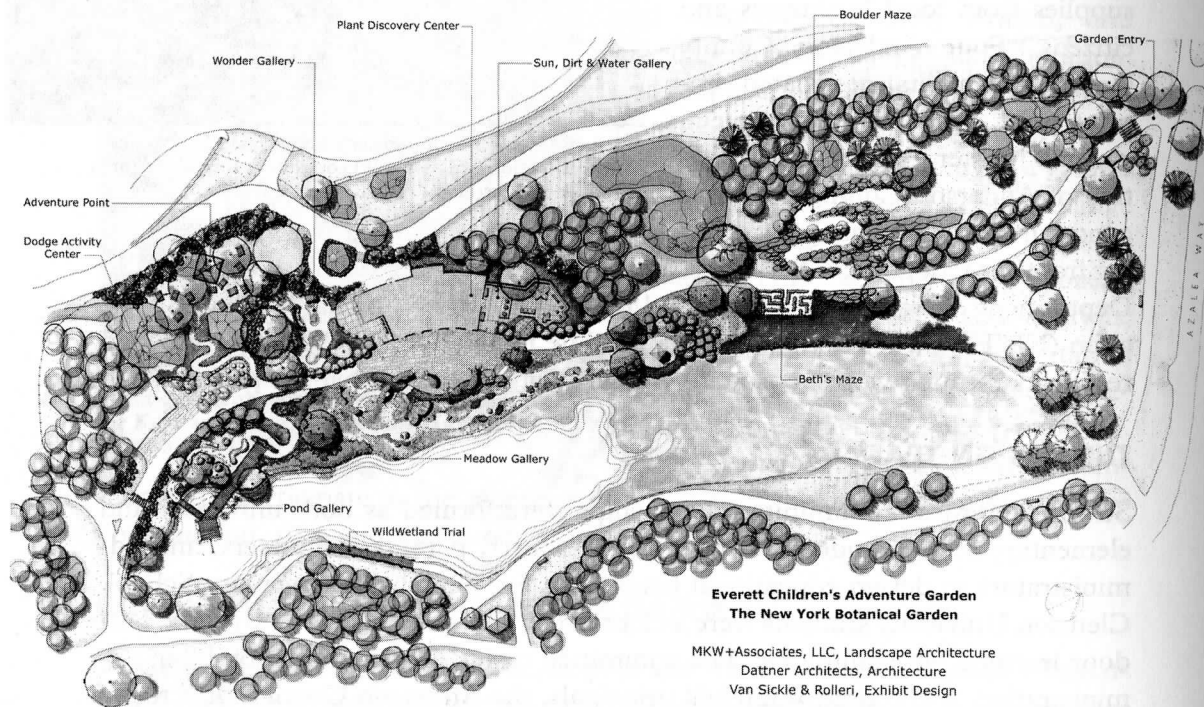


# Sustainable Landscape Concepts



Everett Children's Adventure Garden, The New York Botanical Garden, New York, NY. (COURTESY OF NEW YORK BOTANICAL GARDEN.)

With the beginning of the new century, many are finding that the increased ecological awareness brought about by Rachel Carson and others in the 1960s is just as important, or perhaps even more so today. As a result, many educational institutions are looking for effective ways to integrate environmental sustainability into their curriculum, and parents are looking for ways to help their children become environmentally sensitive stewards. Landscapes can provide stimulating settings for producing and shaping beliefs, and can provide opportunities for students to envision and affect change in a positive way. Developing healthy habits such as recycling waste and reducing consumption are powerful ways to take action. Children can also learn to design sustainable landscapes that provide economic benefits through energy efficiency and financial savings through reduced maintenance while enhancing the quality of life for future generations. Their education may be strengthened by a conscious effort to teach children to feel environmental responsibility. Major categories to plan for when designing environmentally friendly landscapes include:

1. Water conservation
2. Energy conservation
3. Low maintenance
4. Waste reduction (reduce, reuse, and recycle)
5. Wildlife habitat

Look for information on how to establish a National Wildlife Federation certified habitat in Chapter Two, but read further here to find information about enhancement of microclimate and biodiversity, reduction of resource inputs and waste, and ways to save money while creating an environmentally friendly and healthy landscape for and with children. Children have the potential to literally make the world a better place. Teachers, parents, and other caregivers should take advantage of the idealism of youth to spark enthusiasm for the environment and teach children how to be stewards of the land. Youth are empowered when they discover that they can take action and make a difference in the world around them.

## Water Conservation

Water is the most desired play element for children, and is a valuable natural resource that needs to be protected and conserved. Droughts in recent years have spotlighted our dependence on previously plentiful water supplies even in areas like the Southeast, where water seems abundant compared to many areas in the Southwest. Water rationing and outright bans on watering landscapes have imposed severe limitations on the landscape industry as well as on gardeners. Teaching children to prepare for drought now is a sensible alternative to suffering the consequences later. When basic horticultural principles are employed with an emphasis on water efficiency, landscapes use much less water and are drought tolerant. Combining water conservation techniques with landscaping is a concept known as Xeriscape or “dry landscape.” Xeriscaping combines sound horticultural practices to conserve water while maintaining a beautiful landscape. The seven basic Xeriscape principles are:

1. Careful planning and design
2. Appropriate lawn areas
3. Thorough soil preparation
4. Appropriate use of plant materials
5. Effective and efficient watering methods (Figure 5-1)
6. Use of mulch on trees, shrubs, and flower beds
7. Proper landscape maintenance.

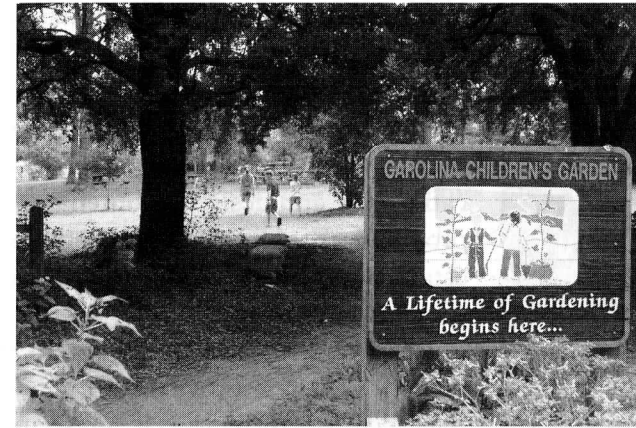


FIG 5-1. Xeriscape principles are critical to the success of the Carolina Children's Garden, which is in the sandhills of South Carolina. Water drains quickly through the sandy soils, so appropriate use of shade, mulch, lawn, and plant selection is important. (COURTESY OF RANDY L. WILSON.)

Each of these principles should be used when designing and managing a landscape. The greatest water efficiency is realized when all seven principles are used in combination. Studies have shown water-use reductions of 30 to 60% or more in landscapes that employ the seven basic principles of Xeriscape. Combining lower maintenance costs with greater survivability of landscape plants in times of water shortage, a Xeriscape is economically attractive. Xeriscaping is a good way to teach children to become socially responsible stewards of our environment.

## PLANNING AND DESIGN

When designing a new landscape or renovating an existing one, planning the landscape on paper is the best place to begin. Follow the design process outlined in Chapter Two, and be sure to note the site's microclimates (Figure 5-2). To achieve the greatest water efficiency, the landscape plan can incorporate “hydrozones”—areas within a design that receive either low, moderate, or high amounts of water. All plants within a zone have the same water requirements and can be watered as a group.

## Appropriate Lawn Areas

Children love to play on grass. It's cool, soft, natural surface makes a great place to run, do cartwheels, and play tag and other games. Lawn areas usually receive

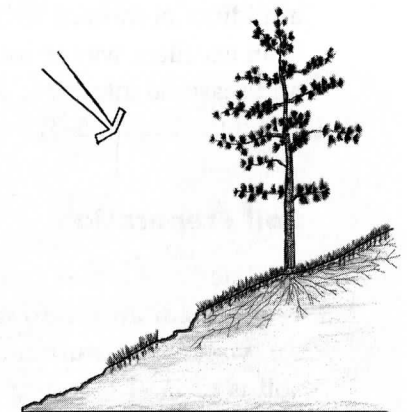


FIG 5-2. The microclimate for steep south or west facing slopes is often hot and dry. If plants are not properly established, erosion occurs and valuable water is lost as runoff. (COURTESY OF GAGE COUCH.)



FIG 5-3. A small grassy area surrounded by drought tolerant plants provides water-conserving space for free play in the Carolina Children's Garden. (COURTESY OF RANDY L. WILSON.)

more water and require more maintenance than any other area in the landscape, so they should be used appropriately. Grasses should be carefully selected depending on location, use and desired maintenance programs. In-depth information on establishing lawns is available from most extension offices.

Mowing the lawn at the proper height will help improve the drought-tolerance of turfgrass. If grass is mowed frequently enough, the lawn clippings should be left on the lawn to mulch the turf and reduce fertility

requirements. The beauty and quality of a lawn cannot be replaced, but the traditional size, design, and maintenance programs must be changed to meet water restrictions and drought conditions. Native grasses provide a low-maintenance alternative, and meadows of native grasses can provide beautiful, water-conserving habitat for wildlife. Transitioning from a traditional mowed lawn to a taller meadow look is an excellent way to incorporate variety, rhythm, and seasonal interest in a way that is interesting to children (Figure 5-3).

### Soil Preparation

A basic life-support system of the landscape, soil is the medium for root growth and a reservoir for water and nutrients. Properly conditioned soil is of vital importance to the health of landscapes. Creating a good soil environment from the start will bring great dividends in the future, and children take great pleasure in the process (see sections on composting and vermicomposting) (Figure 5-4). A good soil is porous and will

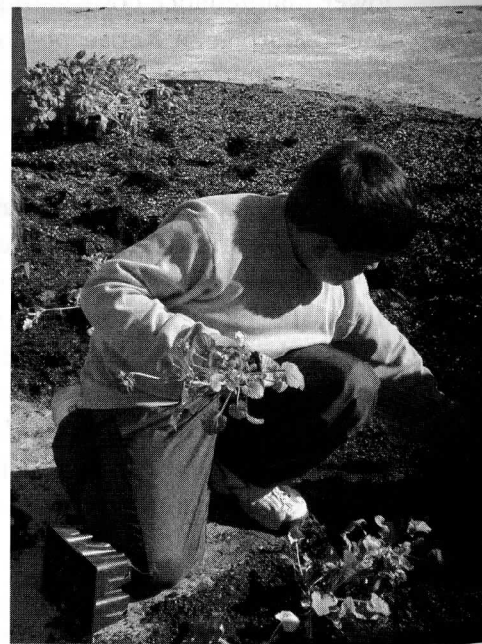


FIG 5-4. Properly conditioned soil makes it easier for children to grow healthy plants. (COURTESY OF BILL JORDAN.)

drain freely, yet retains water and nutrients in a form available to plants. When unsure about the soils in a landscape, call your county extension agent or bring in a soil sample for a complete analysis and recommendations for improvement. Addition of organic matter to the soil is the single most important method of improving soil structure. Organic matter increases water and nutrient-holding capacity, aeration, and drainage. Plants establish more rapidly when planted in well-prepared soils. They are healthier and more vigorous, and they have greater disease and drought resistance.

Some sections of the country receive sporadic rainfall, and excessive moisture may be a problem in poorly drained areas during winter and spring. Drainage may be improved by changing the slope of the site, adding subsurface drainage, or planting at a higher grade.

### Plant Selection

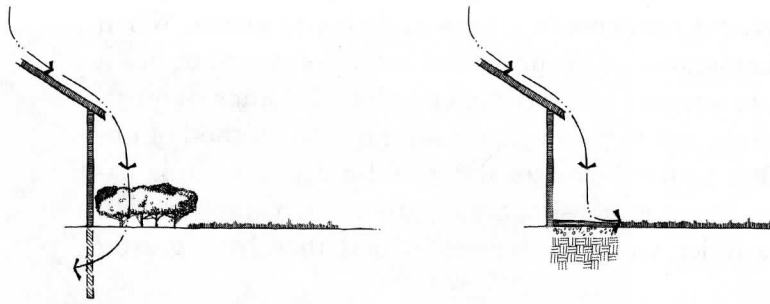
Lush, green landscapes and seasonal color provided by a variety of plants are a hallmark of many parts of the country. Xeriscapes can achieve this beauty while reducing water consumption. Xeriscaping does not require that landscapes become cactus gardens in all regions. However, careful planning and plant selection are important to ensure the investment and longevity of landscape plants in a Xeriscape (Figure 5-5). Any plant is a candidate for use in a Xeriscape; the key to success is how the plant is used. In general, the greatest success is achieved when plants are placed in an environment most similar to the plant's native habitat. However, many plants are adaptable and will perform equally well in different situations. Determining a plant's adaptability often requires research into its cultural requirements, which must be compatible with the plant's placement in the landscape plan.

When selecting plants for a landscape, a designer must consider a number of site conditions such as sun exposure, wind, soil conditions, and drainage patterns (Figures 5-6



FIG 5-5. Many plants are available at nurseries. Be sure to select ones that are well adapted to your site conditions. (COURTESY OF MARY TAYLOR HAQUE.)





Figures 5-6 and 5-7. Drainage patterns should be considered when designing around buildings. To avoid moisture problems in basements, water should drain away from the building and then be dispersed over a surface that can absorb water. (COURTESY OF GAGE COUCH.)

and 5-7). It is important to know the sun/shade patterns of the landscape, for some plants are tolerant of morning sun but not of the intensely hot afternoon sun, while other plants require both to flower prolifically. Soil type, structure, and pH are factors that will determine the success of a par-

ticular plant. Although soil factors can be modified for a given planting, the dominant soil conditions will ultimately be the most important when choosing plants.

Plants requiring areas that are wetter than the site being designed should be used in an area that will naturally receive more water, such as a low spot, near a spigot, or where runoff from the roof or paved areas will provide extra water. Likewise, plants that are adapted to areas that are drier than your site should be located in the design where they will benefit from good drainage, such as slopes, tops of berms, or nonirrigated areas (Figure 5-8).

It is important to bear in mind, however, that a plant tolerant of dry conditions may be stronger and faster growing when it receives extra moisture. Just because a plant is drought tolerant does not mean it has to be used in a dry spot in the landscape. Drainage is often important, and careful attention should be given to placement of species requiring good drainage.



FIG 5-8. Low areas near the distant lake have been planted with moisture-loving plants, while higher areas on sandy soils in the foreground were planted with drought-tolerant selections, creating hydrozones in the Carolina Children's Garden landscape. (COURTESY OF RANDY L. WILSON.)

It is very important to note that most plants are drought tolerant only after they become established in the landscape. It is critical, therefore, that irrigation be provided when necessary for the first and second growing season so that children will have successful experiences with growing plants.

### Effective and Efficient Watering Methods

The use of efficient irrigation systems is a technique inherent to Xeriscape planning. Irrigation systems should provide appropriate amounts of water at critical times. The irrigation system must be designed to correlate directly to the planting zones, known as "hydrozones." The planting zones are created by grouping together plants of similar water requirements. Turf areas need to be irrigated by a separate system or by using timers to control the amount of water the turf receives versus the requirements for ornamental shrubs, perennials, and annual beds. Irrigation systems are available in various forms: the traditional pop-up sprinklers and overhead sprinklers and the more water-efficient subsurface, drip and soaker-hose systems.

Drip and microsprinkler irrigation systems have many advantages.

1. They are precise.
2. They keep the foliage dry.
3. They are simple to install.
4. They can be used almost anywhere.
5. They reduce the number of replacement plants necessary by ensuring better plant survival.
6. They reduce erosion and water loss due to evaporation.
7. They reduce splash-transmitted, soil-borne diseases associated with traditional sprinkler irrigation.
8. They reduce or prevent mildew and decay because water does not hit house siding.
9. They reduce weed populations.
10. The landscape can be enjoyed at any time because there is no water spray to inhibit activities.



11. They efficiently supply water slowly so that puddling is not a problem.
12. Because water is placed directly at the root zone, the plant's water requirements are met by using much less water than conventional methods.

A soaker hose is also an economical choice for an irrigation system. The hose is small and easy for children to handle. Installation is relatively simple and the hose works well in small gardens.

Drip systems, soaker hoses, and subsurface systems have a low profile in the landscape, so vandalism is almost eliminated. However, they can be easily damaged accidentally by children digging in a garden. These systems use much less water than conventional irrigation systems and create attractive Xeriscape landscapes and gardens.

Sprinklers for appropriate turf areas can be used efficiently. If children will be playing on the lawn, be sure to choose a system that minimizes the possibility of accidentally running into irrigation heads. Watering deeply and infrequently encourages deep rooting of plants, which promotes greater drought tolerance (Figure 5-9).



FIG 5-9. Irrigation was not available at this school site, so children used buckets to water this newly planted tree. (COURTESY OF BILL JORDAN.)

### Mulching Trees, Shrubs, and Flower Beds

As much as 75% of the rainfall landing on bare ground is lost due to evaporation and runoff. This loss can be enormously reduced when the proper mulch is utilized. Mulch helps to ensure plant survival and is an important component of Xeriscapes. The two basic types of mulches are organic and inorganic. Some examples of organic mulches are pine straw, pine bark mini-nuggets, pine bark mulch, shredded hardwood bark, wood chip mulch,

composted leaves, and grass clippings. Inorganic mulches include pebbles, gravel, black plastic, and landscape fabrics. Although many materials can be used for mulches, price, availability, and aesthetic appeal often dictate choice.

The best mulches are usually fine-textured and nonmatting organic materials. An organic mulch should decompose slowly, be free of weed seed, and should not be easily washed away by rainfall. Mulches that decompose quickly, such as grass clippings, are less desirable. Gravel mulches reflect heat to the plant's canopy, thereby increasing water loss from the leaves. Children are tempted to throw gravel at each other, so avoid pebbles and gravel in children's landscapes. Organic mulches have many benefits in the landscape. They:

1. Increase water-holding capacity of the soil.
2. Reduce the amount of water lost by runoff.
3. Moderate extreme soil temperature fluctuations.
4. Reduce weed competition.
5. Reduce the incidence of soil-related diseases.
6. Prevent soil erosion.
7. Reduce soil compaction, improve soil structure, and add nutrients and humus to the soil.
8. Create an aesthetically pleasing design feature.
9. Prevent mechanical damage to trees and shrubs caused by mowers and weed-eaters.
10. Prevent splash-back and staining of house foundation and siding.

Woody landscape plants need an application of approximately three inches of a good mulch. This should be applied under the plant and at least out to the drip line, because the root system can extend two to three times the spread of the plant (Figure 5-10). Mulches are critical in a successful Xeriscape and cannot be overemphasized.

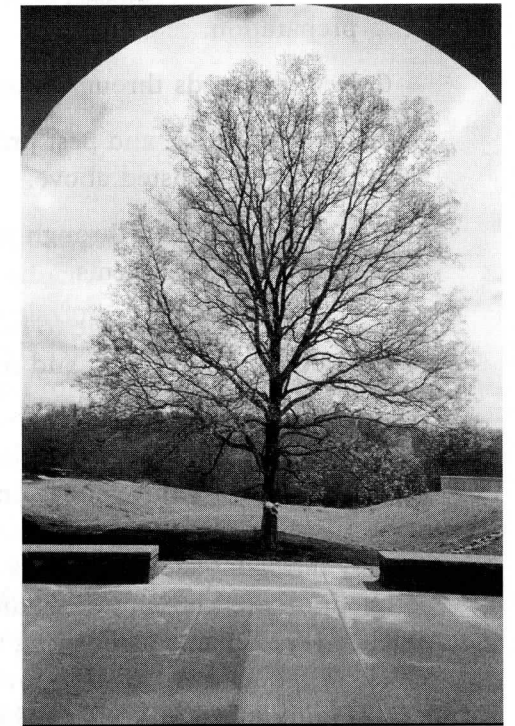


FIG 5-10. Organic mulches should be spread out to the drip line of trees to promote plant health. (COURTESY OF BILL JORDAN.)

## Proper Landscape Maintenance

Xeriscape designs that implement all seven principles have been shown to reduce maintenance by as much as 50%. There are nine main reasons for reduced maintenance. Xeriscape designs:

1. Reduce water loss and soil erosion through careful planning, design, and implementation.
2. Reduce mowing by limiting lawn areas and utilizing proper fertilization techniques.
3. Reduce fertilization through soil preparation.
4. Reduce pruning of trees and shrubs through proper plant selection and through restricted applications of water and fertilizer.
5. Reduce replacement plants through proper watering methods and soil preparation.
6. Reduce weeds through proper mulching.
7. Reduce disease and pest problems by creating less stress on plants through the methods listed above.
8. Reduce irrigation through proper maintenance and selection of plants with healthier root systems.
9. Reduce costly damage to house/structures and foundations through proper selection, placement, and minimum watering near the house.

Xeriscape maintenance practices make disease and pest problems less prevalent because they reduce stress on plants. The plants have been hardened-off by using good irrigation techniques. Correct amounts and timing of fertilizers, especially nitrogen, keep the plants healthier. Soil temperature extremes and weed competition are partially eliminated due to mulching. All of these maintenance practices keep plants from being stressed, reducing pest and disease problems.

Water requirements can be lowered because root systems of plants are healthier (more fibrous and deeper) when proper care and a good maintenance schedule are followed. By being aware of plant signs that indicate the need of water,

a gardener can irrigate more efficiently, conserve water, and produce healthier plants.

Teamwork among administrators, teachers, children, parents, landscape designers, landscape contractors, and maintenance crews is crucial to maximize efficiency of the seven Xeriscape principles. A successful Xeriscape allows gardeners more leisure time to enjoy the environment that they have created as part of the team. In addition, all involved can experience the satisfaction of having contributed to the quality of life for others by conserving a limited, precious, and threatened natural resource: water (Figure 5-11).



FIG 5-11. Teamwork between elementary, high school, and college students resulted in the design and installation of a water conserving landscape at Townville Elementary School. (COURTESY OF BILL JORDAN.)

## Energy Conservation

Landscapes can be designed to make schools, playgrounds, and gardens comfortable and energy efficient as well as fun and educational. Proper landscape design with climate in mind can help children on playgrounds and in gardens avoid problems such as heat exhaustion or skin cancers later in life. Comfortable, safe, and energy conserving landscapes can also help protect the environment because fewer natural resources are used.

## HUMAN COMFORT AND CLIMATE

Human comfort is affected by several aspects of climate including sun (solar radiation), wind, temperature, and precipitation (rain, fog, dew, sleet, snow). These factors can be modified to some degree to help make schools and landscapes more comfortable to live and work in. Natural elements like vegetation, water, and landforms as well as man-made materials can be used to modify local climate and create more comfortable and livable “microclimates.”



## MICROCLIMATE

The microclimate is the climate on your site (Figure 5-12). You can modify the microclimate through design choices. For example, if your children's garden is to be in a cool, mountainous region, you may locate it on a sunny southern slope to take advantage of a warmer microclimate. If you live in a hot, humid region, you can surround your playground with abundant shade to create a cooler microclimate. Nearby bodies of water may increase your site's humidity or decrease its air temperature, creating a microclimate within the larger context of the region. Oceans, lakes, pools, and fountains also provide physical and psychological cooling effects (Figure 5-13).

Different from the average local conditions, the microclimate may be more sunny, shady, windy, calm, rainy, moist, snowy, or dry. These factors influence the type of plants that may or may not grow in your microclimate.

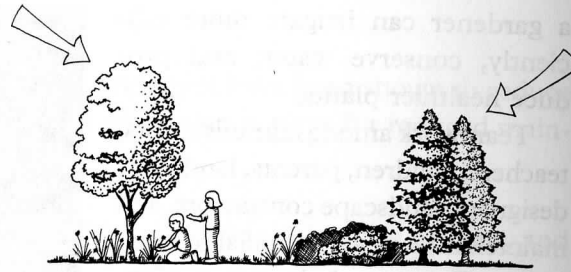


FIG 5-12. Microclimates can be created by planting trees to slow winter winds or to block the sun's rays. (COURTESY OF GAGE COUCH AND BARBARA SIEGEL RYAN.)

## LAND FORMS AND TOPOGRAPHY FOR CLIMATE CONTROL

Landform plays an important role in controlling and directing wind. When siting a school or garden, keep in mind the principle that cold air sinks and warm air rises. Do not locate the building on top of a hill where wind speeds are often 30% higher, or in the bottom of a valley where cold air pockets exist. These high and low points should be left as natural areas, creating wildlife corridors and beautiful natural areas for scenic views and shared recreation.

Locating schools on gentle slopes in between high and low points preserves the views throughout the region. With proper planning, bike and



FIG 5-13. Even a scarecrow seems cooler when sitting next to water on a hot day! (COURTESY OF MARY TAYLOR HAQUE.)

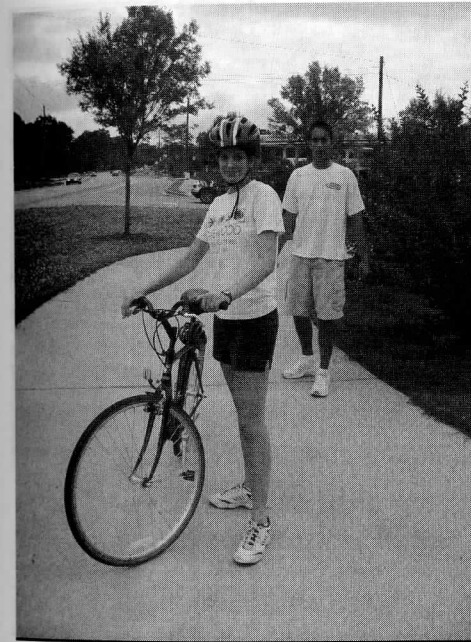


FIG 5-14. Bike trails like the Silver Comet Trail in Atlanta, GA, provide alternate transportation routes and recreation opportunities. (COURTESY OF MARY TAYLOR HAQUE.)

walking trails can network through these green corridors. This provides an energy-efficient alternative to automobiles and provides children and adults recreation opportunities in their community (Figure 5-14).

## USING PLANTS FOR CLIMATE CONTROL

Plants play a significant role in climate control and in helping to achieve energy efficiency. They are the best of all solar radiation control devices (Figure 5-15). Trees, shrubs, groundcovers, and turf, or even a combination of these, are effective in reducing direct as well as reflected solar radiation. An understory of mulch, shrubs, and groundcovers should be planted under trees, especially if they are surrounded with paving. Trees planted in clusters will keep each other cool.

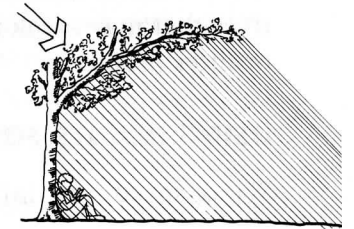


FIG 5-15. Deciduous trees provide excellent solar radiation control. (COURTESY OF GAGE COUCH AND BARBARA SIEGEL RYAN.)

## USING TREES FOR SOLAR RADIATION CONTROL AND EVAPOTRANSPIRATION

The specific placement of plants has direct effects on temperature control. Trees cool buildings and outdoor areas not only by shading, but also by cooling the air around them through a process called evapotranspiration (Figure 5-16).

*Shading and evapotranspiration, the process by which a plant actively moves and releases water vapor from trees can reduce surrounding air temperatures as much as 9°F (-13°C). Since cool air sinks to the ground, air temperatures under trees can be as much as 25°F (-4°C) cooler than air temperatures above asphalt paving nearby. Further, studies by the Lawrence*



Berkeley Laboratory found summer daytime air temperatures to be 3° to 6°F cooler in tree-shaded neighborhoods vs. treeless areas. A consciously well-planned landscape can reduce an unshaded home's summer air-conditioning costs by 15% to 50%. In the case of a small mobile home in Pennsylvania, a study reported air-conditioning savings of as much as 75%. (<http://www.eere.energy.gov>, accessed 2005).

On playgrounds in temperate areas, use deciduous trees that drop their leaves during the winter and allow the sun's rays to filter through the branches. Consider safety and avoid brittle trees that may break in a storm and cause safety or litter problems.

### USING PLANTS FOR WIND CONTROL

Wind speed can influence perceived air temperature in both summer and winter. For example, a 10 mph

(16 kph) northwesterly wind can make an air temperature of 44°F (7°C) feel like 32°F (0°C). Evergreen or coniferous trees and shrubs can reduce the influence of cold winter winds. A windbreak, planted along the edge of a playground, perpendicular to prevailing winds, can provide protection from cold winter winds, helping to make playgrounds more comfortable in winter (Figure 5-17).

Breezes can be directed in the summertime to cool outdoor play areas. Planting trees to funnel prevailing winds into the area can keep children cooler.



FIG 5-16. Both trees and man-made structures provide shade at the Children's Garden of Brookgreen Gardens in South Carolina. Trees also cool surrounding areas through evapotranspiration. (COURTESY OF MARY TAYLOR HAQUE.)

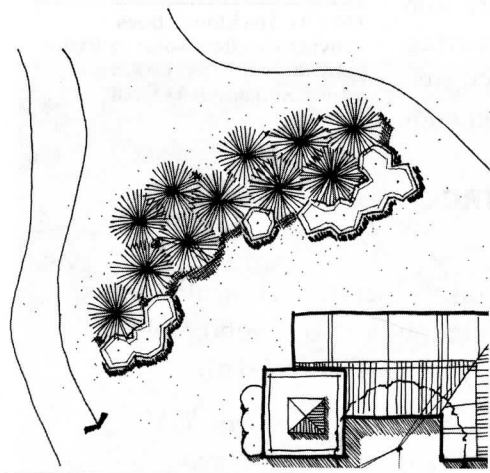


FIG 5-17. Plants can be placed to divert winter winds around outdoor play areas and buildings, creating a more comfortable and energy efficient setting. (COURTESY OF GAGE COUCH.)

## MAN-MADE SHADING DEVICES AND MATERIALS FOR CLIMATE CONTROL

### Arbors

In exposed areas where immediate shade is needed, an arbor or trellis planted with vines is a quick solution. Because deciduous plants follow climatic variations, a vine will be covered with shady leaves in summer and bare in winter, providing a self-adjusting device that changes with the seasons.

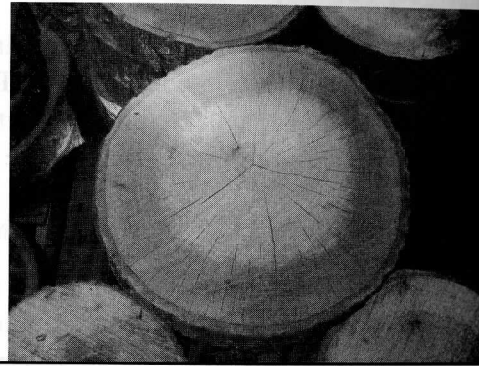
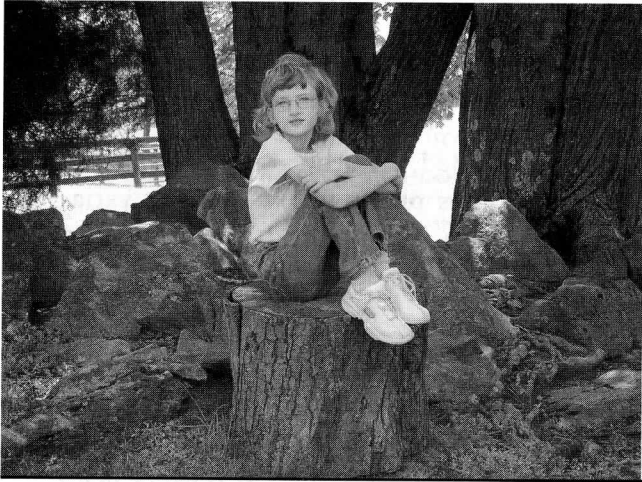
### Dark- and Light-Colored Surfaces

The built environment includes many types of surfaces such as roofs, walls, and pavement. Elements that are dark absorb heat; conversely, light surfaces reflect heat and stay cooler. Thus, asphalt absorbs heat while concrete reflects heat. Dark-colored surfaces such as roofs, asphalt basketball courts, and parking lots contribute to the heat island effect and should be cooled when possible. The sun may be captured indirectly from heated retaining walls, pavements, and isolated objects such as stone, and can help to make use of outdoor play areas during cold seasons.

The measure of a surface's reflectivity is known as albedo. Although a light-colored surface reflects heat, some find it uncomfortable to the eye due to glare. Glare can be reduced when designing with concrete, for example, by texturing the surface, which disperses light rays in several directions. Use a balance of trees and selected surface colors to obtain the most energy-efficient play environment.

### RECYCLED, RENEWABLE, AND LOW ENERGY-CONSUMING MATERIALS

When choosing construction materials for your landscape, use biodegradable, recycled, and low energy-consuming materials, which are locally produced (Figures 5-18 and 5-19). Recycled concrete sidewalks make attractive retaining walls. Local municipalities can save money and space in local landfills by letting you have the large blocks of concrete associated with demolition or redevelopment of an urban area (Figure 5-20). Soil, cement, brick, and stone are also good materials for thermal mass; they will absorb heat during the day and radiate heat out at night. Outdoor play areas of such materials can often be used comfortably day and night in both winter and summer if shaded by deciduous trees.



Figures 5-18 and 5-19. Instead of sending a dead tree to the landfill, have it cut to make seats or stepping surfaces. (COURTESY OF MARY TAYLOR HAQUE.)

Steel, aluminum, and plastics are considered energy-intensive materials and should be used in moderation or when they have been recycled. Using alternative renewable materials will extend our ability to adequately maintain our resources for future generations. By purchasing locally produced building materials, you will save transportation costs involving both money and energy, and will support your neighbors in the local labor market (Figure 5-21).

### Porous Paving Materials

Paved play surfaces, roads, and parking areas can get very hot. Asphalt parking areas can reach 195°F (90.5°C) in the summer. Rain falling on such hot surfaces can warm to 90°F (32°C) before running off into creeks or lakes where it harms temperature-sensitive species of plants and animals. Such runoff also carries



FIG 5-20. This retaining wall at Wonderland Gardens, GA is made from a combination of recycled concrete sidewalks and stone. (COURTESY OF MARY TAYLOR HAQUE.)



FIG 5-21. Using renewable, local materials to build this bench saved transportation costs and energy. (COURTESY OF MARY TAYLOR HAQUE.)

toxic pollutants. Parked cars on hot pavement are not only uncomfortable to get into; they emit gas fumes that contribute to air pollution.

Porous paving materials allow 15 to 25 percent of rainwater to seep through tiny holes in the pavement. They act as a filter, catching oils and chemical pollutants while also allowing cooler earth temperatures from below to cool the pavement. Light colors can be used to make porous paving more reflective, further reducing temperatures.

An exciting example of a more sustainable landscape paving material, porous paving is strong, durable, and is less susceptible than traditional concrete to freeze-thaw cracking because of the open spaces. These materials can be used to teach children how to cool temperatures while improving water quality in their neighborhood.

### CHECKLIST FOR LANDSCAPE DESIGN WITH CLIMATE CONTROL AND ENERGY EFFICIENCY (Figure 5-22)

- Plants are placed to block hot sun.
- Evergreen plants are placed to buffer cold winter winds.
- Plants are used to direct summer breezes.
- Light-colored paving material is used on paved play surfaces, roads, and parking areas.
- Textured paving surfaces are used to reduce glare.



FIG 5-22. Checklists and sketches are powerful tools for analyzing your site when designing for climate control and energy efficiency. (COURTESY OF BARBARA SIEGEL RYAN.)



- Porous paving materials are used to reduce storm-water runoff and cool temperatures.
- Low energy-consuming, locally produced, and recycled materials have been selected.

## *Low Maintenance*

Landscape maintenance usually includes pruning, mowing, watering, weeding, and controlling insects and diseases. Following are ideas to make maintenance of children's gardens more efficient.

### **To Reduce Pruning**

A well-designed landscape should not require much pruning. Select plants with an ultimate height and spread to fit the space that it is intended for. Far too many people plant small shrubs from one-gallon pots without realizing that they may grow a foot or more a year and soon cover the sidewalk or play equipment. Such plants will either have to be pruned every year or replaced with an appropriate-sized specimen.

Specify plants with a natural form (i.e., columnar, rounded, vase shaped, weeping, etc.) appropriate for its spot. For example, a graceful forsythia will not have to be pruned into an ugly round "meatball" if it is given plenty of room to spread out. The natural look is popular and easy, too. Design with informal balance rather than formal balance so that plants do not have to "mirror" each other in the design, and much less pruning will be necessary.

### **To Reduce Watering**

Specify plants that can adapt to the available soil moisture and that are drought tolerant if necessary. Plants native to the area are often appropriate. Be especially careful in selecting plants for south- or west-facing slopes where water runs off and sun is intense.

Avoid containers and planter boxes that collect little natural rainwater. Containers are exposed to drying wind, sun, and heat. If planters are used, leave the bottom open to the ground so that plant roots can access water tables and water can be pulled by capillary action.

If plants are to be surrounded by paving materials, specify porous paving or a material such as brick laid on sand so water can seep through the cracks and provide plants with more moisture.

Locate plants outside of roof overhangs. Materials such as attractive river stones or mulch can add texture and interest in such areas to reduce the amount of soil moisture lost through evaporation.

### **To Reduce Weeding**

Specify two- to three-inch thick mulches of a coarse texture to shade out weeds and to provide a dry surface that does not promote germination of weed seeds that may blow into a bed. Select plants that are aggressive enough to compete with weeds and that will shade them out as much as possible. Spunbond fabrics that allow water percolation and air exchange may be used under mulches to discourage weeds in particularly difficult areas.

### **To Eliminate Spraying for Insects and Diseases**

Design with plants that have as few pest problems as possible. Locate plants with particular attention to cultural details such as sun, drainage, moisture, and climatic requirements so that they will not be exposed to stress conditions. Stress increases susceptibility to disease and insect infestation.

Invite trained personnel who can "scout" for pest problems in the community. A good scout reduces the necessity of preventative spray programs that often call for spraying when it is not necessary. If problems are discovered, ask for natural pest controls, such as natural predators.

Both children and adults enjoy putting up birdhouses for insect eating birds like Purple Martins. Their flight is delightful to watch and they consume many unwanted insects.

### **To Reduce Mowing**

Turfgrass makes a great play surface for children, but it's sometimes overdone. Where appropriate, reduce turf areas and replace them with ground covers, mulch, natural wooded areas, or meadows that do not require constant mowing. Where turf is necessary, specify slow growing species or cultivars. Use ground covers or mulches instead of grass around trees to reduce hand edging and trimming and to protect trees from mechanical damage and the future disease or in-



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sect infestation that often results. When laying out borders between lawn areas and shrub beds, woods, or meadows, design with lines that allow mowers to negotiate smoothly without having to back up.

### **MISCELLANEOUS TIPS FOR LOW-MAINTENANCE DESIGN**

In high-use areas where turf is difficult to maintain, use an inexpensive alternative like mulch.

If the budget allows, porous paving may be used on pedestrian areas in heavy shade where grass is difficult to grow and where a gathering space is needed.

Some trees produce fruit that might be beautiful on the tree, but when placed improperly in the landscape can cause “litter” problems as they drop their fruit or shed twigs onto a manicured lawn, sidewalk, or playground. Sweet gum and crabapples trees are examples of plants that should not be placed over grassy or paved areas where litter would be considered a maintenance problem. When designing around existing plants with such litter problems, incorporate a deep ground cover that will absorb fallen fruit, twigs, etc.

Some plants like southern magnolia and American holly have low-growing limbs that reach the ground and cover up any fruit or leaf drop. Specify that such plants be placed so they can keep their limbs to the ground, hiding fallen fruit, leaves, and twigs. Children love to climb Southern magnolias, and they make great forts with fragrant flowers and interesting fruit.

When designing and implementing a new landscape, specify proper planting and installation techniques; a high-quality implementation job reduces stress on plants and encourages a vigorous, healthy landscape that requires less maintenance.

### **Native Plants**

If your children like nature and want to select low-maintenance plants that are well adapted to your climate, soils, and available water, choose native plants. Natives provide an ecosystem friendly habitat for birds and butterflies, which add color, movement, and song to your landscape. Native plants are indigenous and can restore a sense of place, providing relief from the homogenous landscapes seen wherever you go. They offer a wide array of color, texture, form, and fragrance to stimulate your senses and add beauty to your landscape.

Using a diverse selection of plants will give you year round seasonal interest. Spring, summer, fall, and winter will each hold a special charm, and you can

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marvel at the changing seasons. Diversity also brings stability, and you are less likely to lose a large section of your plants to insects or disease.

Do not destroy wild stands of native plants by digging them from the woods or meadows. Many native plants are available commercially. They should be bought from reputable nurseries where they have been propagated or grown without damage to wild habitats. Ask a local landscape architect, urban forester, grower, extension agent, or member of the Native Plant Society for help with native plants that perform well in your area.

### **Composting**

As landfills are filling up and garbage incineration is becoming an unacceptable practice, it is clear that change is in order to ensure successful disposal of waste. Reducing consumption and waste, as well as recycling waste, are two exercises that provide partial solutions. Composting takes care of waste by converting it into soil for use in the garden. The process is educational, interesting, and easy for children. They can help build compost bins, and can place organic waste in a pile and wait for it to decompose while studying the biological, chemical, and physical processes involved. Most of the work of decomposition is completed by microorganisms, including fungi, bacteria, and actinomycete. The work of these microorganisms can be explored by daily temperature readings and even competitions between children to get separate compost piles to the highest possible temperatures or to hold the high temperatures the longest. Compost piles under optimum conditions reach temperatures of 120°F to 150°F (49°C to 66°C). By understanding the principles of physics, chemistry, and biology that act physically on the compost process, children begin to understand the workings of the scientific and natural world.

One safety concern with composting is combustion when temperatures rise too high. Teachers and administrators should be aware of this danger and regulate the size of the piles, so excessive heat will not build in the centers. Turning piles frequently will also help alleviate this potential problem, which can become a learning experience for children.

Instead of bagging and sending fallen leaves and grass clippings to the landfill, compost them in a designated area on site. As children tune in to the living world around them, they will realize the importance of protecting and enriching the soil. Supporting the earthworms and microorganisms in their own soil helps children form an ancient system that supports native plants in a beautiful and functional way.

## CHECKLIST: IDEAS TO HELP YOU DESIGN FOR LOW MAINTENANCE

- Specify plants whose ultimate height and spread will fit the space available.
- Use an informal design.
- Use plants whose natural form (i.e., columnar, rounded, vase shaped, weeping, etc.) is appropriate for the space.
- Use plants that are drought tolerant, particularly on south- or west-facing slopes.
- Do not use containers and planter boxes that collect little natural rainwater unless they are open from the bottom so that plant roots can access ground water.
- When paving around plants, use porous paving materials such as brick laid on sand so water can seep through the cracks.
- Use organic mulches two to three inches deep.
- Use plants that are aggressive enough to compete with weeds.
- Use landscape fabrics under mulch to deter weeds.
- Use plants with minimal pest problems.
- Use plants that are adapted to local climatic conditions.
- Use trained personnel to “scout” for pest problems.
- Use ground covers, woods, meadows, or mulches to replace unnecessary turf.
- Use slow growing species of turf when possible.
- Use ground covers or mulches near trees.
- Use smooth bed lines to allow mowers to negotiate easily.
- Use low-maintenance alternatives such as mulch or porous paving for high-use or shady areas.
- Avoid using plants with litter problems.
- Around existing plants with litter problems, incorporate mulch or a deep groundcover to absorb fallen fruit and twigs.
- Use proper planting and installation techniques.
- Use native plants.
- Compost organic waste.

## CASE STUDIES

### *Awbury Arboretum: Nature Trails and Wildlife Habitats, Philadelphia, PA*

**Arboretum established:**  
1916

**Educational programs established:** 1980s

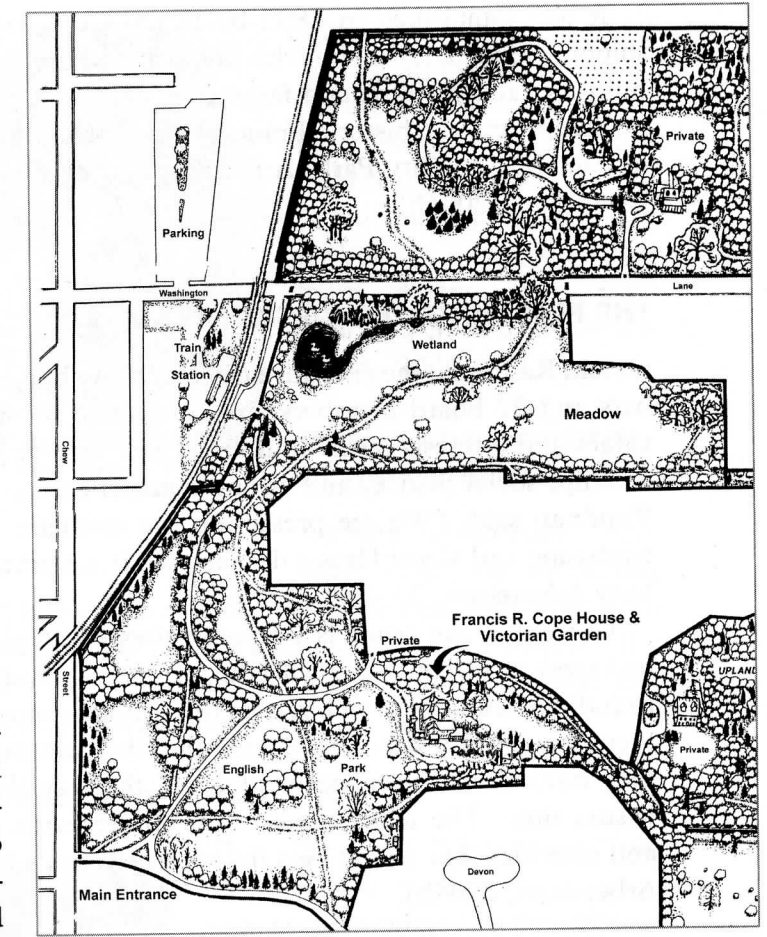
**Acres:** 55 (22.3 hectares)

**Cost Estimate:** N/A

**Funding:** Foundations, individuals, corporations, and government funding

### MISSION AND PURPOSE

Awbury Arboretum is a public garden for education and “the quiet enjoyment of nature.” Its mission is “. . . to preserve and interpret Awbury’s historic house and landscape, thereby connecting an urban community with nature and history” (Awbury Arboretum Field Trips, 2004a.) Awbury’s unique location in the heart of an urban Philadelphia neighborhood strongly influences the nature of the programs and services it provides, including: a School Field Trip Program, Summer Nature Program, a new Landscape Apprentice Program for at-risk young adults, a community garden, volunteer and service learning opportunities, public outreach events, and rental of the Francis Cope House for weddings, conferences, and other community events (Kaufman, personal communication, 2005). Its Children’s Educational Program ties all its lessons to the current Pennsylvania curriculum standards.



The 55-acre (22.3 hectares) Awbury Arboretum provides children with the opportunity to learn from the historic house and landscape. (COURTESY OF AWBURY.)