



GREEN MANSIONS

LIVING WILLOW STRUCTURES ENHANCE CHILDREN'S PLAY ENVIRONMENTS.

By Sharon Gamson Danks

Many landscape architects and restoration ecologists in the United States are familiar with the use of living willow whips for creek restoration, bank stabilization and related environmental remediation projects. Not as common in this part of the world is the use of freshly-cut willow branches to create living fences, archways, domes and other outdoor structures to enhance children's play environments. Whimsical living willow play structures are common in many schools and parks throughout England, southern Scandinavia and other parts of Europe, where they are a relatively recent adaptation of traditional agricultural crafts.

Living willow play structures are dramatic focal points of parks and school grounds where they are installed, due to their dynamic and creative forms. Children love the dappled yellow-green light cast inside the structures

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as sunlight filters through the willow leaves. The seasonal changes evident in these deciduous structures are also quite appealing to children and adults, and encourage year-round play. Leafy branches in the spring and summer allow the children to feel "hidden" inside the living structures, although adults can see them clearly enough for proper supervision. Fall brings colorful leaf changes to many willow varieties that brighten the structures. Bare branches in the winter reveal a structure's interesting woven patterns while continuing to enhance outdoor learning environments and children's games.

These living play structures are inexpensive to build, can take a wide variety of forms and can enliven and "naturalize" the places children play. Living willow play elements can be designed and built by the teachers, children and community members who use them, but can





Bundles of living and dried willow whips (Salix viminalis) from a local "energy forest" await the construction process at a living willow workshop at Mårten School in Lund, Sweden.

be enhanced significantly with the assistance of design professionals and local artists. Annual maintenance on the structures, however, is generally quite straightforward and can be done by those who use them without additional professional assistance.

SIMPLE CONSTRUCTION PROCESSES

The techniques used in this art form are a combination of horticultural principles and basket-weaving skills, which can be learned in a short period of time. Mårten School, in the city of Lund in southern Sweden, was the site of a teacher training workshop during Skapande Uterum, a local "green schoolyards" conference in September 2001. Three substantial living willow structures were built in the schoolyard in a single day as the workshop's teacher-participants learned how to use this material under the direction of their instructor, local expert Kalle Forss. In just six hours, the teachers learned the basics of living willow construction techniques and worked in groups of three or four to build the structures. A graceful living willow archway now marks one of the school's entryways and separates the playground from the classroom buildings. A dramatic living willow pergola is a new focal point in a quiet play area for small children. The teacher-participants also built a compact, woven, soil-filled "speaker's platform" with a living turf top that they transplanted from the new structure's footprint as it was built. The teachers who participated in this workshop plan to teach these techniques to their students in the coming years.

The willow branches used for these projects at Mårten School were harvested from trees in a local "energy forest" that grows willows as a sustainable fuel source. These three living structures were all created using *Salix viminalis* whips, planted in tight holes approximately nine inches deep. This willow species is Forss's favorite material for willow construction projects since the branches are particularly long and flexible, they root easily and they grow quickly.

TYPES OF LIVING WILLOW STRUCTURES

Living willow structures are often used as space-defining elements in the layout of school grounds and parks, as props for informal playtime activities and to facilitate formal outdoor academic instruction.

SPACE-DEFINITION: LIVING FENCES

Living willow fences can be used on school grounds and park land to define and separate areas that are used for different purposes, such as play spaces for younger vs. older children, or active play spaces vs. quiet garden plots. Often referred to as "fedges" (a combination of the words "fences" and "hedges"), these linear structures were traditionally used to separate agricultural fields or mark property lines in southern Scandinavia and parts of England.

Fedges are one of the simplest living willow structures to build. To create a living willow fence, a narrow trench (or a series of small individual holes) is dug in the desired location and long, freshly-cut willow branches are inserted at regular intervals. The trench can follow a straight line or be curved as desired. Many willow fedges are made from branches set in the ground one foot apart. The tall branches are then woven into a simple diagonal diamond pattern and tied together so that they will maintain this form as they grow. As the willow whips root and then leaf out and lengthen over time, some of the new growth is woven into the fence to make it taller or stronger, and undesirable growth is pruned away for use as firewood, animal fodder or additional building material. Over time, many of the branches in a fedge will pressure-graft together where they are crossed and tightly tied, making the structure stronger as it ages.

Living willow fedges can also be used to build sturdy, soil-filled walls that are attractive and functional sound barriers. These types of structures are currently used in parts of Europe along roadways where they reduce traffic noise and capture some of the pollution generated by the passing cars. These dense willow walls are constructed using two parallel, woven willow fences, partly filled with earth.

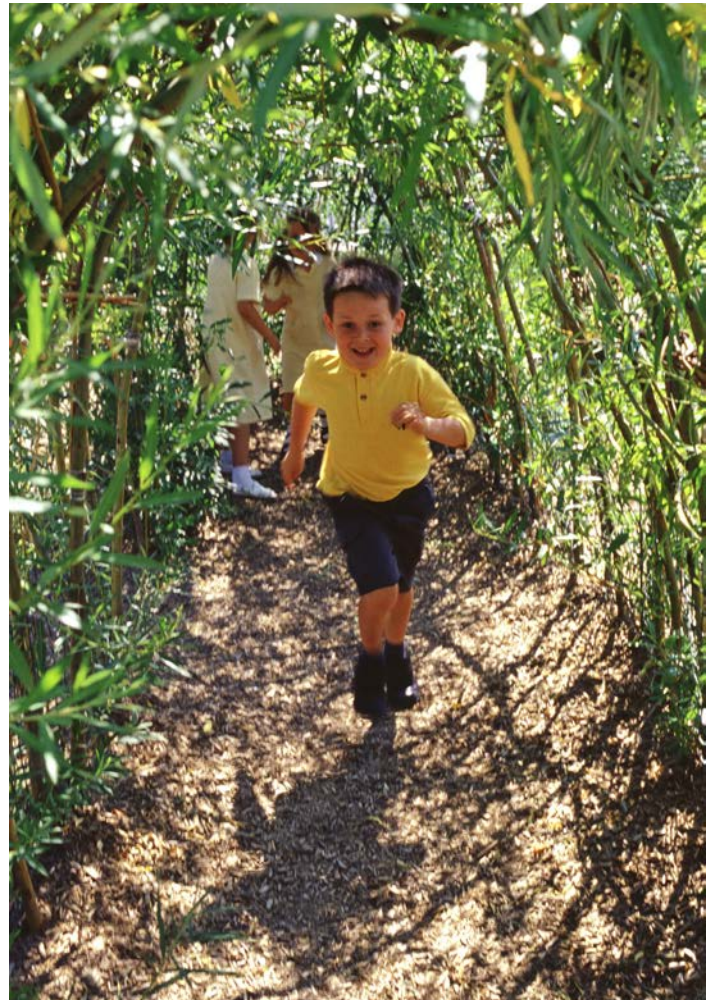
PLAY ELEMENTS: LIVING MAZES AND TUNNELS

Willow tunnels and mazes are variations on the simple fedge planting pattern and are usually built solely as play elements. To create a tunnel, two parallel trenches are dug and planted with willow whips that are then woven together at the top to create an enclosed tube or series of arches. Similarly, mazes can be constructed by planting willow whips in trenches that have been laid out in any type of maze pattern, with the resulting living fences acting as the maze's walls and boundaries. Children happily run through both types of structures, enjoying their translucent walls

and curving corridors. As these structures age and leaf out, their walls become increasingly opaque, contributing to their play-value.

Tunnels are fairly simple to construct and are commonly found on school grounds and other play areas. Mazes are less common, however, since they require a significantly larger space to build and a much more substantial initial planting effort. These bigger structures also present proportionally larger annual pruning and watering maintenance requirements.

Gorsemoor County Primary School in Staffordshire, England, is home to an elaborate living willow maze planted in March 1999 in the shape of a “Stafford Knot,” a symbol of the County of Staffordshire that is included on the school’s badge. Teacher Barbara Heath, Gorsemoor’s Environmental Coordinator, and members of the British Trust for Conservation Volunteers and the Cannock District Rangers, helped to organize the project and train the school’s students, teachers and parents to plant and care for the willows. All 460 students at the school participated in the project on planting day. Some of the students helped to mock up the maze design on the planting site, the very moist location of a former pond. The site’s existing grass was covered with a permeable black mulch mat prior to planting to prevent competition with the new willows. The final version of the design, covering an area approximately 60 feet by 25 feet, was then painted on the ground to guide the planting effort. Eight hundred willow whips (*Salix viminalis*) were placed into the wet ground in tight pilot holes dug using the point of an old screw driver. The main archways defining the maze’s walls and tunnels were constructed from the strongest whips, planted at one foot intervals. Additional branches were set at 45 degree angles to cross brace the walls. These angled branches were then woven and tied two feet from the ground to create horizontal



Elementary school students at St. Peter Chanel Primary School in Kent, England, enjoy playing in their schoolyard’s living willow tunnel.

rails that further stabilize the walls. Now three years old, the maze has grown in well and is a vibrant centerpiece of the school grounds that provides amusement and shade for the students and habitat for wildlife. The structure is also becoming a source of new willow whips for additional living willow projects onsite.

A snaking, living willow tunnel, approximately 5 feet tall and 50 feet long, is the vibrant centerpiece of the playground at St. Peter Chanel Primary School in Kent, England. Parents led the construction process for this project in February 2001, using *Salix viminalis* (osier willow) whips. Children and school staff members also helped with the planting. The photograph above shows the tunnel approximately five months after it was constructed. In that short period of time, the structure has rooted and leafed out enough to shade the interior and make the tunnel an exciting place to play. Students love to play in and around the finished tunnel and often run down its length, darting in and out of its archways and open walls.

The design for the Nature Playground at Valby Park (*Naturlegeplads i Valbyparken*) outside of Copenhagen,



Hundreds of students at Gorsemoor County Primary School in Staffordshire, England, helped to plant a large living willow maze on school grounds. Photograph by Barbara Heath.



Denmark combines creative examples of both living and dried willow play structures. One section of the park is devoted to a series of sinuous walls, approximately 3 feet tall, made from woven dried willow branches. The walls are arranged in a maze-like pattern and surround a “village” of small domed huts made from living willow, shown in the photograph to the right. The huts are approximately 6 to 7 feet tall and 4 to 6 feet in diameter and look somewhat



BASIC TECHNIQUES FOR WORKING WITH LIVING WILLOW ON SCHOOL GROUNDS

Living willow whips are a sustainable resource harvested from hardy, fast-growing trees. Donor trees are typically trimmed every year or two in a process referred to as coppicing, to supply the whips used for living willow construction projects. Willow whips are a very flexible material that can be used to make functional and whimsical forms, limited only by a designer’s creativity.

DESIGN AND PLANNING

- ☞ Choose a planting site away from school buildings and underground water pipes because willow roots often go to great lengths to find water during dry periods and can disturb foundations and underground infrastructure.
- ☞ Select a site that is somewhat moist year-round. If the chosen site is not naturally wet, be prepared to water the structure frequently for the first year until the cuttings root and contact the water table.
- ☞ Plan to implement your project at the beginning of the rainy season for your region so that the whips will have the greatest chance of rooting.
- ☞ Involve the children who will use the finished structure in all aspects of the design, planting and stewardship processes. This will give them an understanding of how the structure came about and also encourage them to take care of it as it grows.
- ☞ Lay the design out on the site, at full scale, with the help of the children who will use it so that everyone can see where the structure will go and how large it will be.
- ☞ Select a willow species to use for your project. Many different species of willow may be used for these structures, but *Salix viminalis* is a favorite in Europe because it roots easily and reliably, grows quickly and has long, strong, pliable branches. Other willow species

native to your own region might work just as well, but be sure to test them on a small scale before undertaking a large project.

- ☞ When selecting a willow species to use for a living willow structure, remember that a fast growing species will allow a newly planted structure to look mature more quickly, but it will also need more maintenance to keep the desired shape over time.
- ☞ Consider using multiple willow species in a single project to add a variety of bark and leaf textures and colors to your structure. For example, *Salix alba* varieties are sometimes used to introduce red and yellow bark colors.
- ☞ Use basket-weaving techniques and patterns to add strength and interest to your structure. Consider using dried willow branches, soaked before use to regain their flexibility, for added horizontal stability or a basket-weave aesthetic.

PLANTING TIPS

- ☞ Long, straight willow branches should be harvested after the trees have lost their leaves but before the branches start to produce buds, typically between November and March. The cuttings should be treated as live plants and prevented from dehydrating. Some living willow builders recommend placing the whips in a bucket of water until used, while others say that the branches will live for several days in a cool place without additional moisture. In either case, plant the structure as soon as possible after the cuttings are harvested.
- ☞ Many living willow builders use long, straight branches from second year growth for the main structural elements in a willow project. These branches are



like inviting, hollow green haystacks. Evoking a feeling of mystery and privacy, these small huts are the perfect size for one or two small children to play in together. Although they feel like enclosed spaces from the inside, adults can see through the greenery easily enough to supervise the play area.

The Nature Playground at Valby Park was designed by landscape architect Helle Nebelong in 1999. The willow

maze and huts were constructed in 2000 using two different species of willow, selected for different purposes. The living willow structures were planted using the versatile and popular species, *Salix viminalis*. The winding walls, woven from dried willow whips, were constructed using another willow variety called *Salix clone nr. 183*, selected because it has long, flexible fibers that make it easy to bend into organic shapes.

typically at least one inch in diameter at their base and can be eight to ten feet long. Smaller branches, from first year growth, may be used for cross bracing the structure, or for creating windows, doors and other artful additions. Remove side branches from your willow whips to simplify the construction process.

- ✿ Remove existing vegetation from your planting site. Cover the planting area with a water-permeable, biodegradable weed barrier to limit the competition between existing grasses or weeds onsite and the new willow plantings. Plant the willow whips through the weed barrier and cover it with bark chips after planting, if desired.
- ✿ Plant willow whips by making a narrow planting trench or by digging individual holes for each branch using a rebar rod or similar hole-digging tool. The branches should fit snugly in their holes and be planted approximately eight to eighteen inches deep. If the structure will be arched, angle the planting holes away from the direction of the curve in order to strengthen the structure.
- ✿ Living whips should be arranged so that the wider end is buried in the ground and the narrower end is pointing upward. Be sure that the branch is not bent downward at any point in the structure, as the sap will not flow downhill, and any portion of the branch that is bent toward the ground will die back.
- ✿ Apply traditional basket-weaving techniques to strengthen structure, using either living or dried whips. If dried whips are use, it is helpful to soak them for several days to improve their flexibility.
- ✿ Bind the structure together using strong cords, split willow branches or other materials. If desired, cut away notches of bark at the points that cross to encourage pressure grafting.
- ✿ Reinforce the structure's entryways, windows and other sculptural elements using woven patterns, as desired.

Refer to traditional basket making books for design ideas and weaving patterns.

- ✿ Solid constructions, such as a speaker's platform, bench or sound barrier wall may be filled with soil and planted with turf or other durable plants.
- ✿ When the structure is complete, thoroughly soak the surrounding ground to help the cuttings settle into their new holes and initiate the rooting process.
- ✿ Expect the whips to begin to root in the first few months and to leaf out when spring arrives. Since a portion of the whips sometimes fails to root, plant more whips than you think you will need to ensure structural stability.
- ✿ The number of whips needed per linear foot will vary with the type of design and structure. However, many living willow designers plant their whips approximately one foot apart. Sometimes this spacing accommodates two whips per planting hole, for example in the construction of a diamond-patterned fence.

MAINTENANCE AND STEWARDSHIP OF LIVING WILLOW STRUCTURES

- ✿ Water the living willow structure deeply throughout its first year so the branches will take root. If the climate or seasonal weather is dry, continue watering the structure until the new trees have found the water table. Be sure the ground around the structure remains very wet throughout its first summer.
- ✿ Keep the ground around the willow plantings free of weeds as the plants get established.
- ✿ Twice a year, inspect the structure for new growth and weave in or remove branches as desired to maintain the overall aesthetic, transparency and strength of the form.
- ✿ Empower children to be the structure's stewards and encourage them to assist with all annual maintenance tasks.



ENCLOSED SPACES: LIVING DOMES AND TEEPEES

Living willow whips can be planted in circular patterns to create rounded domes or pointed cone-shaped, teepee-like structures. These enclosed spaces are often used as meeting places for outdoor lessons and for small group projects. During playtime, enclosed domes and teepees provide a private-feeling retreat away from the otherwise noisy and busy playground environment. Students often seek out leafy, enclosed willow structures to talk quietly, “play house” and just relax.

As the domes and other enclosed structures age, their structural branches get thicker and stronger and the trees produce additional twigs and leaves that make the walls more opaque. Annual or semiannual pruning is required to maintain the desired form and transparency of domes, teepees and other enclosed structures.

Students and teachers at Cowick First School in Exeter, England, constructed a living willow dome on their school grounds in 1996, using *Salix viminalis* whips. The structure encloses a space 6 feet high and 10 feet in diameter. The dome, pictured on the first page, has matured nicely and was quite strong and leafy when observed after five years of growth. Students enjoy playing inside the dome during recess and sometimes use the space as a meeting area for outdoor lessons.



Students at Ebchester Church of England Primary School in County Durham, England, enjoy their cat-shaped playhouse.

At St. Paulinus Church of England Primary School, in Kent, England a living willow structure was built in the context of the school’s extensive, wildlife habitat area. Students crawl into the “bird hide,” an igloo-shaped domed structure with a long entrance tunnel, and are concealed inside while they observe birds and other wildlife that come to visit their colorful wildflower meadow and nearby pond. This structure allows the science curriculum to be tied directly to the outdoor environment and also creates an interesting place for the children to play.

ENTRY MARKERS AND OPEN MEETING PLACES: ARCHWAYS, PERGOLAS AND SCULPTURAL FORMS

Living willow whips can also be planted in more complex arrangements to form elaborate archways, entry gates and open pergola structures. In most of these designs, the whips are typically planted in clusters to create the living “columns” that support the structure. Individual branches are then angled and intertwined as desired to create airy archways and pergolas. These structures can be used to mark entrances to school grounds and parks or to create focal points within these landscapes. They function effectively as meeting places for formal lessons and as venues for informal games during playtime.

These more complex structures, in particular, benefit from the assistance of local artists, landscape architects and other design professionals who can help teachers, students and community members to implement them. They also lend themselves to artistic expression and can be shaped to suit the desires of those who will use them.

Ebchester Church of England Primary School, in County Durham, England invited local artists, working



*Bundles of living and dried willow whips (*Salix viminalis*) from a local “energy forest” await the construction process at a living willow workshop at Mårten School in Lund, Sweden.*

with an organization called “Makers and Shakers” to create unique living willow sculptures to compliment the existing ecology-related features of their school grounds. The artists, Kath Bedingfield, Jane Gower, Paul Denton and Tony Scandrett, worked with the young students in the Spring and Summer of 2001 to plant *Salix viminalis* willow whips and weave them into various shapes inspired by the children’s ideas. The final “living sculptures” include a willow dome with a whimsical cat’s head and tail, and tufted columns surrounding newly planted trees with playful open archways.

The cat dome, shown on the previous page (top right), is one of the most inviting structures for the children. Approximately 8 feet in diameter and 6 feet tall inside, the dome can accommodate up to eight small children at a time, or a teacher may use the space for informal outdoor lessons with a small group of students. A low door and round windows were woven into the dome at the perfect height for young children to enjoy. (Adults have to crawl to enter!) Inside the shady dome, the light is softened by the leaves, giving the interior environment a magical yellow and green glow. Once inside, students imagine that they are out of sight, but teachers can still see them through the leaves as they supervise the playground.

Next to the dome, a series of archways encircles a small patch of lawn, creating a more open meeting area, shown in the photograph below. This airy willow structure can also be used as an outdoor classroom or a meeting place for informal games. The site also includes woven willow “baskets,” constructed of dried willow branches, that protect the newly planted trees at their centers. Over time, the protective woven baskets will disintegrate and allow the maturing trees to grow unencumbered.

POTENTIAL APPLICATIONS TO SCHOOLYARDS AND PLAYGROUNDS IN THE UNITED STATES

Living willow play structures have great potential to enhance schoolyards and playgrounds in the United States. Willow whips are readily available in this country from many local plant nurseries that supply materials for creek restoration work. This natural, sustainably harvested material is inexpensive, easy to use and lends itself well to a wide variety of creative design ideas. It can be used for functional purposes and has almost limitless possibilities for building unique play environments. It is an excellent medium to use on school grounds and playgrounds since it lends itself well to participatory design and construction processes and requires minimal annual maintenance. Landscape architects, restoration ecologists and other design professionals in the United States are the ideal advocates for this exciting material and will benefit from its suitability to children’s play environments and the design freedom and creativity it allows.

Environmental planner Sharon Gamson Danks is CEO of Green Schoolyards America and principal of Bay Tree Design in Berkeley, California. She is author of Asphalt to Ecosystems: Design Ideas for Schoolyard Transformation and co-founder of the International School Grounds Alliance. Her work transforms school grounds into vibrant public spaces that reflect and enhance local ecology, nurture children as they learn and play, and engage the community.

For more information, please visit Green Schoolyards America at www.greenschoolyardsamerica.org.

