

A LIVING WILLOW STRUCTURE FOR THE AUBURN PERMACULTURE PARK

Essential Questions and Design Guide for Adults and Children being schooled at home

There is a proposal to build a living willow structure in the Auburn Permaculture Park, located in Miles Lepak Park in Auburn. We would love to have your help in designing the structure. Firstly, we need to give you some background information, in a series of **Essential Questions** (meaning important questions).

A series of 15 questions follow below. Multiple online resources and ideas for further development are provided. The depth of exploration is entirely up to the interest of the children and adults. Although, most of the Guide is written from the point of view of a schooling-at-home audience, adults are encouraged to explore the material. When some items are more involved and technical, a note has been made (“adult”).

Here is an outline of the sections:

1. Why do we need plants? What do they give us?
2. What do plants need from us to grow?
3. What is the nature of willow?
4. What is a LWS (Living Willow Structure)?
5. What is permaculture?
6. What is the Auburn Permaculture Park (APP)?
7. Why do we want to build a LWS in APP?
8. Let's get to know the site of the Auburn Permaculture Park.
9. The location of the structure in the Park.
10. The 2018 Draft Living Willow Structure Design.
11. What are the size limits to the design of the 2020 Living Willow Structure?
12. What are the potential design forms?
13. What is your design for the Living Willow Structure?
14. How will we plant the structure?
15. How will we take care of the structure? YOU can help.

So, let's jump in...

1. WHY DO WE NEED PLANTS? WHAT DO THEY GIVE US?

- a. <http://www.mbgnet.net/bioplants/earth.html> Biology of Plants. A very good resource from the Missouri Botanical Garden with additional links on the left and right. On the left of the home page are six interactive links while on the right is a song to sing and a lesson plan with three pages of activities (all ages)
- b. <http://florida4h.org/projects/plants/Lesson2.pdf> Why are Plants important. A great Florida University 4H resource of 30 pages with lesson plans and countless activities. (all ages with adult help)
- c. <https://www.ck12.org/c/biology/importance-of-plants/lesson/Importance-of-Plants-BIO/> (all ages) Includes video.
- d. <https://plantscapers.com/7-reasons-why-plants-are-valuable-and-important/> A good summary of what plants give us. (older kids +adults)

2. WHAT DO PLANTS NEED FROM US TO GROW?

- a. <https://biggreen.org/wp-content/uploads/2018/06/K-2-Plant-Needs> Seven page lesson plan for adults and then activities on plant needs for K-2.
- b. <https://learnaboutag.org/resources/lesson/what.pdf> Very extensive lessons for Grades 2-4 from the California Foundation for Agriculture in the Classroom. Lots of adult-child projects. Younger children will need help from adults but older kids can study on their own.
- c. <https://www.gardeningknowhow.com/special/children/how-plantgrow.htm> Great with embedded interactive videos and projects. All ages.

3. WHAT IS THE NATURE OF WILLOW?

Willow is a deciduous (drops its leaves in the winter) plant which is either a shrub (the shrub never becomes a tree) or is a tree (such as a weeping willow tree). The genus is Salix. Please see Question 4 for an image of shrub willow

which is cut every year and is the type of willow we will use in our living willow structure.

- a. <https://www.thespruce.com/twelve-species-willow-trees-and-shrubs-3269668> Gives an idea of the great range of willow (all ages)
- b. <https://kids.kiddle.co/Willow> Great for young children
- c. <https://en.wikipedia.org/wiki/Willow> Adult Resource which is very thorough.
- d. <http://wildfoodsandmedicines.com/willow/> A good resource for adults who are working with children. A good set of references at the end for more scientific research.

Willow is a very useful plant for cordage (strong string) , bows, basketry, artist charcoal making (burning the willow under controlled conditions), natural aspirin, cricket bats, false legs (in the old days), herbal remedies and folklore, liquid rooting hormone for cuttings, stream bank erosion control (S. purpurea Streamco), land reclamation, biomass fuel, sculpture and living willow structures!! There are a lot of videos and other information online regarding the uses of willow.

Why don't you research the uses online and marvel at the power of willow?

Our artist, Bonnie Gale is a willow basketmaker and you can see her **basket work** on www.englishbasketrywillows.com.

4. WHAT IS A LWS (LIVING WILLOW STRUCTURE)?

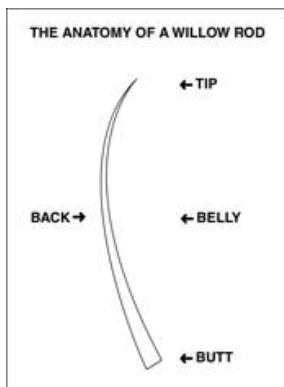
Let's take those three words apart and see what we get.....

- a. **LIVING** Definition of "Living"
To be "living", anything must grow and develop, use energy, reproduce, be made of cells, respond to its environment, and adapt.
- b. **WILLOW** Tree or scrub?
Please see below.

Weeping willow **tree**, 80 years old.



Shrub willow. Cut annually.



Anatomy of a one year willow rod for a living structure.
The butt end is where the rod is cut and we place that butt end 18 inches into the ground.

c. **STRUCTURE**

Willow rods naturally self-root in the ground so an unrooted rod can literally be pushed into the ground to grow. Easy!! The rods can then be woven together to contain space, for example: arch, dome, tunnel, maze or outdoor room. Depending on the size and shape of the structure, the structure may have a light internal metal frame which is completely hidden from view. There are two methods of construction:

(1) fedge (fence)

and **(2) poling**



FEDGE METHOD

A woven fence involving uprights and diagonal weavers to give a sense of enclosure.

POLING METHOD

A lot of rods are tied together and attached at the top. This structure has a more open feel to it.

5. WHAT IS PERMACULTURE?

Kid's definition: Designing with Nature's principles so that the wellbeing of all forms of life and the environment is considered for the health of future generations.

Adult definition: Permaculture is an ethical and ecological design system for creating regenerative human environments. It is an integrated system of ethics, principles and design methods that can be used to create landscapes (as well as buildings, systems and social cultures) that are modeled and patterned after Nature. It is the careful design of beneficial ecological relationships to create an efficient, healthy sustainable whole, with less energy input and more abundant results. Forest Gardening is a gardening system that mimics a natural woodland environment that is self-watering, self-weeding, self-mulching, self-fertilizing and highly productive with little to no maintenance.

Other important concepts in permaculture planting that you might hear are "the three ethics", "principles", "guilds", "polycultures" and "zones". Don't worry. Permaculture is a hefty subject but worthy of research and study. The Auburn Permaculture Park has already planted Phase One of the Fruit Forest and Guild. Please research how a fruit tree guild might be composed. Hint: it will have many layers: overstory trees, understory trees and ground cover fruits and vegetables. **Can you find out what these plants might be in a Fruit Tree Guild and let us know?**

<http://encyclopedia.kids.net.au/page/pe/Permaculture> A kid's definition of permaculture.

<https://medium.com/invironment/permaculture-and-kids-ba5a8d441765> A guide for adults to introduce children to permaculture

<https://www.permaculturenews.org/2020/03/28/6-ways-to-teach-kids-about-permaculture/> A good guide for adults with 6 ways to teach children about permaculture. Lots of links included.

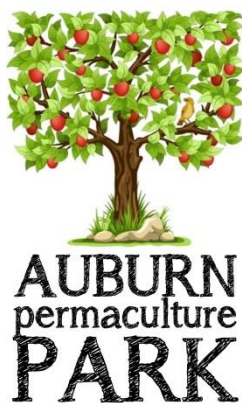
<http://www.permaculture.us.com/> The Institute of Permaculture Education for Children (IPEC). Great Resources tab.

<https://planetschooling.com/2019/08/20/can-children-create-a-permaculture-design/> Explains how children successfully created a permaculture design for a site in Brazil.

<https://www.edutopia.org/blog/permaculture-classroom-systems-based-approach-michael-becker> First article discusses teaching permaculture in the classroom and then goes on to discuss the home schooling movement right now.

Videos on permaculture: There are a lot of permaculture videos. **Edible Acres** (www.edibleacres.org) located in our region, have a lot of wonderful U Tube videos .Please check them out....

6. WHAT IS THE AUBURN PERMACULTURE PARK (APP)?



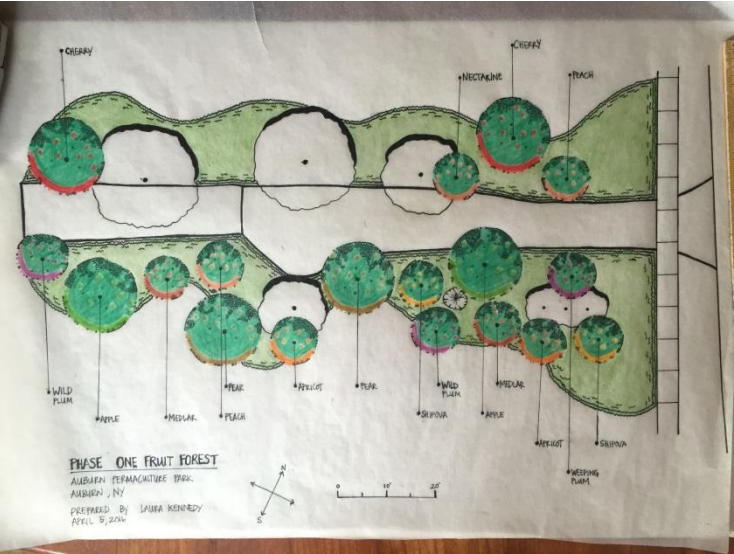
The Auburn Permaculture Park is an edible forest garden and educational gathering space located at Michael Lepak Memorial Park in Auburn, New York. It was started in 2015.

This Park uses permaculture design principles to build living soil, harvest rainwater in the landscape, and cultivate a perennial based food system. By

replacing resource intensive lawn with edible forest gardens and installing food forests in public parks and along public pathways, we can make fresh fruits, nuts, and vegetables abundant and available for everyone. Auburn Permaculture Park will bring our community together by fostering a resilient approach to urban food production and land stewardship.



Concept Map for APP (to be revised in 2020)
No pond in the location shown!



In 2016, the first phase of Fruit Tree Forest was planted

Goals for 2020 at the Auburn Permaculture Park (APP): Erin Humphrey writes: *“Aside from the willow project, our main work this spring through fall will be weekly snacking/tending dates. This is where we can stay distant but*

maintain the park and find what foods are coming along. We don't know when we'll start yet, but probably in May. We'll develop a schedule to accommodate volunteers and the coordinators as best we can. We did this last year, each week meeting on a different day for a couple hours in the afternoon/evening. We also aim to be installing signage and some trellises as well as further mapping and planning. It's best to follow our Facebook page (www.facebook.com/auburnpermaculturepark) to keep up to date on activities and schedule. One addition we've discussed this year with the current situation is to add annual crops that people will recognize, as it makes sense in open spots of our planting.”

To make contact, please email auburnpermaculture@gmail.com, Peter Cramer and Erin Humphrey are the lead coordinators of the Permaculture Park.

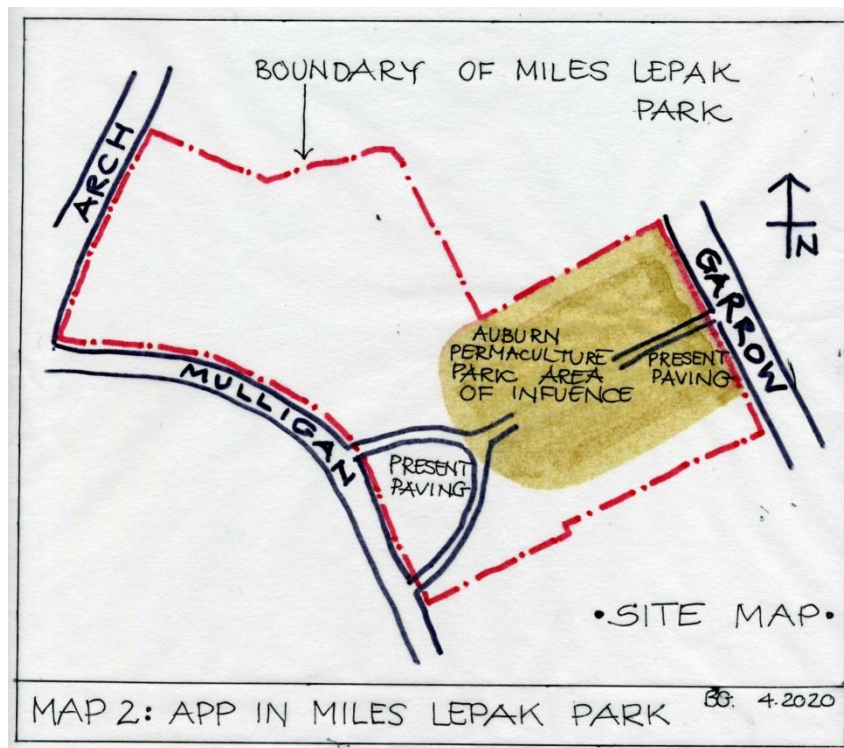
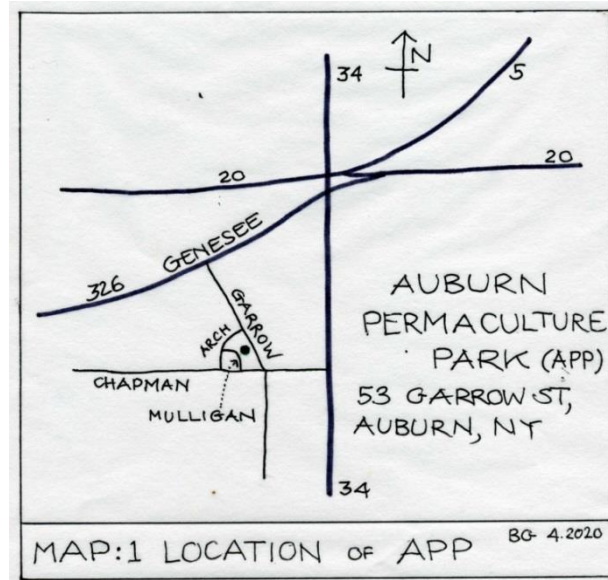
7. WHY DO WE WANT TO BUILD A LWS IN APP?

Although the actual design will be worked out below, a Living Willow Structure will benefit the Auburn Permaculture Park, due to the fine interrelations of a living willow structure with permaculture. Bonnie Gale, the Artist, is trained in permaculture and has a certificate to teach permaculture. The benefits of the living structure will be in many ways:

- a. It will provide a multi-use living structure in the Park. Permaculture is all about stacking functions and uses as well as using living plants in high density and interrelated ways.
- b. Due to the proximity, it will be integrated into the food forest plantings.
- c. It will act as a visual focal point and aesthetically, act as a beacon as one enters the park through the existing central pathway off Garrow Street.
- d. It will increase the biodiversity (range of life forms) such as flora and fauna attracted to the structure (butterflies, nesting birds and insects).
- e. The building and the care of the structure will provide lots of opportunities for all ages to learn to value Nature and the natural world again and reap the benefits.
- f. It will provide a community focal point for meeting, sitting and playing.
- g. It will provide community engagement in the care of the structure.
- h. It can be used as an outdoor classroom with observations of the stages of willow growth over the seasons. Schools and classrooms are encouraged to visit, use and study the structure.

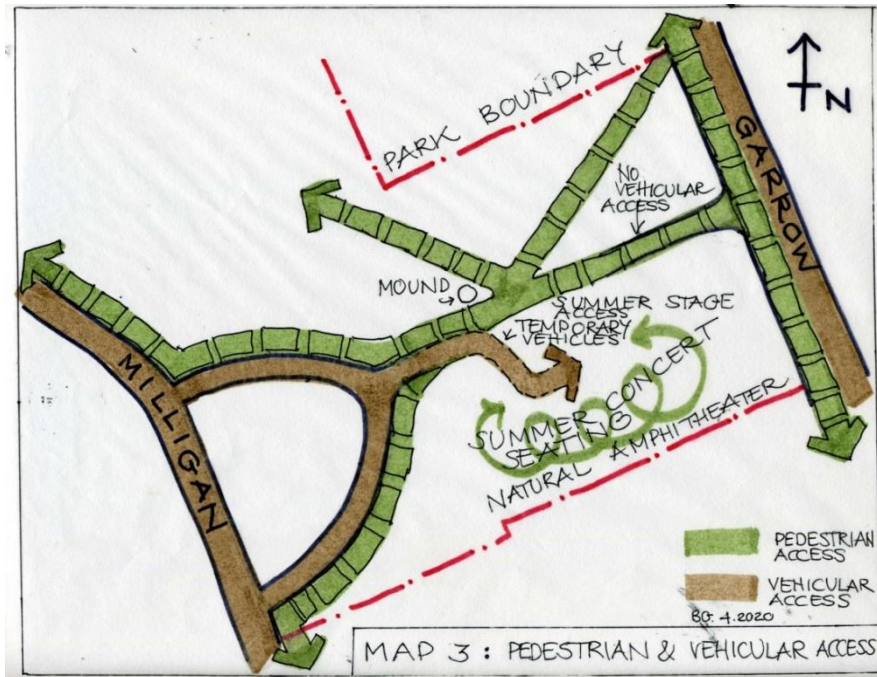
8. LET'S GET TO KNOW THE SITE OF THE AUBURN PERMACULTURE PARK

The Auburn Permaculture Park is located at 53 Garrow Street in Auburn, as shown below in **Map 1**. The second map (**Map 2**) shows the boundaries of the Miles Lepak Park and the area of influence and planting of the Permaculture Park. Vehicular access is obtained from Garrow, Arch and Milligan Streets.

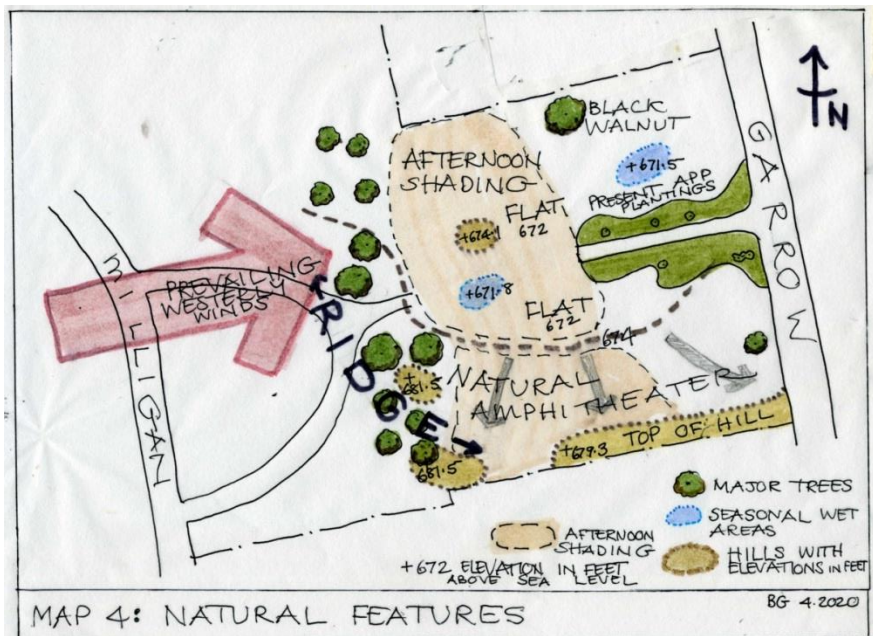


Spot the Difference! Can you see a road name that is misspelled in Maps 1 and 2? Please let us know!!

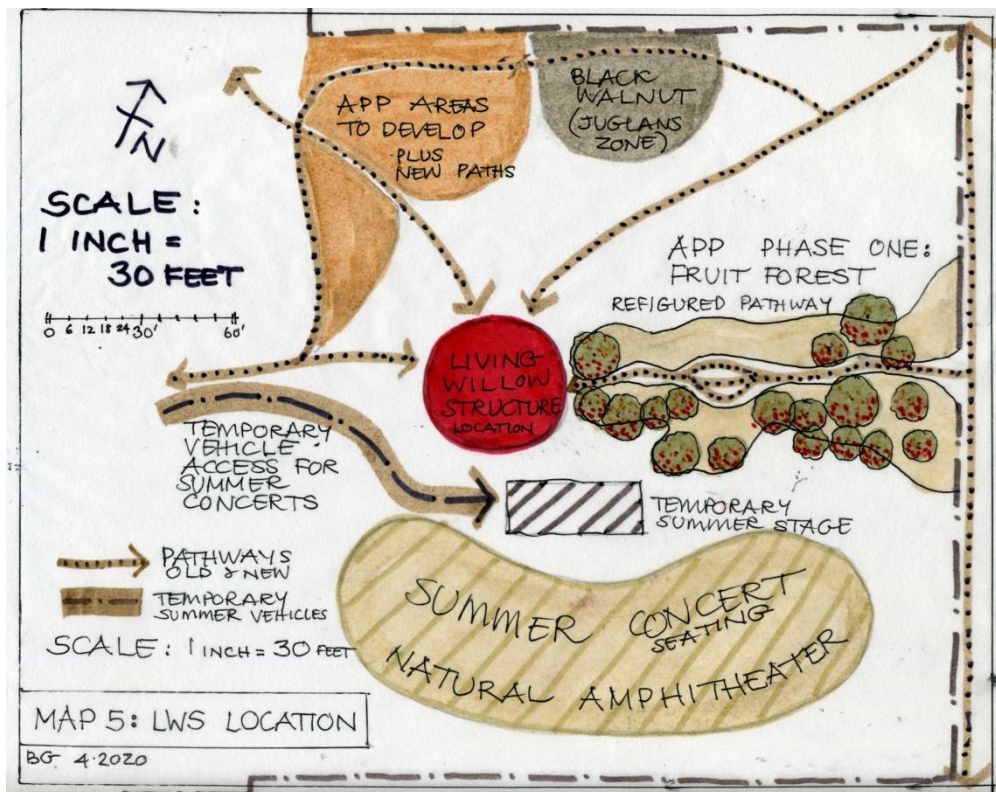
Map 3 shows how people move around the Permaculture Park. There is a strong pedestrian route from the northeast corner to the southwest as well as use of the old paved strip off of Garrow Street through the planted forest garden. In addition, the naturally sloping amphitheater in the south of the Park is used for seating for summer concerts.



Map 4 identifies the ridge crossing through the west of the site which is part of the natural amphitheater. Most of the large deciduous trees are



growing on top of this western ridge. These large trees create a belt of afternoon shading to the east of them. Another significant feature is the large Black Walnut tree on the northern boundary which creates a planting zone around it which most other plants find intolerable. There are two naturally low areas which have seasonal wetness. Some elevations spots are given in feet above sea level.



The potential location of the living willow structure is shown in **Map 5**. It is located at the end of the fruit forest and hence will act as a visual beacon for visitors, entering off Garrow Street. The map is to the scale of one inch equals 30 feet. We have an area 30 feet or even larger to design.

9. THE LOCATION OF THE STRUCTURE IN THE PARK

Below follows a series of five images from different view in the Park, showing the potential site with a red circle. **Please give us your comments!**



View from Garrow Street,
looking west.

View further west towards the ridge.



View looking east back to
Garrow Street.



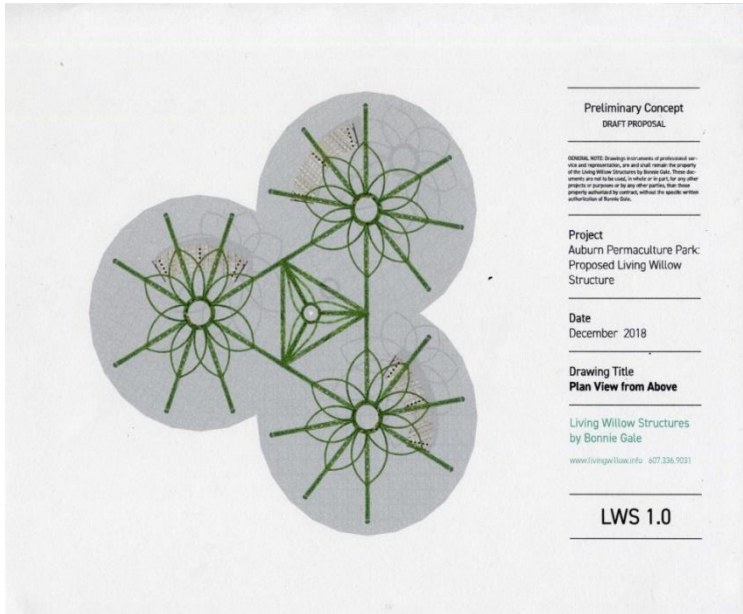
View looking south to the ridge.



View looking north.

10. THE 2018 DRAFT LIVING WILLOW STRUCTURE DESIGN

We are asking folks to review the design included below. This design was presented to the City in December 2018 when the project was first discussed and Bonnie Gale met with City officials and members of the Permaculture Park. It is a draft design only. It involves getting a large area of coverage with living willow. Three 14 foot diameter open domes intersect with a small children's area. The overall dimensions of the structure are approximately 28 feet square and 7 feet tall. With provided seating in the domes, the idea is that parents can watch the children in their own kid sized area.



Preliminary Concept
DRAFT PROPOSAL

GENERAL NOTE: Drawings are an artistic or professional opinion and representation, and are not intended to be construed as a contract or a guarantee of any kind. These drawings are for informational purposes only and are not intended to be used for any other purpose or project. The drawings are the property of the author and are not to be used, in whole or in part, for any other project or project of any other party, without the explicit written authorization of Bonnie Gale.

Project
Auburn Permaculture Park
Proposed Living Willow
Structure

Date
December 2018

Drawing Title
Plan View from Above

Living Willow Structures
by Bonnie Gale

www.livingwillow.info 607.336.9031

LWS 1.0



Preliminary Concept
DRAFT PROPOSAL

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Project
Auburn Permaculture Park
Proposed Living Willow
Structure

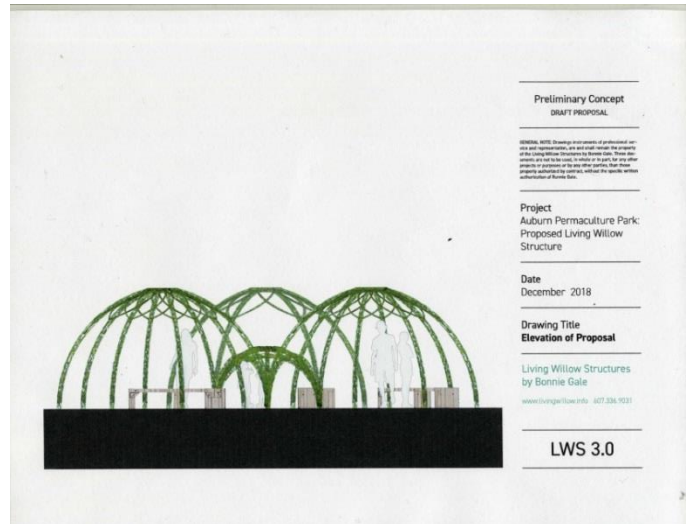
Date
December 2018

Drawing Title
Aerial View

Living Willow Structures
by Bonnie Gale

www.livingwillow.info 607.336.9031

LWS 2.0



Preliminary Concept
DRAFT PROPOSAL

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Project
Auburn Permaculture Park
Proposed Living Willow
Structure

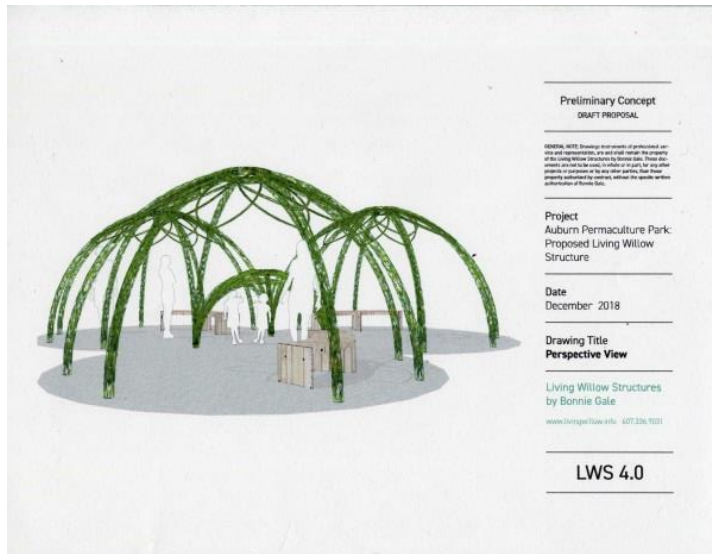
Date
December 2018

Drawing Title
Elevation of Proposal

Living Willow Structures
by Bonnie Gale

www.livingwillow.info 607.336.9031

LWS 3.0



Preliminary Concept
DRAFT PROPOSAL

GENERAL NOTE: Drawings are an artistic or professional opinion and representation, and are not intended to be construed as a contract or a guarantee of any kind. These drawings are for informational purposes only and are not intended to be used for any other purpose or project. The drawings are the property of the author and are not to be used, in whole or in part, for any other project or project of any other party, without the explicit written authorization of Bonnie Gale.

Project
Auburn Permaculture Park
Proposed Living Willow
Structure

Date
December 2018

Drawing Title
Perspective View

Living Willow Structures
by Bonnie Gale

www.livingwillow.info 607.336.9031

LWS 4.0

Thoughts about this 2018 Design Bonnie Gale, the designer, admits that there are certain limitations to the present design. She states: *“The central play area could be more extensive in size. It could also provide tunnels, directed walkways or other play forms for children connected to the structure.”*

1. What would you add?
2. Does the design cater to all sectors of the population?
3. What other organic forms can be created?

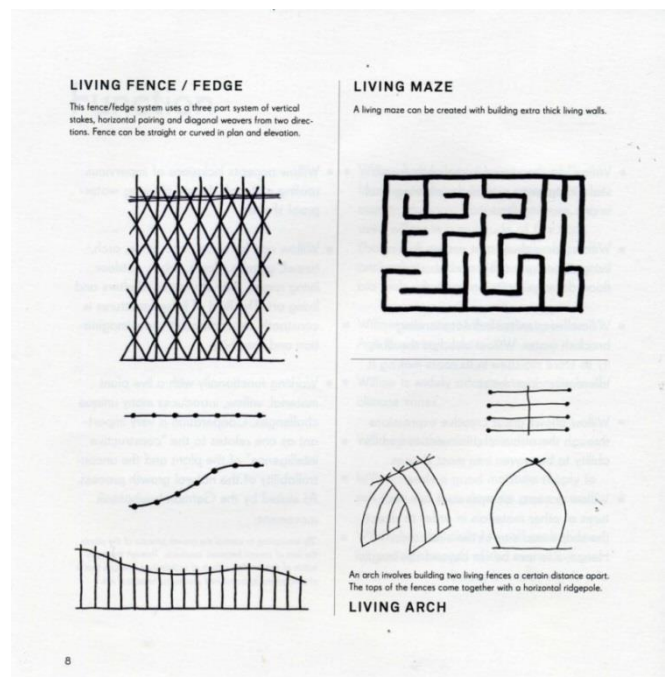
11. WHAT ARE THE SIZE LIMITS TO THE DESIGN OF THE 2020 LIVING WILLOW STRUCTURE?

With regard to **coverage** or **area** of the structure, the tentative design from 2018 (see section 10 above) covers an area approximately 28 feet square. The structure area can be larger, up to 40 feet in diameter. It can also be designed to have offshoots to the north, in particular, where there is more room.

With regard to **height** of the structure, the willow rods for the 2020 growing season are 10 feet tall at the maximum height. As the willow is planted at least 18 inches in the ground in order to give sufficient root development, then there are 8.5 feet maximum above the ground. In order for an internal height of a dome, for example, of 7 feet, then a **dome can only be 10 feet in diameter** at the ground level with an allowance to have enough willow at the tips ends.

12. WHAT ARE THE POTENTIAL DESIGN FORMS?

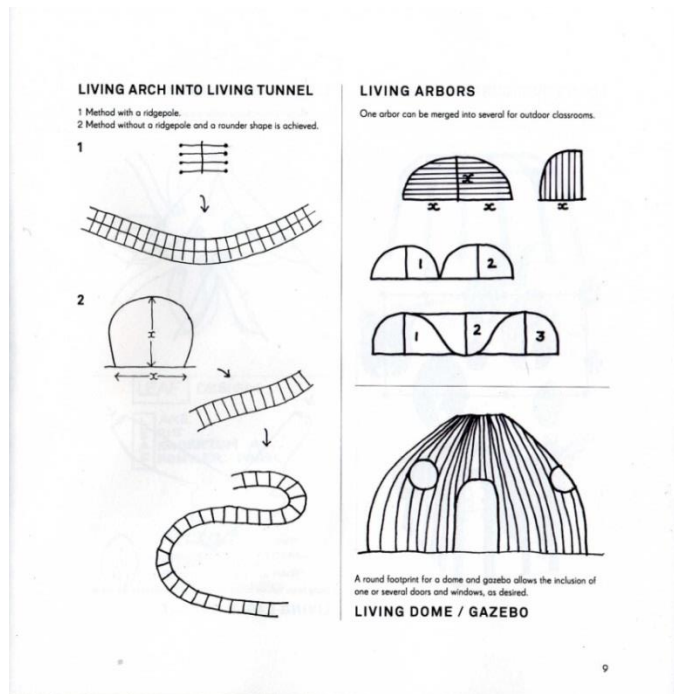
- a. As shown in the diagram page opposite, we start with a **simple woven fence or fedge** as the first building block. The fence can be curved; be at different heights and can go



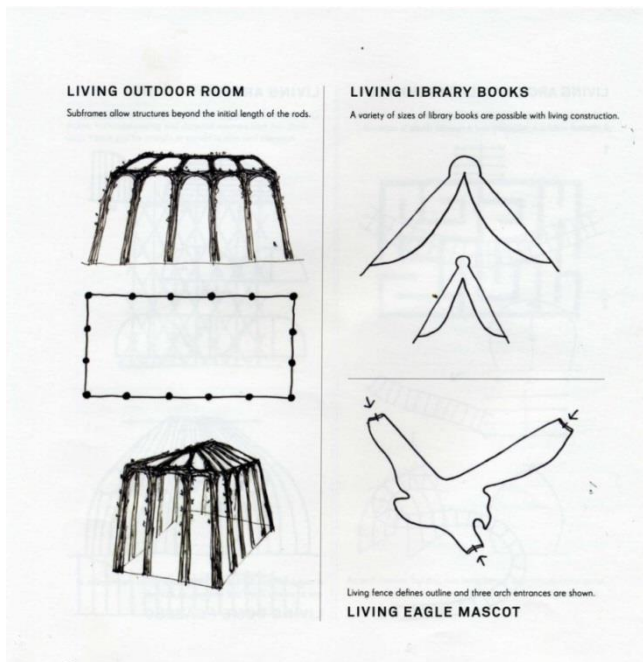
from a foot above the ground to 8 feet tall.

- b. Then, we can put two lines of fence about 3 to 4 feet apart and we get a **directed pathway**. Living Erie Leaf installation below shows the use of these directed pathways to create a LEAF design (as seen from the air). This installation is within the projects on Bonnie's web site: www.livingwillow.info.

- c. These fences can be arranged into a **maze**.
- d. Two short lines of parallel fence which are brought together at the top become an **arch**.
- e. Two long lines of parallel fence then can become a **tunnel** which either comes to a ridgepole or has a rounded top.
- f. So, with regard to **domes** and other enclosures, we have seen above in section 4c. that there is the choice of **woven fedge method** or the **more open poling method**. It is also possible to have a structure that is a mix of both methods.

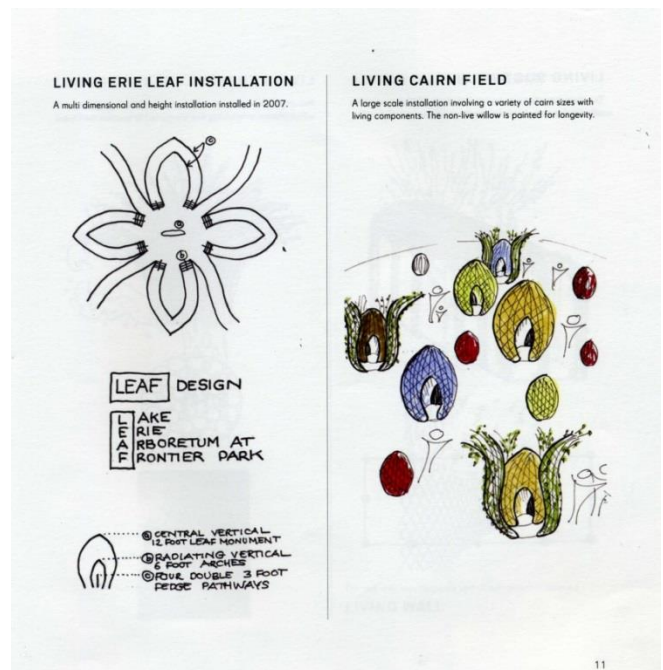


- g. Half of a dome becomes an **arbor** and these can be put together to an arrangement of two or three arbors (often used for outdoor classrooms!)
- h. For **outdoor rooms**, they can be **square** or **rectangular** and they use an internal light metal framework.
- i. It is also possible to take the shape of a **symbol** (living library book for a Library) or a **mascot** (for example, an



eagle) and plant the fedge so that the shape is seen from the air. Bonnie has designed and built many of these designs.

- j. Lastly, the **Living Cairn Field** is an example of both live and dead willow. Using the cairn or mound shape, a series of sizes are created. The color that you see in the drawing are those woven cairns that are painted with exterior latex paint which gives rich color and protects non-alive willow from deteriorating. Around some of the larger cairns in the drawing, you can see two doorways have been included as well as a sheath of live willow in the outside. FUN!! So, think **living willow art!** Bonnie Gale's living structure work for the last 16 years can be viewed at www.livingwillow.info. Please take a look!!



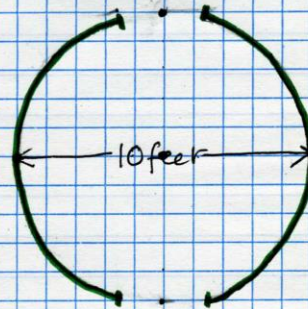
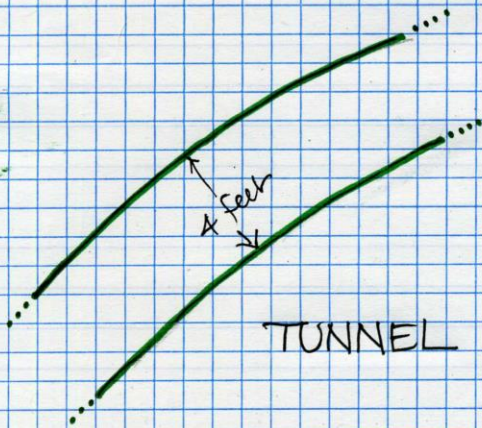
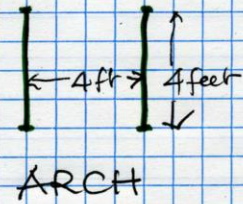
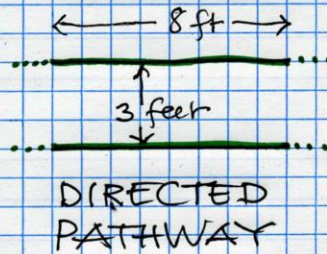
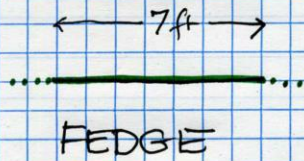
13. WHAT IS YOUR DESIGN FOR THE LIVING WILLOW STRUCTURE?

It is now the time for you to design the structure!!! Either starting with the 2018 Draft Design or not and then using the ideas of **Fence/fedge, Directed pathway (2 parallel fences), Maze, Arch, Tunnel, Dome, Arbor, Outdoor Room, Symbolic Shape, Art or Some Other Design Idea, as discussed above**, please show us your stuff!! **Please remember on the larger structures to choose the fedge and/or poling method.** Below is a graph sheet on which you can create a scale (say, one square is a foot). If you cannot create a design digitally, then there is a separate Word document with the same sheet on which you can print the graph paper, draw on it and then scan or take an image and send us the results. **Please note that we do need a scale or dimensions written on your drawings!**

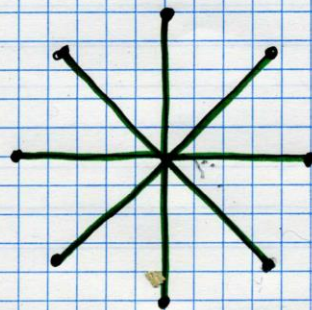
If you would rather give your comments in writing, that is brilliant, as well. We would love to hear from you!

EXAMPLES OF DESIGN FORMS

— HOW TO DRAW THEM TO SCALE
(ONE SQUARE IS ONE FOOT)



FEDGE DOME
WITH TWO 3foot
OPENINGS



POLING DOME (10feet)

LWS AUBURN: YOUR DESIGN!

YOUR NAME:

SCALE IS ONE SQUARE IS ONE FOOT (OR SPECIFY)

14. HOW DO WE PLANT THE STRUCTURE?

The **fedge** method portions of the structure will involve digging a trench a foot wide and 18 inches deep to follow the layout of the design lines. The soil is removed (if rocks in the soil), loosened and returned to the trench. The upright rods are planted every 8 inches apart. There is then a top row of weaving and two sets of diagonals to create the woven form).

The **poling** method of construction involves laying out the location of the poles and then using a posthole digger to make the discreet holes for each pole. The “poles” are created ahead of time and then placed in the holes. The top weaving then completes the structure.

15. HOW WILL WE TAKE CARE OF THE STRUCTURE? YOU CAN HELP.

We are encouraging neighborhood residents to join with the core group of the Auburn Permaculture Park to volunteer as “guardian angels” to monitor growth and public interaction with the structure. Please contact the APP group for more information after the structure has been built. Please see section 6 above for contact information.

THANK YOU SO MUCH FOR YOUR DESIGNS AND COMMENTS!!!

Please send them to Ms. Renee Jensen, Senior City Planner at the City of Auburn at rjensen@auburnny.gov by MAY 15th

If you have questions, Ms. Jensen can be reached at the email or 315-253-3513 and Ms. Bonnie Gale, Willow Artist at bonwillow@frontiernet.net.