

## Gangamma's Mandala: The Tropical Home or Village Garden

Bill Mollison

(Extract from *Permaculture: A Designer's Handbook*, 1988, Tagari Publications, PO Box 1, Tyalgum NSW 2484 AUSTRALIA)

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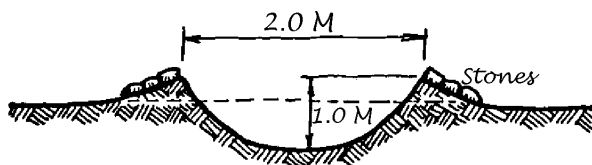
*The mandala garden provides an excellent example of both advantages and problems of using curvilinear shapes in gardening. Besides the advantages that Bill lists, there are at least two other major benefits. First, this is a very beautiful garden. beauty attracts the garden's most useful symbiote, the gardener.*

*These gardens draw us in on emotional and aesthetic planes. We may visit to commune with Earth spirits, but we surely also notice that the parsley needs thinning or that the hot peppers have reached the fire-truck red stage and need harvest. [Earth spirits expect such observations from us.] Furthermore, this garden has an enormous amount of edge, which, **if properly organized**, can magnify yield immensely.*

*One must learn this method of gardening, however, to locate plants in the correct aspect to shade and sun, to harvest the benefits of companion planting and avoid excessive competition, to get a feel for planting distances, root growth, water needs, and other factors, all of which differ from conventional gardening in kind and complexity - DH*

In Taiwan and the Philippines, small (90 square meter--970 square foot), intensively planted home gardens feed a family of five all year. I have added to these designs my own permaculture "least path" layouts to give a very concise and effective model of sustenance garden design for tropical and subtropical regions. These can also be adapted to temperate regions, using suitable species. The overall pattern can be altered to fit almost every site form, but is presented here as a flat site pattern. Although the building of such a garden is fast and simple, the theory and design input are sophisticated.

The whole design owes much to the work of the East-West Institute in Hawaii, and the Samaka gardens of the Philippines, but the layout is purely permaculture. I have named the total layout "Gangamma's Mandala" after one of our Karnataka (India) permaculture design graduates.



**Figure 18.** The banana-sweetpotato-papaya circle garden.

Steps in the process are:

1) At the center of a 100-square-meter (1075 square foot) or larger area, describe a circle two meters (six feet) across and excavate the soil to a dish shape, ridged on the perimeter, and about 0.6 to one meter (two to three feet) deep from hollow to rim. This is the banana-sweet potato-papaya circle garden, as in **Figure 18**.

Then cover the whole circle with wet paper or wet cardboard, banana leaves, or any sheet mulch material and fill the hollow (or over-fill it as a dome) with "rough mulch" of short logs, coarse twigs, hay, rice husks, and sawdust, or indeed any humus-creating materials. A little scatter of manure, ash, lime, dolomite, or fertilizer can be added. If stones are available, bank them to the outside of the rim.

Then plant the rim with four to five papayas (a tall variety), four or so bananas (dwarf types), and eight to 10 sweet potato plants. If available, place yams or taro *inside* the rim. Later, plant beans to climb the banana and papaya stalks.

2. A circular sunken path 0.6 to one meter (two to three feet) wide is sawdusted or graveled around this central circle garden, and off it, five-six "keyholes" or indentations are made. The garden now looks like **Figure 19**.

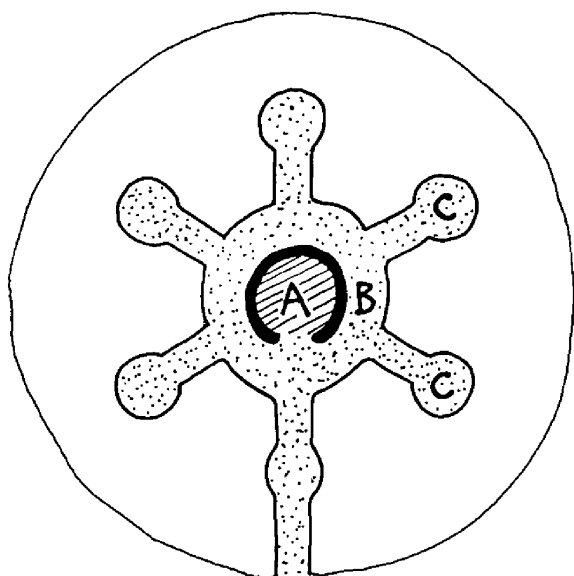


Figure 19.

- A. Mulch or circle garden=banana circle.
- B. The annular path.
- C. The keyhole paths.

3. Around each 'keyhole,' a bed 1.5 to two meters (five-six feet) wide is first edge-banked with soil 100-200 cm. (four to eight inches) high to prevent water run-off. Then paper and mulch the beds as for the banana circle. The garden now resembles **Figure 3** in plan. The thick lines represent low earth ridges.

We have thus made six major keyholed beds, each of which is separated from the next by a thin strip of lemon-grass (*Cymbopogon c<sup>3</sup>itratus*) or vetiver grass (*Vetiveria zizanioides*). Just outside the periphery ridge, plant strips of lemon-grass, comfrey, and arrowroot (*Canna edulis*) for a "kikuyu grass barrier," and behind that, a taller border of cassava/banana/papaya/pigeon pea/*Leucaena* /*Crotalaria* forms a hedge or windbreak. All these borders yield mulch, forage, barrier effects, or food. The whole mandala is fenced, or has spiny woven hedge boundary for cattle exclusion, if necessary.

The mandala has been earth-shaped and mulched to prevent run-off and to conserve moisture. Now plant, using buckets of good soil, the following "zones" of plants.

A. On the track edge border of the central path and keyholes, within scoop-reach of the path, plant those frequently plucked or everyday greens of high value. The placement and selection criteria here are

that **all the plant, or most of it, is picked for much of the year.** These are the "path side greens." They include all the chive and shallot species, plenty of parsley, coriander (cilantro), thyme and sage, celery, broccoli, edible chrysanthemum, chard, and any long-bearing or perennial greens, e.g., various perennial "spinaches". This is therefore a narrow border to the inner side of the keyhole beds, planted in the ridge soils there.

B. Behind or outside the path side plants, we plant a 1 meter (three foot) wide strip of species that are **frequently picked over a short season to a long season**, e.g., tomatoes, eggplants, sweet and hot peppers (chilies), bush or staked beans and peas, kale, corn, okra and so on.<sup>4</sup> These are the "narrow bed" plants, all within reach of a path or keyhole. As yet, we do not need to step on any beds to harvest.

C. Just out of reach, on the outer borders of the keyhole beds, plant most long-term root crops (potatoes, sweet potatoes, carrots) or any crop we "cut off and remove" (cauliflower, head lettuce, and cabbage). Thus, for this crop we step (once) on the bed to harvest and replant, following root crop with fava beans or dahl (dried beans or lentils).

In the banana circle, we can place a grid or platform of wood over the mulch, and this then becomes an outside shower or wash-up area. Replant all beds as harvested, and apply a top mulch of straw, sawdust, bark, dry manure, or chips annually (or as convenient--DH). Feed rabbits, guinea-pigs, chickens, or small livestock weeds, waste vegetables, household scraps, and forage greens from the border hedge (comfrey, cassava, *leucaena* or lemon grass). Cut for mulch vetiver grass, lemon grass, etc., three to five times annually. The roots of vetiver grass prevent rodents from burrowing from "outside" as do root masses of *Euphorbia* species.

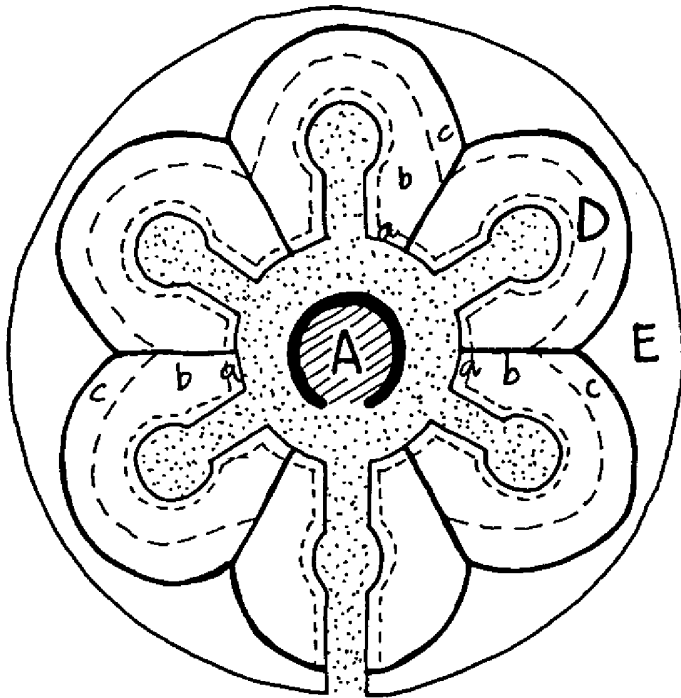
Plant all trees, shrubs, and tubers before you lay any mulch, including sheets. Then add about 300 cm (a foot) of trodden-down, wet mulch. Transplant tray seedlings eight to 10 cm (three to four inches) high. Plant large seeds such as peas or beans, each in a hole scooped into the mulch. Use a double handful of soil in each hole.<sup>5</sup> Thickly scatter small seeds (lettuce, carrot) on lenses of soil 500 cm (one and one half feet) across and five to eight cm (two to three

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inches) thick, placed and firmed on top of the trodden mulch. After broadcasting the seed, dust them with a one cm (one half inch) thick layer of fine soil. All seed can be pre-soaked. The whole bed needs a good soak with a sprinkler at each stage.

If the mulch contains no weed seeds, the beds are weed free. It takes nine to 15 months to build up a worm population and a good soil. Push any surplus compostables under the top mulch layer.

maintain, provides everyday greens, minerals, vitamins, allows no water run-off, and can be built on ANY substrate (rock, concrete, roof areas). We can plant a *leucaena* or palms for high shade and mulch, at the junctions of the keyhole beds. The hedge surround eventually provides the annual mulch.



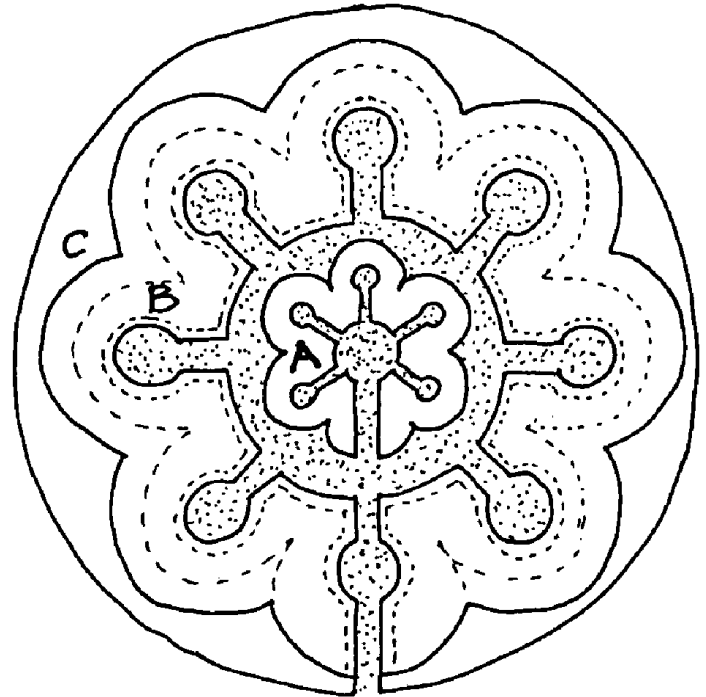
**Figure 20.**

D. Keyhole beds about 15m across.

E. Hedgerow and barrier plants.

Zones in keyhole beds:

- a. pathside greens.
- b. narrow bed plants.
- c. one-visit crops.



**Figure 21.** A mandala with combined hexagonal and octagonal arrays.

A. 5 banana circles.

B. 8 keyhole beds.

C. hedge edge and barrier.

A larger garden, designed for a community kitchen at a rural center in Karnataka<sup>3</sup> state (India), uses a core assembly of four to five banana circles and has eight to 12 keyhole beds. In this case, a keyhole accesses the banana circles. Any one of these banana circles can contain a small pond for frogs and water convolvulus (water spinach - *Ipomea reptans*) or taro.

This garden is intensively planted, has very little path per bed area, and easy to build and

We here combine basic nutrition, soil building, rainwater harvest, eventual self-mulching, various weed and animal barriers, small livestock fodder, overhead shade, non-dig gardening, "least-path" access, direct waste water dispersal, and a pleasing design. Any improvements are welcome. This is a challenge to your further revelation or intuition. Try it, teach it, spread it, refine it.

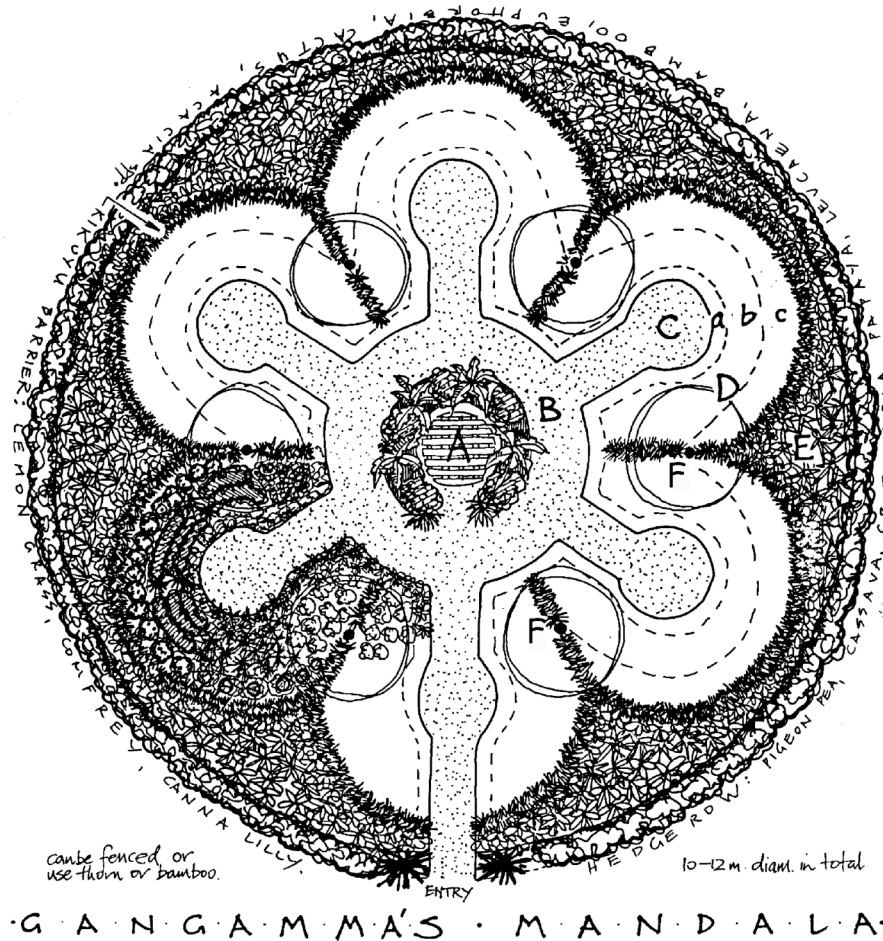


Figure 22.

A. Banana-papaya circle with shower-wash grid fitted.

B. Sawdusted, rice husks, or gravel paths.

C. Keyhole paths as B above.

D. Keyhole beds: a. pathside plants, b. narrow bed plants, c. one-visit plants.

E. Weed, wind, animal barrier-hedge sequence, e.g., [inner --> outer] vetiver or lemon grass, comfrey, arrowroot, taller hedge of cassava, papaya, crotolaria, leucaena, pigeon pea and banana.

F. In garden trees are leucaena or palms for shade in hot regions.

## Nelson's Mandala by Dan Hemenway

Several years ago, I prepared a permaculture design for the Granary Wholefoods Inc., of Orange Park, Florida (USA). I asked Nelson Helmut, the Granary's owner, to explain his vision for the site. He wanted several things, paramount of which were plantings of mostly native Florida food plants, a pond and a mandala like the one he saw illustrated in Mollison's Permaculture Designer's Manual.

With a site 100 feet wide by 300 feet deep, I felt stymied at how to fit everything into the site. I looked up the mandala illustrations in Mollison's book, and the solution jumped right out at me. I made Nelson's pond the mandala paths, and put the beds around the edge, an inversion of Bill's idea, but one that worked. We had a situation something like chinampas (See TIPS Journal, Vol. 1, No 3.) The resulting design is on the next page.

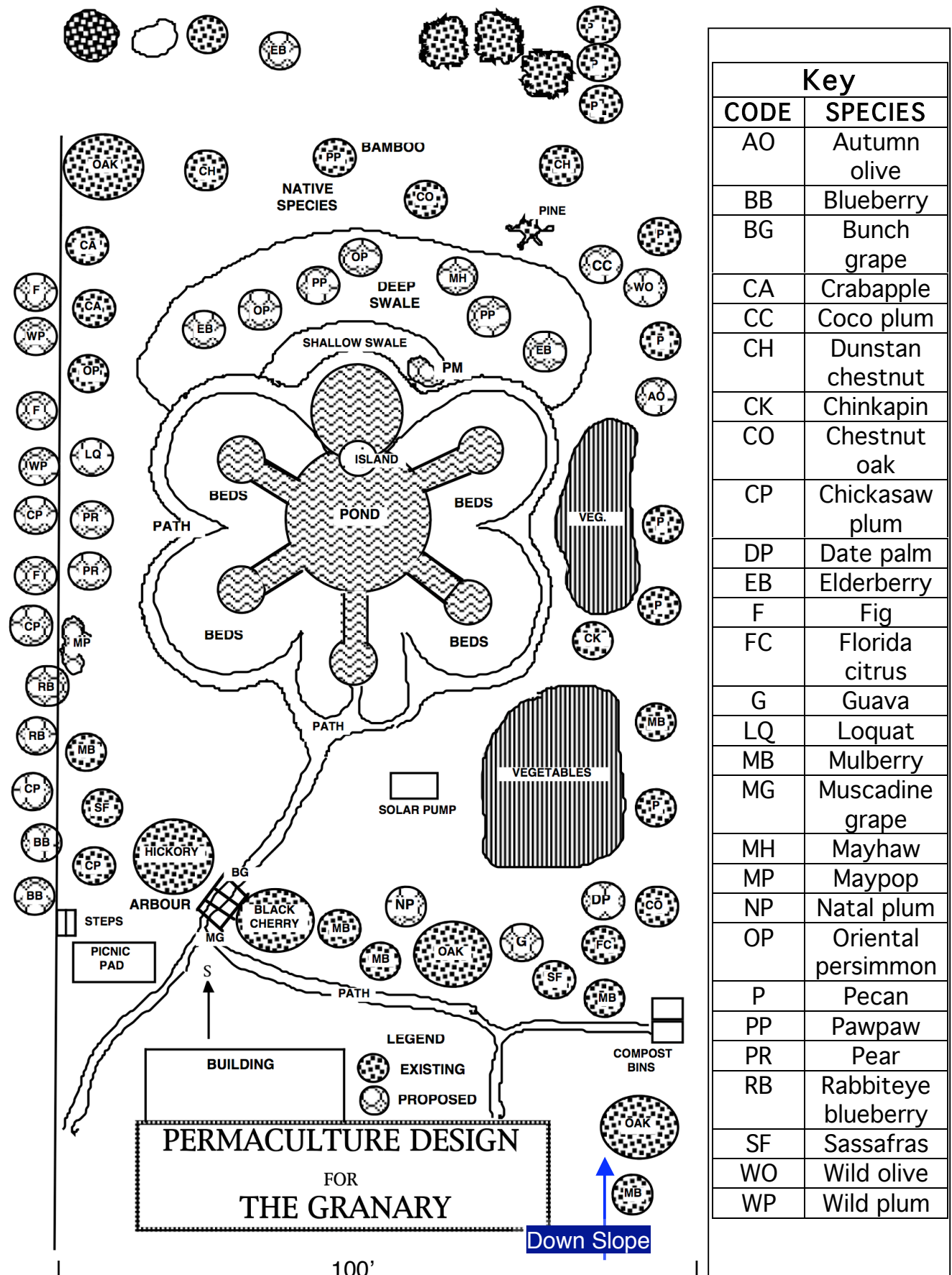


Figure 23. Nelson's mandala.

This is the second iteration of the design. My daughter, Cassandra was digging the pond as part of her permaculture design internship. She encountered a water oak sapling that she felt should be spared. So redesigned slightly to retain the oak on the island shown.

Because the area received considerable runoff from parking lots, buildings, etc., I wanted the design to be able to absorb a great deal of

### **Draw a Mandala** Dan Hemenway

I describe how to draw the mandala on the ground. You can easily infer from these instructions methods for drawing the plan on paper or with a computer.

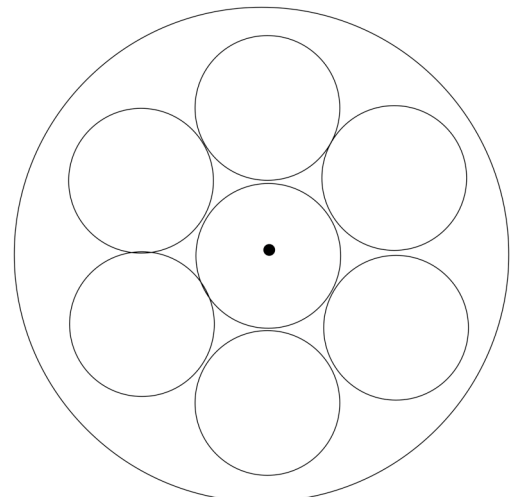
First, drive a stake or pin into the ground where the center of your mandala will be. Now attach a string to the pin and make a knot about half the diameter of your inner circle. Walk around, holding the string tight, drawing the circle at the knot. On dark soil you can draw with ground limestone, wood ash, or gypsum. On light soil you can draw with charcoal, which is very good for the soil anyway. Or you can scratch the circle with a pointed stick.

This circle is the basis for your mandala. Drive a pin anywhere on the circumference that you have drawn on the ground. Using the same string and the same knot, go straight out from the circle and drive another pin, just lightly at first. Make an arc, using the string, from this new pin. If it is tangent to the circle, you have succeeded. If it overlaps, move the pin a little ways back and try again. (There are ways to get the center of the next circle right on the first try, but this is probably simpler.)

water. However, because the soil is sand, we had to seal the pond. The solution was to incorporate a pair of swales behind the pond to absorb water when the runoff overflows the sealed excavations. The swales are of different depths to accommodate plants with different moisture preferences and different flooding tolerances.

Now draw a new circle, tangent to the first one. Keep adding circles around the center circle, taking care to keep each circle tangent to both the original circle and the one to the right or left. Six should fit exactly. The center of the original circle serves as the big circle's center, also. The big circle is the boundary of your defensive perimeter, so you need to have designed it before deciding how far from the mandala center to make it.

Your Earth art should look about like this:

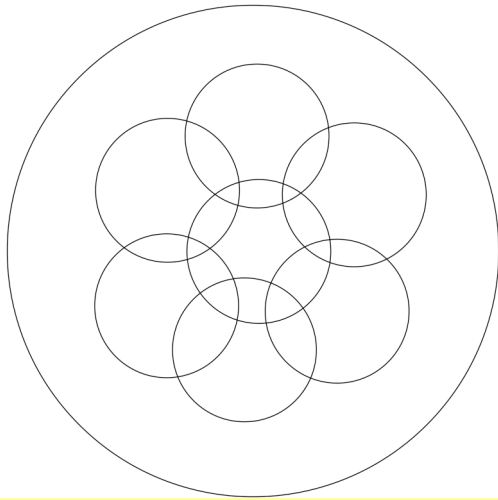


**Figure 24.** Mandala outlines.

You can see that this differs from Bill Mollison's design. Hexagonal array of circles overlaps the center circle a bit, and so perforce

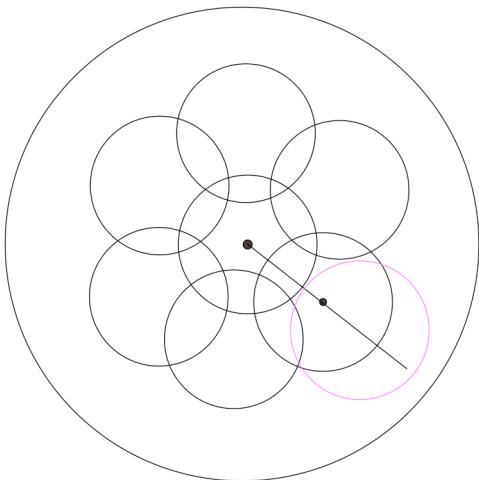
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they also overlap each other. The first Earth drawing would therefore look more like this:



**Figure 25.** Basic Earth drawing for a Mollison-style mandala.

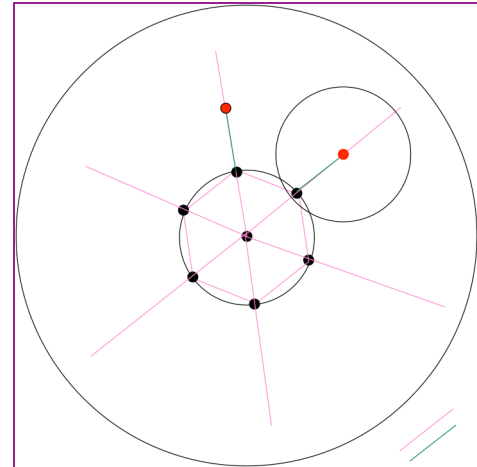
If you started with something like **Fig. 25**, you will want to ensure that you bring each circle in toward the center directly, without leaning to one side or the other. To do this, stretch a string from the pin at the mandala center and the center of one of the satellite circle pins. Drive the pin for the new center along this line.



**Figure 26.** The pink circle is the original of one of the satellite circles. The center pin been moved inward along a line between the two original pins. The new center is show here.

This is actually the way you would work on a computer or on paper. On Earth, there is an easier way. The knot on your string marks off the exact radius of your inner circle. The radius fits inside the circle exactly six times. Drive a pin anywhere on the

circumference, keeping in mind where you want to enter the mandala. Move the knot over the circumference on either side and drive another pin. Repeat until you meet the point where you started. You will have six pins around the circumference. Extend a line from the center pin past each pin around the circumference. Decide how much overlap you want for your satellite circles and shorten the distance to the knot (make a new knot) by that amount. Drive a pin along one of the radiating lines at the distance you have determined your satellite circle shall be from the center.

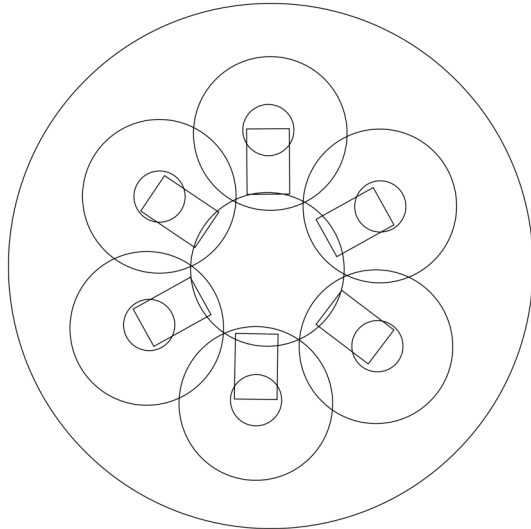


**Figure 27.** Sink six equidistant pins temporarily around the circumference of the inner circle. The distance between pins is the same as the circle radius. Extend a line (pink here) from the center pin well past each of the six outer pins. We have arbitrarily selected a distance shorter than the radius. We drive a pin or stake (red spot) the chosen distance (green line). That pin (red) becomes the center for a new circle of the same size as the center. Because the two circles are closer than their diameter, they overlap. For more overlap, reduce the distance between the black pin and the red pin.

By this process, we draw on the ground a set of overlapping circles such as seen in **Figure 25**. The amount of overlap in **Fig. 25** exceeds that in **Fig. 27**. This is subject to the designer discretion.

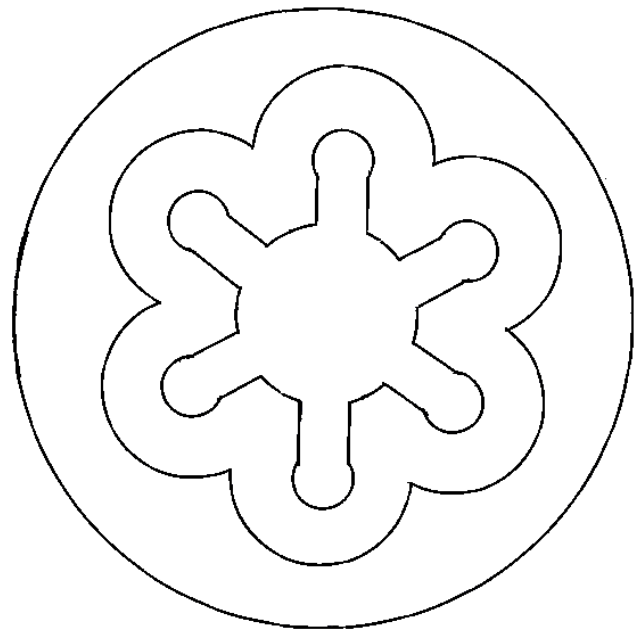
The next step is to draw smaller circles inside the perimeter array of six, based on the same center pins. Again the designer's discretion applies. A good starting point would be  $1/3$  the diameter of the larger circles.

Now draw aisles connecting the little circles with the center circle. I've drawn rectangles because on the computer that is easiest. However two parallel lines suffice.



**Figure 28.** The mandala, all but complete.

Now all that remains is to rake out or cover over the lines you do not want.



**Figure 29.** You have drawn a mandala on the ground.

## More Curves in the Garden Crescents, Wheels, and Spirals

### **Casting Fertile Crescents** by Michelle Maggiore

*Michelle Maggiore was a student in our permaculture design course online. Each student prepares a personal report on some topic. This was hers.*

When people doodle, invariably they draw patterns- subconscious imprints from the landscape inside and around themselves. My daughter likes to draw animals in her downtime; my husband is fond of drawing people, usually old men with beards. (Himself in 20 years?) I happen to be a mandala doodler. I also seem to draw eyes, usually concentrating on the pupils and irises- the circular.

What I am attempting to do now is to translate my subconscious circular-loving right brain to my landscape, which is a partly inherited and partly self-imposed system of boxy beds and linear crop rows. Maybe our long thin rectangular acre on a long thin peninsula of Southeastern Virginia has also influenced previous gardeners here as well as myself. In any case, it is time for a change! I finally began to study permaculture

more in-depth like I have wanted to since moving here five years ago, and it is obvious to me the landscape and its inhabitants will be much happier and healthier if more circles, crescents and curvilinear patterns are introduced (or should I say re-introduced) to Moonwise Farms....

Although I am a novice, fewer mistakes have been made here when I followed my heart instead of my head. For the lawnmower in my family, I thought it would be practical to introduce clean lines and edges in places. But I couldn't bear to do that when planting strawberries, and my daughter Ajah, who was five or six at the time, insisted on a crescent shape for her "own garden" some years ago. Even though I could've planted the same things in other beds, the moon plants and sunflowers appeared more beautiful and vibrant, and the