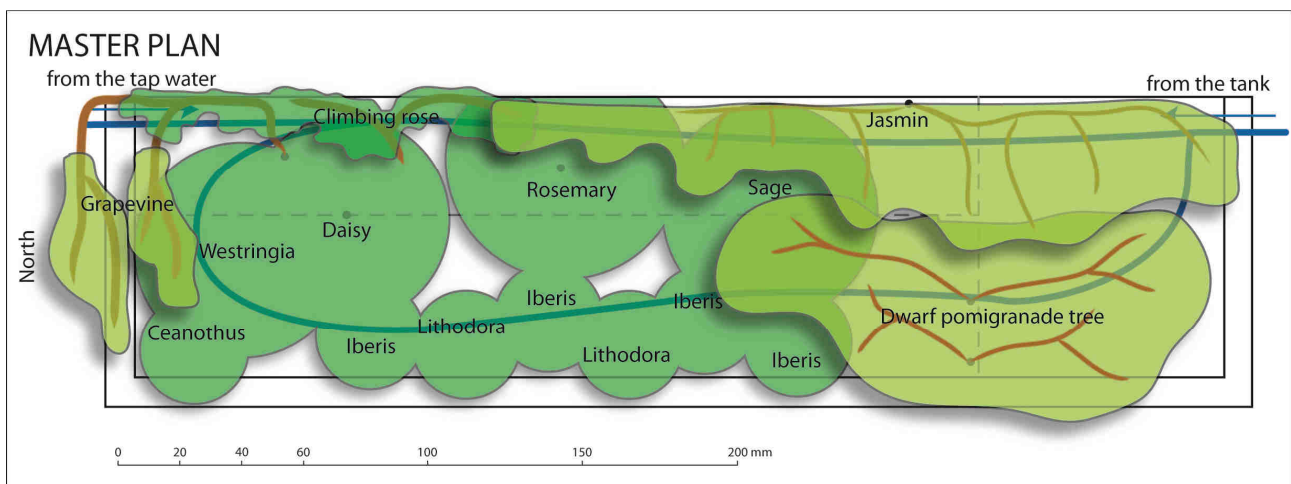


FLOWERBED

Podgora road (Ravenna) – Italy



March 2016

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I SUMMARY AND LESSON LEARNT

This design is for a four square meters flowerbed in the garden of my house. The plants are watered using the rain water collected in a tank, fertilized using the compost and vermicompost produced from the kitchen waste and the pest management is a mix of physical tools (against cats) and a mix of different plants and compost tea.

I have observed the flowerbed for more than a year and I realized that the main issues are:

- The presence of two cats that damage plants by their very acidic pee
- Lack of water in the summer months (mainly July and August)
- The presence of very hungry insects (*Zygina rhamni* and *Empoasca vitis*) that damage the leaves of the aromatics.

To design the flower bed and to solve or at least try to handle the problems listed above, I try to learn from where I had gone wrong, especially with cats. On the other hand, the design served to place the plants and to decide how to manage the water.

As for the problem of water in the summer months, at the end of the summer I will know if the choices made have proved successful or if I have to do some tweaking .

In relation to insects, during the autumn and winter time I have worked on the soil by adding compost and covering it with mulch in order to add some microorganism in the it. In Spring I will prepare some compost tea to spray on the leaves of the plant and I will add some more compost as inoculum on the soil under the mulch layer.

The soil regeneration is going well, unfortunately from spring to autumn is not possible to use a soft mulch layer (straw for example) due to the cats; they like to pee in it. Therefore I have eliminated the mulch layer with consequences on the regeneration process and on the plants too. Next spring I will try to sow dwarf clover as a cover crop in order to eliminate the mulch layer. The watering system is working very well but unfortunately in summer there is no rain from mid-June to the end of august and so it is necessary to have the double system (water from the tank and water from the tap). The main issues to solve is the leaves eater insects. I didn't want to use any form of strong poison to kill them and so I chose to create an environment more rich and diverse in order to attract competitors or antagonists. Unfortunately this strategy didn't work and the plants are suffering really a lot. Next year I will try to clean and burn everything and in June if the

insects will be there again I will try with the fungal spore strategy. A different possibility could be to add in the flowerbed only plants that are not affected by these insects.

I.1 ETHICS

Earth Care: to have healthy plants I need an healthy soil. I will continue to improve the flowerbed soil by adding compost and by leaving as much as mulch is possible.

People care: a good-looking and scented flowerbed will improve the family garden, and we will enjoy to stay outside and having lunch or dinner in the garden near the flowerbed.

Fair Share: I can see a share in the sense that I create a green area where flowers and plants thrive and where animals (from the reptiles to insects to birds and cats) can spend their time looking for food, rest and protection.

I.2 PERMACULTURE PRINCIPLES:

Observe and interact: I have observed the flowerbed and its visitor for more than 10 years, many things have changed and I know this is only a new step in the constant evolution. Every step on the other side, is base on the observation of the years before.

Catch and store energy: water collection and storage in the tank. Sun energy stored in the beauty of plants and flowers.

Obtain a yield: the yield will be in the form of fruits (grapevine and aromatics) and in the form of beauty and perfume.

Apply self-regulation and accept feedback: cats are really good guru in this sense. Together with climate cats forced the situation and let me recognize what was going on and what nature was telling me. Change and doing is a good answer.

Use and value renewable resources and services: I will use the sun energy and the rain water to grow plants. Unfortunately the timer will be battery charged. I will think about this and try to find a better solution.

Produce no waste: All the waste produced within the flowerbed will remain on top of the flowerbed soil or added to the compost heap which is in the front house garden.

Integrate rather than segregate: I will let the cats to enjoy the flowerbed, rest on it, play with insects, lizards and birds, therefore I integrate cats with plants, I don't need just their poo, pee and digging.

Use small and slow solution: the collection of rain water from the roof to the tank and the water system are slow solutions.

Use and value diversity: in the flowerbeds there will be perennial and annual, flowers, plants, climbers, shrubs and many between insects, reptiles and birds.

Use edges and value the marginal: I valued the wall by adding a metal net to let the climbers climb on and I will study a solution for the semi-shade area in the south in order to add a tolerant plants.

Creatively use and respond to changes: adding the metal net for discourage cats from digging, pee and pooing in the flowerbed.

I.3 DESIGN TOOLS

- Base maps
- Client Interview
- PASTE
- Zones
- Sectors
- SWOC

II INTRODUCTION

In our house in Ravenna we have a great resource, a garden inside the house. At the beginning the garden was covered with grass and plants but three years ago we decided to make some works in order to improve the use of it. We paved the garden with stones and we created a flowerbed with bricks.



Figure 1: Image of the garden and the flowerbed.

The Permaculture design method chosen for this project is the **S.A.D.I.M.:**

Survey, **A**nalysis, **D**esign, **I**mplementation, **M**aintenance.

III SURVEY

III.1 OVERVIEW:

The flowerbed will take place in a garden inside a house. The garden is 6 x 4 meter and is completely surrounded by buildings and walls. The surrounding roofs will provide the water for the plants and some climbers (vine and jasmín) will provide some shade.

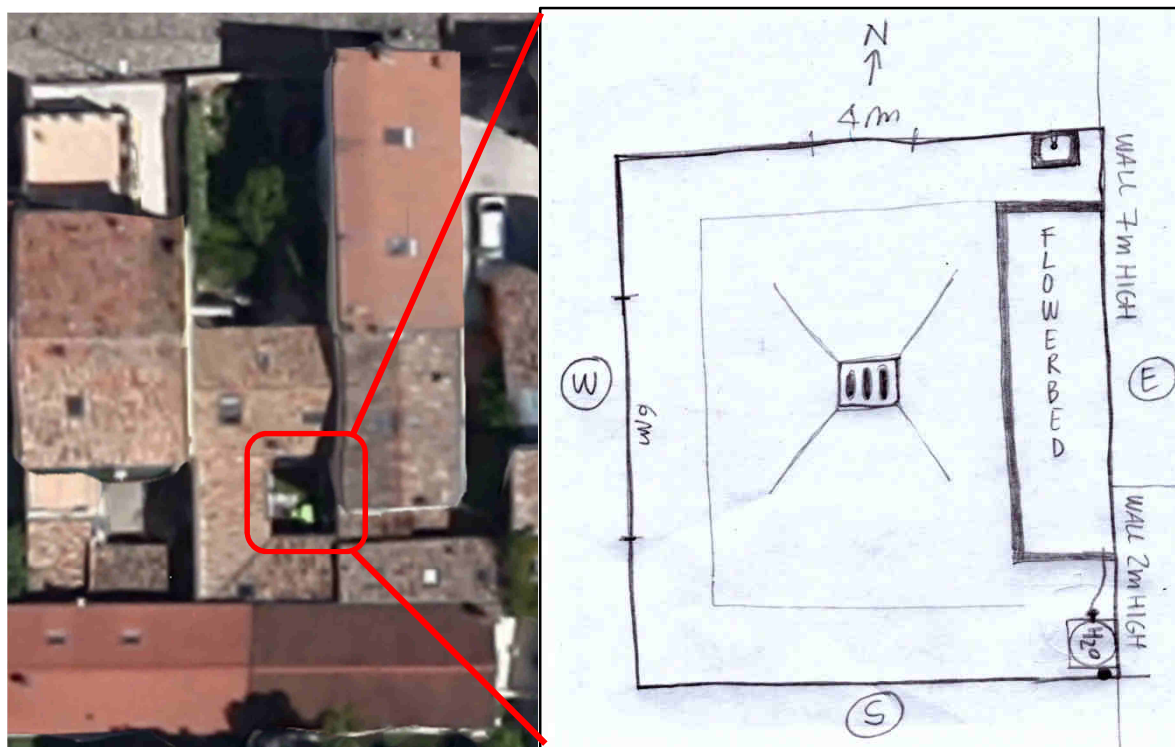


Figure 2: Draft map of garden inside the house in via Podgora 10 - Ravenna.

III.2 CLIMATE

Altitude: less than 15 m wsl

Precipitations:

769.2 mm/year average 1960-1999;

546.4 mm/ year average 2000-2010

Snow: normally between December and March, max 50cm. Late frost in April with an average of 2,8 days of frost in April.

Late frost: they could occur between the 16th of March to the second half of April due to cold winds coming from the Balcans. The minimum temperatures are registered at dawn and the duration can be from a few hours (normally 1 or 2 after dawn) to a max of 10 hours in extreme situations.

Drought: strong from April to May, medium from May to July

Temperature: Min -5° C, Max 35°C

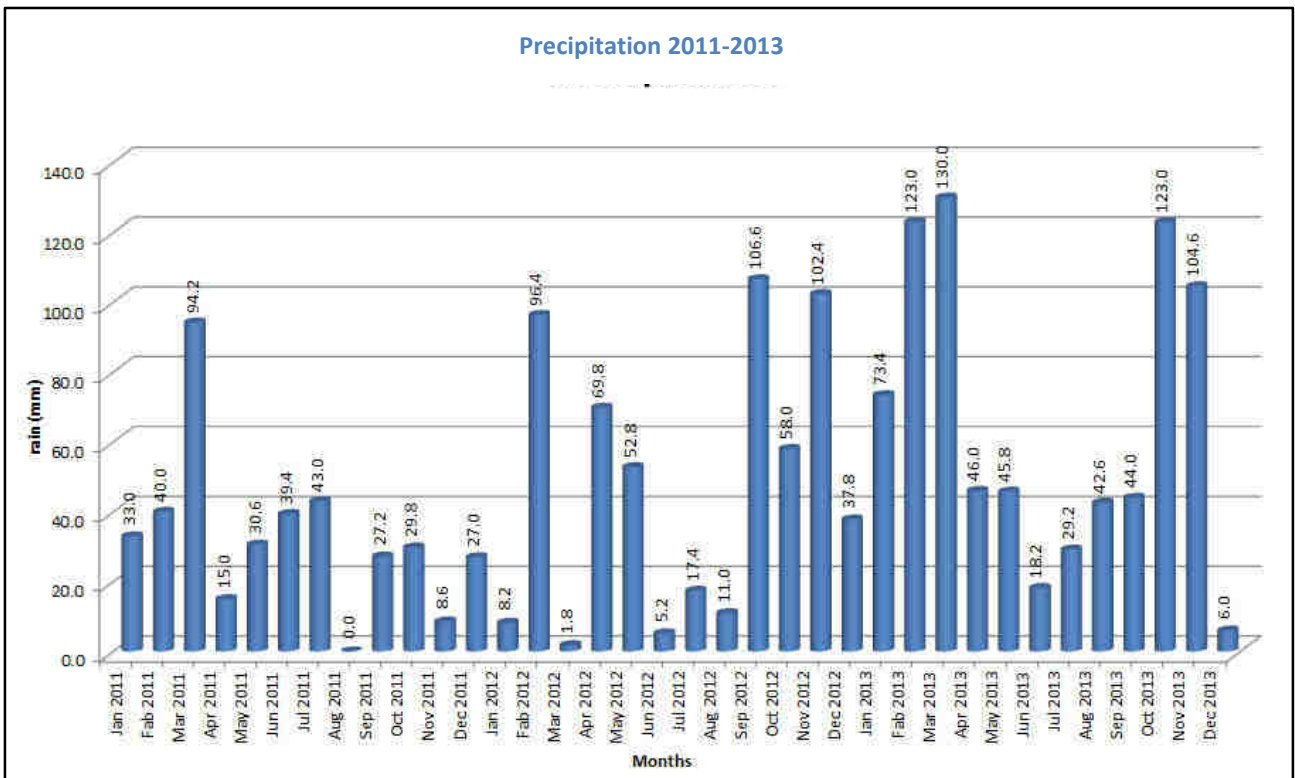


Figure 3: Monthly precipitation diagram for the last three years (2011, 2012 and 2013)

Winds: Winter: from North-West, Spring and Summer: from East and South-East and Autumn: from West and North-West. The wind between the buildings are always different and in this particular case, the winds come from the top of the wall (East side) down to the flowerbed, but only when the wind is stronger than the majority of the times (say less than 10 time in a winter). In summer the vine protects the flowerbed from the wind.

III.3 CLIENT INTERVIEW

The interview has been done on the 10th of February 2015.

- **Name:** Andrea Minchio and family.
- **Address:** Via Podgora 10 - Ravenna - ITALY.
- **Dimension of the garden:** the garden is 6 x 4 m and the flowerbed is 1 x 3,7 m.
- **Number of people in the garden:** 4 (my family)
- **People visiting and living the garden :** friends.
- **Works and skills:** Good
- **VALUES:** No use of synthetic fertilizers, Permaculture, No waste, No chemical products to spray on the soil or plants.
- **Food attitude:** Omnivorous but mainly vegetarian.
- **Age:** from 2 to 43.
- **Economic situation:** Not a lot of money to invest (say less than 100 €)
- **Resources:** tap water, big roof
- **Type of property:** family property.
- **Restrictions:** none
- **Potential weather adversities:** Snow and ice, heavy rain.
- **Maps:** land register maps, Google map/ Bing
- **Requested products:** flowers, aromatics, perfume and good-looking flowerbed.
- **Privacy:** no.
- **Priorities:** regenerate the soil, plant the flowers.
- **Water:** tap water and rain water.
- **Soil:** good.
- **WANTS:** Flowers and aromatics, good-looking and scented flowerbed
- **NEEDS:** low maintenance systems, water, self-sufficiency, fertile soil, fertilization, pest control.
- **Winds:** in winter cold winds come from the top of the wall direct into the flowerbed.

III.4 P.A.S.T.E. (Plants, Animals, Structures, Tools and Events)

PLANTS	ANIMALS	STRUCTURES	TOOLS	EVENTS
1 dwarf pomigranade 1 vine tree 1 <i>Jasminum polyanthum</i> 2 plants of white daisy 1 plant of rosemary 1 plant of <i>cattleya</i>	Worms Birds Cats Snails and slugs	Tap water		Drought in summer

III.5 ZONES AND SECTORS

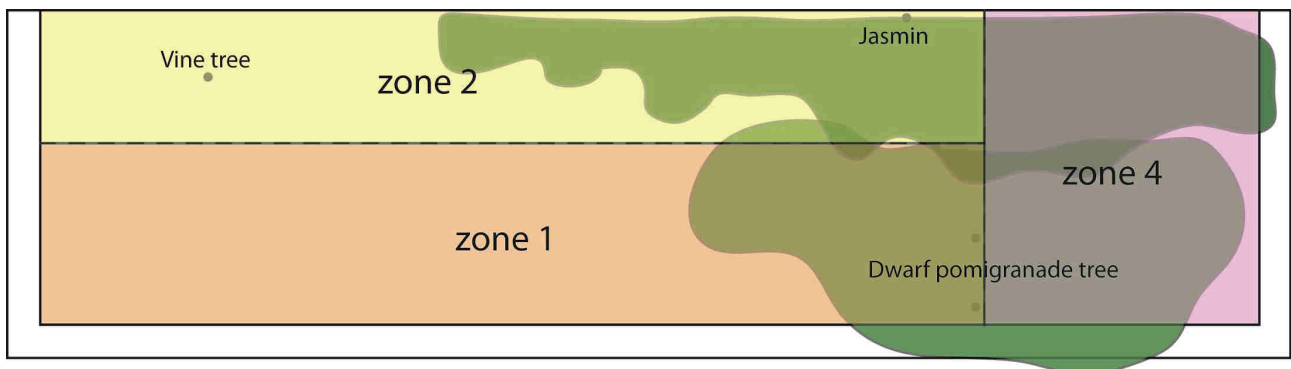


Figure 4: Flowerbed zone map

The flowerbed can be divided in three zones:

Zone 1 in the easier to reach zone, the one in front of the user. In this zone is easy to take care at the plants, remove dead flower and leaves, make some pruning and treatment.

Zone 2 is the one in the back, not easy to reach. In this zone we have to plant higher plants or climbing and also those plants that need less maintenance work.

The zone 4 is at the end of the flowerbed, this part is almost always in the shade due to buildings and Pomigranade.

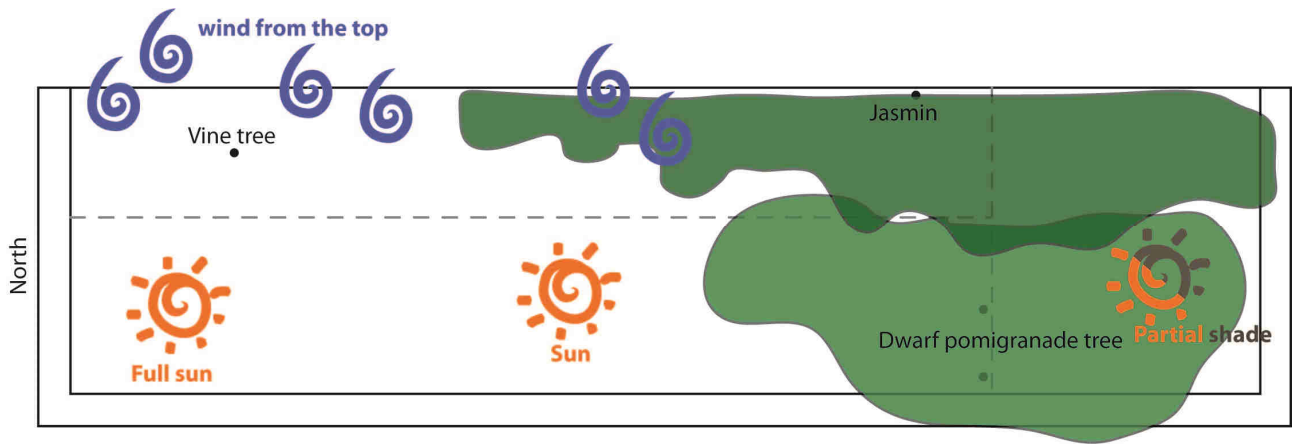


Figure 5: Flowerbed sector map.

This is the sector map; there is not a lot to say except for the sun exposition and the wind. The flowerbed is well exposed to the spring and summer sun and in summer the sun could be even a problem because of the heat. Due to its particular position in a garden between buildings, the flowerbed is affected by strong wind coming from the top. This kind of winds are very an-usual and may occur less than 10 times in a year.

IV ANALYSIS

IV.1 NEEDS, WANTS AND VALUES

NEEDS	WANTS	VALUES
Water	Flowers and aromatics	No use of synthetic fertilisers
Self-sufficiency	Good-looking flowerbed	No chemical products to spray on the soil or plants
A good and fertile soil	Scented garden	No use of poison
Low maintenance		No waste
Fertilisation		Permaculture principles
Pest control		

IV.2 LIMITING FACTORS

There are two cats that stay in the garden and they can pee and poo in the flowerbed and/or damage the plants by sitting on them or by playing with them.

Lack of water in the summer months (mainly July and August)

Presence of very hungry insects that damage the aromatics

IV.3 FUNCTIONS, SYSTEMS and ELEMENTS

FUNCTIONS	SYSTEMS	ELEMENTS
Irrigation	Raised tank (220L)	Support Tank Timer Irrigation line 1 tap 3 m tube (backup)
	Dripping lines	7 m. dripping line tube Ø 16 mm 1 taps
	Tap water	2 m pvc tube Ø 16 1 tap
Pest Control	Mulch	Straw Rice chaff Sawdust Wood shavings
	Beneficial insects hotel	Recycled wooden box Canes Straw Wood logs Drill and tools Nails and screws
	Reptiles nest	Stones Branches
	Spray with compost tea	Compost tea Nebulizer
	Soil improve	Humic acid dynamised Compost Vermicompost

	Fungal war	Use of Beauveria bassiana spores
Fertilization	Compost inoculation	Compost
	Compost spray	Compost tea Nebulizer
	N fixers plants	Lupins, beans and peas
	Pee	Direct pee on the flowerbed Pee in plastic bottle
Perfume and beauty	Aromatics	Rosemary Sages
	Flowers	Sages Daisy Ceanothus Nepeta Climbing rose Bulbs
Low maintenance	Irrigation system with timer	Drip lines Water tank Timer connectors
	Use of healthy and strong plants	
Cat protection	Net cover	Metal net

IV.4 WATER SYSTEM

The flowerbed is very well exposed to the summer sun. During the three summer months the rain is very low and a bit of help may be needed. We can use the surrounding roofs to collect water and store it in a tank.

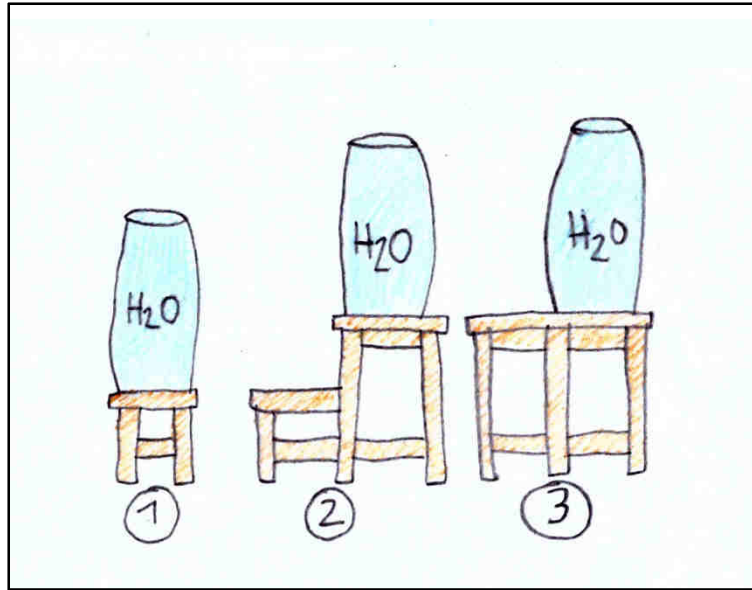
I need to put the tank on a support in order to improve water pressure and let the irrigation system work.



Figure 6: Rain water collected from the roof and stored in a tank. From the tank to the dripping line system.

SWOC ANALYSIS

To decide the typology of support I have used a SWOC Analysis.



	STRENGTHS	WEAKNESSES	OPPORTUNITIES	CONSTRAINTS
1	Cheap Less space Easier	Less stable Less secure	More space around Easier to install the irrigation system	No place for other things except the tank
2	More stable More secure	More space occupation More expensive More difficult to built	Lower part is ok to place a plant	Limits the opening of the hatch
3	More stable More secure	More space occupation More expensive	During winter time can become a small greenhouse	Limits the opening of the hatch Good support for thieves

I have selected the support number 1 because it is the easier to build and I decide to fix it to the wall in order to make it safer. I also change the material from wood to concrete bricks, they allow me to mount the support very fast and they will last forever.

IV.5 CAT PROTECTION

Cats have proven to be a big source of problems for the plants. They like to sleep in the flowerbed between plants and they also like to pee and poo in it. Last year I planted several aromatics and I did not protect them from the cats, at the end of the summer the plants were all suffering and some of them died.

Some years ago to protect plants and to avoid cats from digging we used to lay a metal net on the ground, and it worked. Therefore I will add a light metal net (the one used for building chicken coop is perfect) to protect the soil and to discourage cats from digging, peeing and poeing in the flowerbed.



Figure 7: metal net to protect the soil from cats digging and to discourage cats from peeing or poeing.

In addition to the metal net covering the soil it was necessary to add a second level of plant protection. A different metal net was added around each plant.



Figure 8: metal net around plants to avoid cats to damage them.

V DESIGN

V.1 WATER SYSTEM

The water system is composed of a dripping line which go around inside the flowerbed, connected to the rain water tank in one side and to the tap water in the other side.

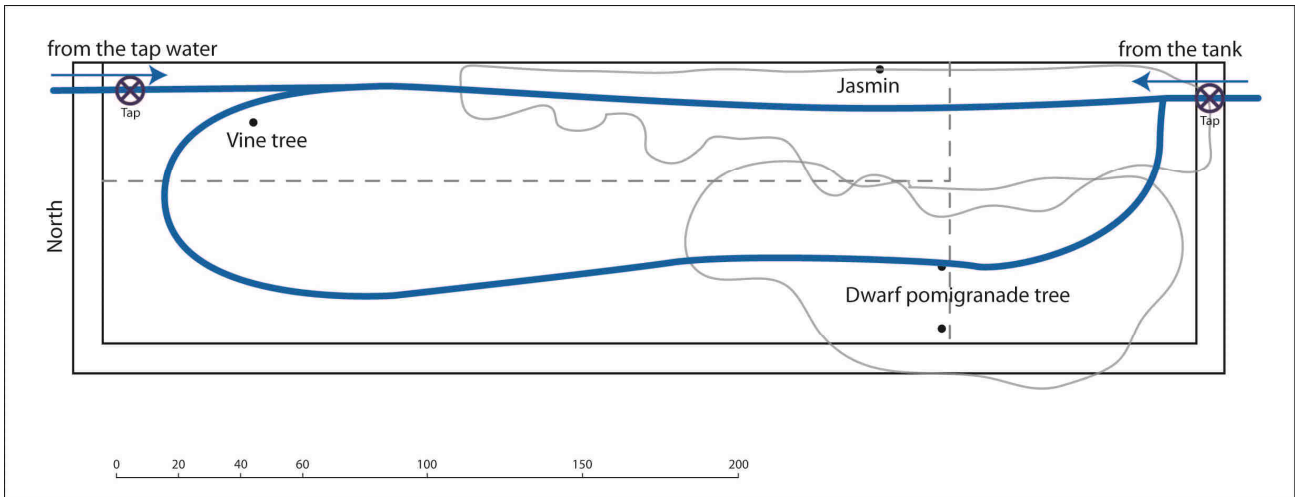


Figure 9: Water system scheme.

During the spring and autumn the drip lines is connected to the tank with a timer that regulate the amount of water to use; in summer there is not enough water in the tank due to poor rain events, therefore the drip line is connected to the tap water with the timer, in order to guarantee a source of water for the plants.

V.2 PLANTS POSITION

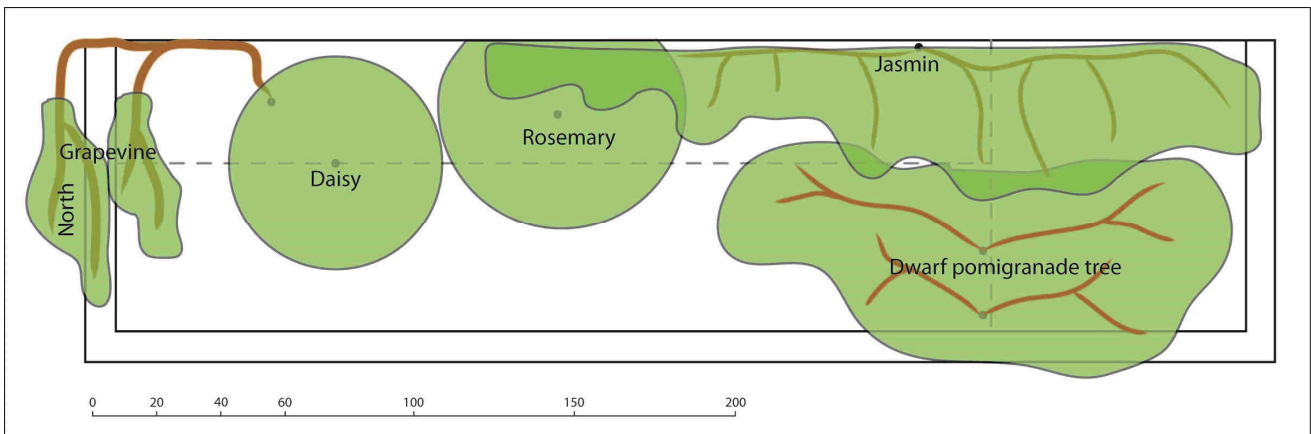


Figure 10: Existing plants.

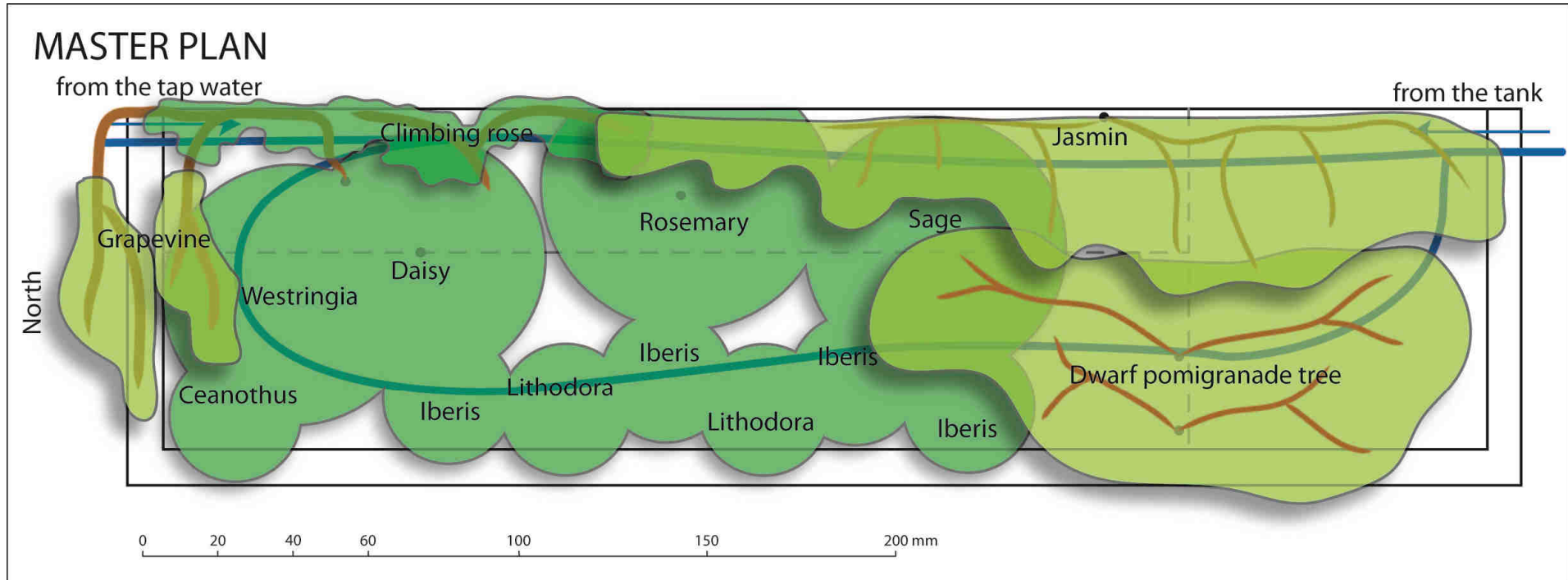
The perennial plants we are going to add are:

2 Lithodora: Lithospermum is a choice groundcover or rock garden plant, making an unforgettable display when grown well. Plants form a low, creeping mat of hairy grey-green leaves, studded with sapphire-blue star flowers from late spring through summer. Plants MUST have a well-drained, acidic soil in order to thrive. Heavy clay soils are sure death. In colder regions this will benefit from a light covering of evergreen boughs as soon as the soil is frozen in late fall. Combines well with Heaths and Heathers, since plants have similar requirements. Evergreen where hardy. Not especially vigorous.

1 Ceanothus: Ceanothus is a large genus of diverse, versatile and beautiful North American native shrubs in the buckthorn family Rhamnaceae, many native to California, and some endemic to Sonoma County. Ceanothus species are easily identified by their unique leaf-vein structure shared by all plants within this genus. The ovate leaves, mostly with serrated edges, have three prominent parallel veins extending from the leaf base to the outer margins of the leaf tips. The leaves normally have a glossy upper surface, and vary in size from 1/2 inch to 3 inches. Many of the very drought-tolerant species have spiny, holly-like leaves. Bloom period is generally March into May. Ceanothus species are used as food plants by the larvae of some butterfly and moth species, and also attract bees and other beneficial insects, so can be considered components of a habitat garden, or an Integrated Pest Management program. Several members of the genus can form a symbiotic relationship with soil micro-organisms and fungi, forming root nodules which fix nitrogen. This is a reason why fertilizing is not normally recommended--adding fertilizer may just kill off the good micro-organisms and make room for the bad ones. Ceanothus plants are better left fending for themselves.

1 Climbing Rose: Large-flowered climber. Romantica. White or white blend. None to mild fragrance. 103 to 105 petals. Average diameter 5". Large, very full (41+ petals), in small clusters, cupped, old-fashioned bloom form. Blooms in flushes throughout the season. Tall, climbing, spreading. Large, semi-glossy, dark green, dense foliage. Height of 5¾' to 6¼' (175 to 190 cm). Width of 5' to 5' 10" (150 to 180 cm). Can be used for cut flower, garden or pillar. Remove spent blooms to encourage re-bloom. Remove unproductive wood every third year or so.

V.3 MASTER PLAN



VI IMPLEMENTATION

VI.1 COSTS

Plants:	50.00€
Tank:	recycled
Water system (timer, tubes):	recycled
Accessories for tubes and tank:	13.30€

At the end of last year in the flowerbed there were some aromatics (in very bad condition) a dwarf pear tree, the pomigranade, the grape vines and the jasmine. The soil was covered with a mulch of pine barks.

In Spring I have eliminated almost all the previous plants and the dwarf pear tree while leaving the pomigranade, the grape vine and the jasmin, oxygenate the soil by lifting it with a 4-tine fork/aerator, add some sand and compost and mulched with leaves and straw. At the end the flowerbed was ready for new planting.

In April I planted the requested plants. Everything was fine!

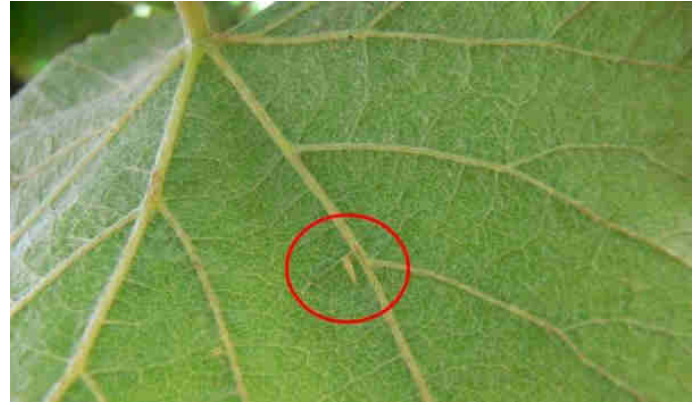
In may I have sprayed compost tea on all the leaves of the plants and on the soil. After the treatment it seemed that the plants enjoyed it.

In June the insects started to attack the plants, I have prepared a water container (20 liters) with a mix of chopped *Artemisia absinthium*, nettles and comfrey, leave it for 40 days and then sprayed on the leaves in order to kill the insects. The insects did not suffer from the mix and they are still there.

In July I have made some researches and I found out that the insects that are killing all the plants of the flowerbed and also of the garden are:



Empoasca flavescens



Zygina rhamni

The insect usually spend the winter in the adult stage on plants with persistent leaves (Conifers). In spring (late April- May) the overwintering adults lay their eggs inside the ribs of young leaves. From these eggs originates the first generation that flickers in June; followed by a second generation, the most dangerous, in high summer (August) and a third in late summer (September-October) that will generate the overwintering adults.

To control them there are some startegies:

Among the natural enemies we can include some *Hymenoptera parasitoids* and some *Hemiptera anthocorid* predators. Another form of control can be to spray *Beauveria bassiana* spores.

Beauveria bassiana is a fungus that grows naturally in soils throughout the world and acts as a parasite on various arthropod species, causing white muscardine disease; it thus belongs to the entomopathogenic fungi. It is being used as a biological insecticide to control a number of pests such as termites, thrips, whiteflies, aphids and different beetles.

VII MAINTENANCE

To organise the flowerbed I decide to prepare a year work schedule. The schedule will help in managing the flowerbed in the best way, it will come in a printable format and could be used as a diary as well.

MAINTENANCE SCHEDULE

SPRING

- € Check water system (add timer, add battery, connect dripping lines)
- € Fertilization: add compost as inoculum at the soil.
- € Sow annual flowers
- € Spray compost tea on plants leaves
- € Set the timer of the water system
- €
- €

Notes:

SUMMER

- € Spray compost tea on plants leaves
- €
- €

Notes:

AUTUMN

- € Clean the flowerbed from leaves and all flowers
- € Harvest the grapes from the grapevine
- € Mulch the flowerbed soil with a thin layer of straw or dead leaves
- € Remove the timer
- € Disconnect water system from the tank
- € Prune Lithodora by half to maintain the compact shape of the plant
- €
- €

Notes:

WINTER

- € Prune grapevine
- € Prune jasmin
- € Once every three years check the tank inside (next check will take place in 2018).
- €
- €

Notes:
