

Creating a bog garden



Introduction

In May 2009, my wife and I decided that our ca. 900 m² garden was in need of a facelift. Maintenance had been falling behind, partly because I was working abroad, so the garden had become an unmanageable jungle full of weeds. Besides that, there was a huge weeping willow in the garden, which despite regular pruning (3 times a year) became bigger and bigger and by now covered 200 m² of the garden. Nothing would grow in these 200 m² because of lack of light and water. After much deliberation we decide to bring in the bulldozers, i.e. to take out most of the existing garden and start with a clean slate. The only part that would remain unchanged was the north-facing rock garden. Of course, a variety of plants was saved from the old garden to be placed in the new. One of the new focal points of the garden would be the bog garden, one of my wishes, as I had always found carnivorous plants fascinating, particularly Sarracenias and Droseras.

The new garden, including the bog garden, was created in the period September 2010 to April 2011 guided by a garden designer.

Design – Location

The location of the bog garden had to meet several criteria: rain water had to flow in, excess rain water had to flow out, and there had to be protection from wind, cold and the fierce afternoon sun.

The choice was made to create the bog garden on the north side of the garden, next to the existing rock garden. This space would be sheltered by the rock garden to the west, a series of raised U-elements and the house to the south, and a 2-meter tall beech hedge to the north (*Fagus sylvatica* 'Purpurea', particularly suitable as a windbreak because it keeps its leaves in winter). To the east would be a new gravel patio with a greenhouse. This meant the bog would be protected from wind from all sides.

The rain water is supplied from the roof of the house. Excess water could drain away into the rock garden, which consists of a thick layer of river rock on a sand base. As the rock garden was already 20 years old at this point, it was extremely stable. To further protect the bog from the afternoon sun, we planned to place small bushes in front of the U-elements making up the south border.



The bog garden is the dark green shape at the top (north side) of the plot. The two grey lines leading into it from the house are the H-profile gutters.

Design – shape

Initially there were two competing ideas. One was to have a bog garden at two levels, with the first being part of the rock garden. On the east side of the rock garden would be a retaining wall to cover a height difference of 60 centimetres. At the bottom of this wall would be a footpath and on the other side of that the second bog. The second idea was to have one large bog garden with a walking bridge right through the middle of the bog. This would not just be interesting for viewing the plants, but also for maintenance. Eventually (at the last minute, to my garden designer's despair) I chose for one large, 20 m² bog. The technical details of creating two bogs were very complicated, and I thought it would be harder to find and maintain a natural balance in two bogs than in one.

Design – water management

The bog garden would receive water from the roof of our house. This water would have to partly drain into the swamp itself and partly into the cistern that would be a reserve for dry times. While it was possible to do all of this underground, I really wanted to see the water flow when it rained. Our garden designer came up with the idea to have the rain water from the roof drain into 2 H-profile steel beams which would lead from the house, across the garden path, to drain into the bog. We thought it was an amazing idea. The water from the other side of the house would be led to the cistern via underground pipes.

Using regional weather data from the national institute for meteorology, I was able to see that from April to August, more water evaporates than there is precipitation. Using the meteorological data, the surface area of the bog and that of the roof, I could calculate how many litres of water would enter the bog and the cistern each month. Combined with the data on water evaporation, I now knew how big the average water shortage would be each month. The average water shortage is largest in July, when there is an almost 2000 litre shortage. By my calculations, the 2000 litre cistern would receive enough water each month to be completely filled, so it would be possible to bridge these shortages (and indeed, in practice this has turned out to be the case). Only if there is absolutely no rain from April to August would I be in trouble – and of course this occurred in the bog garden's very first summer, 2011. Since then I also keep an emergency supply of 250 litres of rainwater in jerrycans, though I haven't had to use them since 2011.

The water from the cistern had to be pumped into the bog garden, and I also wanted a connection with the greenhouse in case I wanted to grow more carnivorous plants there and feed them rainwater via e.g. a drip irrigation system. The whole system was to be connected to my home automation system so that I could handle the watering both manually and automatically based on precipitation and temperature (very important when going on holiday, for instance).

Construction – overground water drainage

One of the first things to be placed were the drainage H-profile steel beams from the house. Two identical constructions were made off-site and then transported to the garden. The H-profiles measure 18x9 cm. Each drain consists of a horizontal part of 4 meters in length and a diagonal part of 2.5 meters in length, plus a vertical leg for support. The horizontal parts were attached just below the gutter on the house. The support legs were screwed onto concrete pedestals placed on the southern edge of the bog. More concrete was poured around them to secure them. This ensures that the profiles won't blow over in a storm. Immediately after placing them, there was indeed a massive storm, which on the positive side showed that the construction worked beautifully, but on the negative side meant the garden turned into a mud pool, and then a swimming pool, and water had to be pumped out to continue with the construction.



The H-profile gutters in the winter of 2010/2011.

Construction – clearing out and base construction

The weeping willow was already removed during the design fase (spring 2010). After I had filled my wood store, the whole neighbourhood could come and pick up wood – it was a VERY large tree. Part of the trunk and the roots remained and were only removed when the construction of the bog garden started in September 2010. Part of the trunk is still in the bog garden to this day.



The area that was to become the bog garden after cutting down the weeping willow. That big piece of trunk remained in the garden as a feature.

For the whole area where the bog garden would be, the topsoil was removed with a digger. This has the advantage of also removing most weeds, root and seed. A small part of the rock garden also had to be dug up, but the rocks were reused elsewhere. (By the way, it was at THIS point, after the digging had started, that I made the decision to go for one bog garden and not two. Our poor garden designer!)

Next, the digger dug out the bog garden, about 100 centimetres deep. The excess soil was taken off-site. (This is the point where the above-ground H-profile drains were placed) Around the pit, hardwood poles were placed in the soil and a wooden edging was attached to these. All sharp objects – rocks, branches, anything that could pierce a liner – were removed and a layer of sand was deposited on the heavy clay soil. A pond liner was placed on top of this (fact: pond liners are heavier than you think). To make sure the liner was placed properly, with no air pockets underneath, it was filled with water. This was easy because it rained cats and dogs right after we placed the liner, and as

the overground drainage pipes were already placed, half a house-roof worth of water was deposited in the liner very quickly. So, within a matter of days I had a beautiful pond.



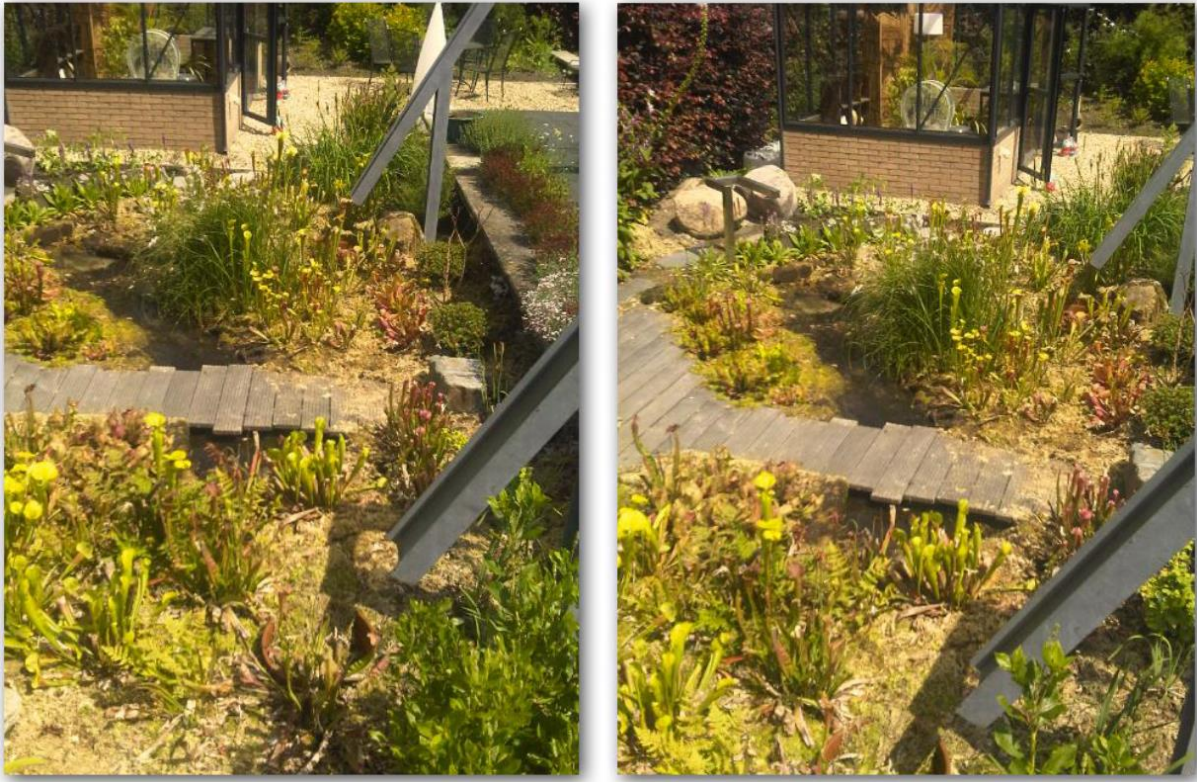
The hardwood edge around the pond and unfolding the pond liner.



Filling the pond liner with water to settle.

After everything had settled, we had to pump some of the water out again so that we could attach the liner to the wooden edge. We did not make any holes in the liner for the bog garden. While it is important that there is not too much stagnant water in a bog garden, I wanted the water to flow away over the edge of the liner into the surrounding garden. Both the bog itself and the surrounding area would be covered with the same soil mixture, so there would be a moist area for marginal bog plants too.

Next, my garden designer started the construction of the bridge. Hardwood poles were used to create the foundation in three places, which support long beams leading over the bog. The walking planks were attached to these, deliberately creating an uneven effect by having them be of different lengths. The bridge appears to be very long but most of it is in fact on solid ground outside of the bog. The height difference between the U-profiles and the bridge is covered by a stepping stone. A few more stones and the trunk of the old weeping willow were placed on the north side to form a further barrier and provide some interest by way of height differences.



Bridge and stepping stone

Construction – cistern and pumps

To capture rainwater, I chose to use an underground tank of 2 cubic meters. Possibly a 3 cubic meter tank would have been even better, but the hole that had to be dug for the smaller tank was already huge. The tank is made of environmentally friendly polyethylene, measures 196x126x171 cm and weighs 100 kg. It has a long lifespan and is completely recyclable.

The digger had to dig a 2.5-meter-deep hole for the tank to be placed. At the bottom, a layer of sand and then gravel was placed to stabilize the tank. After the tank was placed, it was filled with water, before the hole was filled in with gravel, sand and soil. By filling the tank first, it would not be brought off-balance by the work of filling in the hole. Luckily it rained during and after this work, so the soil settled quickly around the tank.



The tank being dug in.

In order to fill the tank with rainwater from the south side of the roof, various pipes and a filter had to be placed. From the roof, rainwater is led to the cistern via underground pipes which run underneath the garden paths and patios. Before it reaches the tank, it passes through a filter to avoid organic material such as leaves and moss entering the tank. The filter is a Trident shaft filter. Rainwater flows over the filter and filtered water flows via the exit 14 cm lower than the inflow to the tank. If the tank is full, rainwater is automatically diverted via the overflow into a gravel pit next to the tank.



The filter being installed. In the right picture, the bottom pipe is the inflow, the left hand pipe leads to the cistern and the right hand pipe is the overflow into the gravel pit.

After placement of the tank, a well pump was also installed in the tank, which is connected to the home automation system. Both the filter and the tank are placed underneath the gravel patio next to the bog garden. To access both for maintenance, the gravel needs to be removed from above the lids. For the tank, a shaft was built over the lid, closed off with a hardwood lid of its own, which can be entered with a ladder. It is a bit of work to inspect the tank this way but it is done regularly.

Controls of the system are centralized in the greenhouse. Water can be pumped into the bog or to a tap in the greenhouse, where it can be connected to a drip irrigation system if desired. Because the pump is integrated into the home automation system, it can be programmed to operate automatically, as well as being controlled via the house computers or via the internet. A few options for automatic use:

1. Fill the bog for X minutes at certain times or days.
2. Fill the bog for X minutes depending on weather circumstances, such as 5 days without rain or an average day temperature above 20 degrees for 3 days.
3. Send an email or text when the temperature in the bog and/or the greenhouse exceeds a certain threshold, so that I can take action even when I'm away.

Construction – filling the bog

In spring 2011, the bog garden was ready to be filled. I wavered for a long time about the best soil mixture. An earlier experiment with perlite granules I considered unsuccessful. The perlite granules are so light that they float to the surface in the waterway and on top of that, the aesthetic appearance of white grains does not have a natural effect in the swamp. So I had to make a choice between peat or a mixture of peat and calcium-free sand. Various books and online information sources contradicted each other. In the end I went for a 50% sand/50% peat mixture. I ordered 13 cubic meters to start with.

At this point, the pit was filled with rainwater again, but I didn't pump any out. Instead I dumped the sand/peat mixture directly into the water, saturating the medium. Over the course of many weekends I moved 170 wheelbarrows worth of peat/sand mixture to the pit (this was most of the 13 cubic meters; the remainder was used for a few small rhododendron bushes elsewhere in the garden). It took so long not just because it was hard work, but also because the water was slowly absorbed by the peat/sand. So after dumping one cubic meter, I had to wait for a day for the mixture to settle before I could continue. The result looked very similar to a regular flower border.

Once all the soil was placed, a decision had to be made about the way the cistern would empty into the bog. There were two options: a natural flow or a water feature. In the end my wife made the decision to go for a water feature. The pump pumps the rainwater up and the water feature sprays it into the swamp. This may seem dramatic due to the impact of the water, but I designed the area so that the force of the water does not impact the plants. Through the middle of the bog garden is a lower area with peat block banks which allows water to slowly absorb into the bog. Sometimes this pool is completely filled, but sometimes it is dry. To capture the impact of the water from the H-profile gutters, I dug a 45x50 cm terracotta pot without a bottom into the bog below each gutter. This way, the rainwater crashes into the pot instead of into the planting. With small water volumes, the water is absorbed through the bottom and with heavy rains, it flows over the edge of the pot.



Left: Water feature pumping rainwater from the cistern. Right: The H-profile gutters drain into dug-in terracotta pots (2011)

With all the construction work done, it was time to give the bog its final shape – and its plants! This turned out to be a lot more difficult than anticipated.

1. First, I experimented with different heights to create different levels of humidity.
2. One week later, torrential rains completely undid all this work as the entire bog, bridge included, as well as the adjoining gravel patio, were completely flooded.
3. I tried to use peat blocks to create a bank around the water pool in the middle. Turns out peat blocks float. They definitely float in torrential rain. I put the peat blocks back in their place and tried to attach them to each other with bamboo sticks. In the next storm, the peat blocks floated away in little rafts of peat and bamboo. Finally, I placed each peat block in rainwater for a week. I then put them back and pinned them in place using bamboo skewers. Since then, they have remained in place.
4. The torrential rains also uncovered a problem with the filter: the water pressure can make the lid pop off, which means the filter than fills with gravel. Turns out the overflow can't handle the truly massive storms. In those (rare) cases, the filter has to be manually emptied of gravel.
5. With these two months of unusually heavy rain, it became apparent that the soil had not settled as much as I thought it had before I started planting. The bog was sinking down more than expected, which meant the plants were in danger of sinking below the edge of the pond liner. This asked for extreme measures: I ordered an extra cubic meter of the peat/sand mixture. I dug out the plants, put them in temporary pots, filled in the bog with the extra soil, waited for it to settle (luckily there was still plenty of rain to help this process along) and replanted the plants. The whole process took a month, but it worked, and all the plants survived!



The stainless-steel water feature. Below it, you can see the bank of peat blocks (2011)



Damage done after first torrential rains. Peat blocks all over the place, plants beaten down – but they survived (2011)!

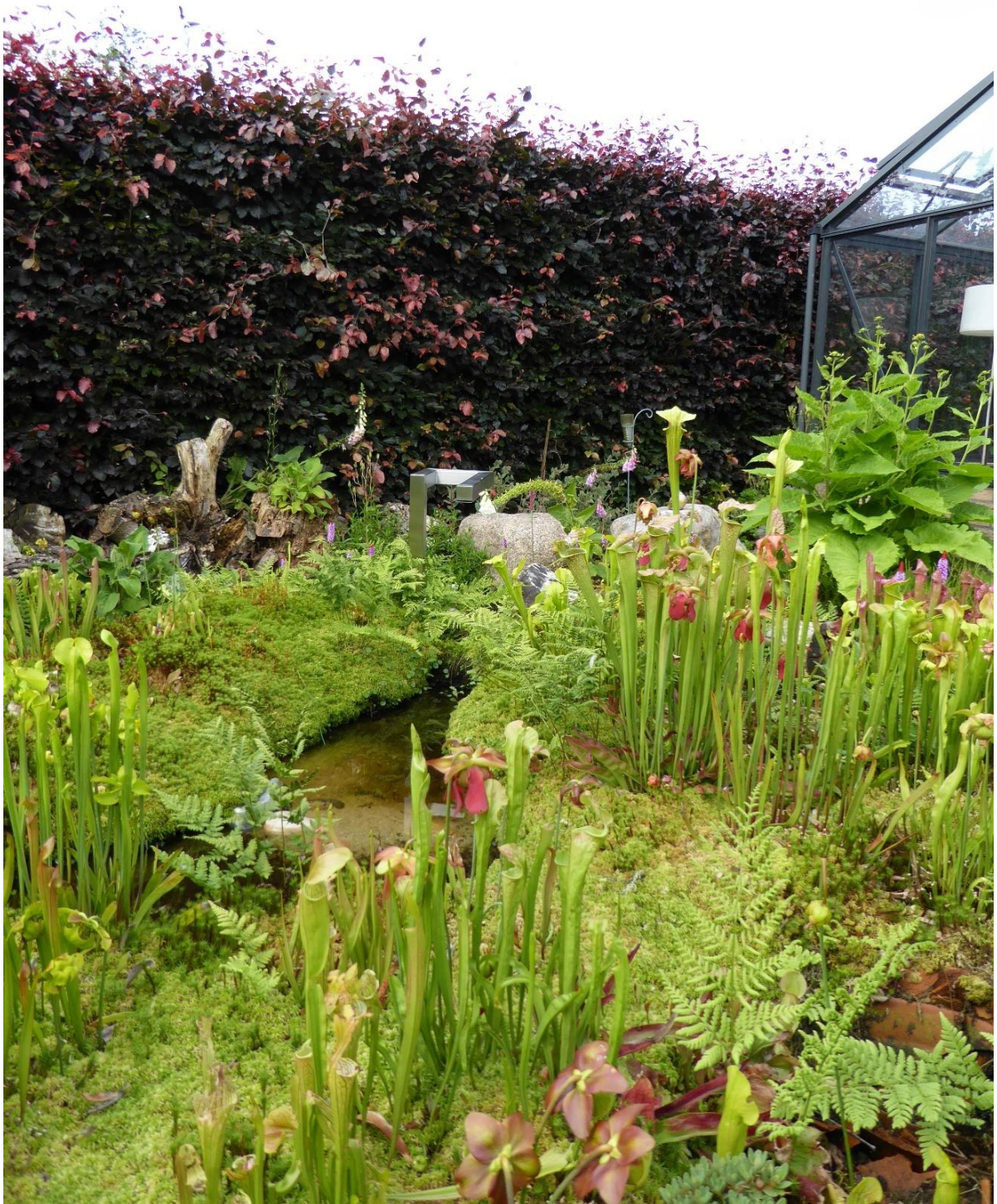
The plants

I bought eight books about carnivorous plants. Tropical carnivorous plants would not survive in our winter. I didn't want to dig out the plants every winter, plant them in the greenhouse and replant them in spring in the swamp.

So I picked the families *Sarracenia*, *Drosera*, and *Pinguicula*. I chose a variety of species from each, both to make the garden look visually more interesting and to increase the odds of any plants surviving. The *Pinguicula* lasted several years, but have disappeared. But all species of *Sarracenia* and *Drosera* survived all the winters. In 10 years I have only covered the swamp 3 times in winter with a foil. These cold winters had the lowest temperatures of -17°C and twice -21°C , measured 50 cm above the swamp. The plants survived all other winters with temperatures down to -12°C with no special measures taken.

The plants of both families also seed. Miniscule new plants are growing all over the swamp. The protection of the peat moss ensures that these young plants do not dry out. I would like to try planting *Pinguiculas* again, because the minimum temperatures are much higher in the last three winters than before.

Final words in pictures







FAQ

What do you do to winterproof the bog?

I fight the **cold wind** and the **frost**.

1. The swamp is protected from cold winds. On the north by a beech hedge of 2.5 meters wide, on the east by a rock garden extending 1 meter above the level of the bog, on the on the south by a raised path bordered by concrete U-elements and on the west by a greenhouse and large shrubs. The beech hedge and rock garden are also a great habitat for sparrows!
2. The swamp contains more than 20 cubic meters. In summer the sun warms the water. And when the air temperature drops below the water temperature, heat is released from the swamp. The foliage of the plants will die anyway, but the clump and roots will not freeze. Of course, for this thermal storage to work, you must have a large amount of water. In a swamp of only 50 cm deep, the plants will have a very difficult time or die.
3. In the early years I used sphagnum moss to cover the bog garden in winter. But I stopped doing that several years ago, because it is not natural (and a lot of work). No plants have died. Moss continues to grow on the soil, providing an extra frost barrier.

Do you have any trouble with pests?

I have about 10 to 15 green frogs in the swamp, but they don't break anything at all. The neighbours' cat likes to lie on the moss to hunt for frogs (unsuccessfully as far as we know). But the cat does no harm. Snails are a big topic, but I don't use poison in the swamp at all (also in the garden). That means I have to catch the snails, which I don't mind. The snails are released alive in a forest (snails are also animals). I never had a carnivorous plant that was mouldy.

Sometimes an invasive plant settles in the swamp. Then I have quite a job to remove such plant without damaging the swamp. On that note, do not plant *Eriophorum angustifolium*. It looks stunning, but is too aggressive and will take over the bog.

Which plants do you have in the bog?

Carnivorous plants

1. *Drosera rotundifolia*
2. *Drosera binata*
3. *Sarracenia purpurea* (various subspecies)
4. *Sarracenia rubra* (various subspecies)
5. *Sarracenia leucophylla* (various subspecies)
6. *Sarracenia flava* (various subspecies)
7. *Sarracenia rosea*

Bog plants (wet)

1. *Ginkgo biloba* 'Mariken'
2. *Campanula* 'Pink Octopus'
3. *Tulbaghia simmlerii* 'Alba'
4. *Tulbaghia violacea*
5. *Dactylorhiza majalis praetermissa*
6. *Veratrum californicum*
7. *Rhodohynoxis*, species unknown
8. *Isotoma fluviatilis* 'Dark Blue'
9. *Cypripedium*, species unknown
10. *Zantedeschia aethiopica*
11. A third orchid, species unknown

Marginal bog plants (moist)

1. *Tricyrtis formosana* 'Seiryu'
2. *Primula vialli*
3. *Iris chrysographes* 'Black Night'
4. *Iris* 'Empress of India'
5. *Saxifraga arendsii* 'Schneeteppich'
6. And more...

Periphery plants (drier soil)

1. *Ophiopogon planiscapus* 'Niger'
2. *Sedum* 'Red Carpet'
3. *Arenaria montana*
4. *Acer*, species unknown
5. *Aquilegia*, species unknown (self-seeded there)
6. And more...