

# The Way to Plant Recycling

The construction of Yurigahara Park started in 1979 as a project to build a memorial park "The World Lily Gardens" for the 50th anniversary of the Showa Emperor's reign. The design was based on a concept by the Department of Agriculture at Hokkaido University and it was completed in 1987.

At the beginning, the soil of the World Lily Gardens covering more than 50 percent of the total area of flower beds in the park would be replaced with new soil to a depth of 30 centimeters every three or four years to keep its condition best for the lilies. However, in 1992, five years after the park was completed, the plants in the flowerbeds began to decline due to the sterile formation of the reclaimed land to which only chemical fertilizers had been applied.

To prevent diseases at Yurigahara Park faded spikes, stems and foliage used to be taken out of the park as waste materials. Also, prunings used to be burnt within the park and mowings and weeds used to be piled up in woodlands. There was a continuous supply of these materials and dumping them just as waste was definitely a waste of money.

In 1991 four compost heaps were built and Yurigahara Park started making leaf mould.

A chipping machine was deployed when Sapporo City's project "The Research for Recycling Prunings"(now "Greenery Recycling Project") started in 1994, which increased the re-use of prunings and wood as mulch. In 1995 mowings and weeds were made into composts and in 1996 more compost heaps were built. As a result, the use of almost all plant wastes in the park became possible including the use of faded spikes and stems as materials for composting. Since 1998, composting from old lily plants has been attempted.

In 1999 a 70-horsepower chipping machine made by JENSEN in Germany and a caterpillar tractor with a grabbing arm were deployed.

Replenishing composts and mulching are essential for Yurigahara Park to maintain the flower beds.

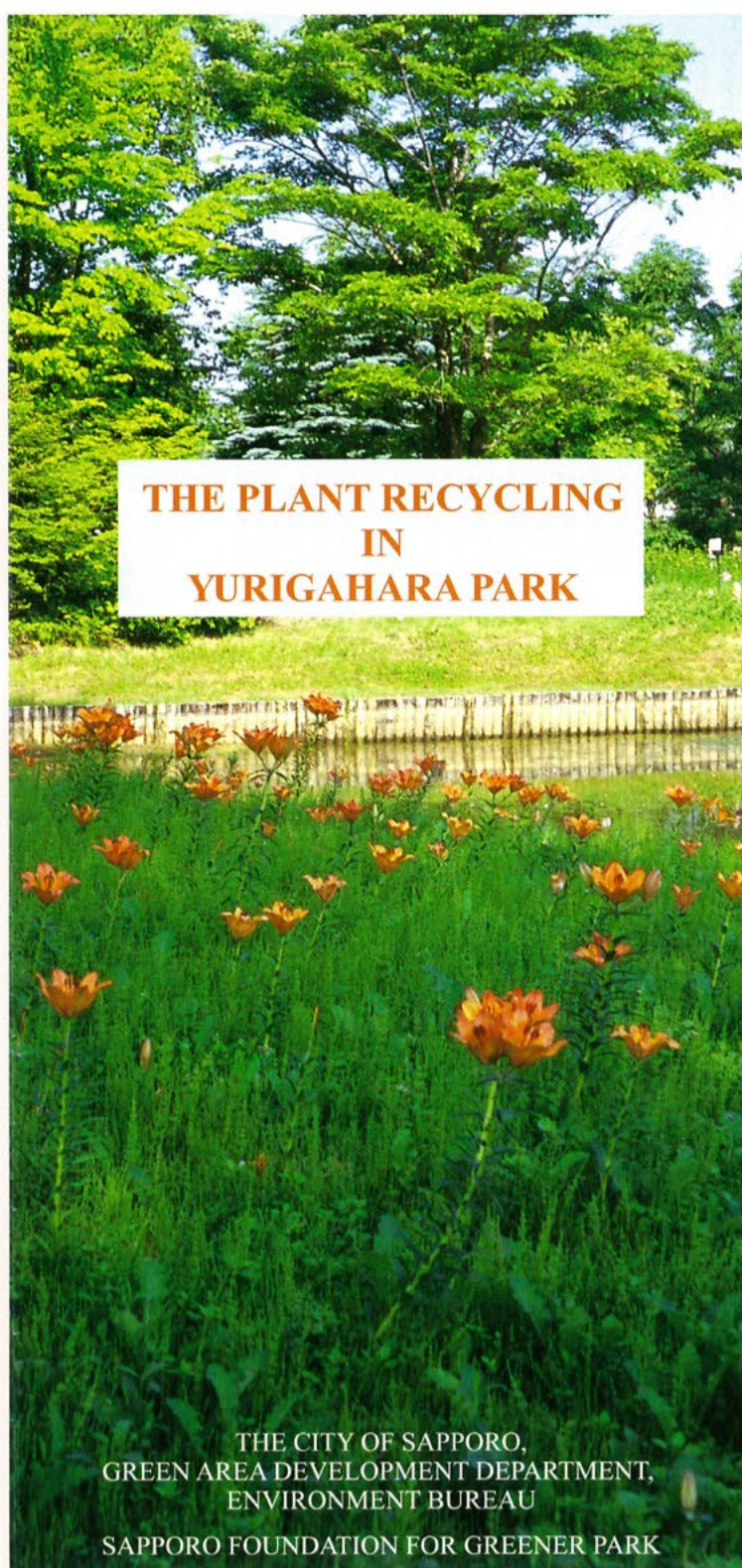
Using plant wastes produced by park maintenance for composting or mulching materials according to each plant waste's characteristic, and giving them back to the plant's roots, is a way to maintain the park without much involving the nature around it. This leads to low cost plant maintenance in the long run since it does not involve the environment very much.

# Greenery Recycling Project

In 1994 Sapporo City started to research into the recycling of street tree prunings, and since 1998 the Greenery Recycling Project has been carried out.

By locating facilities for Greenery Recycling in Yurigahara Park and some other parks, Sapporo City plans to recycle the plant wastes produced by Sapporo City as useful resources.

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# Usage

Plant wastes in the park are sorted into the following four groups according to their characteristics:

- ① Prunings, bamboos, trunks and stumps, timbers, logs.
- ② Mowings, weeds, foliages, stems, spikes and rootstocks of garden plants and straw ropes.
- ③ Leaves.
- ④ Potting soils.

① The materials in the first group take longer to decompose. They are first crushed into small pieces to mulch beds of shrubs or cover roots of trees; this plays a role in preventing evaporation from the surface of the beds, in keeping the ground temperature stable, and in controlling weeds. Also, where people often walk, they protect roots as a buffer.

Trunks more than 50 centimeters in diameter are put in woodlands to be insects' habitats

Timbers and logs are crushed into small pieces and used mainly to cover paths.

② The materials in the second group, so-called grasses, are used as composts for flowerbeds. Tall and hard grasses are first shredded into small pieces and heaped up. It does not take them long to decompose. Therefore, to adjust moisture and oxygen, they must be turned about every other week. The materials which are heaped up from May to July can be ploughed into beds as composts at transplanting in October of the same year.

③ Leaves on paths and specific lawns are collected and heaped up. As they decompose slowly, they are turned several times a year. Some specific plants are mulched with two year old leaf mould, and three year old is mixed into specific plant bed soils. Only four year old and over can be used for seedling beds and pottings.

Leaves collected in Nakajima Park and Maruyama Park are also brought into Yurigahara Park.

④ Old potting soil for lilies which were displayed in the Conservatory is stored in the nursery and used as top-dressing for lawns in specific areas.

Organic soils from seedling beds and orchid pottings are re-used in the soil mixture for perennial beds and rock gardens.

As for prunings of street trees in Sapporo city, twenty percent of the summer prunings are brought into Yurigahara Park and they are crushed, composted and used as composts and mulch. On the other hand, almost all winter prunings are brought into Yurigahara Park and crushed. They are mulched around the trees to protect their roots in several parks in Sapporo city, or they mulch shrubs in Yurigahara Park.

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# Estimated Demands

The amount of composts needed in Yurigahara Park is estimated 285 cubic meters per year.

Plan of Using Composts As of October 1999

| Gardens                     | Area   | Frequency | Annually            | Types of Composts                       |
|-----------------------------|--------|-----------|---------------------|---|
| World Lily Gardens          | 10,740 | 4years    | 134.3               | grasses, leaves, animal manures,        |
| Border Gardens              | 633    | 2years    | 15.8                | summer prunings                         |
| Beds along Lily Train track | 3,788  | 6years    | 31.6                | leaves, animal manures, summer prunings |
| Muscari Walk                | 1,214  | 5years    | 12.2                | animal manures, summer prunings         |
| Fragrant Garden             | 1,200  | 5years    | 12.0                |   |
| Dahlia Garden               | 498    | 1years    | 24.9                |   |
| Rose Gardens                | 1,999  | 5years    | 20.0                |   |
| World Gardens               | 599    | 3years    | 10.0                |   |
| Rock Gardens                | 325    | 5years    | 3.3                 | leaves, summer prunings                 |
| Conservatory                |        |           | 8.9                 | leaves                                  |
| Nurseries                   |        |           | 12.0                |   |
|                             | 20,996 |           | 285.0m <sup>3</sup> |   |

Area : m<sup>2</sup>

The total area where mulch can be applied is estimated 21,689 square meters. Standard depth for herbs is three to five centimeters, for woody plants and roses seven centimeters, and for rhododendrons ten centimeters. The total volume of mulch needed is 948 cubic meters. As approximately thirty percent of the total amount of mulch has to be supplemented each year, the amount of mulch continuously needed each year is estimated 154 cubic meters.

Demands of Mulching Expected in 2000

| Plants( flower-beds)               | Area   | Vol.(1st year) | Vol.  | Suitable Materials      |
|------------------------------------|--------|----------------|-------|-------------------------|
| World Lily Gardens                 | 10,740 | 179.0          |       | leaves, summer prunings |
| Beds along Lily Train track        | 3,368  | 168.4          |       |                         |
| Perennial Boarder Gardens          | 633    | 19.0           |       |                         |
| Fragrant Garden                    | 1,200  | 60.0           |       | summer prunings         |
| Munich Garden & Portland Garden    | 320    | 9.6            |       |                         |
| Japanese Garden & Shen fang Garden | 572    | 57.2           | 17.2  | winter prunings         |
| Roses                              | 2,108  | 147.5          | 44.3  |                         |
| Lilacs                             | 74     | 5.2            | 1.6   |                         |
| Hedges                             | 256    | 17.9           | 5.4   |                         |
| Protection for roots of trees      | 456    | 45.6           | 13.7  |                         |
| Surface for garden paths           | 419    | 83.9           | 25.2  |                         |
| Rhododendrons                      | 1,543  | 154.3          | 46.3  | pine tree prunings      |
|                                    | 21,689 | 947.6          | 153.7 |                         |

Area : m<sup>2</sup>  
Volume : m<sup>3</sup>

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# Separating Plant Wastes and Making Composts

In the park, various kinds of plant wastes are produced. These plant wastes are sorted based on their shape, characteristics and good and bad points for the most suitable re-uses. Usage of sorted plant wastes is divided into three: composts, mulch, and soils.

Sorts and Main Usage of Plant Wastes

| Types of plant wastes   | Sorts                       | Main usage  |
|---|-----------------------------|---|
| weeds, mowings, rootstocks, stems, spikes, straw ropes, straw mat | grass compost               | flowerbed compost   |
| remains of lilies and Lily family plants                          | lily compost                | flowerbed compost (except for Lily family)                              |
| leaves  | leaf mould                  | seedling beds, potting soils, composts for specific lilies & perennials |
| rose prunings   | rose compost                | compost for roses (plan)  |
| summer prunings of broad leaved tree                              | summer pruning compost      | flowerbed compost, mulch  |
| Winter prunings, bamboos  | chips of winter prunings    | mulch for trees & shrubs  |
| pine tree prunings, sphagnum, peatmoss                            | chips of pine tree prunings | mulch for rhododendrons   |
| logs, waste timbers   | waste timber chips          | surface of garden paths   |
| trunks (50cm in diameter), stumps                                 | Stumps                      | Biotope (habitat for insects)   |
| potting soils   | potting soil                | lawn top dressing, flowerbed soil                                       |
| bed soils in the conservatory                                     | soils                       | flowerbed soil  |

**Grass Composts /** Tall grasses and hard stems are first shredded. Weeds and mowings are heaped up in a compost heap. Then 60 kilogrammes of Sapporo Compost per compost heap is blended and they are piled up in layers. The inside temperature of the piled-up composts goes up to 70 degrees Celsius. For about two weeks, they are covered with a sheet to kill weed seeds with the fermentation heat. After that, the piled-up composts are turned every two weeks and again kept warm. The high temperature fermentation is completed in a month. After low temperature fermentation for two months, they are ready to be used by the autumn or the following spring.

**Leaf Mould /** Leaves collected in autumn are heaped up. After the next spring they are turned two or three times a year and are ready to be mixed into soils in the third autumn. Seedling beds in nurseries are composed of four year old leaf mould.

The fermentation temperature of leaves is low and it is slow to decompose because it contains only under two percent nitrogen.

**Summer Prunings Composts /** Materials used for the composts are branches and leaves of street trees pruned in summer. After crushing into two to three centimeters long pieces by a chipping machine, they are heaped up. They contain enough nitrogen to decompose easily. The inside temperature of them goes up over 70 degrees Celsius. To adjust moisture and oxygen, they are turned every other week. It takes about 90 days to finish the high temperature fermentation. In the following autumn, when the low temperature fermentation is over, a compost is completed. For mulching, they are ready to be applied after the high temperature fermentation is over.

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**Chips /** Winter prunings, pine tree prunings, and waste timbers are crushed into two to three centimeters long chips for mulching and paving. Those chips are separately piled up and stored for use.

Main Facilities for Recycling

| Facilities                                  | Standards                  | Quantity |
|---|----------------------------|----------|
| Wood chipping machine ANGELN A328 Alligator | 70hp, 10m <sup>3</sup> /hr | 1        |
| Hay shredding machine Cylinder Cutter       | 6ps, 1.8t/hr               | 1        |
| Wood chopping machine Pick Pine PS42        |                            | 1        |
| Wheel tractor shovel                        | 0.2 cubic meter            | 1        |
| Caterpillar tractor with free grabbing arm  | 53ps                       | 1        |
| Farm tractor                                |                            | 1        |
| Cultivator                                  |                            | 1        |
| 2t dump truck                               |                            | 1        |
| Carriers                                    |                            | 6        |
| Compost heaps                               | W3m×L3m×H1.1m              | 4        |
|   | W3m×L4m×H1.1m              | 4        |
|   | W5m×L4m×H1.1m              | 13       |
|   | W6m×L4m×H1.1m              | 4        |
|   | W12m×L4m×H1.1m             | 1        |
|   | W4m×L4m×H1.1m              | 5(plan)  |



# The Consumption of Composts and Mulch

The consumption during the 1999 fiscal year

| Name of Composts            | Volume (m <sup>3</sup> ) |
|-----------------------------|--------------------------|
| Grass compost               | 78.8                     |
| Leaf mould                  | 57.4                     |
| Summer pruning compost      | 97.8                     |
| Husk compost                | 70.7                     |
| Animal manure               | 93.7                     |
| Chips of winter prunings    | 145.8                    |
| Chips of pine tree prunings | 45.8                     |
| Potting soil                | 25.1                     |

During the 1999 fiscal year, consumption of 398.4 cubic meters of composts and 191.6 cubic meters of chips in the park are estimated.

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### 10 The Lawn Square

**Care of the Lawn:** Mowings are left where they are mown. We aim at a circulatory system, in which micro-organisms decompose mowings and the grasses take in their nutrients. However, decomposition of the dead grass is not very good and areas of disease are conspicuous on the lawn. Promotion of decomposition by micro-organisms has been attempted.

**Mulch around the Trees:** Around the *Populus alba*(Silver-leaved poplar) by the Silo Observatory, which is one of the oldest trees in Yurigahara Park, and other *Ulmus davidiana* var. *japonica* (Japanese elms) are mulched with chips of winter prunings to protect the roots which are damaged by mowing and being stepped on and to control weeds.

**9 The Improvement of the Muscari Walk:** Leaf mould is mixed in when Muscari are transplanted every five years and when tulips are transplanted every year.



### 50 Old Stump's Pockets

Trunks of cut-down trees and stumps more than 50 centimeters in diameter are put in woodlands to be home for insects. Traces of woodpeckers coming to look for worms are seen here.



### 13 The Floral Square

**13 Mulch for roses:** The rose gardens around the monument are one of the first places where mulch was applied. Chips for pulp were purchased and they covered the rose beds in 1991. Some of the chips would be blown off onto the lawns to be an obstacle for mowing. However, chips of prunings solved this problem. The purpose of this mulch is to control the moisture of the soil and annual weeds. Chips of broad-leaved tree prunings are mulched and the depth is kept to five centimeters.

Making composts from rose prunings and leaves and putting them back to the rose beds has been attempted.

**14 Mulch for Azaleas:** On the east side of the Floral Square, the beds of *Rhododendron japonicum*(Japanese azalea) groups are improved by mulching with pine tree chips.

**15 Soil Improvement in the Dahlia Gardens:** Every spring, when bulbs are planted, grass compost is ploughed into beds.

**Care of the Lawns:** Mowings within the Floral Square are left where they are mown.



### 11 The World Gardens

**The Portland Garden and Munich Garden:** Flowerbeds in those western style gardens have been improved with leaf mould and summer pruning composts. Rose beds are mulched with chips of winter prunings.

**Mulch for Rhododendrons:** The *Rhododendron brachycarpum*(Fujiyama rhododendron) bed on the right side of the Cui hun Gate in Shen fang Garden, and the rows of *Rhododendron brachycarpum* along the path between Munich Garden and the Portland Garden have been mulched with chips of pine tree prunings since 1988. The fine roots of rhododendrons have spread in the well matured moulds. The standard depth is seven centimeters.

**Mulch for Azaleas:** The beds of azaleas in the Japanese Garden are mulched with chips of pine tree prunings. The pruning chip mulch is excellent for the rhododendrons' growth especially for root aeration and keeping the soil moisture.

**12 Mulch for the Hosta Garden:** The hosta garden on the left side of the entrance of the World Gardens is mulched with summer pruning composts to control weeds.

## The Plant Recycling Expedition in Yurigahara Park



#### KEY

- 1 World Lily Gardens
- 2 World Gardens
- 3 Conservatory
- 4 Rock Gardens
- 5 Heather Garden
- 6 Rose Walk
- 7 Lilac Collection
- 8 Beech Hedge
- 9 Muscari Walk
- 10 Fragrant Garden
- 11 Perennial Gardens
- 12 Dahlia Gardens
- 13 Rose Gardens
- 14 Border Gardens
- 15 Hydrangea Collection
- 16 Wisteria Pergola
- 17 Lawn Square
- 18 Lily Train
- 19 Restaurant Yurigahara
- 20 Garden Shop
- 21 Playgrounds
- 22 Croquet Courts
- 23 Park Golf Courses
- 24 Rhododendrons
- 25 Old Stump's Pockets

### 1 The World Lily Gardens

**Composts:** Every three years lily bulbs are transplanted. For lily cultivars, grass compost(50 l/m<sup>2</sup>) and home made husk compost(30 l/m<sup>2</sup>) are mixed into the soil. For lily species which are sensitive to diseases, leaf mould(50 l/m<sup>2</sup>) is mixed.

**Mulch:** After bulbs are planted, the beds are mulched with summer pruning compost to enhance the lilies' stem-roots and to control weeds. Also, mulching prevents the surface of the ground from being compacted by raindrops. Beds of rhododendrons are mulched with chips of pine tree prunings to adjust the moisture of the soil and to control weeds. The depth of the mulch is kept about seven centimeters. In the Central Garden, *Taxus cuspidata* (Japanese yew) hedges and beds of *Pinus mugo*(Mountain pine) are mulched with chips of winter prunings. The depth of it is maintained at five centimeters. Various young shrubs are still being planted now. They are mulched with chips of winter prunings.

**Surface of Small Paths:** In the groups of *Lilium regale* (Regal Lily) spreading over the south part of the gardens, paths are covered with chips of winter prunings. The paths are pleasant and easy to walk on. However, since they gradually decompose and reduce, more chips need to be added.

**Care of the Lawns:** On the lawns in the Central Garden, mowings are left where they are mown for the purpose of circulating nutrients. However, the old grass builds up and the growth of the roots declines. Potting soils from the Conservatory are used as a top-dressing on the lawns.



### 14 The Border Gardens

The Border gardens are the most sterile gardens. However, the soil has been improved with leaf mould and summer pruning composts. Mulching with summer pruning composts every spring prevents plants in the Border Gardens from thirst by the summer heat. However, almost all mulch decomposes in a year.

### 4 The Rock Gardens

In the Rock Gardens, when flowerbeds are newly made, old potting soils and seedling bed soils are re-used. Five year old leaf mould is used in the replacement of beds.



### 6 The Rose Walk

In the Rose Walk, the Lilac Collection, and the Lilac Walk, the shrubs are mulched with chips of winter prunings to control the moisture of the soil, which is effective to control annual weeds. The standard depth is seven centimeters. They need adjustment for nitrogen shortage.



### 8 The Beech Hedge

The perennials are mulched with summer pruning composts and *Fagus sylvatica*(European beech) hedges are mulched with chips of winter prunings.

