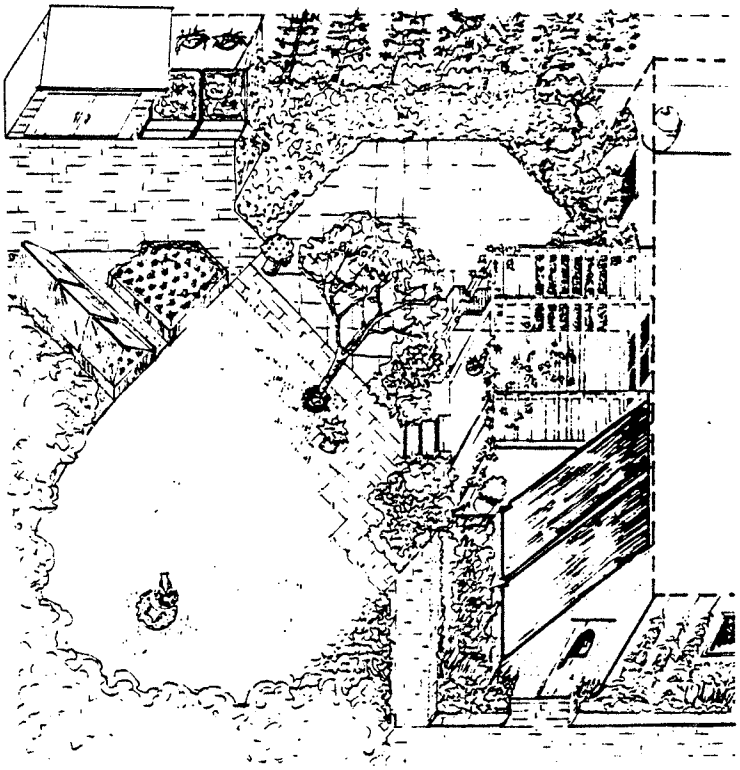

LANDSCAPE DESIGN WITH EDIBLE PLANTS

A Practicum submitted to the Faculty of Graduate Studies in partial fulfilment of the requirements for the degree of Masters of Landscape Architecture.

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ABSTRACT

The purpose of this practicum is to introduce the reader to the many ways edible plants can be used to enhance the residential landscape.

It is intended that the homeowner will discover that food crops can be grown using space and resources efficiently within a pleasing and functional design.

ACKNOWLEDGEMENTS

I wish to thank my advisors, Professor Charles H. Thomsen, Cynthia D. Cohlmeyer and Dr. John Stewart for their guidance and expertise. I would like, also, to thank my family and friends for their advice and support. Finally, many thanks to Carroll Powney for typing the practicum.

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1.0 INTRODUCTION

In my experience designing residential landscapes, I have frequently encountered a resistance by suburban homeowners to the use of edible plants, i.e. a "garden", in their home landscape design. Generally, the reasons for avoiding them are:

1. "Gardens are ugly": Garden plots and vegetable plants are usually considered unattractive. Even fruit trees and shrubs are considered "messy" because they drop fruit and attract birds.

2. "Not enough room": gardens are perceived to take up too much space in the home landscape at the expense of other desired functions such as recreation (barbequing, sunning, children's play), hobbies and storage.

It is the intention of this practicum to show that these concerns are unfounded; that the typical suburban lot can provide adequate recreational space, be delightful aesthetically AND... yield an abundance of fresh fruits and vegetables for the family table.

The practicum is divided into four main sections. The first is a discussion of the concerns about and reasons for landscaping with edible plants.

The second section addresses the issue of growing food crops in limited space and discusses space-saving techniques.

The third section contains a design solution for a typical single-family suburban lot, illustrating intensive food-growing combined with recreational and utilitarian space as required by the average family.

The fourth section provides some ideas for growing food plants to attain better quality food and a healthier home environment.

Finally, after some concluding remarks, there is an appendix containing a glossary of terms followed by an annotated list of references.

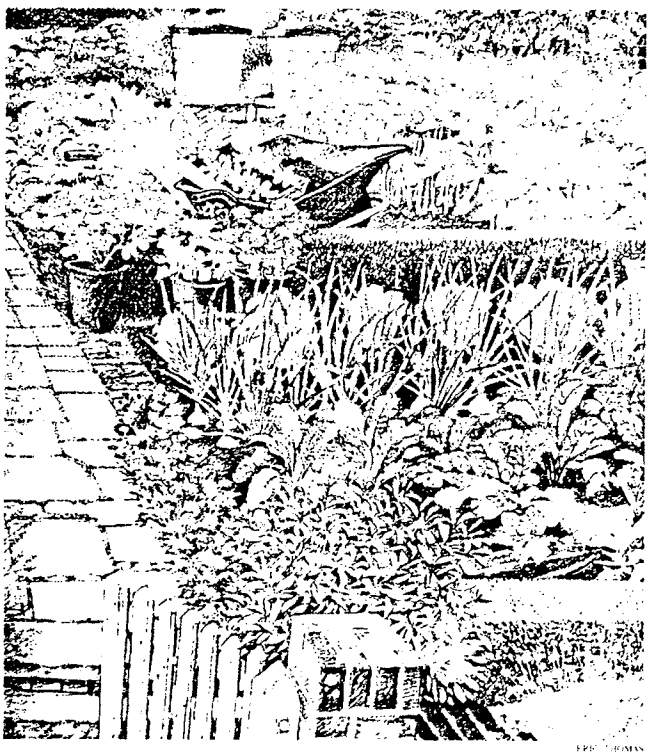


Fig 1 A portion of a home landscape showing the richness and variety in the foliage of edibles.

1.1 PROBLEMS TO BE ADDRESSED

Maximizing available space

How much can be reasonably grown on a city lot? Typical suburban lot dimensions are 50 by 100 feet or 5,000 square feet (464.5 m^2). When the space for house, driveway and walks are removed, there is generally about 2,000 sq. feet (185.8 m^2) left for growing. Estimates vary, but it seems that to feed a family of four, anywhere from 1200 to 2400 square feet (111.48 to 222.96 m^2) are required. The amount of area needed depends on how much one wishes to produce. The higher figure is the amount estimated to be necessary to supply a family of four with fresh and canned produce year round (Davis & Burke, 1976, p. 13).

Maintaining the multi-functional and aesthetic requirements of the suburban homeowner

Generally, the backyard functions as an outdoor extension of private indoor space. The transparent nature of glass patio doors integrates the two spaces visually and physically. The interior floor generally extends outside, becoming the deck or patio upon which many warm weather activities take place such as eating, sunning and children's play. All these activities are important to suburban families, especially in a climate where the warm season is short, so space must be allotted accordingly.

The appearance of the site is generally of equal importance. Usually, ornamental plants (that is, nursery stock selected and grown for aesthetic qualities such as form and color) are used to enhance the home and yard. Plants without nutritional value such as the ornamental flowering crabapple have, in many instances, completely replaced the edible apple in both public and private landscapes. In his book, City Forms and Natural Processes, Michael Hough states

> Conventional landscape design has no place for cabbages, runner beans, squash or any other edible plant. But these have aesthetic qualities too in texture, form and colour if we stop to look at them with a designer's eye. The consciously designed landscape of the city... is one that has been created by a leisured class that has no need or desire to grow its own food. (Hough, 1984, p. 230)

The question becomes how to use edible plants as aesthetic elements within the design framework while accounting for the limitations of the suburban home landscape.

Growing and preserving food

Concern about the safety of commercially grown food is mounting among consumers as new evidence continues to come to light relating use of pesticides in food production to cancer and other diseases. Modern agriculture is heavily entrenched in the use of synthetic chemicals for pest control and fertilizing. Even home gardens account for about 19 percent of all pesticides sold (McEwen & Stephenson, p. 60).

Enlightened gardeners who grow food at home are doing so "organically" in order to produce food that is unadulterated by chemicals or additives.

1.2 WHY DESIGN WITH EDIBLE PLANTS?

Within the home landscape, where personal outdoor space is at a premium, edible plants can easily function as ornamental elements. The lot need not be dominated by a large garden plot, rather, the edible plants can be distributed throughout the yard. Herbs, fruits and vegetables can be incorporated into bed shapes and patterns of limitless configurations. Grown in various combinations, edible plants can be delightful design components, providing richness to the landscape in color, texture and form. In northern regions such as Winnipeg, they add to the relatively limited variety of trees and shrubs, enriching the supply of design material.

By growing these plants with organic growing methods, one can help to improve the health and well-being of one's family. "Organic" growing involves making the most of solar energy and recycling nutrients within the landscape. A willingness to learn about nature's processes and inter-relationships is an important characteristic of the organic gardener.

Growing food organically is great therapy for people of all ages. It provides physical exercise, fresh air, mental stimulation and a sense of accomplishment. From planning to harvest, working outdoors with plants and soil is a relaxing yet challenging activity that the whole family can enjoy together.

Professor Stuart Hill, entomologist at McGill University is an outspoken proponent for natural organic methods for gardening and farming:

> The opportunity to commune with nature is one of the main reasons why I keep an organic garden. I just love getting my hands into the soil, caring for it and watching it become more productive. I enjoy carrying out little experiments and following the growth of plants through the growing season. I even enjoy watching the pests turn up and then watching their predators and parasites keeping them in check. I marvel every year at the conversion of leaves and vegetable wastes in my compost heap into sweet-smelling, fertile humus. It has become very important to me to be close to nature.
>
> Hill: Organic Gardening: A Personal View, McDonald Journal, McGill University December, 1973, pp 7-10.

Another reason for landscaping with edible plants is the freedom to select varieties for taste and nutritive qualities. This reduces the need to rely on commercially produced food. A greater diversity of food types are available to the home food grower when favorite seeds are saved and shared with others. (See list of organizations in the bibliography for Seed Swap groups to join).

There are cost savings by growing and preserving edibles at home, but the primary reward is the satisfaction of knowing the food one produces is nutritious and safe to eat.

1.3 HISTORICAL PERSPECTIVE

For centuries, gardeners have striven to incorporate edible plants into well-designed landscapes that were both beautiful and functional.

In the thirteenth century, while journeying from Persia to China, Marco Polo discovered a garden in

Persia that was a virtual oasis in a desert landscape. It was planted with fruit-bearing plants and 'four conduits, one flowing with wine, one with milk, one with honey, and one with water. There were fair ladies there... and he gave his men to understand that this was Paradise' (Thacker, 1979, p. 31). Paintings and woven rugs often depict such luxurious places enclosed by walls and filled with flowers mixed with fruits and nuts such as pomegranate and almond, along with trees, vines and birds.

The Mughal emperors of fifteenth century Persia loved verdant gardens filled with flowers, fruit and foliage. Such gardens contained oranges, bananas, sugar cane and pomegranates planted around a water reservoir. Flowers were also important elements in these gardens and would often include spring-blooming tulips, narcissi and irises.

Turkish gardens of the 18th Century had many of the characteristics of earlier Persian gardens. They were also enclosed and sometimes contained flowing water and fountains as well as flowers. Fruit trees were integral elements and many Turks would pass their evenings sitting beneath them, drinking coffee and listening to music played or sung by an attendant slave (Thacker, 1979, p. 35).

The Chinese appreciated the beauty of fruit trees and their spring blossoms. A peach tree grown near a doorway was believed to provide good fortune and long life to the household. The Chinese have long been proficient gardeners, able to grow food in the smallest of spaces. The skills they brought to North America are most applicable to the tiny yards of urban centers. "He who plants a garden, plants happiness" is an old proverb that captures the Chinese love for growing things.

In medieval Europe, the art of gardening was kept alive during the turmoil of the Dark Ages by monks within the confines of their walled monasteries. The monastic community was an island of security in a sea of turbulence. A primary objective was self-sufficiency and the monastery walls usually contained crop fields, orchards and a source of water. Vegetables and medicinal herbs would be grown in neat beds, often with a well at the center. Pathways between the beds were used for strolling and contemplation.

As knowledge and interest spread to the secular world, gardens became important to home life. Walled or hedged for protection against animals and thieves, the gardens were usually laid out in geometric patterns. Edible species were often used to enclose the gardens: pomegranate in hot climates, and nut, plum or quince in colder climates. The growing beds often were raised several inches to improve drainage and planted mainly with herbs, followed by vegetables and flowers.

Fig. XXXV.
In Tabernaemontanus' *Herbal* of A.D. 1588 (fig. xxxv.), the raised beds are no longer all rectangular, but some are arranged in a circle round the fountain.

Fig.2 A well tended garden. from (Medieval Gardens, volume I, 1924, by Sir Frank Crisp).

Some written works on gardening in the Middle Ages demonstrate peculiar superstitions. One book advises the

use of the cycles of the moon to regulate planting, sowing and grafting times. However, many of the techniques used today, such as raised beds and container growing can be seen in the illustrations of these early writings.

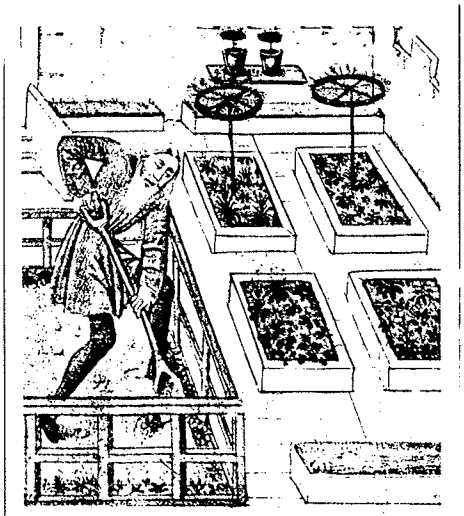


Fig. 3 A gardener of the Middle Ages tending his beds.

With the influx to Canada of Asian and European immigrants at the end of the nineteenth century came a wealth of gardening knowledge. Many settled in urban centers creating distinct ethnic communities. The tiny inner city yards of Chinese and Italian neighborhoods for example, display a rich tapestry of edible plants and an ingenuity for making use of limited available space. While the ancient pleasure gardens of the well-to-do often contained food-producing plants, it was servants or slaves who kept them lush and beautiful. For early immigrants to Canada who were often poor and in search of a better life, growing their own food was part of their everyday lifestyle. Even after achieving economic freedom, many still chose to garden, a true labor of love.

Fig. 4 Italian-Canadian Raphael Cristofaro stands proudly in his small Montreal backyard containing vegetables, herbs, flowers and a grapevine. (from The Harrowsmith Landscaping Handbook, 1985).

Intensification

GROWING MORE IN LESS SPACE

2.0 INTENSIFICATION

2.1 WHY INTENSITY

In order to allow the home landscape to perform the many functions desired by modern urban families, it is important that space be used judiciously. Food plants can be grown by intensive gardening methods which frees up more of the landscape for other purposes.

In some cultures, such as Brittany in Northwestern France, the entire home landscape is usually given over to food production. There, lots are small and "La vie est chere" (Life is expensive) so every bit of available space, even nearby railway right-of-ways is employed in growing edible plants (Country Journal, Sept., 1984, 45-52). Food is grown intensively and even the heights of trees are regulated so as not to shade a neighbor's garden.

In our culture, intensive planting allows the landscape to be multifunctional: The average suburban lot has 5,000 square feet (464.5 m^2) of space. If 1200 (111.5 m^2) are taken up by the house, there are still 3800 (353 m^2) left. One estimate for the amount of growing room needed for self-sufficiency for a family of four is 2500 square feet (232 m^2) (Burke, Davis, 1976, p. 13). This leaves 1300 square feet (232 m^2) for other functions such as car parking, walks, outdoor eating and childrens' playing space.

Intensive gardening techniques will increase yield per square foot over conventional methods and reduce work at the same time. It has been demonstrated that well-planned, intensively planted raised beds do not require a great deal of time to maintain. In fact, the same area of lawn may take more time and energy because of the watering, fertilizing and mowing needed to keep it looking green and neat. In terms of quality of time spent, it is far more productive to care for plants with economic and nutritive value than to maintain grass which consumes energy, time and money but yields no food value. Intensive gardens are higher-yielding and less time consuming than conventional garden plots with widely spaced rows that require more watering and weeding. Intensive gardens tend to be more attractive, also, because there is less bare ground to look at. All that is required is the effort to learn the methods and put them into practice.

Edible plants can be grown intensively with non-edible ornamental plants. For instance perennial flowering plants such as columbine might be grown among raspberry plants. Spinach and carrots could be tucked in among the rose bushes. The display could be changed, from year to year for endless variety. With some forethought as to the color, texture, leaf size, and space requirement of each plant variety, many interesting combinations can be made.

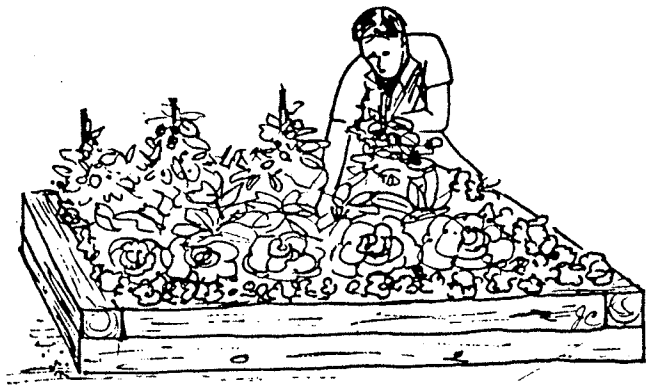


Fig. 5 A raised bed

2.2 TECHNIQUES

This section describes methods for growing food in small spaces. These time-tested ways to improve yield will be discussed under the following headings:

Raised bed gardening
Spacing plants closely together
Intercropping and successional planting
Vertical growing
Container growing
Pruning and training

RAISED BED GARDENING

More vegetables can be grown per square foot by planting in small raised beds than in the traditional row type garden. The beds can be planted up to four times as densely because there are no wide unplanted spaces. The beds are raised up from the existing ground level to improve drainage and to maintain a light airy soil texture. The soil is kept light by the frequent addition of compost and manure, and by the fact that the beds are never walked on.

The beds are raised by building a box of wood or stone or by the "deep bed" method (see glossary terms). The beds are usually square or rectangular but may be any shape that suits the landscape design. The important dimension is the width. Four to five feet is considered maximum while allowing easy access to the center of the bed without stepping on and compacting the soil.

The height of the beds can vary to suit individual needs. They may be as low as 8 to 10 inches (20 to 25 cm) or as high as 3 feet (91 cm). The higher level would suit the ambulant disabled (walking with an aid) while a height of 18 to 24 inches would be more comfortable for the wheelchair gardener.

Raised beds tend to dry out more quickly than inground gardens but are not likely to get water-logged in periods of heavy rain. Soil is kept moist by mulching the surface and spacing the plants close enough so that their leaves will overlap near maturity. The leaves shade the soil and help retain moisture while excess moisture is easily drained away. Good drainage is especially important in a region of heavy clay soil such as Winnipeg.

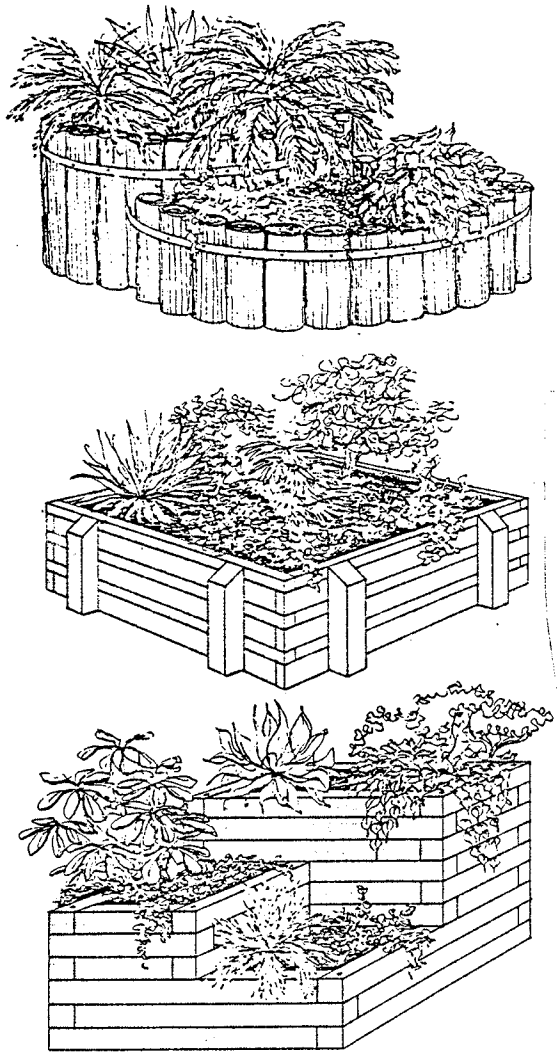


Fig. 6 Three raised bed designs of wood construction (from Your Garden in the City by J. Kramer, 1982).

The soil warms up faster in the spring (the previous year's mulch having been removed or worked into the soil), aiding early root growth and gives seedling a head start. This allows them to grow faster than they otherwise would in the colder ground below (Maingay, 1977). When

properly mixed with organic matter, the soil can be easily worked with simple hand tools because of its light structure. The small size and raised height of the beds make weeding, picking and hoeing much easier tasks.

SPACING PLANTS CLOSELY TOGETHER

Spacing plants closely together was originally intended only to conserve space. However, other benefits were discovered, mainly a reduction in watering and weeding. Another benefit was discovered by Eugene Odum who found that spacing plants closely together resulted in higher yields. He wrote that 'maximum productivity of broad-leafed crops occurs when the leaf surface area exposed to the incoming light from above is about 4 to 5 times the surface area of the ground'. (Maingay, 1977).

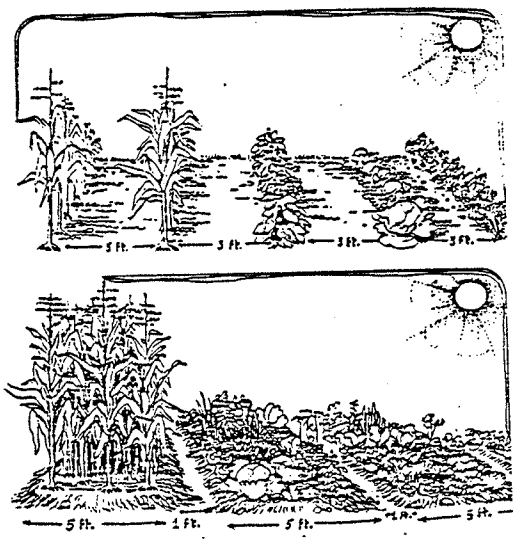


Fig. 7 Much more can be grown in beds with one-foot rows (bottom) than in a typical garden with three-foot rows (top).

When bare ground is left between rows of plants, more irrigation is required because water evaporates from soil exposed to wind and sun. Surface run-off and soil erosion during heavy rains can lower the productivity of the soil. By spacing the plants as closely together as possible, root systems become interwoven, holding soil particles and soil moisture in place. Overlapping leaves shade the soil, preventing evaporation and retarding weed development. Care must be taken, however, in spacing seedlings so as to prevent overcrowding or their aerial parts will become weak and spindly as they compete for light.

Seed packet recommendations for spacing rows are usually based on the need to get equipment down the rows rather than on the actual growing room required by each plant. It is better to take note of the recommended spacing between plants within the row and then plant in block fashion in raised beds.

The most efficient spacing method is equidistant. The plants are staggered so that the same amount of room is left on all sides. This works well for the block method of planting. However, for small-seeded crops such as carrots and beets, narrowly spaced rows often yield as well as equidistant spacing. Carrots planted 1 1/2 inches apart in furrows 4 to 5 inches apart produce the same as carrots spaced 2 inches apart in all directions.

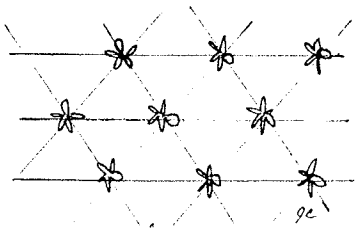


Fig. 8 Equidistant spacing

SPACING SUGGESTIONS FOR EQUIDISTANT PLANTING

CROP	SPACE BETWEEN PLANTS
beets	5" (13 cm)
broccoli & cabbage	12-18" (30-45 cm)
brussel sprouts	30" (76 cm)
cauliflower	21" (53 cm)
celery	12" (30 cm)
eggplant & peppers	18" (45 cm)
lettuce - leaf	6" (15 cm)
lettuce - crisphead	12" (30 cm)
onions	3" (8 cm)
sweet corn	12" (30 cm) small varieties
	18" (45 cm) large varieties
tomatoes	18" (45 cm)

Table 1
from "Elbow Room in an Intensive Planting", BACK YARD GARDENING SEMINAR, Brandon, Man., 1983.

INTERCROPPING AND SUCCESSIONAL PLANTING

Fast-growing crops can be planted between widely spaced plants like broccoli and tomatoes. This takes advantage of the surface area that would otherwise be under-utilized for the month or so that the main crop is relatively small. Some early-maturing crops suitable for intercropping are lettuce, radishes, looseleaf Chinese cabbage and turnips. They will be ready to harvest before the main crop begins to shade them. By intercropping, more food can be harvested from the garden. The soil is covered by leaves earlier in the season, helping to conserve moisture and reduce weed growth.

Planting times of these faster-maturing crops may also be staggered two or more times throughout the summer. This is known as successional planting. Depending on the length of the growing season and the maturation time of each crop, vegetables can be staggered at 2 week intervals up to 3 or 4 times for a longer season of fresh eating. Some gardeners plant this way to avoid having to pick, shell and preserve all at one time. Lettuce, carrots, swiss chard, beets, peas, spinach and radishes are all suited to successional planting.

VERTICAL GROWING

The food-growing capacity of the home landscape can be greatly expanded by taking advantage of vertical and above-ground surfaces. Surface areas suitable for growing include walls, fences, overhead trellises and rooftops.

Vegetation on south-facing walls can also reduce heat gain in buildings and on surrounding outdoor ground space. Michael Hough refers to a German study which shows "that vegetation on vertical surfaces can lower summer temperatures of the street by as much as 5°C" (Hough, 1984, p. 40).

WALLS The south, east and west walls of the house often can provide a great deal of suitable growing space. The north side is generally too shady for food crops. Attention must be paid to shadow patterns of adjacent buildings, trees and fences as plants require about 6 hours of direct light per day during active growth. A white stucco wall is ideal for light reflectivity, though smooth surfaces are even better. A dark wall absorbs solar radiation, keeping plants warm after the sun has set. If side walls have enough empty space but not quite enough direct light, brightness may be enhanced by the use of reflective materials. Aluminum foil or highly polished tin sheeting can be used to

bounce light onto the plants by placing the material opposite the growing surface.

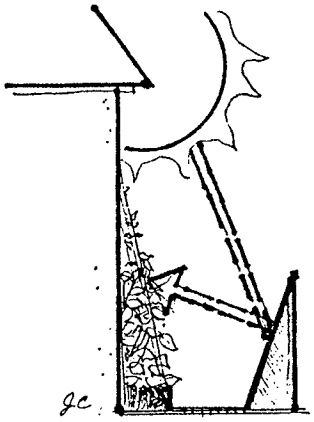


Fig. 9 Shiny metal used to reflect light onto plants

Wire or string hung from the eaves of the house and anchored in the soil, will support peas, beans and cucumbers. The growing plants will help shade the house as well. The fruit is cleaner and easier to pick. Prompt picking encourages fruiting and, therefore, higher yields.

The glazed walls and roof of the garden greenhouse can provide space for vines such as native Manitoba grape (Vitus vulpina) or hybrid varieties such as 'Beta' and 'Valiant'. The large leaves filter out the hot summer sun and the grapes harvested in fall are ideal for wine and jelly making. In winter, the leaves are gone, allowing sunlight to enter the greenhouse. One must ensure that the building is strong enough to support the weight of the heavy vine and fruit.

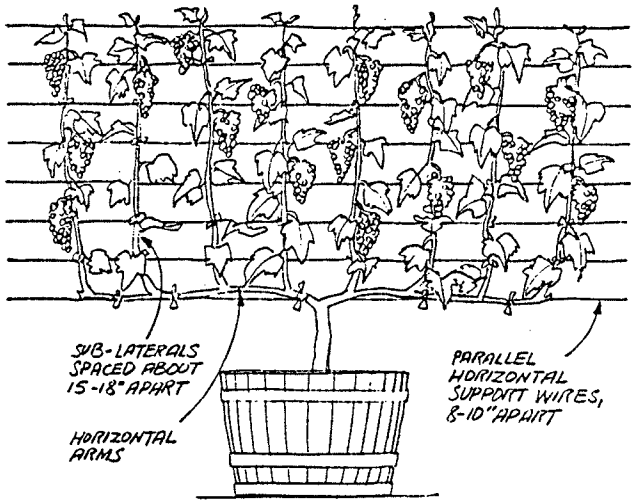


Fig. 10 Grapes can be grown in a container and trained onto a trellis as a privacy screen for a deck. (from The Harrowsmith Landscaping Handbook, 1985)

FENCES Sturdy wooden fences which usually surround suburban backyards can be used to support climbing plants. A neat chainlink or plastic mesh fence can also be used and allows good air circulation and light penetration. A wooden fence should have some space left between the slats to prevent mildew caused by humidity and stagnant air.

Crops suited to growing on fences include tomatoes, peas and beans. Even heavy fruits such as winter squash, melons and cucumbers can be trained to grow up a fence rather than sprawling over precious ground area. As the fruits begin to grow, they need to be supported with a porous fabric such as cheesecloth, nylon net or an onion bag to keep them from breaking off the vine. Vining varieties yield more than bush types because their growth is indeterminate, that is, they will continue to grow as long as the season will allow. Pole beans will climb 10 feet or more and scarlet runner beans, over 12 feet, though these need to be tied regularly as they are not true climbers. Staked

tomatoes take up as little as one square foot of space yet can yield more than if left to sprawl on the ground. Unstaked tomatoes can claim as much as 4 to 5 square feet per plant.

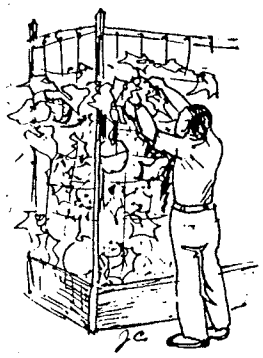


Fig. 11 Tying up melons

Climbing structures must be sturdy. Heavy posts with wires at top and bottom and strings attached vertically make an easily constructed fence. Strings are spaced 4" (10 cm) apart for peas and beans and a foot (30 cm) apart for tomatoes. For heavy crops, welded wire mesh used in making concrete slabs can be used. It is available in 5' (1.5 m) widths, is long-lasting and can be easily stored over winter. The mesh can be anchored to an existing fence or wall and shade a row of lettuce as well.

OVERHEAD SPACE Decks or patios on the south or west side of the house can be very hot places in mid summer. Relief can be provided by building an overhead trellis. Attached to the house, a trellis will also shade and cool the interior by filtering out strong light. Sitting areas are transformed into cool, inviting outdoor rooms. In summer, when vines leaf out, the areas below become even more shady.

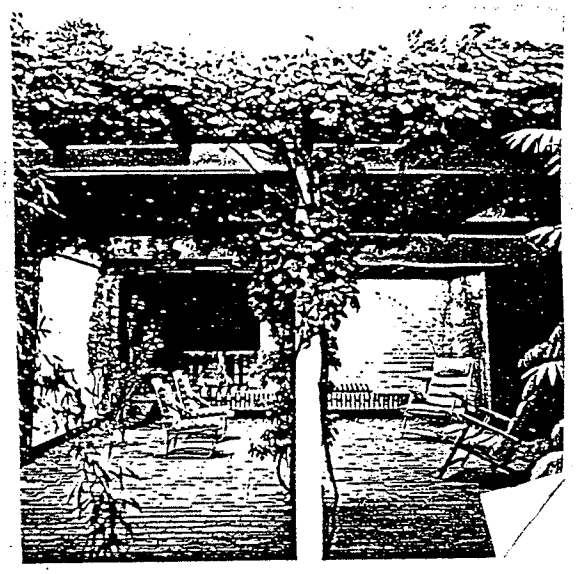


Fig. 12 A brick patio is given a sense of lushness and enclosure by a vine-covered trellis. (from The Personal Garden by B. Wolgensinger, 1975)

ROOF TOPS Flat roofs of garages and carports can provide a great deal of extra room for growing food crops. The roof should receive adequate light and be strong enough to support the weight of soil-filled containers. 'Load specifics' or weight-holding capability of the roof should never be guessed or the results could be disastrous. A cubic foot of water-logged soil weighs about 80 lbs., much heavier than one would guess when carrying up dry soil to fill the planters. Weight can be reduced by growing the plants hydroponically (soiless growing). A solution of nutrients is supplied to the plants which are anchored in a lightweight materials such as vermiculite or perlite. These weigh about 20 lbs. waterlogged; one fourth the weight of soil.

A roof top can be a hostile place; both hot and wind-swept. There may be a lot of glare from the roofing material or adjacent buildings. Constructing a trellis will render the roof top more hospitable for

people and plants. Artificial green turf has been used successfully to reduce glare and make the space more comfortable. Wood decking, although more work to construct, makes an excellent surface. The roof area needs to slope slightly for good drainage. Plants such as trees in large, heavy containers should be placed where major beams and posts are located for extra support. A roof top can be a pleasant place to garden and relax with a little imagination in design and choice of plant material.

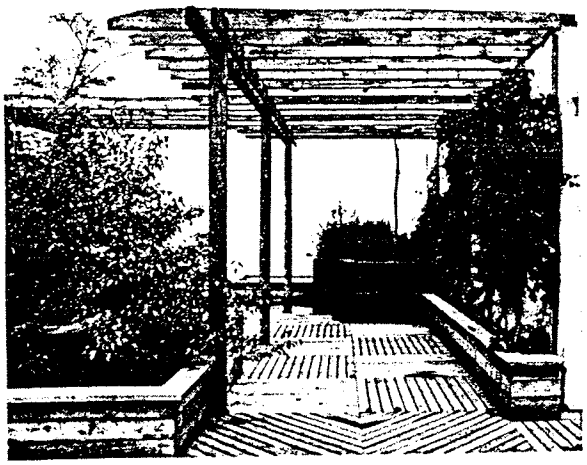


Fig. 13 A roof deck with wood decking, trellis and planters. (from "Roof Decks Design Guidelines")

Further information can be obtained from: "Roof Decks Design Guidelines", CMHC, 1979.

CONTAINER-GROWING

Edible plants and flowering annuals can be grown in a variety of containers to take advantage of additional space and enliven patios, decks and doorways. Almost every type of vegetable will grow well in some sort of container, provided there is enough light, moisture and room for root development. Many gardeners prefer container-growing because the raised height of the plants are easier to tend. Containers can be as plain or ornate as desired and made from almost any material. Wood, brick, pottery and pre-cast concrete are among the more frequent choices.

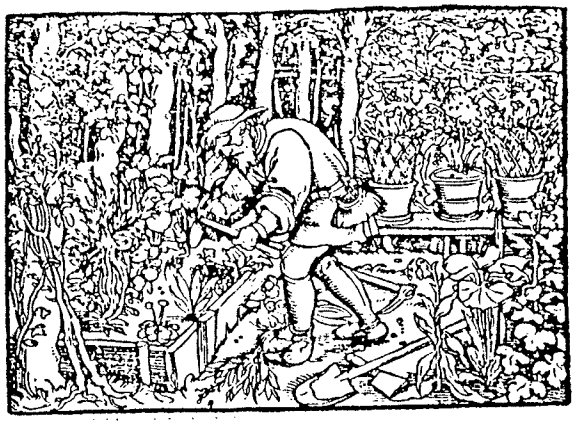


Fig. 14 Raised beds and containers tended by a Medieval gardener. (from Medieval Gardens, F. Crisp, 1924)

Because the plants are not in the ground, they are subjected to more stress than garden-grown plants. The soil will need checking every day for signs of dryness. Morning is the best time to water so that excess moisture can evaporate from the leaves before evening, discouraging disease and fungal growth.

Container-grown plants need more frequent watering than garden grown plants as moisture cannot be drawn up from the ground. Drainage holes are necessary in the bottom of containers to prevent saturation of the soil which may drown roots and kill the plants.

Fertilizer needs to be provided to container-grown plants as nutrients are continuously being leached away with the draining water. Commercial fertilizers supply the three main nutrients required by plants: nitrogen, phosphorous and potassium. They have a numerical code indicating the proportions of nutrients. Each aids a different aspect of plant growth:

Nitrogen(N): leaf growth
Phosphorous(P): flower, root and fruit development
Potassium(K): stem strength, disease resistance

Leafy vegetables such as spinach or lettuce would require a fertilizer with a high nitrogen content, perhaps 16-0-0. Strawberries would require more phosphorus. Fertilizer is needed only once every 2 or 3 weeks as over-fertilizing can burn roots and stems as well as adversely affect the growth cycle. Rotted manure, dissolved in a pail of water, makes a nourishing plant food known as "manure tea". This solution can be fed weekly and may have all the nutrients most plants need.

A critical factor when planting in containers is providing adequate drainage. As well as drainage holes, containers need material such as broken pottery or coarse gravel below the soil to keep it from getting water-logged. A layer of peat moss over the drainage material prevents the soil from washing away. Perlite or vermiculite are recommended drainage materials for window and roof top boxes because of their light weight.

Fig. 15 Cucumbers and beans in a moveable container

A combination of trailing and upright plants look attractive when grown in the same container. A window box would make an interesting display when planted with trailing lobelia, wrinkled red lettuce, spikey onions or carrots with their fern-like foliage. A hanging basket could hold a mini tomato or cucumber plant with one or two leaf lettuce plants. Trailing annuals include lobelia, allysum, petunia and begonia. Strawberries also provide color to containers. The variety "Ogallala" is every-bearing and provides flowers and fruit all season long. A miniature herb garden can be created in a container for an interesting display of textures and colors that can be harvested at the end of the season.

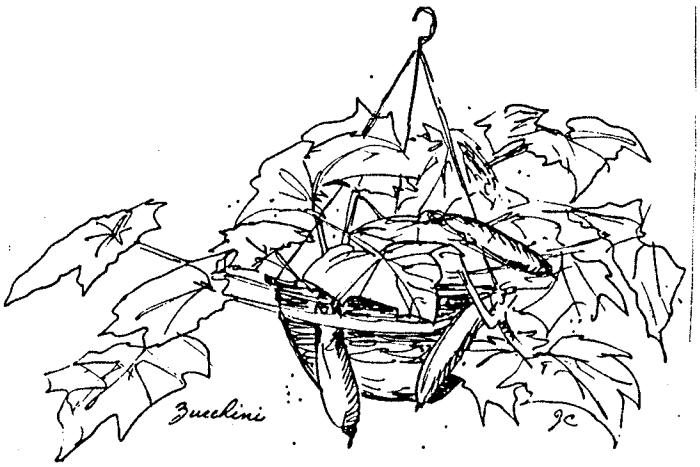


Fig. 16 A hanging basket of zucchini

PRUNING AND TRAINING FRUIT TREES

Apples and pears are as desirable today as they were to the early settlers from Europe where fruit trees were an integral part of the garden. In the urban landscape, fruit trees are not always practical to grow because they consume so much space with their low, spreading growth habit. However, there is a way to grow fruit trees so that they take up very little space. In France, where space-saving

techniques are an indispensable part of gardening, the method is termed "espalier". A row of espaliered fruit trees is also known as a "trellised hedgerow". A small lot can contain several fruit trees grown in this manner.

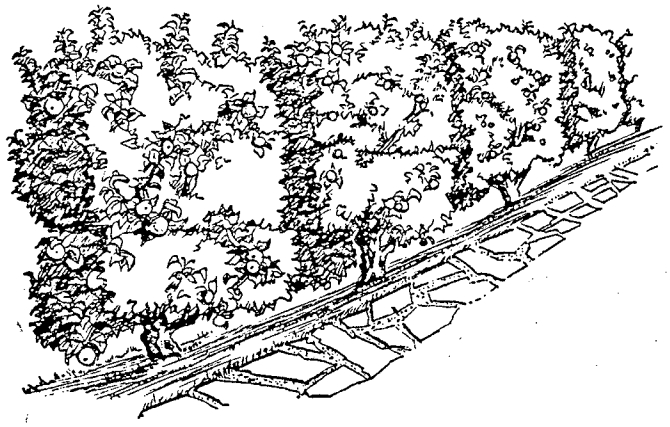


Fig. 17 Dwarf fruit trees are especially suited to training as a hedgerow.
(from The Edible Landscape, by R. Creasy, 1982)

Each tree is maintained at a height of 6 to 7 feet (1.8 to 2 m) and spaced about 6 feet (2 m) apart. Therefore, a fifty foot (15 m) fenceline could support 8 trees. Because the trees are pruned to a 2-dimensional shape, they occupy very little ground space and cast very little shade. The fruit is also very accessible for thinning and picking. Espaliered trees tend to bear earlier than standard fruit trees - one year from planting as opposed to 3 to 4 years. Each tree can yield one to two bushels per year and bear up to 40 years with proper maintenance. The trees require attention throughout their entire life span and will not do well left unattended.

Fruit trees can also be suited to the small lot when dwarf varieties are used. Six dwarf fruit trees will fit in the space of a single car garage. They still must be pruned regularly to maintain their diminutive size and encourage fruiting. If the trees are pruned in mid-summer, they will be kept small (spring pruning stimulates growth). Pruning opens up the tree so that more light reaches the fruit and causes better coloring and improves air circulation. Summer pruning also helps reduce aphids which are discarded with the pruned wood. Techniques for training and maintaining must be learned but the work is very rewarding when a variety and abundance of fruit is desired in the home landscape.

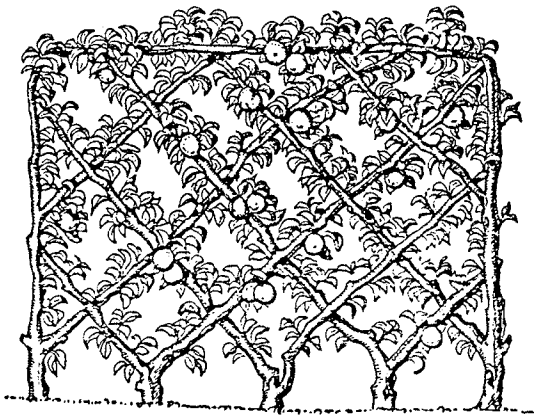


Fig. 18 The Belgian fence, one of the most decorative espalier patterns. (from The Edible Landscape)

For more information on the art of espalier and general pruning see:

"Pruning and Training Fruit Trees", published by Agriculture Canada, no. 1513, 1981.

A Landscape Plan

3.0 A LANDSCAPE PLAN

The plan on the following page illustrates a design solution using edible plants for a typical suburban house and lot in the city of Winnipeg. The layout allows for the production of enough food to feed a family of four in a pleasing and multifunctional design.

The design solution is shown as an axonometric drawing to give a bird's eye view of the plan and a feeling of being "in" the space. The main elements in the plan are numbered on the drawing. A corresponding key describes both the practical and design function of each element.

3.1 SITE ANALYSIS

Climate: The Winnipeg area has a continental climate with widely varying temperatures throughout the year. There are approximately 130 frost-free days, although July is the only month in which frost rarely occurs. July has the greatest number of hours of sunshine: 320 hours, as opposed to December which has the least: 81 hours. Winds are generally from the south in summer and from the north and northwest in winter. Most precipitation occurs as rainfall from spring to fall (21") (53 cm) and as snow in winter (52") (132 cm).

Location: In a new subdivision of single-family homes on former farmland adjacent to the city.

Soil: Red River Clay

Lot: 50 X 100 feet rectangular (5000 sq. ft.) (464.5 m^2).

Orientation: House faces north

Structures: Single family dwelling, split level, wood frame construction, front facade of cedar with stucco sides. A solid six foot high wooden fence with half inch spacings between slats surrounds the back yard.

Total area of the house is 1220 square feet (113 m^2) including a double attached garage. There are single- story houses on either side of the lot.

3.2 PROGRAM

Owners: Family of four, including two children.

Needs and desires: attached greenhouse for growing plants and passive solar heating, outdoor entertaining space for small groups, room for children's play, color and variety in plant selection, perennials and annuals; bird feeding in winter, gardening and preserving. Design to evolve over time to allow for the changing needs of growing children.

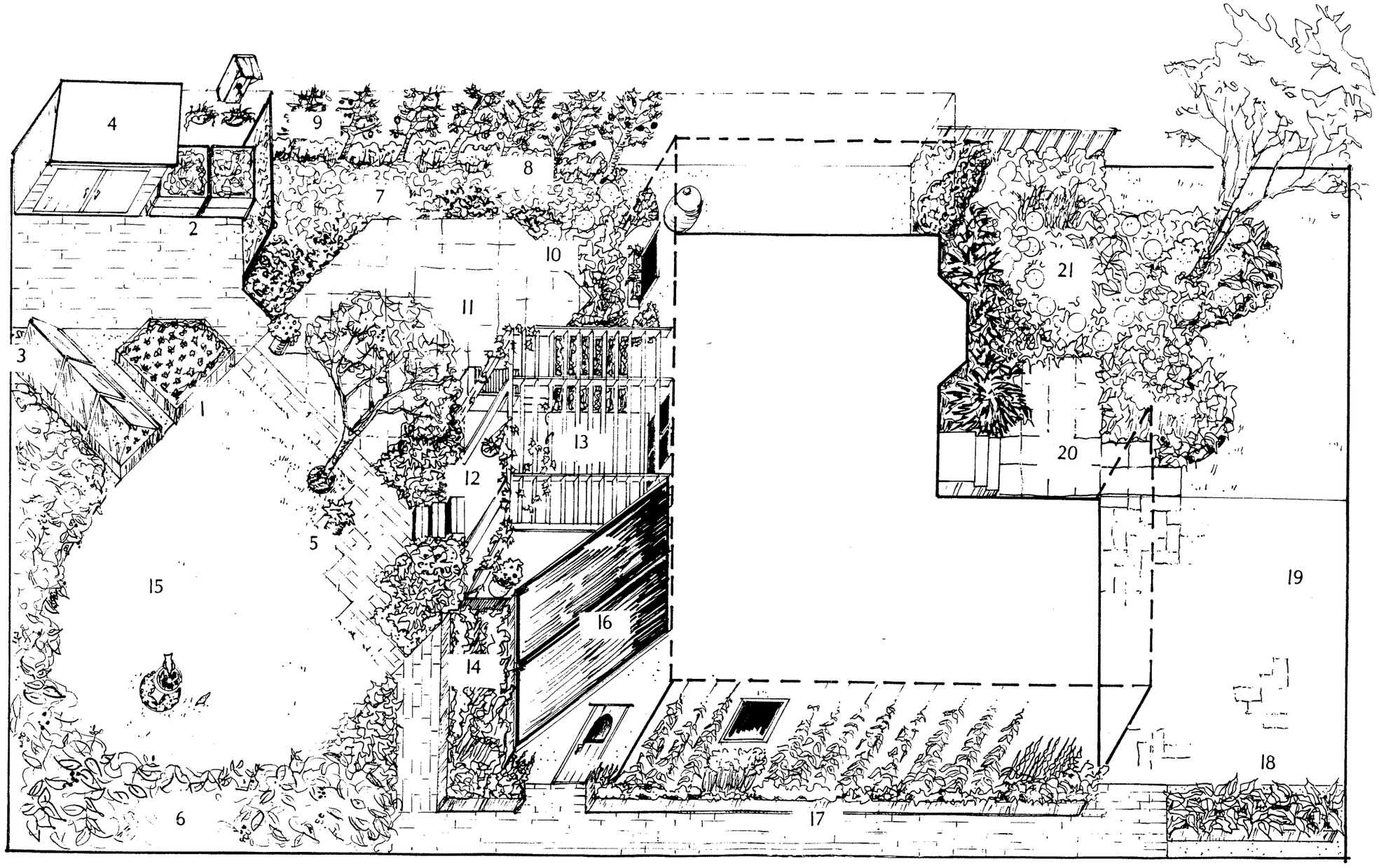
3.3 DISCUSSION OF DESIGN SOLUTION

The functional and aesthetic roles of each of the main design elements are discussed in the section following the plan. The elements are numbered and keyed to the plan for easy reference.

Following this section, is an analysis of the actual food-growing area of the plan with comparisons made to conventional garden design.

Next, the plan is discussed in terms of the changing play requirements of growing children, indicating how it can evolve over time.

Finally, it should be noted that this type of landscape requires an understanding of the care and requirements of edible plants. Useful references can be found in the bibliography.



KEY

1 Raised Beds
2 Compost Bins
3 Cold Frame
4 Garden Shed
5 Container
6 Fruit-bearing Shrubs
7 Strawberries
8 Raspberries
9 Apple Tree Espaliers
10 Stepping Stones
11 Patio
12 Deck
13 Arbor
14 Ornamental Beds
15 Lawn
16 Greenhouse
17 Side Yard
18 Raised Planter
19 Driveway
20 Entry Walk
21 Front Yard Planting

A LANDSCAPE PLAN

SCALE 0 5 10 feet

Jennifer Chernetz

KEY TO PLAN

PRACTICAL USE	DESIGN ROLE
1 RAISED BEDS	
-for growing annual vegetables. -crops can be rotated from bed to bed each year to avoid transferring diseases. Gravel paths between beds eliminate need to step on beds. -beds are narrow enough to reach center.	-relates to overall geometry of the design. -relieves monotony of parallel rows found in typical garden layouts.
2 COMPOST BINS	
-4' x 4' wooden structure for putting all garden and household organic wastes. -accessible to beds for transferring decomposed material.	-neat box shape fits well in corner with the garden shed. -makes use of an out-of-the-way space. -the bins are concealed from deck by a vine-covered screen.
3 COLD FRAMES	
-movable structures have sloping glass tops to shed water and admit sunlight. -used to 'harden off' seedlings from the greenhouse before planting out. -can be inexpensively constructed from discarded windows.	-portable frames can be stored in shed when not in use. -an interesting feature in the spring garden.
4 GARDEN SHED	
-4' x 10' building stores all gardening tools, hoses, winter bird feeder and containers when out of season. -large double doors make contents easily accessible.	-fits neatly into the corner -part of "work space". -a sloping roofline, neat siding and good maintenance could make the shed more attractive than utilitarian in appearance.

PRACTICAL USE	DESIGN ROLE
5 CONTAINERS	
-used to grow a mixture of flowers and vegetables -can be moved about to take advantage of sun.	-ornamental splashes of color and texture. Trailing and upright plants combine to make interesting displays. -can be moved for variety
6 FRUITING SHRUBS	
-fruit-bearing shrubs, good for making jelly, pies and deserts. -include saskatoon, cherry, cranberry currents and plum.	-shrubs provide colorful bright red and purple fruit and good fall leaf color. -branches give texture and interest to fenceline in winter. -unpicked fruit provides winter food for birds.
7 STRAWBERRY BED	
-edible fruit available all summer with ever-bearing variety.	-matting growth habit makes an excellent ground cover. -red leaf color in fall.
8 RASPBERRIES	
-produce lots of juicy fruit for jam making or eating out of hand.	-makes a taller background for the strawberries. -helps soften the fenceline and adds depth to the bed.
9 APPLE TREES	
-are 'espaliered': pruned and trained to take up very little space along a fence line, yet yield well. -can be grown where standard trees would not fit. -will not shade the yard.	-make an eye-catching 'living fence' or 'trellis hedgerow' which can be trained into different patterns. -seasonal variations provided by blossoms, fruit and fall leaf color as well as branch pattern in winter.

PRACTICAL USE	DESIGN ROLE
10 STEPPING STONES	
-provide access to storage area and to rain barrel. -allows tending plants and picking fruit in deepest part of bed.	-round shapes add variety in form to the straight lines of the overall patterns. -in front yard bed, provide an interesting way to reach the front door as an alternative to walking up the driveway.
11 PATIO	
-provides extra space for passive recreational use, children's games (e.g. hopscotch), etc.	-relates to shape of lawn. -adjacent to deck for comfortable flow of movement and activities. -contains built-in barbecue next to deck steps and convenient to house.
12 DECK	
-14' x 13 1/2' treated wood -outdoor extension of the house; level with interior floor elevation. -provides sitting and eating space for 4 to 6 people.	-raised level gives pleasant vantage point. -stairs on 2 sides give choice of movement - to patio or to walk way.
13 ARBOR	
-overhead wood structure shades deck and glass doors. -provides some wind protection to sitting area. -supports grape vines which yield edible fruit.	-provides a 'roof' to the deck, giving a restful, enclosed feeling to the sitting area. -cool and inviting on hot summer days. -rustling vine leaves add to enjoyable sensations.
14 ORNAMENTAL BEDS	
-contains cutting flowers and herbs for use indoors. -edible plants are mixed with ornamentals to increase yield. increase yield. -hides empty space beneath deck and steps.	-provides various colors, textures and fragrances early and late in the season. -display of flowers, roses and foliage close to sitting areas for enjoyment at close range.

PRACTICAL USE	DESIGN ROLE
15 LAWN	
-front yard: separates home from the street. -back yard: provides extra sitting and play space. -open space to put a winter bird feeder that can be viewed from the house (feeder stores in shed in summer).	-front yard: lawn area provides visual continuity with the other homes on the street. -back yard: soft, cool monochromatic counterpoint to the myriad colors and textures of beds. -attracts robins after rainfalls and provides open space preferred by birds visiting the birdbath.
16 GREENHOUSE	
-provides passive solar heat to the home in winter. -extends the growing season and provides a warm, sunny place to start seedlings for the garden.	-adds an interesting architectural feature to an ordinary suburban house. -provides color, fragrance and other pleasurable experiences indoors.
17 SIDE YARD	
-has a walkway to backyard and access to greenhouse. -every bit of space is used productively. -white wall color reflects light, brightening the space.	-vertical wire supports allow climbing vegetables to fill up drab, empty wall space.
18 RAISED PLANTER	
-contains both vegetable plants and annual flowers, increasing overall yield. -makes productive use of otherwise wasted space.	-interesting edge condition for the driveway. -planting display can be changed from year to year.
19 DRIVEWAY	
-parking space for 2 vehicles. -suitable for washing cars, fixing bicycles, ball or skipping games, visitor parking.	-an extension of the garage and a connection to the public street. -paving materials such as brick or interlocking paving stones provide a more interesting texture and pattern than concrete.

PRACTICAL USE	DESIGN ROLE
20 ENTRY WALK	
-provides access to front door of home. -extended into planting bed permits easier reach to tend plants without stepping on bed. -more room for saying goodbye to departing guests.	-wide walk is more generous and inviting to visitors. -planting frames the walk and gives it a 'courtyard' effect. -patio blocks provide a textural change to the driveway surface material.
21 FOUNDATION PLANTING	
-deep bed supplies plenty of space for growing edibles as well as ornamentals. -evergreen shrubbery covers the foundation wall throughout the year. -large bed area reduces amount of lawn to be mowed. lawn to be mowed.	-vegetables can be combined artfully with shrubs, perennials and annual flowers so that the bed has a decorative effect to the public view. -taller evergreen shrubs nestle the house into the landscape. -a tall, open tree such as paper birch (Betula papyrifera) gives height to the bed without casting too much shade and softens the facade of the house, blending it into the landscape.

3.4 SPATIAL ANALYSIS

The area of the various elements within the landscape have been calculated in order to determine the total food-growing area. (See Table 2). This amounts to a surface area of 1004 ft^2 (93.3 m^2) comprised of vegetable beds, fruit beds and one third of the ornamental beds. If this was a conventional garden plot, it would take up almost half of the entire back yard. A square plot would be roughly 30 x 33 feet and a rectangular plot would be about 20 x 50 feet. It would not be easy to fit all the elements of this plan into the spaces left over. Also, the ornamental potential of edible plants is virtually lost when grown in a separate plot.

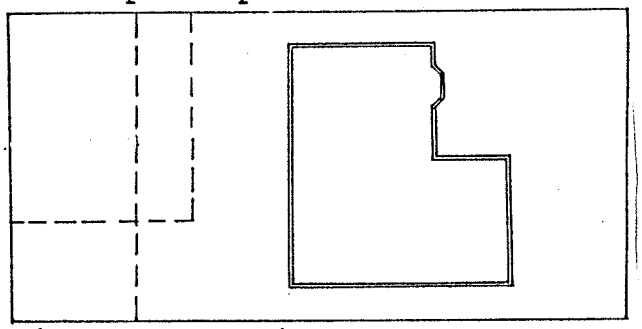


Fig. 20 Conventional Garden Plot Layouts: square or rectangular

In addition to the 1004 square feet of ground area devoted to edibles, vertical and overhead space (wall, fence, arbor), as well as several small containers, contribute an additional 687 ft^2 (63.8 m^2). This provides a total of 1691 ft^2 (157.1 m^2) of food-growing space. This area would take up virtually the entire backyard if laid out in a garden plot.

When edibles are incorporated into the overall design rather than grown in a single large plot, more space becomes available for other activities. The plan still provides enough food to feed a family of four all season long and through the winter, too. In fact, the intensively planted beds in the example plan could yield about 30% more than a conventional garden plot in which one third the space is bare soil between rows. Also, the potential for creating new and interesting shapes in the landscape is greatly improved when food-producing plants are used as part of the design.

To significantly increase food production, the lawn area in the back yard could be turned into more growing beds:

	ft^2	m^2
lawn converted to beds:	570	53.0
existing beds:	1004	93.3
containers and vertical space:	687	63.8
TOTAL:	2261	210.1

This total bed area is close to the amount considered necessary to provide a family of four with fresh and preserved produce throughout the year (Davis and Burke, 1976, p. 13).

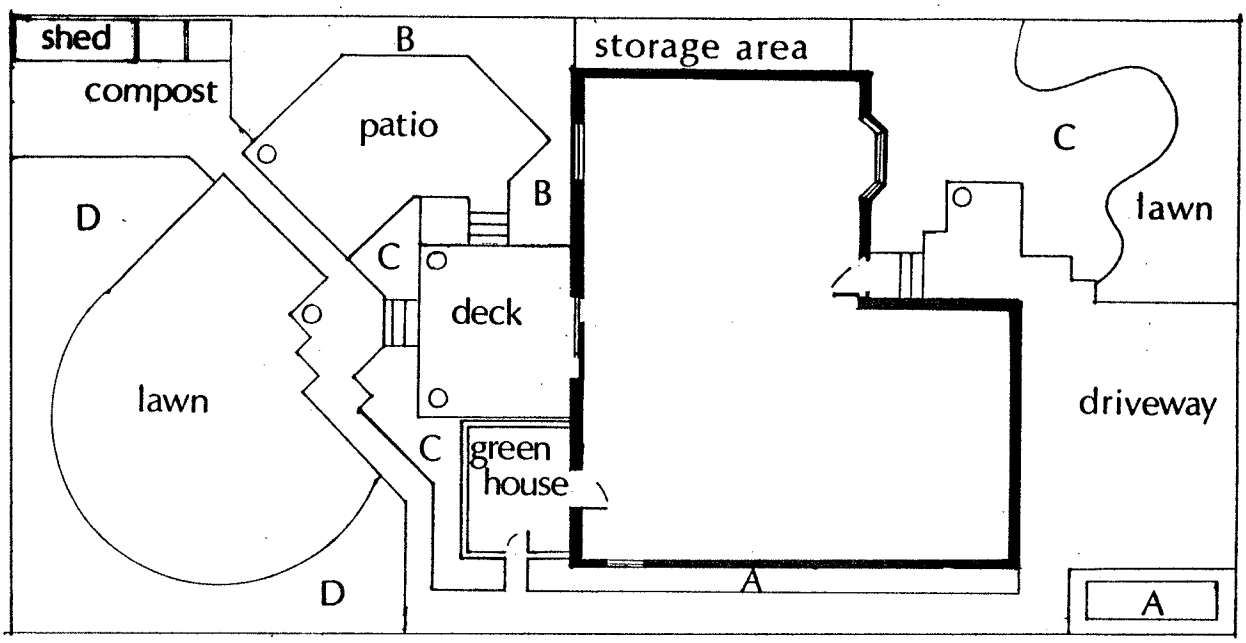


Fig. 21 Spatial Analysis: Area

	FT^2	M^2
LOT (50 X 100 feet)	5000	464.5
HOUSE	1220	113.3
OUTDOOR AREA	3780	351.2
HARD SURFACES		
driveway	380	35.3
front walk	115	10.7
side walk	104	9.7
back walk	267	24.8
storage area	115	10.7
patio	260	24.2
deck	189	17.6
TOTAL	1430	132.8
STRUCTURES		
house	1220	113.3
greenhouse	108	10.0
garden shed	40	3.7
compost bin	32	3.0
TOTAL	1400	130.1
BEDS		
vegetable beds (A)	106	9.8
fruit beds (B)	217	20.2
ornamental beds (C)	530	49.2
fruiting shrubs (D)	504	46.8
TOTAL	1357	126.1

	FT^2	M^2
LAWN		
frontlawn	243	22.6
back lawn	570	53.0
TOTAL	813	75.5
CONTAINERS		
5 round planters	5	.5
6 hanging baskets	3	.3
1 window box (6"x24")	1	.1
TOTAL	9	.8
VERTICAL AND OVERHEAD		
east wall of house (36'x8')	288	26.8
east greenhouse wall (9'x8')	72	6.7
west fence (25'x6')	150	13.9
grape arbor (12'x14')	168	15.6
TOTAL	678	63.0
TOTAL FOOD-GROWING AREA		
vegetable beds	106	9.8
fruit beds	217	20.2
1/3 ornamental beds	177	16.4
containers	9	2.8
vertical and overhead	678	63.0
fruiting shrubs	504	46.8
TOTAL	1691	157.1

Table 2. Area calculations for landscape components.

3.5 ADAPTING THE PLAN OVER TIME

When children are very small, their needs include supervision and suitable play space. This landscape plan can be implemented in three stages to suit the play requirements of youngsters as they grow. Also, fruit and vegetable beds are minimized because of the relatively limited time that can be spent tending plants during the early years of a child's life.

STAGE 1 - PRESCHOOLERS

Very young children enjoy the creative aspects of sand play. A large sand box is built into the patio and can be seen from the deck, patio and house. Most of the yard is lawn for active play and a tricycle path defines future bed areas. Stepping stones leading to the playhouse can be used to replace the sandbox when it is outgrown. A wading pool can be placed on the lawn where it will get plenty of sun. Hardy fruiting shrubs fill the southwest corner while higher maintenance vegetables and flowers are concentrated around the deck and house.

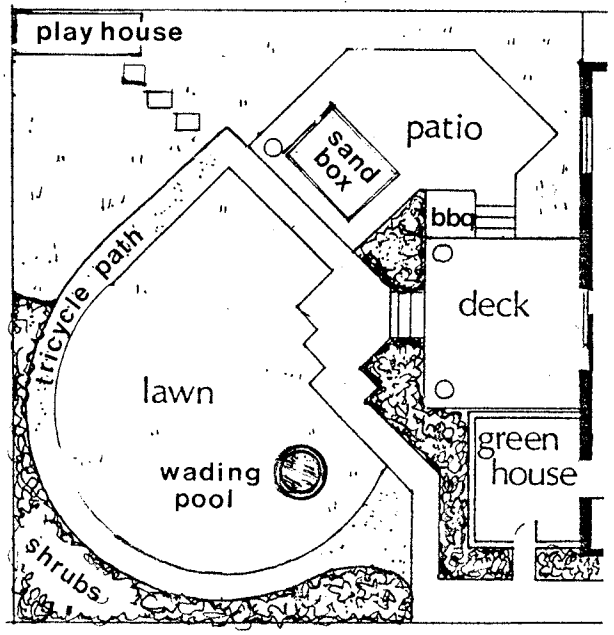


Fig. 22 Yard plan for preschoolers

STAGE 2 - ELEMENTARY SCHOOL AGE

The tricycle path is removed and the large shrub bed widened in its place. The sand box is removed while climbing structures are added to the playhouse for more challenging and energetic play. Eventually, in the final stage, the playhouse will become the garden shed, the gravel area will be replaced by brick and sod will be taken up around the patio and central lawn area to create more growing beds.

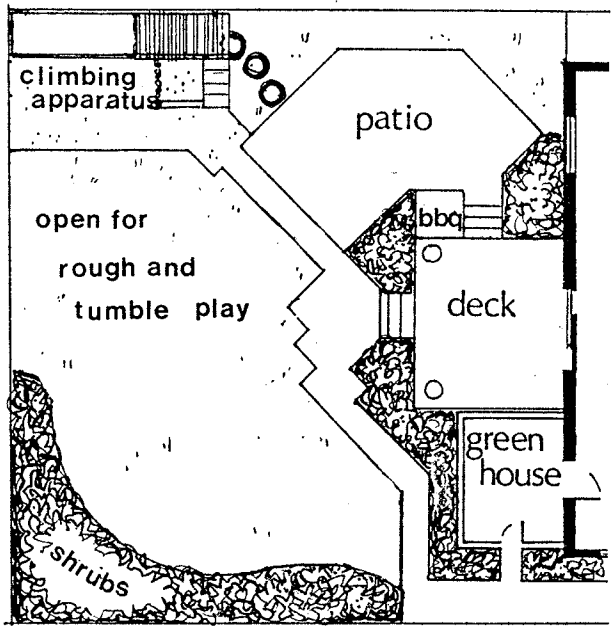


Fig. 23 Yard for elementary school age children.

STAGE 3 - THE LONG TERM PLAN

The long term plan is shown on page 17 and discussed on pages 18 through 24. It is intended to provide a great deal more food production which may be increased as the children grow older and their need for active play space within the yard decreases.

Home Grown Food Quality

4.0 HOME GROWN FOOD QUALITY

Just as intensive methods and design considerations are important when planning an edible landscape, so too are factors concerning the quality of the food itself. The following sections discuss ways to achieve higher quality produce.

4.1 SELECTING VARIETIES
4.2 NUTRIENT RECYCLING
4.3 INSECT MANAGEMENT
4.4 PRESERVING
4.5 SAVING SEED

4.1 SELECTING VARIETIES

The growing of food in the home landscape allows the individual to attain high quality produce. Varieties can be selected for taste, juiciness and nutritive value. Vegetables can be picked at the peak of ripeness and eaten at their freshest. Commercial produce tends to lack these qualities because it has been developed for size, shape, color and durability for shipping and handling. None of these qualities has anything to do with the most important factor in food-growing: food value (Hill, Ecology, 1977, p. 197). For instance, potato varieties in North America and Europe have less protein and vitamin C than the original South American plants from which they are derived. Apple varieties such as Delicious, Spartan and MacIntosh are much lower in vitamin C than many other varieties. Commercial crop improvement processes have been much more successful in increasing yields than nutrient content (Winnipeg Free Press, March 12, 1983).

4.2 NUTRIENT RECYCLING

Organic matter is recycled through decomposition. Soil microorganisms and invertebrates break down complex organic molecules into simple elements which can be used by plants.

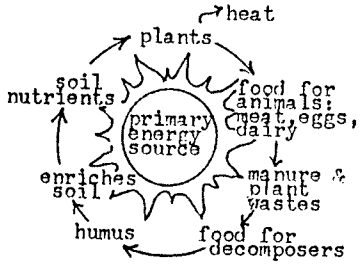


Fig. 24 Cycling of organic matter

There are many elements which are necessary for healthy plant growth. The main elements used by plants are nitrogen, phosphorous and potassium. The minor elements are used in much smaller amounts but necessary none-the-less. These are iron, magnesium, calcium, sulfur, and traces of boron, copper, manganese, molybdenum and zinc. The best way to supply these elements to plants is to make a compost bin, then add the composted or decomposed material into the soil. Organic material for composting is readily available within the home and community. Plant trimmings, lawn cuttings, leaves, eggshells, coffee grounds and peelings can be added to the bin.

Neighbors who bag and discard leaves and grass are a ready source of compost material to enrich the soil. Care should be taken, however, not to use clippings that have had a herbicide applied to them.

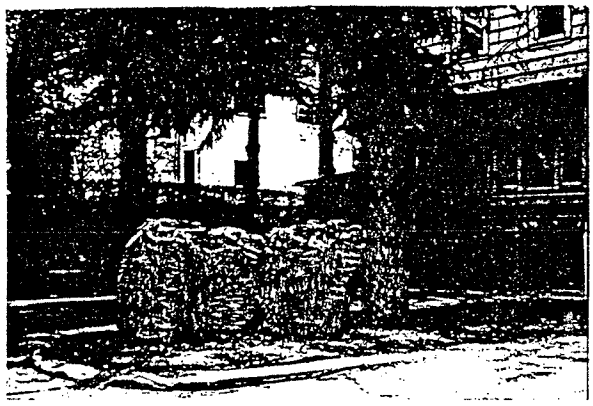


Fig. 25 Autumn leaves: a wealth of nutrients in polyethylene bags waiting for garbage pick-up.

Compost improves the "tilth" or texture of the soil, making it lighter and fluffier. It improves drainage and increases air spaces in the soil. Materials should be added in layers with perhaps a light watering during dry periods to aid decomposition. The pile should be damp but not soggy. Microorganisms are the main decomposers in a compost pile and their presence can be ensured by occasionally adding a layer of rotted barnyard manure, old compost or some good garden soil. It takes about a year for the pile to decompose completely. Then it is ready to be forked into the growing beds. Two or even three bins are better than one as they will be in progressive stages of decomposition throughout the year.

Compost can be simply piled on the ground but the appearance of a small yard can be improved by using containers. Three-sided bins made of concrete blocks, bricks or boards all look quite respectable and protect the compost from cold and heavy rains that might wash away valuable nutrients. The front side of the bin should have removable boards which can be stacked as the pile gets higher. Whether the compost is stored in a bin or piled loose in a corner, it should be an integral component in the home landscape. The waste that every home and yard produces should never be simply thrown away, but, rather, seen for what it really is: a valuable and inexpensive source of plant food.

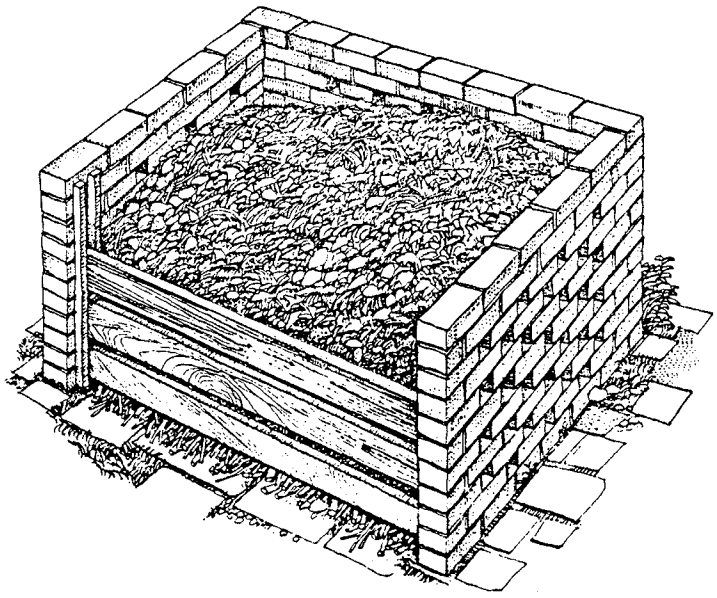


Fig. 26 Brick compost bin. The Bricks are spaced for ventilation. (from The Self Sufficient Gardener, 1980)

4.3 INSECT MANAGEMENT

Control of insect pests is a fact of life in the garden. There are many ways to reduce insect damage to food plants while protecting one's health and environment. These methods are best used in combinations rather than as single solutions. Helga Olkowski, a pest management specialist and co-author of the City People's Book of Raising Food, says,

> "You can't do just one thing. Thats what's wrong with pesticides. They're too simplistic. The system is complicated. You've got to use a series of strategies to deal with what is really a complex biological system" (Jobb, 1979, p. 136).

A single pest infestation is an indication that something is wrong with the ecological system within the garden. Chemical applications result in imbalances in plant-pest relationships, often allowing certain pests to flourish. This

prompts the use of more chemicals, compounding the problem. Pesticide control is temporary (the "magic bullet" approach) and can lead to an increase in pest populations, Since the most resistant insects survive to reproduce. Also, the reduction in predator populations such as lady bugs which prey on aphids, allows the pests to increase unchecked.

An increasing number of people prefer to eat fruits and vegetables grown without the use of chemical pesticides. These substances have been linked with cancer in animals and humans, yet continue to have widespread use in agricultural crop production as well as in home gardens. It is time to examine our current insect control methods and look for the safest insect management strategies possible.

Fig. 27 Poisonous sprays can create "Super Insects" (Environment Canada, 1984)

Control methods should be as varied as the insect life within the garden. The following methods have shown to be safe for plants, animals and humans.

DIVERSIFICATION Crops planted in small groupings among other varieties tend to resist the devastation that insects can wreak upon large single crop plantings (monoculture). This is because the food supply appears limited to the insect.

BAITS AND TRAPS Baits are substances which lure insects and may include light, smell, darkness or pheromones (sex attractants). Traps may be liquid or sticky substances. For instance, pots of honey will attract and trap ants. Slugs, attracted to beer left in shallow dishes among plants will fall in and drown. Some insects are attracted to certain colors. White flies are partial to yellow and will become trapped to strips of sticky yellow paper among the plants. Rolled up newspapers attract earwigs at night. The papers can then be discarded the next morning.

BARRIERS Insects can be prevented from reaching plants by barriers such as screens, nets or sticky paper. Tin can collars around seedlings discourage cut worms. Dry ashes around peas are used to control snails. Netting can save fruit crops from being decimated by flocks of birds.

HAND PICKING This simple method will control large insects such as slugs, snails and caterpillars. Leaves and branches that are heavily infested with small insects such as scale and mealy bugs should be cut off and destroyed.

PREDATORS Many useful predator insects can be purchased and released in the garden. They will be an effective control as long as there are some prey insects on which they can feed. Plants should be provided to feed the adult predators as it is usually the larvae that do the preying. Dill, lemon balm, sweet clover and Queen Anne's lace all have small flowers that produce the pollen and nectar that adult predators like to eat. Other predators include birds such as Purple Martins which eat flying

insects, and toads and garter snakes which also eat a variety of insects. In rural areas, foxes, hawks and owls are useful predators because they prey on mice and rabbits. If these small mammals were left to multiply unchecked by their natural enemies, they could have a disastrous effect on commercial crops as well as home gardens.

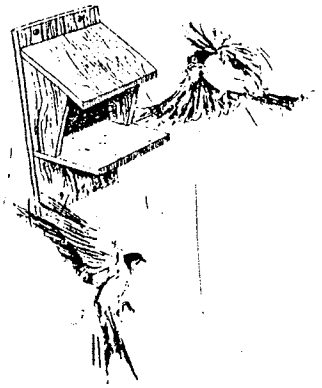


Fig. 28 Many birds such as swallows eat more than their weight in insects per day. Suitable housing will attract them to the home garden.

REPELLENT PLANTS These are plants with chemical properties that repel certain insects. For example, marigolds are known to discourage asparagus beetles and soil nematodes while nasturtiums repel aphids and squash bugs.

GOOD MANAGEMENT The observant gardener watches the natural processes occurring from day to day and strives to keep ahead of the pests. A clean and neat garden area assists the gardener in achieving this goal. Pruning dead and diseased plant parts and removing boards, dead leaves and refuse will give insects fewer places to live. Fall disposal of plant debris deprives pests of over-wintering sites (the compost pile will not harbor pests because of the elevated temperature of active decomposition).

ORGANIC INSECTICIDES These are relatively safe substances made from natural biological sources. They must be used with care because, they are generally non-specific. They will kill all insects, beneficial as well as harmful. The following products are available to the home gardener:

Bacillus thuringiensis (BT): an insecticide containing bacteria which infects and kills leaf-chewing insects such as cutworms, tomato hornworm and tent caterpillars.

Diatomaceous Earth: dust-like particles derived from the skeletal remains of aquatic diatoms. These particles clog the breathing holes and abrade the waxy coating on insects resulting in dehydration.

Insecticidal Soap: soap selected for its insecticidal properties; effective against aphids, mealybugs, scale and others. Tends not to be harmful to lady beetles, parasitic wasps of aphids and only minimally to honey bees. This product is non-toxic to humans and pets.

Nicotine: nicotine is mixed with water to make a spray. It breaks down quickly in soil and does not cause development of resistant strains of insects. Nicotine should be used with care as it is toxic to humans if inhaled.

Pyrethrum: a natural insecticide derived from the dried aromatic heads of certain Old World Chrysanthemums.

Rotenone: a crystalline insecticide made from tropical plants of low toxicity to humans (genus: Derris).

Fig. 29 Safer alternatives to the usual chemical insecticides.

A useful reference to have on hand with many suggestions for biological control: Organic Plant Protection, 1976, from Rodale Press (see bibliography).

4.4 PRESERVING

Concern for food quality leads many home gardeners to 'put up' as much produce as possible. This gives the assurance that the home grown fruit and vegetables are chemical-free and processed when most fresh. Home canning and freezing may be time consuming but worthwhile to those concerned with taste and nutritive quality.

Other methods of preserving are salting, drying and pickling. Also, many fruits and vegetables can be stored for varying lengths of time in a "cold room" maintained at about 0°C. Larger amounts of produce than can be grown at home may be picked at nearby market gardens. Good economic value is possible when local seasonal crops are abundant. This saves many trips to the supermarket because there is a variety of good food on hand at home from which to make a meal.

Cost savings may not be great over commercially canned food. An Agriculture Canada food consultant has observed that "only when the homemakers are not paid for their time does home food preservation cost less than the commercial equivalent" (Manitoba Cooperator, June 12, 1986). Costs include energy use, ingredients, containers and processing equipment. Canning is considered the most economical method at 4 1/2¢ per pound. Drying costs about 6¢ and freezing 21c| (Fresh Food, Dirt Cheap (All Year Long!), p. 71).

Fig. 30 A well stocked larder

Further reading:

Preserving: see The Self Sufficient Gardener by John Seymour, 1980

Cold Storage. See Home Storage Room for Fruits and Vegetables, Agriculture Canada, publication 1478/E.

4.5 SAVING SEED

A good way to ensure food quality is to save seeds. Many commercially available seeds are hybrids. These are produced by corporate seed suppliers which are usually owned by major drug and chemical companies. Gradually, good quality, old-fashioned nutritious varieties are disappearing as gardeners purchase the well advertised and enticing hybrids. These seeds must be purchased each year and there is no guarantee that a favorite will always be on the market.

Seeds are bred for large-scale global markets. A hundred years ago, farmers grew thousands of different grains and vegetables.

Today only thirty crops supply 90% of the world's calories and over half of these are from only four crops: corn, wheat, rice and sorghum (Winnipeg Free Press, March 12, 1983). Because only six varieties of corn are grown in North America, a leaf blight in 1970 devastated most of that year's produce. All six were so similar genetically, none were blight resistant. Had there been older, genetically different varieties growing at the same time, some of the crop could have been saved.

Carolyn Jabs is the author of a book about collecting and growing old and rare varieties of vegetables and fruits: The Heirloom Gardener, 1984. She sums up the importance of preserving such food plants in one word: choices. She says, "The essence of freedeom is the opportunity to choose among alternatives: (Jabs, 1984, 4). Even old varieties that are flawed in some way are worth saving from extinction, if only as a bundle of genes that control such characteristics as flavor and disease resistance. In the home garden, plants which exhibit desired characteristics can be left to go to seed for next year's planting (providing they are not hybrids which are sterile).

Some qualities to look for are drought-tolerance, early ripening and frost resistance. Often, such attributes are discovered accidentally. One Manitoba gardener, who left her garden untended all summer, returned from vacation to find the bok choy crop dead from dehydration, with the exception of three plants. These were watered and two were left to go to seed. The seeds were collected and became the source of a drought tolerant strain of bok choy. Creative experimentation will lead to plants that suit individual tastes and adaptation to local growing conditions.

Concluding Remarks

5.0 CONCLUDING REMARKS

Edible plants can be grown in such a variety of ways that 'eye appeal' need not be sacrificed when imagination and good planning are used in the overall design. The intensive methods described not only allow increased yield in smaller spaces but can result in interesting and pleasing design forms. Also, in a climate with a growing season as short as our prairie environment, edible plants increase the selection of woody and herbaceous species with which to enrich our landscapes.

As can be seen throughout this practicum, the use of edibles in home landscape design offers opportunities for providing:

1. Education - a dynamic landscape such as this teaches us much about the care and nurturing of plants through the changing seasons.

2. Sustenance - The landscape provides us with good, wholesome food that can be picked, eaten or preserved when most fresh.

3. Habitat - A diverse landscape that is rich in berries and flowering plants provides the ecological complexity for many insects and birds such as butterflies, dragonflies and humming birds. While there will always be insect pests, suitable habitat will attract the predators that help keep them under control.

4. Recreation - This type of landscape requires care, patience and diligence. It is most suited to the homeowner who views tending plants as both enjoyable and challenging.

5. Stimulation - Finally, the home landscape brimming with edible plants offers intangible rewards that a plain "lawnscape" cannot. There is richness and diversity in color, form and texture. The passing weeks of the growing season presents changing views, different tasks and new opportunities for growth and discovery.

5.1 WHERE DO WE GO FROM HERE?

Our cities and suburbs, often emerging from prime agricultural land, have great potential for food production that is often overlooked. Edible species such as apples, cherries, currents, saskatoons, raspberries, strawberries and grapes could have wonderful ornamental value in civic and corporate landscapes. The fruit could be maintained and harvested for use by hostels and shelters, providing employment as well as food. Private corporations located in expansive industrial parks might be persuaded to allow land to be used as allotment gardens.

Creating allotment gardens is a good way to make productive use out of non-productive land. Rather than having to mow and rake large lawns, the grounds could be divided into small rental gardens. Allotment gardens are quite popular in Britain and other parts of the world where private outdoor space is scarce. Inner city residents, apartment dwellers and even suburbanites wanting larger gardens might welcome the opportunity to use this space. Public parks could have a certain percentage of edible species of trees and shrubs. Even flower gardens could have vegetables mixed into the display.

Children can be taught to understand the value of growing food. At home we can show them the beauty and creativity possible in growing food.

Fig. 31 from Environment Canada, "Save It!" Kit, 1984

At school, food-growing can be part of their formal education. Some schools are turning unused and barren-looking areas of the school yard into food-growing projects. Whole classes and all grade levels become involved in the gardens. The program at Lord Roberts School in a densely populated part of Vancouver is an example of such a project. It has helped many children to discover first hand how food is grown before it reaches the supermarket. As a dynamic teaching tool, the food garden provides lessons for subjects such as biology, nutrition and economics. Co-ordinator Michael Levenston sums up the value of the project:

> The urban school garden of the 1980's is a way to introduce a whole new generation to food production, and that will lead them to think about related issues like energy conservation and pesticide use. All the environmental issues that have come to the fore in the last 10 or 20 years can be better understood through gardening. If we expose kids to growing food in the city at an early age, they'll be hooked.

Fig. 32 The new garden at Vancouver's Lord Roberts Elementary School has been an educational experience for students as well as the teachers. from: "The Children's Crusade", by D. Bruce White, Harrowsmith, Jan/Feb, 1987, pp. 117-118.

Hopefully, the children will become enthusiastic about gardening and take a spade to part of their own back yard. As luscious produce begins to replace weeds or grass, a sense of achievement and pride naturally follows. As children watch their gardens grow, they will come to observe the interelationships of the many organisms within it.

The desired result is that today's young people will develop a sensibility and nurturing attitude from their gardening experiences so that the future will see responsible, well-informed adults who care about their environment and have the wisdom to protect it.

Appendix

6.0 APPENDIX

6.1 GLOSSARY OF TERMS

The following is a list of terms with emphasis on gardening, organic growing and ecology. Most of the terms are taken from two main sources: Canada as a Conserver Society, 1977, Science Council of Canada and the writings of Dr. S.B. Hill of McGill University, Quebec.

BIOSPHERE

The biosphere is a continuous film of life - the layer at the surface of the globe in which all life exists. On the continents, it is no thicker than the height of the tallest trees to the depth of the deepest roots. It is a vast ecosystem composed of many smaller systems,, all deriving their basic energy from the sun.

COMPLEXITY

The natural environment is full of complex interactions such as food chains and predator-prey relationships. This complexity results in stability, allowing natural ecosystems to be self-sustaining. Ironically, through increasing technological complexity, modern agriculture attempts to simplify nature.

COMPOST

Conversion of organic wastes (plants, manure, food scraps, grass clippings, etc.) to rich humus through natural bacterial action combined with moisture and heat (process of decomposition). Compost replenishes the soil with the nutrients essential to healthy plant growth.

COMMUNITY

Assemblage of a variety of plant and animal species occurring and interacting naturally together in, for example, a river, forest or prairie grassland environment. A combination of community and environment is called an ecosystem.

DEEP BED (FRENCH INTENSIVE METHOD)

Developed in France by 19th Century market gardeners near Paris who attempted to get as much produce as they could from their small gardens. It is a system of digging deep beds, in which a trench is dug spade-deep and the loosened soil from the second trench is thrown into the first. As many trenches as needed are dug for each bed; the soil left from the first going into the last. The beds created become higher and lighter than the surrounding land because of the incorporation of air. Manure and compost are forked in each year, lightening the soil even further. The beds are never walked on to avoid compaction. Deep beds can also be made by filling a built container with soil. These are known as "raised beds".

DIVERSITY

The variety of interacting plant and animal species in a community. Diversity in natural ecosystems helps to ensure the successful survival of all individuals and of the ecosystem itself. A one-crop field is much more likely to suffer from drought, blight or insect infestation because it lacks the ecological diversity that might resist such a disaster.

ESPALIER

This term refers to the art of pruning fruit trees such as apple and pear into decorative shapes. The trees are kept low and usually trained along fencelines to take up

as little space as possible.

ECOLOGY

The study of relationships between organisms and their environment, including human relationships with nature. It is also concerned with consumption of natural resources, growth of human populations, effects of industrial and agricultural pollution on human health and the surrounding natural environment.

ECOSYSTEM

Includes everything that contributes to the maintenance of life within a specific space and time. It is the combination of community with its non-living environment and all the interactions occurring therein. An ecosystem is independent, containing its own matter and energy (except sunlight) and is able to circulate elements such as nutrients, minerals and water to sustain life. Examples of ecosytems include tall-grass prairie, tropical rain forest and tundra.

ENVIRONMENT

Includes both the organic and non-living parts of the world where life occurs. Weather, physical and chemical composition of the soil and seasonal changes are all part of an organism's environment or surroundings.

HUMUS

The uppermost layer of soil in which organic matter such as leaves, grass and dead insects are in the process of decomposition but not yet worked down into the inorganic component of the soil stratum. Humus is the light, spongey and rich portion of the soil capable of holding air, moisture and provides the trace minerals essential to plant growth.

INDIGENOUS PLANTS

Species occurring naturally in the area in which they are found. In landscaping, they are often more successful than exotics since they are usually better adapted to local soil and climate conditions.

NATURAL PEST MANAGEMENT

Insects are controlled to within acceptable limits using natural or organic methods, never chemical pesticides. It is accepted that there will always be low levels of pest damage to crops as there must be some pests in order to sustain the predators that control them.

ORGANIC MATTER

That part of the soil derived from once-living sources through decomposition (dead plants and animals eaten by soil microorganisms and earthworms), providing the nutrient component of the soil required by plants.

ORGANICALLY GROWN FOOD

Food grown from soil that is rich and fertile with organic matter and naturally derived minerals. Pesticides, artificial fertilizers or synthetic additives are not used in its production.

PESTICIDE

A chemical compound (there are thousands) usually sprayed to kill crop-eating insects. Negative effects include: use increases need to continue use, constant use creates new and resistant pests, often kills natural predators. North American agriculture is heavily locked into this system, with the 'need' spreading to developing countries.

QUALITY OF LIFE VS. STANDARD OF LIVING

Quality of life refers to the healthful amenities provided by the natural environment from which we receive our basic needs for air, water, food and living space. Our psychological and social needs for nature's beauty and order are also met by the natural environment. Quality of life emphasizes spiritual, intellectual and aesthetic values in which material wealth is not a prime consideration.

Standard of living refers to the amenities and services of the technological and built environment, e.g. television, appliances, vehicles and electronic communication. Aspects of one's standard of living can also enhance one's quality of life. However, increase in S.O.L. has nearly the same effect on the biosphere as an increase in population. In North American society where S.O.L. is high, there is a trend toward an appreciation for quality of life - e.g. outdoor recreation in parks and other natural environments. In societies where S.O.L. is low, there is a desire to increase consumption of goods and services, often with deleterious effects on the natural environment.

SENSIBILITY

Defined by Webster's Dictionary as "awareness of and responsiveness toward something". Having ecological sensibility means that one is aware of the delicate balance of nature and the impact of human activities upon this balance. It also means that one responds by taking positive action toward rectifying negative impact and ensuring that one's daily habits are not harmful to the global ecosystem.

SIMPLICITY

An attitude of responsibility for maintaining an ecologically sound environment. By limiting our desires to real needs as much as possible, our life-styles can have a minimal impact on the earth and its resources. (However, needs vary with social environment - as Rene Dubos put it: "The phrase "essential need" is therefore meaningless, because in practice people need what they want" (So Human an Animal, p. 170). We have to use prudence and good judgement in order to simplify our lifestyles according to our consciences.

SOIL

An extremely complex ecosystem. Both organic and inorganic, it is formed from the combined ongoing processes of decomposition of plant and animal life and the weathering of rock. As organic material decays, it gives off acids that release nutrients obtained from the minute rock particles.

SUSTAINABLE

A system in which energy flows and matter cycles such that life processes are stable and on-going. No part of a sustainable system suffers as a result of the activities of another part. Natural ecosystems are sustainable but human activities tend, rather, to be exploitive and polluting causing losses and instability in the natural environments. Soil erosion is an example of this.

SYMBIOSIS

Two different organisms interacting and living together for their mutual benefit.

TRELLIS

Usually constructed of wood, a trellis is a structure designed to give shade to an outdoor space while still admitting light and air. It can be an overhead structure or used as a wall. Often, vines are trained to climb the trellis.

WEED

"What is a weed? A plant whose virtues have not yet been discovered" - Emerson. Weeds are unwelcome self-starters because they are considered unattractive and compete with desirable species for space, water and nutrients. Weeds are often prolific because they are able to exploit new environments such as cleared fields and roadsides. Their advantages, which are often overlooked, include edibility and high vitamin content. Their presence in soil can indicate, depending on species, soil elements and presence of ground water. For example, ox-eye daisy indicates wet or poorly drained, uncultivated or neglected soil, acid or low lime pH and relatively low fertility. Weeds left in exposed soil help keep it light with their roots and protect topsoil from the erosional forces of wind, rain and sun.

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Contains a good chapter on using herbs and vegetables as part of the ornamental landscape.

Cohlmeyer, Cynthia D., The Aspen Parkland and Its Application to Landscape Design, Master's Thesis, University of Manitoba, 1977.

The ecological costs of traditional landscaping are discussed and the benefits of landscaping with native plants to create natural environments are well documented. There is a comprehensive list of native species suitable for use on the prairies in home and corporate landscaping.

Common Garden Pests, Ecological Agriculture Projects, Quebec, 1981. 13pp.

A compilation of fact sheets on insect pests, their life cycle, type of damage and biological control measures.

Creasy, Rosalind, The complete Book of Edible Landscaping, Sierra Club Books, San Francisco, 1982. 379pp.

A well-illustrated book containing sections on design, an encyclopedia of edible plants and sources of supplies and information.

Curl, Huldah, ed., Winona: Towards an Energy Conserving Community, University of Minnesota, Minneapolis, MN., 1975, 122pp.

Based on papers and an exhibition prepared by the 1974-75 students of the Energy Design Studio, School of Architecture and Landscape Architecture, the book is a response to the energy crisis of the early 1970's It offers alternatives to dependence on fossil fuels in a comprehensive design strategy for the community of Winona near Minneapolis. It is suggested that an old monastery could be a model of communal living and discusses the concepts of agricultural self-sufficiency, solar collectors, heat pumps, wind pumps, anaerobic digestors, greenhouses and grow holes. There are several isometric plans, sections, photos and diagrams to illustrate the ideas.

Davis, Burke, Newer and Better Organic Gardening, Longman Canada Ltd., Toronto, Ont., 1976, 95pp.

Diekelmann, John & Robert Schuster, Natural Landscaping: Design and Native Plant Communities, McGraw Hill, Inc., U.S.A., 1982. 276pp.

The authors differentiate between traditional planting and naturalized planting, giving two design examples. There are plenty of good ideas and sound principles for home landscaping. Discussions include analyzing, planning and designing the site, open, shaded, wetlands, private, public and corporate landscapes. There are abundant black

and white photos, illustrations, 54 color plates, glossary of terms and index. Additional reading is suggested at the end of most chapters.

Eckbo, Garrett, Home Landscape: The Art of Home Landscaping. McGraw-Hill, Inc. New York, 1978.

A thoughtful guide to understanding the home landscape design process. Also discusses the aesthetic qualities of plants, lighting, color and landscape.

Gilkeson, L. and M. Klein, A Guide the the Biological Control of Greenhouse Aphids, The Ark Project, Charlottetown, P.E.I., 1981. 25pp.

An illustrated handbook describing the life cycle of this common pest and of beneficial predatory insects.

Grasby, Nancy, Imaginative Small Gardens, Hearthside Press, Inc., New York, 1963, 256 pp.

This book contains some interesting designs for small spaces. The author also looks to nature for inspiration for design, so that it might be elevated to an art form. Planting material listed is generally not suitable for the prairies. There are 63 line drawing and 27 photos.

Greentree, Joan, "The Amazing Non-Garden Garden," Landscape Architecture. July, 1975, 286-291.

A brief but well illustrated article on creating a natural environment as an alternative to traditional home landscaping.

Grounds, R., ed., The Sunday Times Two Hour Garden. Transworld Publishers, Ltd., London, 1976, 144 pp.

Written for homeowners who would like to spend their time enjoying their yard, this book describes how to create a landscape in one year from two hours work a week. Most plants recommended are not suitable for the Canadian prairie. Full of color illustration.

Harp, H.., The Prairie Gardener. Hurtig Publishers, Edmonton, 1970. 304 pp.

Informative discussion of gardening techniques for the prairie environment and description of plants which can thrive in it.

Hill, S.B., "Biological Approaches to Pest Control", in Proceedings of the P.E.I. Conference on Ecological Agriculture, Charlottetown, P.E.I., 1978. 174-197.

Dr. Hill advocates proper management of soil and crops for pest control rather than chemical methods.

_____, "Composting for Farm and Garden: Part 1: The Whys and Wherefores. Part II: How to Do It", Macdonald Journal. Quebec, 1975. 36 (11): 6-11,20.

Discusses the importance of recycling wastes by composting at both home and farm.

_____, "Eco-Agriculture - The Way Ahead?", Agrologist, 1979, 8(4): 9-11.

The food producing and distribution system is examined as it presently exists and recommendations are made for the benefit of producers and consumers alike.

_____, "Ecology", Food from Land, Publ. 5129, Agriculture Canada, Ottawa, 1977, pp. 95-110.

Describes the present food system and its manipulation of wants rather than response to real needs of the consumer. Hill illustrates his ecological ideas in contrast with traditional attitudes.

_____ & J. Ramsay, "Weeds as Indicators of Soil Conditions", Macdonald bJournal. Quebec, 1977. 38 (6):8-12.

Outlines the benefits of weeds to agriculture and their role in revealing changing soil conditions.

Hills, Lawrence D., Organic Gardening, Penguin Books, Ltd., London, 1977.

Hills addresses the question, "Why garden organically?" by suggesting that one can save money, improve one's health by avoiding the build up of pesticides in the body, and improve the quality of the food we grow and eat.

Hough, Michael, "Metro Homestead: Tapping the City's Agricultural Resources", Landscape Architecture, Jan/Feb 1983, (73)1, pp. 54-58.

Food should not only be grown in the country but must be grown in the city if we are to shift to a conserver frame of reference. The urban environment is an untapped resource of land and nutrient energy according to Hough. The article outlines how and why the city can be made a productive source of food for its inhabitants.

_____, City Form and Natural Process, Towards a new urban vernacular, Croom Helm Ltd. London, 1984. 281pp.

Michael Hough describes in detail ways in which human and natural resources can be used efficiently to make our cities enriching and productive following the principles that guide natural processes.

Jabs, Carolyn, The Heirloom Gardener, Sierra Club Books, San Francisco, 1984, 310pp.

All about heirloom plants and how gardeners can help save this living legacy. Contains listings of U.S. seed exchanges, seed companies, living museums and farms, all dedicated to the perpetuation of heirloom seeds.

Jeavons, John & Helen, How to Grow More Vegetables than You Ever Thought Possible on Less Land than You Can Imagine, Ecology Action, Palo Alto, CA., 1982, 159 pp.

Describes the biodynamic French intensive method of gardening and how one can earn money on one fifth of an acre. Includes an extensive bibliography and source list.

Jobb, Jamie, The Complete Book of Community Gardening, William Morrow and Company, Inc., New York, 1979, 190 pp.

Full of helpful advise for any group of people wishing to convert vacant land into thriving, productive community gardens. Citis existing programs throughout the U.S.

Korn, Larry, ed. et al., The Future is Abundant: A Guide to Sustainable Agriculture, Tilth, Washington, 1982. 192pp.

This is a source book and bibliographic reference for organic farming and gardening particularly for the U.S. Pacific Northwest. It contains useful ideas for making agricultural practices more like natural processes and was inspired by the Japanese farmer, Fukuoka in The One Straw Revolution and by Australian environmental scientist, Bill Mollison who authored Permaculture One and Permaculture Two.

Kramer, Jack, Natural Gardens: Gardening with Native Plants, Charles Scribner's Sons, New York, 1973, 150 pp.

Written for the U.S. but includes southern half of Canada in the climatic zoning. Suggests use of suitable native plants in home landscape for appropriate environmental conditions; e.g., open meadow, bog, shady woodland. Included are some design ideas and maintenance suggestions. Well illustrated.

Laurie, Ian C., ed., Nature in Cities: The Natural Environment in Design and Development of Urban Green Space, John Wiley and Sons Ltd., Great Britain, 1979, 428 pp.

A collection of articles on humanizing and naturalizing the urban environment. Does not deal specifically with private outdoor space. Well illustrated.

Laurie, Ian C., Over-Design is the Death of Outdoor Liveliness", Landscape Architecture, November, 1978, pp. 485-486.

Describes civic landscapes as often being lavish and contrived designs which are also inhospitable environments. The author suggests that urban open spaces should offer some relationship with the living biological world.

Leopold, Aldo, A Sand County Almanac, Oxford University Press, New York, 1975, 226pp.

Leopold believes that wild things have a right to exist in their natural environment and that we must learn that we are an integral part of the entire biotic community. The book, written over forty years ago, stresses the importance of the community concept and is filled with philosophical wisdom and personal insights about the natural order of things.

Logsdon, Gene, Two Acre Eden, Rodale Press, Emmaus, PA., 1980. 237pp.

The author professes to love gardening, subsistence farming and "organic" living. With delightful humor, he offers much practical wisdom in home-steading and backyard ventures.

Maingay, Hilde, "Intensive Vegetable Production", Journal of New Alchemists, Falmouth, MA., 1977, 4:47-55.

Describes the process of gardening intensively using the raised bed system, from construction to expected productivity. Includes tables, illustrations and references.

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Discusses landscape design in which man and nature co-exist in a balanced relationship.

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McHarg, Ian, Design with Nature. Doubleday and Company, Inc., New York, 1971. 198pp.

An important book dealing with man and his relationship to the earth. Discusses the effects of man's activities through out history and demonstrates the necessity for stewardship and cooperation with all other living organisms.

McRobie, George, Small is Possible, Sphere Books Ltd., London, 1982, 331pp.

Written as a sequel to Small is Beautiful, by E.M. Schumacher, McRobie advocates non-violent, simple, capitol-saving technologies that are sparing in their use of resources. He shows that "small" technology is possible by citing examples of organizations working in developing countries and the use of alternative forms of energy and technology in affluent countries such as Britain, United States and Canada.

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All about raising food in the city, from vegetables to small livestock.

Nelson, Jr., Wm. R., Landscaping Your Home, University of Illinois at Urbana-Champaign, College of Agriculture, Circular IIII, 1975, 246pp.

A practical guide to aid the homeowner. Plenty of illustrations. Plant list too extensive for Canadian Climate, hardiness zones provided.

Organic Gardening, Editorial Staff, Home Power!, Rodale Press, Inc., Emmaus, PA, 1976.

Stressed in this little book is the fact that the home can be a tax free investment by growing food, making repairs, making clothes and saving energy. It suggests ways that households can become more productive and less dependent on the market economy by, for example, trading or selling one's surplus fruit, livestock or vegetables.

Organic Gardening Publication Editors, The Best Gardening Ideas for the '80's, Rodale Press, Inc., Emmaus, PA., 1980, 131pp.

This work contains several short articles by a variety of authors eager to share their methods and discoveries for successful organic gardening. The premise of the book is that 'the more we understand, the closer our gardening approaches Nature's ways'. Plenty of photos and illustrations complete the text.

Science Council of Canada, Canada as a Conserver Society: Resource Uncertainties and the Need for New Technologies, Report no. 27, Ottawa, Sept., 1977, 108pp.

Issues such as resource depletion and denegration of the environment are discussed. Ways in which energy and resources can be used more wisely and efficiently are suggested in a list of recommendations at the end of the report.

Schumacher, E.F., Small is Beautiful: Economics as if People Mattered, Harper and Row, New York, 1973, 305pp.

Presents the current use of science and technology as exploitive of peoples and environments and discusses the need for new, gentler, non-violent technologies.

Seymour, John, The Self-Sufficient Gardener: A Complete Guide to Growing and Preserving All Your Own Food. Doubleday and Company, Inc., New York, 1980. 256pp.

A useful and well illustrated reference for planning, cultivating and preserving garden produce. Natural methods of pest control and soil improvement are discussed.

Small Space Gardening, 1983. Harris Publications, Inc. 2:1, New York, 83pp.

An annual publication dealing with plant material, techniques and design suitable for small spaces.

Sommer, Robert, "Robert Sommer Looks at Privacy and Crowding", Landscape Architecture, May 1982, (72)3, 81-83.

Sommer predicts crowding within the home due to the preponderance of home entertainment devices, as necessitating design considerations for privacy in the home landscape. As well, gardens will become more important, not only for economic reasons, but because of the psychological need to get close to nature.

Thacker, Christopher. The History of Gardens, University of California Press, Berkeley and Los Angeles, 1979, 288pp.

Many color photos and illustrations of gardens around the world. Discusses the historical development of garden design to modern times.

Vick, Roger, Gardening on the Prairies, Western Producer Prairie Books, 1987, 246 pp.

A useful book for gardeners in the prairie provinces. Lists old and new cultivars of fruiting trees and shrubs and their relative hardiness. Many illustrations and color photographs.

Yespen, Roger B., ed. Organic Plant Protection: A comprehensive reference on controlling insects and diseases in the garden, orchard and yard without using chemicals, Rodale Press, Inc., Emmaus,, PA., 1976, 688pp.

A useful guide for both understanding and using biological controls in plant protection.

Canadian Organic Growers
33 Karnwood Drive
Scarborough, Ontario
M1L 2Z4

Monthly newsletter, seed swap, five dollar annual membership fee.

Earthcare Group
Indian Head,
Saskatchewan

Concerned with ecological agricultural practices.

Ecological Agriculture Projects
P.O. Box 225
Macdonald Campus
St. Anne-de-Bellevue, P.Q.
H9X 1C0

Research and publications for ecological alternatives in agriculture.

Fallarones Institute
The Integral Urban House
1516-5th St.
Berkely, California
94710

Devoted to promoting self-sufficiency. Old house completely redesigned for urban self-reliance in heating, waste disposal and food production.

Maskwa
444 River Ave.
Winnipeg, Manitoba
R3L 0C7

Promotes soft-path lifestyle: organic gardening, solar heating, wind power, self-sufficiency. Site located near Bissett. Open to the public.

The New Alchemy Institute
P.O. Box 432
Woods Hole, Mass.
02543

A non-profit research and education center for environmentally sound living. Annual publication.

The Prairie Christian Training Center
Fort Qu'Appelle, Saskatchewan

Held a conference in 1983: "Goals for Canadian Agriculture: Canadian Farm Policy and the Family Farm". Reports on a variety of issues concerning Canada's Environment.

Science Council of Canada
150 Kent St.
7th Floor
Ottawa
K1P 5P4

Well-documented reports on environmental issues are available to the public upon request.

Sierra Club
530 Bush St.
San Francisco, Calif.
94108

Founded in 1892 by John Muir; devoted to study and protection of the earth's scenic and ecological resources, the preservation of wilderness and quality of life.

Harrowsmith
7 Queen Victoria Road
Camden East, Ontario
K0K 1J0

Published bimonthly by Camden House Publishing Ltd., Ontario. Articles relating to "quality" lifestyle: organic gardening, country living, energy conservation.

PERIODICALS

Organic Gardening
33 East minor St.
Emmaus, PA
18049

Published monthly. Contains articles and readers' tips on organic gardening and pest control methods.

The Prairie Garden
P.O. Box 517
Winnipeg, Manitoba
R3C 2J3

Published annually. Contains articles on landscaping, propagating, growing and selecting ornamentals and edibles suitable for the prairie environment.

GOVERNMENT PUBLICATIONS

Agriculture Canada
Communications Branch
Ottawa, Ontario
K1A 0C7

There are many publications available on the different aspects of home food growing such as northern gardening, composting, pruning and training fruit trees and progation. Most are free of charge.

Environment Canada
Public Affairs
804, 9942-108 St.
Edmonton, Alberta
T5K 2J5

Produces publications such as "SAVE IT!": A Practical Family Kit on Saving Resources, Saving Money, and... Saving the Environment (1984). Contains addresses for more information on various issues such as recycling, alternatives to pesticide use and energy conservations around the home.

U.S. Department of Agriculture
National Agricultural Library
Public Services Division, Room 111
Beltsville, Maryland 20705

A bibliography of organic farming and gardening obtainable free of charge.