

McWater's Park Permaculture Gardeners

Permaculture Design Workshop
and Charrette

Polyculture Design
Part 2

Selecting plants that will improve the local conditions:

Support a pollinators to improve fruit production

Support carnivorous insects to reduce herbivorous insect populations

Generalist and Specialist Nectories
- through out the growing season

Specialist Nectaries

Feeding pollinators with shallow mouth parts

The Umbelliferae family, which includes carrots, parsley, dill, cilantro, fennel, chervil, parsnip, celery, and celeriac — named after their umbrella shaped flowers, called umbels.



The Compositae, or daisy family (also called the Asteracea, or aster family), so named because the centre is in fact a composite flower, consisting of a cluster of many little flowers called 'florets', with one set of petals around them all.



Other plant families also have small flowers that can serve as a food source for beneficial insects





Specialist Nectaries



Plan for blooms all season long

Bloom Period	Common Name	Scientific Name	Flower Color	Max. Height*	Water Needs
	Forbs			(Feet)	L: low; M: medium; H: high
Early	1 Golden Alexanders	<i>Zizia aurea</i>	yellow	3	H
	2 Wild geranium	<i>Geranium maculatum</i>	pink	3	M
Early-Mid	3 Spiderwort	<i>Tradescantia virginiana</i>	blue	3	M
	4 Blue vervain	<i>Verbena hastata</i>	blue	5	H
Mid	5 Narrowleaf mountain mint	<i>Pycnanthemum tenuifolium</i>	white	3	L-M
	6 Swamp milkweed	<i>Asclepias incarnata</i>	pink	5	M-H
	7 Wild bergamot	<i>Monarda fistulosa</i>	purple	4	M
Mid-Late	8 Boneset	<i>Eupatorium perfoliatum</i>	white	5	H
	9 Cardinal flower	<i>Lobelia cardinalis</i>	red	4	H
	10 Field thistle	<i>Cirsium discolor</i>	purple	6	M
	11 Wild golden glow	<i>Rudbeckia laciniata</i>	yellow	7	H
Late	12 Bottle gentian	<i>Gentiana clausa</i>	blue	2	M
	13 Calico aster	<i>Symphyotrichum lateriflorum</i>	white	3	M
	14 Gray goldenrod	<i>Solidago nemoralis</i>	yellow	2	L
	15 New England aster	<i>Symphyotrichum novae-angliae</i>	purple	6	M
	16 Wrinkleleaf goldenrod	<i>Solidago rugosa</i>	yellow	3	M-H

From <https://xerces.org/publications/plant-lists/pollinator-plants-northeast-region>

Tallamy Keystone Species

“All plants are not created equal, particularly in their ability to support wildlife. Most of our native plant-eaters are not able to eat alien plants, and we are replacing native plants with alien species at an alarming rate, especially in the suburban gardens on which our wildlife increasingly depends. My central message is that unless we restore native plants to our suburban ecosystems, the future of biodiversity in the United States is dim.”

– Douglas W. Tallamy, **Bringing Nature Home**



COMMISSION FOR ENVIRONMENTAL COOPERATION
COMISION PARA LA COOPERACION AMBIENTAL
COMMISSION DE COOPERATION ENVIRONNEMENTALE

- 1.0 ARCTIC CORDILLERA
CORDILLERA ARTICA
CORDILLERE ARCTIQUE
- 2.0 TUNDRA
TUNDRA
TOUNDRA
- 3.0 TAIGA
TAIGA
TAIGA
- 4.0 HUDSON PLAIN
PLANICIE DE HUDSON
PLAINE D'HUDSON
- 5.0 NORTHERN FORESTS
BOSQUES SEPTENTRIONALES
FORETS SEPTENTRIONALES
- 6.0 NORTH-WESTERN FORESTED MOUNTAINS
MONTANAS BOSCOSAS NOROCCIDENTALES
MONTAGNES FORESTEEES DU NORD-OUEST
- 7.0 MARINE WEST COAST FOREST
BOSQUE COSTERO OCCIDENTAL
FORET MARITIME DE LA COTE OCCIDENTALE
- 8.0 EASTERN TEMPERATE FORESTS
BOSQUES TEMPLADOS DEL ESTE
FORETS TEMPEREES DE L'EST
- 9.0 GREAT PLAINS
GRANDES PLANICIES
GRANDES PLAINES
- 10.0 NORTH AMERICAN DESERTS
DESERTOS DE NORTEAMERICA
DESERTS DE L'AMERIQUE DU NORD
- 11.0 MEDITERRANEAN CALIFORNIA
CALIFORNIA MEDITERRANEA
CALIFORNIE MEDITERRANEENNE
- 12.0 SOUTHERN SEMI-ARID HIGHLANDS
ELEVACIONES SEMIARIDAS MERIDIONALES
HAUTES TERRES SEMI-ARIDES MERIDIONALES
- 13.0 TEMPERATE SIERRAS
SIERRAS TEMPLADAS
SIERRAS TEMPEREES
- 14.0 TROPICAL DRY FORESTS
SELVAS CALIDO-SECAS
FORETS TROPICALES SECHEES
- 15.0 TROPICAL WET FORESTS
SELVAS CALIDO-HUMEDAS
FORETS TROPICALES HUMIDES

Echelle/Escala/Scale
0 200 400 600 800 Miles
0 400 800 1200 Km
Projection Azimutal de Equivale de Lambert
Proyección Azimutal de Equiv-área de Lambert
Lambert Azimuthal Equal Area Projection

ARCTIC OCEAN
OCEANO ARTICO
OCEAN ARCTIQUE

PACIFIC OCEAN
OCEANO PACIFICO
OCEAN PACIFIQUE

ATLANTIC OCEAN
OCEANO ATLANTICO
OCEAN ATLANTIQUE

Gulf of Mexico
Golfo de Mexico
Golfe du Mexique

Mackinac Bay
Baie de Mackinac

Canada
United States of America
Estados Unidos Mexicanos

Three countries working together to map our shared environment.
Tres países trabajando juntos para cartografiar nuestro medio ambiente.
Trois pays s'unissent pour cartographier notre environnement à l'aide.

ECOLOGICAL REGIONS OF NORTH AMERICA
REGIONES ECOLÓGICAS DE AMÉRICA DEL NORTE
RÉGIONS ÉCOLOGIQUES DE L'AMÉRIQUE DU NORD

Level I Nivel I Niveau I

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Ecological regions are areas of general similarity in ecosystem and in the type, quality, and quantity of environmental resources. They serve as a spatial framework for the research, assessment, management, and monitoring of ecosystem and resource consequences. They are effective for national and regional state of the environment reports, environmental account derivation and assessment, setting regional resource management plans, determining carrying capacity, as well as developing biological criteria and water quality standards. The development of a clear understanding of regional and large continental ecosystems is critical for evaluating ecological risk, sustainability, and health.

Ecological classification is based on hierarchy—ecosystems are nested within ecosystems as mapped, although in reality, they may not always nest.

Such classification integrates knowledge; it is not an overlay process.

It recognizes that ecosystems are interactive—characteristics of one ecosystem blend with those of another.

Map lines depicting ecological classifications boundaries generally coincide with the location of zones of transition.

The maps shown here represent a second attempt to delineate clearly and map ecological regions across the North American continent (Commission for Environmental Cooperation Working Group, 1997). The mapping from 1997 and 2000 was both open ended efforts that have been individually in all three countries (e.g., Wilson 1984, Omernik 1987). Those approaches recognized the need to consider a full range of physical and biotic characteristics to explain ecosystem regions (Omernik 2004). Finally, they recognized that the relative importance of such characteristics varies from one ecological region to another regardless of the hierarchical level in describing vegetation in Canada (Wilson 1984) east.

A Roman numeral hierarchical scheme has been adopted for different levels of ecological regions. Level I is the coarsest level, dividing North America into 15 broad ecological regions. These highlight major ecological zones and provide the broad backdrop to the ecological mosaic of the continent, putting it in context at global or intercontinental scales. The 50 Level II ecological regions have been defined and are intended to provide a more detailed description of the large ecological areas nested within the level I regions. Level II ecological regions are useful for national and subnational ecosystem or ecological patterns. At level III, the continent currently contains 112 ecological regions. The level III ecological regions map depicts regions and sub-regions of active level I, II, and III ecological regions (1997, 2007, McManus et al., 2001, Omernik 1987, USEPA 2006, Wilson 1986, Wilson et al., 1996). These smaller divisions enhance regional environmental monitoring, assessment and reporting, as well as decision-making. Because level III regions are smaller, they allow locally defining characteristics to be identified, and more specifically oriented management responses to be formulated.

Ecological level classification is a process of delineating and classifying geographically discrete areas of the Earth's surface. Each area can be viewed as a discrete system which has resulted from the mark and interplay of the geologic, landform, and topographic, climatic, soil, water and human factors which may be present. The dominance of any one or a number of these factors varies with the given ecological level unit. This holistic approach to level classification can be applied incrementally on a scale related basis from very site-specific ecosystems to very broad ecosystems.

Delineating ecological regions at a continental level is a challenging task. It is difficult, in part, because North America is geologically diverse and because a nation's territorial boundaries can be a hindrance to seeing and appreciating the perspective across the land-mass of these countries. Developing and refining a framework of North American ecological regions has been the product of research and consultation between federal, state, provincial and territorial agencies. These agencies were often government departments, but the initiative also involved non-governmental groups, universities and institutes. The Commission for Environmental Cooperation (CEC) was instrumental in bringing these groups together. The CEC was established in 1994 by Canada, Mexico, and the United States to address environmental concerns common to the three countries. The CEC serves as formal mandate from the North American Agreement on Environmental Cooperation (NAAEC), the environmental side accord to the North America Free Trade Agreement (NAFTA).

Omernik, J.M., 1987. Ecosystems of the continental United States (map supplement). *Annals of the Association of American Geographers*, v. 77, no. 1, p. 118-125, scale 1:7,500,000.

Omernik, J.M., 2008. Perspectives on the nature and definition of ecological regions. *Environmental Management*, v. 34, Supplement 1, p. 37-44.

U.S. Environmental Protection Agency, 2006. Level III ecosystem of the continental United States (revision of Omernik, 1987). Corvallis, Oregon, USEPA - National Health and Environmental Effects Research Laboratory, Map M-1, various scales.

Wilson, E.O., 1984. *Biological diversity: Canada, Ontario, Environment Canada, Ecological Land Classification Series*, no. 18, 26 p.

Wilson, E.O., Gashler, D., Marshall, E.B., Lovins, R., and Havens, B., 1996. A perspective on Canada's ecosystems: An overview of the terrestrial and marine ecosystems. *Ontario, Ontario, Canadian Council on Ecological Areas, Occasional Paper No. 14*, 95 p.

These maps represent the working group's first consensus on the delineation and classification of major ecosystems on all three levels throughout the three North American countries. The methodology incorporated these points in mapping ecological regions.

Ecological classification incorporates all major components of ecosystems: air, water, land, and biota, including humans.

It is holistic ("the whole is greater than the sum of its parts").

The number and relative importance of factors that are helpful in the delineation process vary from one site to another; therefore, the level of generalization.

Region boundary Level I
Límite de regiones Nivel I
Limite de regiões Niveau I

International boundary
Límite internacional
Limite internazionale

Keystone Species of the Northern Forests

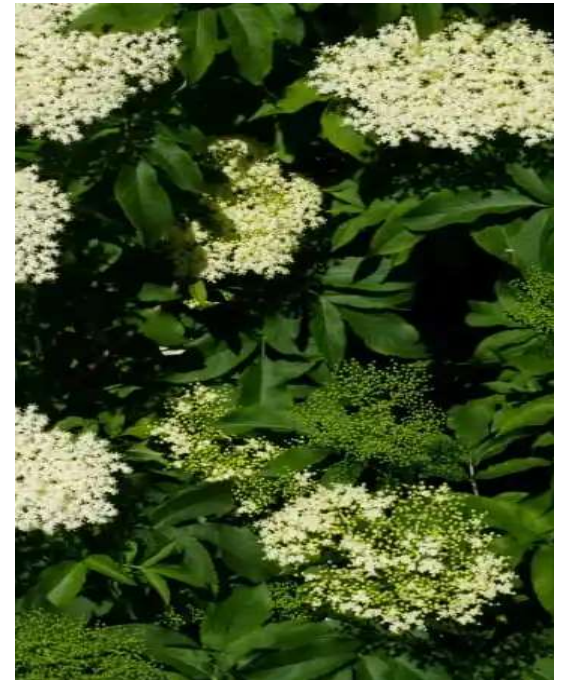
Examples: Maple, Hickory*, Walnut*, Oak, American Linden (Bass Wood), Alder, American Plum, Hybrid Hazels*, Beach plum*, High bush Blueberry, Sunchokes, Maximillian Sunflowers, sweet golden rod, violets, common milkweed, New England asters, Bee balm, Lupin



Protection from competition from other plants

ground covers, edge protectors, spacing,
planning for available light

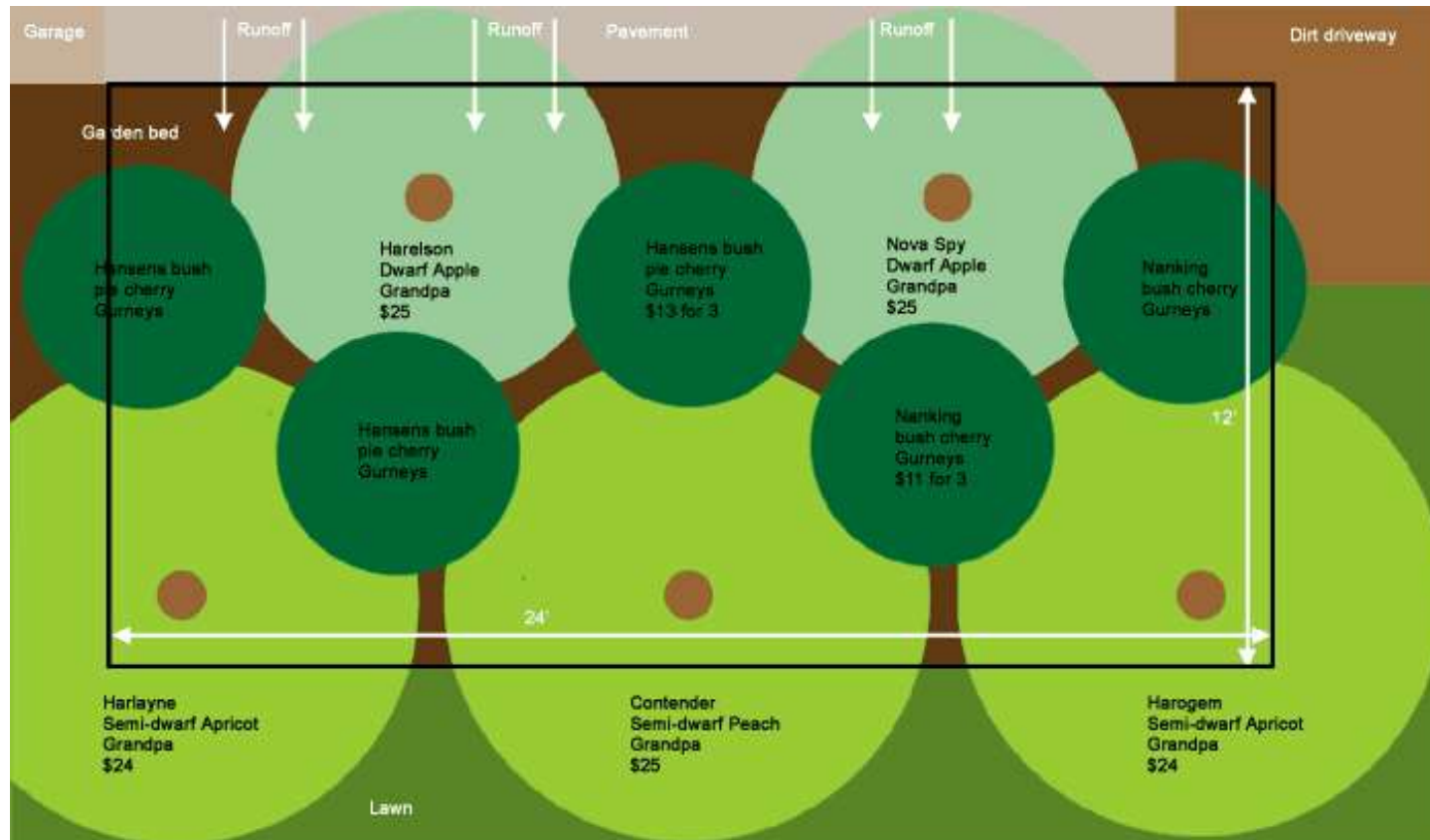
Ground Covers



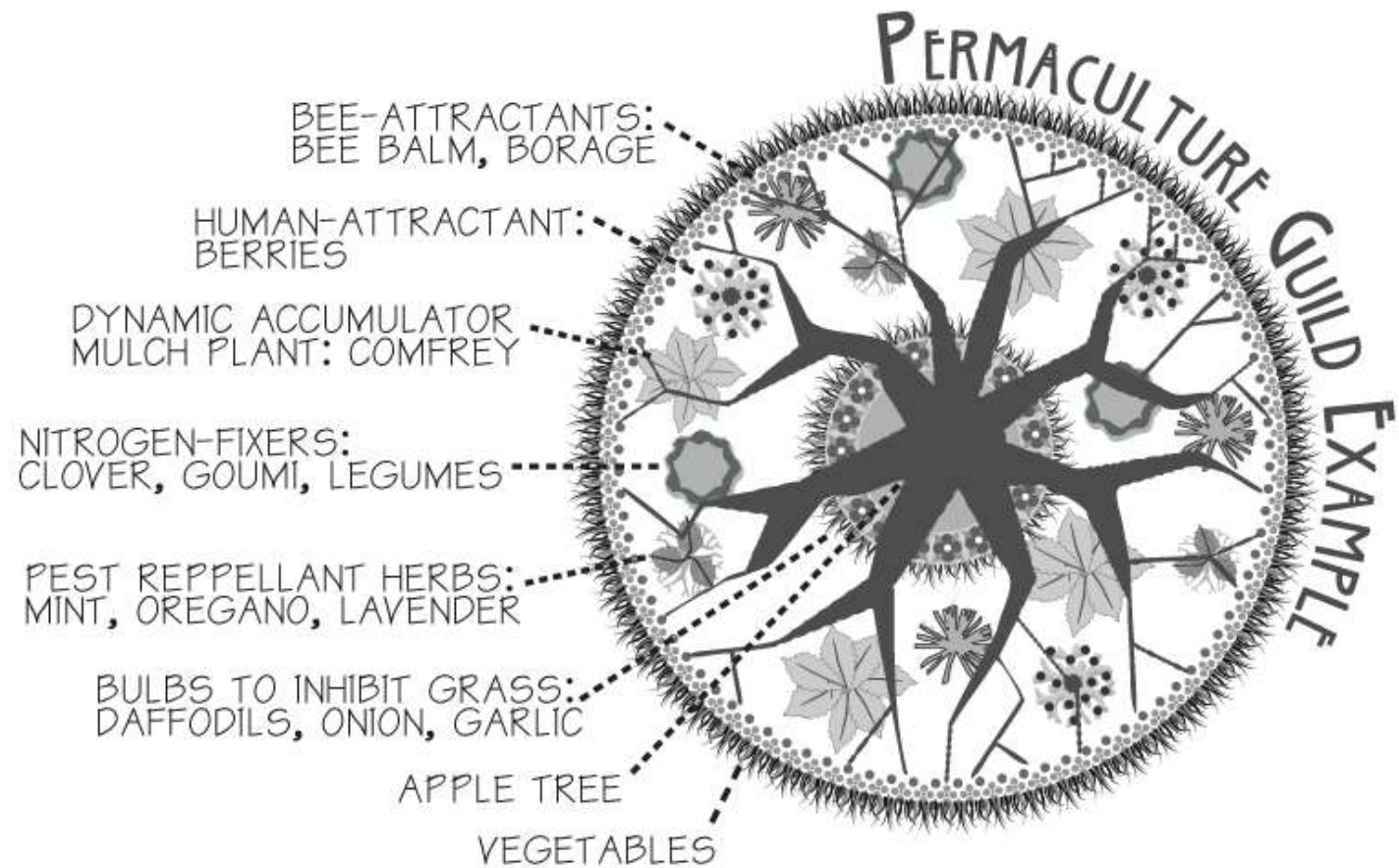
Edge Protectors



Pacing for Canopy Closure and Planning for Sun Exposure












Available
light
changes
over the
years



By planning maintenance:

- Plan for succession
- Protection from predation and destruction:
humans, other mammals and insects
- Considering zone of use
- Considering maintenance resources
- Consider attractiveness

Forest Succession

								
Mature oak/hickory forest destroyed	Farmland abandoned	Annual plants	Grasses and biennial herbs	Perennial herbs and shrubs begin to replace grasses and biennials.	Pines begin to replace shrubs.	Young oak and hickory trees begin to grow.	Pines die and are replaced by mature oak and hickory trees.	Mature oak/hickory forest
		1-2 years	3-4 years	4-15 years	5-15 years	10-30 years	50-75 years	

Rich Northern Hardwood Forest is a quintessential Vermont forest type, dominated by sugar maple. White ash and basswood are common as well. Additional tree species that may be present include sweet birch, bitternut hickory, black cherry, yellow birch, hophornbeam, and butternut. American beech occurs locally, under specialized conditions and in older forests. Limestone and marble bedrock in the Taconic Mountains weathers rapidly and provides important plant nutrients such as calcium and magnesium.

**Soil biological
succession causes
plant succession**



Bacteria ...A few Fungi.....BalancedMore Fungi..... Fungi

Bacteria:	10 µg	100 µg	500	600 µg	500 µg	700 µg
Fungi:	0 µg	10 µg	250	600 µg	800 µg	7000 µg

More Nitrate	(type of nitrogen needed)	More Ammonium
10%	(percent of energy that plant puts below ground)	80%

Accelerated Forest succession

Conventional agricultural systems try to keep the the ground at the weed stage (annual plant stage) of forest succession by expending huge amount of energy in an attempt to try to reverse Nature's processes.

Ways to accelerate succession to a food producing forest:

- Using existing plants to build soil
- Introducing only hardy plants initially
- Raising the levels of organic matter in the soil artificially
- Substituting the plants of the forest succession stages with useful species that we choose

<https://deepgreenpermaculture.com/permaculture/permaculture-design-principles/8-accelerating-succession-and-evolution/>

Considerations: The desired point in succession may be before the transition to maturity where the canopy is not closed and the potential for food production is greatest.

Protection from predation and destruction:
humans, other mammals and insects

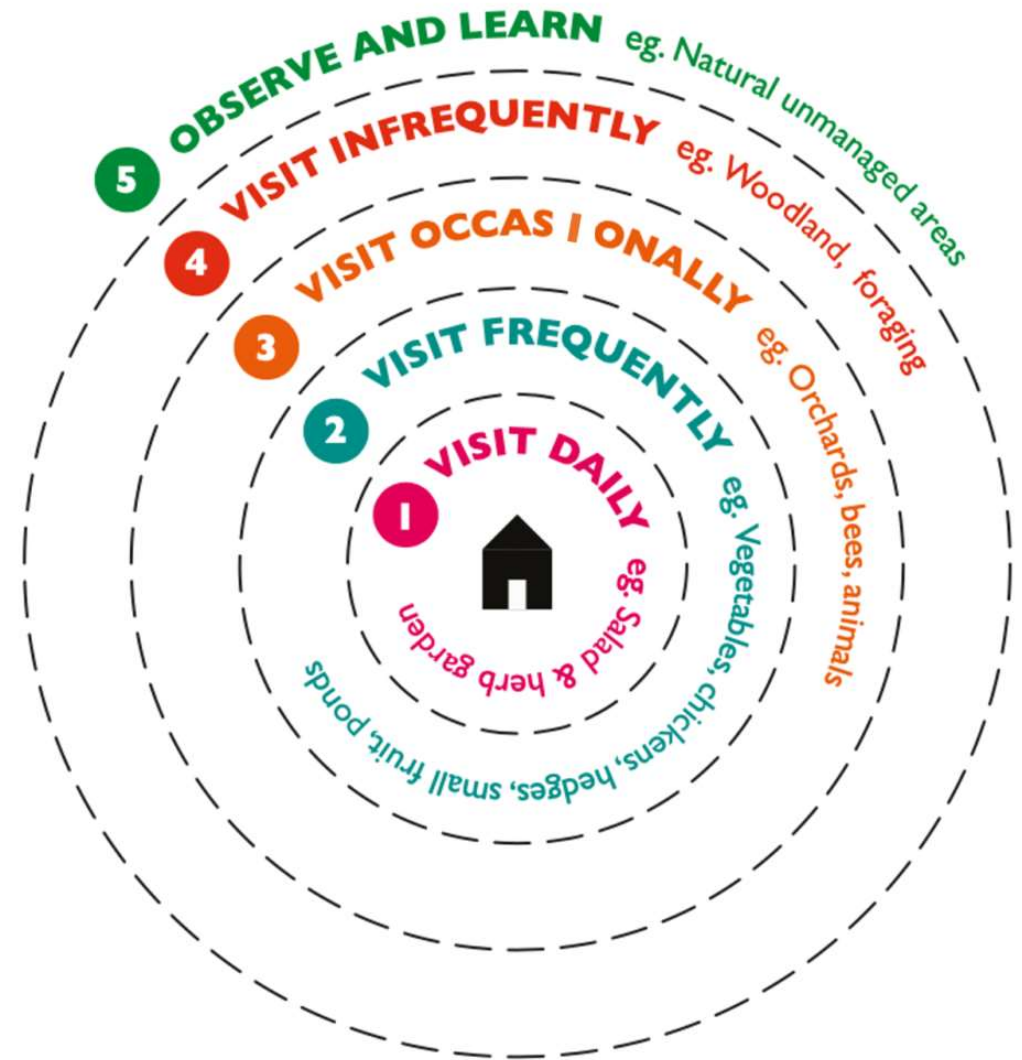
Deer Fencing



Insect Protection

- Ideal conditions make healthier plants and healthier plants are less vulnerable.
- Established perennials are more resistant and resilient than annuals.
- Plant communication is better through healthier soil.
- Diversity of plants camouflages and distracts.
- Diversity of insects keeps anyone population in check.
- Plantings can be chosen to match the spot, to produce aromatic confusion, to support predatory insects

Considering zone of use



Zone 1



Zone 2 and Beyond

Consider Maintenance Resources

People - Time – Money

Source of Plants

Source of materials

People

- Who is going to do the work?
- How much time do you have?
- How much work can you do?
- What is going to keep you engaged and happy in your work?
- Can you afford to hire help?
- What kind of hired help is available?
- How can you attract more help?

Time

Time = people

Time = money

Time = good planning

Sources of Plants and Materials

Plants can be bought from nurseries

You can propagate them yourself

- Grafting
- Division
- Rooting
- Seeds

Materials can be bought or gathered

- Newspaper, cardboard
- Chips from road crews
- Other found and recycled ideas

Consider attractiveness

- Who is your audience
- What are your goals

It's a matter of goals and resources

