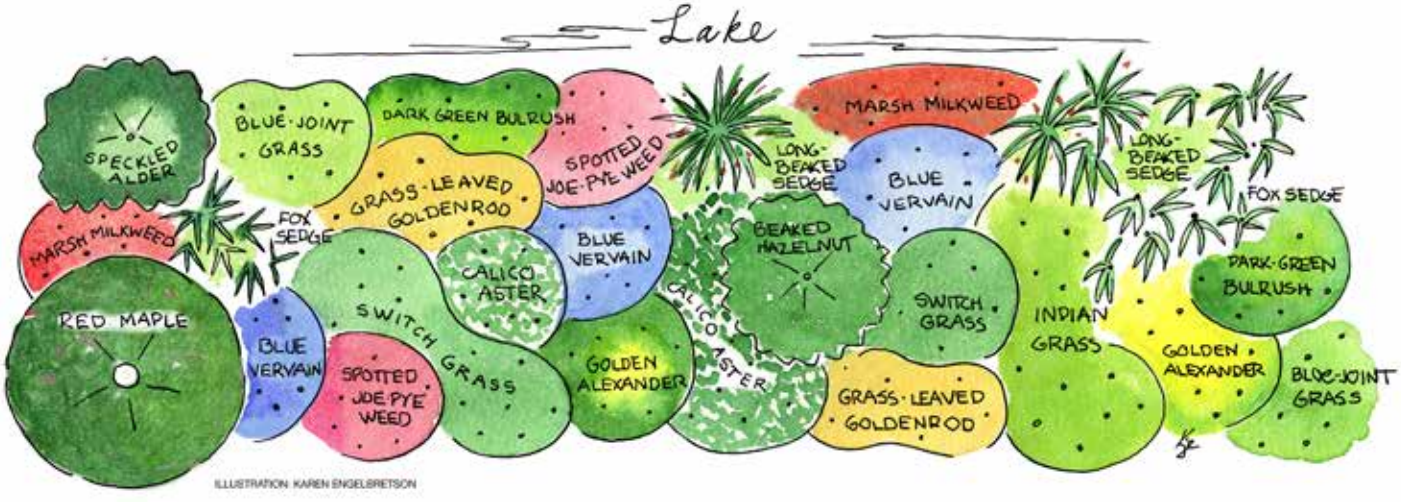
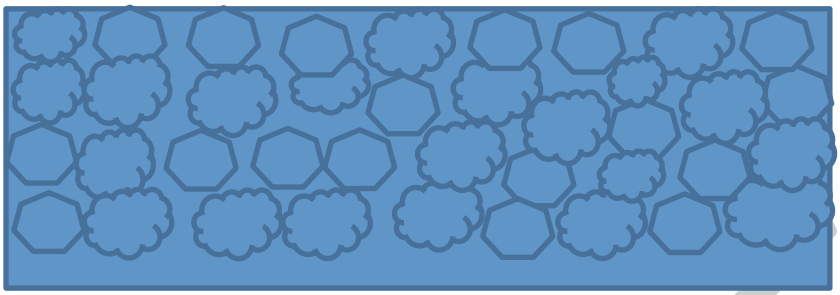
DRAFT Native planting companion guide – Healthy Lakes Initiative



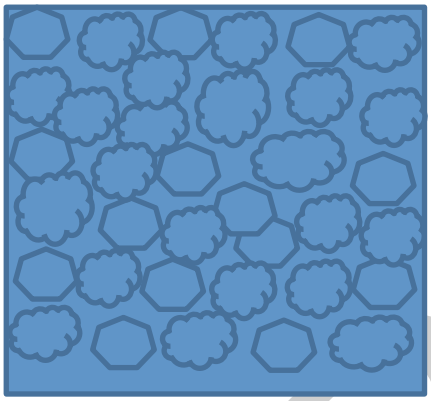
A native planting refers to bringing in new sources of native plant species as live plants of various sizes. Live plants are grown at nurseries and sold in a range of sizes: containers or pots; small seedlings planted in a grouping (plugs, flats, or "six-packs"); and bare-root seedlings (usually shrubs and trees, sometimes forbs and grasses as well).

Step 1 - identify the location and shape of your native planting:

- First, mark the area(s) you want your native plantings to be place at on your lakeshore. The edge of the area can be marked with spray paint, flagging, or stakes and twine. Choose the shape of your native planting area from the options below:
- Native planting - shape choices:
  a) 10' X 35' rectangle



  b) 18.5' X 19' block



IMPORTANT NOTES:

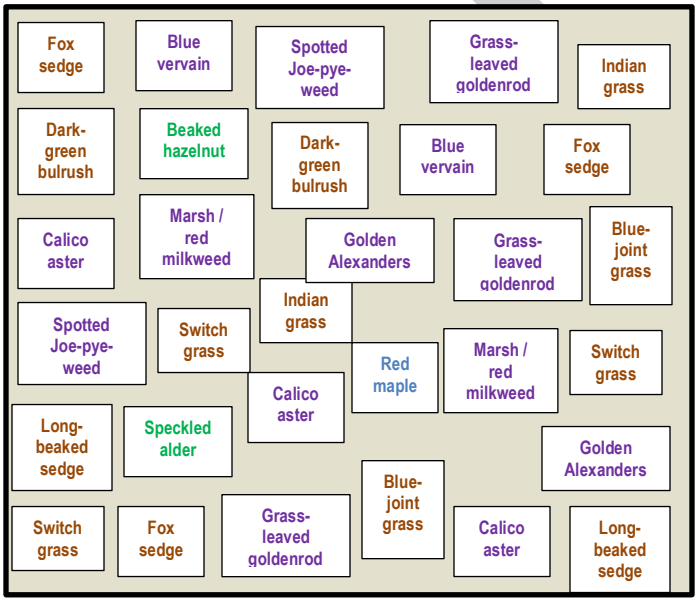
- *You can utilize whatever shaped planting works for your site as long as it is a minimum of 10 feet wide [or has a radius of 10'].*
- Planting densities followed are according to the Natural Resource Conservation Service. 2001. ***Wisconsin biology technical note 1: shoreland habitat***. 34 pp.

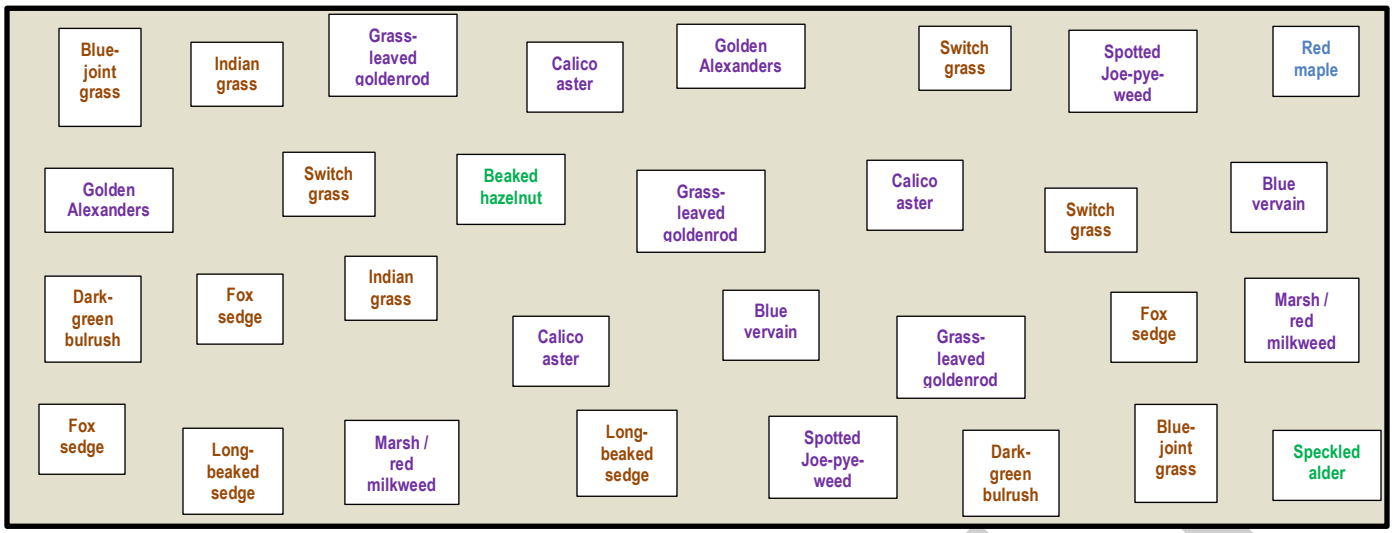
Step 2: Determine which plant list meets your site conditions for amount of sunlight, soil characteristics, and planting types (i.e., short-growing; bird/butterfly habitat; general wildlife habitat support):

1. Lakeshore edge planting option:

Moist and wet (moisture conditions):

Plant type	*Flower color*	*Bloom time*	*Height range*	*Total plants*
Trees				
1. Red maple (*Acer rubrum*)	Pink/red	May-June	70-90'	1 tree
				1 tree
Shrubs				
2. Beaked hazelnut (*Corylus cornuta*)	Reddish-brown	March-May	10-16'	1 shrub
3. Speckled alder (*Alnus incana*)	Reddish-brown	March-May	12-24'	1 shrub
				2 shrubs
				3 woody plants
Grasses, rushes, & sedges				
4. Blue-joint grass (*Calamagrostis canadensis*)	Green	June-Aug.	3-6'	6 per spot / 2 spots = 12 total
5. Dark-green bulrush (*Scirpus atrovirens*)	Green	July-Aug.	3-5'	6 per spot / 2 spots = 12 total
6. Fox sedge (*Carex vulpinoidea*)	Green	April-May	1-3'	6 per spot / 3 spots = 18 total
7. Indian grass (*Sorghastrum nutans*)	Green	Aug.-Sept.	4-6'	6 per spot / 2 spots = 12 total
8. Long-beaked sedge (*Carex sprengelii*)	Green	May-July	1-2'	6 per spot / 2 spots = 12 total
9. Switchgrass (*Panicum virgatum*)	Green	May-Sept.	4-6'	6 per spot / 3 spots = 18 total
				84 grasses, rushes, & sedges
Wildflowers				
10. Blue vervain *(Verbena hastata)*	Blue	July-Sept.	3-5'	6 per spot / 2 spots = 12 total
11. Calico aster *(Aster lateriflorus)*	White	Aug.-Sept.	1-2'	6 per spot / 3 spots = 18 total
12. Grass-leaved goldenrod *(Euthamia graminifolia)*	Yellow	July-Aug.	1-3'	6 per spot / 3 spots = 18 total
13. Spotted Joe-pye-weed *(Eupatorium maculatum)*	Pink	July-Sept.	4-6'	6 per spot / 2 spots = 12 total
14. Marsh/red milkweed *(Asclepias incarnata)*	Red	June-Aug.	3-5'	6 per spot / 2 spots = 12 total
15. Golden Alexanders *(Zizia aurea)*	Yellow	May-July	2-4'	6 per spot / 2 spots = 12 total
				84 wildflowers
Medium plant density = ~50 plants per 100 sq. ft.[1]				***168 herbaceous plugs***




Blue-joint grass
Indian grass
Grass-leaved goldenrod
Calico aster
Golden Alexanders
Switch grass
Spotted Joe-pye-weed
Red maple
Golden Alexanders
Switch grass
Beaked hazelnut
Grass-leaved goldenrod
Calico aster
Switch grass
Blue vervain
Dark-green bulrush
Fox sedge
Indian grass
Calico aster
Blue vervain
Grass-leaved goldenrod
Fox sedge
Marsh / red milkweed
Fox sedge
Long-beaked sedge
Marsh / red milkweed
Long-beaked sedge
Spotted Joe-pye-weed
Dark-green bulrush
Blue-joint grass
Speckled alder


Blue-joint grass
Grass-leaved goldenrod
Spotted Joe-pye-weed
Fox sedge
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Dark-green bulrush
Calico aster
Blue vervain
Switch grass
Switch grass
Marsh / red milkweed
Calico aster
Red maple
Long-beaked sedge
Fox sedge
Blue vervain
Switch grass
Blue-joint grass
Golden Alexanders
Indian grass
Calico aster
Golden Alexanders
Marsh / red milkweed
Fox sedge
Grass-leaved goldenrod
Long-beaked sedge
Speckled alder

2. Bird / butterfly (wildlife support package):

a) Dry to medium (moisture conditions):

Plant type	Flower color	Bloom time	Height range	Total plants
Trees				
1. White oak (*Quercus alba*)	Pink/red	May-June	70-80'	1 tree
				1 tree
Shrubs				
2. Shadblow / service berry (*Amelanchier canadensis*)	White	April-May	to 20'	1 shrub
3. American highbush cranberry (*Viburnum opulus* L. subsp. *trilobum*)	White	May-June	3-15'	1 shrub
				2 shrubs
				3 woody plants
Grasses, rushes, & sedges				
4. Side oats grama grass (*Bouteloua curtipendula)*	Tan	June-Aug.	1-2'	6 per spot / 3 spots = 18 total
5. June grass (*Koeleria cristata*)	Tan	July-Aug.	1-2'	6 per spot / 3 spots = 18 total
6. Indian grass (*Sorghastrum nutans*)	Brown	Aug.-Sept.	4-6'	6 per spot / 3 spots = 18 total
7. Canada wild rye grass (*Elymus canadensis*)	Tan	June-Oct.	3-5'	6 per spot / 3 spots = 18 total
				72 grasses, rushes, & sedges
Wildflowers				
8. Butterfly milkweed (*Asclepias tuberosa*)	Orange	July-Sept.	1-3'	6 per spot / 2 spots = 12 total
9. Common milkweed *(Asclepias syriaca)*	Pink to cream	June-Aug.	3-6'	6 per spot / 2 spots = 12 total
10. New England aster (*Aster novae-angliae*)	Purple	Aug.-Oct.	1-7'	6 per spot / 2 spots = 12 total
11. Rough blazing star *(Liatris aspera)*	Purple	Aug.-Oct.	2-4'	6 per spot / 3 spots = 12 total
12. Sky-blue aster *(Aster oolentangiensis)*	Blue	Aug.-Oct.	1-3'	6 per spot / 2 spots = 12 total
13. Stiff goldenrod *(Solidago rigida)*	Yellow	July-Sept.	3-5'	6 per spot / 2 spots = 12 total
14. Yellow coneflower *(Ratibida pinnata)*	Yellow	July-Sept.	4-5'	6 per spot / 2 spots = 12 total
15. Wild columbine *(Aquilegia canadensis)*	Red	April-June	1-3'	6 per spot / 2 spots = 12 total
				96 wildflowers
Medium plant density = ~50 plants per 100 sq. ft.				***168 herbaceous plugs***

b) Moist to wet (moisture conditions):

Plant type	Flower color	Bloom time	Height range	Total plants
Trees				
1. Swamp white oak (*Quercus bicolor*)	Pink/red	May-June	80-100'	1 tree
				1 tree
Shrubs and vines				
2. American hazelnut (*Corylus americana*)	Reddish-brown	April	6-8'	1 shrub
3. Virgin's bower (*Clematis virginiana*)	White	July-Sept.	to 9'	1 vine
4. Pagoda dogwood (*Cornus alternifolia*)	White	May-July	15-25'	1 shrub
				3 shrubs/vines
				4 woody plants
Grasses, rushes, & sedges				
5. Fox sedge (*Carex vulpinoidea)*	Brown	April-May	2-3'	6 per spot / 4 spots = 24 total
6. Prairie brome grass (*Bromus kalmii*)	Tan	June-July	2-3'	6 per spot / 4 spots = 24 total
7. Switchgrass (*Panicum virgatum*)	Tan	May-Sept.	4-6'	6 per spot / 4 spots = 24 total
				72 grasses, rushes, & sedges
Wildflowers				
8. Black-eyed Susan *(Rudbeckia hirta)*	Yellow	June-Sept.	1-3'	6 per spot / 2 spots = 12 total
9. Cup-plant *(Silphium perfoliatum)*	Yellow	July-Sept.	4-9'	6 per spot / 2 spots = 12 total
10. Culver's root (*Veronicastrum virginicum*)	White	July-Aug.	3-5'	6 per spot / 2 spots = 12 total
11. Golden Alexanders *(Zizia aurea)*	Yellow	May-July	2-4'	6 per spot / 2 spots = 12 total
12. Great St. John's wort *(Hypericum pyramidatum)*	Yellow	May-July	4-6'	6 per spot / 2 spots = 12 total
13. Marsh/red milkweed *(Asclepias incarnata)*	Red	June-Aug.	3-5'	6 per spot / 2 spots = 12 total
14. Spotted Joe-Pye-Weed (*Eupatorium maculatum*)	Pink	July-Sept.	4-6'	6 per spot / 2 spots = 12 total
15. Wild bergamot *(Monarda fistulosa)*	Lavender	June-Aug.	2-4'	6 per spot / 2 spots = 12 total

				96 wildflowers
Medium plant density = ~50 plants per 100 sq. ft.				***168 herbaceous plugs***

3. Woodland planting option (part shade):

a) Dry to medium (moisture conditions):

Plant type	*Flower color*	*Bloom time*	*Height range*	*Total plants*
Trees				
1. Wild black cherry (*Prunus serotina*)	White	April-May	75-80'	1 tree
				1 tree
Shrubs				
2. Smooth serviceberry (*Amelanchier laevis*)	White	April-June	10-16'	1 shrub
3. Downy arrow-wood viburnum (*Viburnum rafinesquianum*	White	May-July	10-15'	1 shrub
				2 shrubs
				3 woody plants
Grasses, rushes, & sedges				
4. Bottlebrush grass (*Elymus hystrix)*	Green	July-Aug.	3-4'	6 per spot / 3 spots = 18 total
5. Common oak sedge (*Carex pensylvanica)*	Green	May-June	.5-1'	6 per spot / 3 spots = 18 total
6. June grass (*Koeleria macrantha*)	Tan	June-Sept.	1-2'	6 per spot / 3 spots = 18 total
7. Silky wild rye grass (*Elymus villosus*)	Tan	June-July	3-5'	6 per spot / 3 spots = 18 total
				72 grasses, rushes, & sedges
Wildflowers				
8. Big-leaved aster *(Aster macrophyllus)*	White	Aug.-Oct.	1'	6 per spot / 2 spots = 12 total
9. Bishop's-cap *(Mitella diphylla)*	White	May-June	3-4'	6 per spot / 2 spots = 12 total
10. Early meadow rue *(Thalictrum dioicum)*	Green	April-May	1-2'	6 per spot / 2 spots = 12 total
11. Grass-leaved goldenrod *(Euthamia graminifolia)*	Yellow	July-Sept.	3-4'	6 per spot / 2 spots = 12 total
12. Jacob's ladder *(Polemonium reptans)*	Blue	May-June	1-2'	6 per spot / 2 spots = 12 total
13. Wild geranium *(Geranium maculatum)*	Purple	July-Sept.	to 1'	6 per spot / 2 spots = 12 total
14. Wild ginger *(Asarum canadense)*	Red	April-June	.5'	6 per spot / 2 spots = 12 total
15. Zig zag goldenrod *(Solidago flexicaulis)*	Yellow	April-June	2-3'	6 per spot / 2 spots = 12 total
				96 wildflowers
Medium plant density = ~50 plants per 100 sq. ft.				***168 herbaceous plugs***

b) Moist to wet (moisture conditions):

Plant type	*Flower color*	*Bloom time*	*Height range*	*Total plants*
Trees				
1. Balsam fir (*Abies balsamea*)	Cones	May-June (pollen shed)	70-80'	1 tree
				1 tree
Shrubs				
2. Pussy willow (*Salix discolor*)	White to green	April-May	to 25'	1 shrub
3. Red osier dogwood (*Cornus stolonifera*)	White	June-Sept.	8-10'	1 shrub
				2 shrubs
				3 woody plants
Grasses, rushes, & sedges				
4. Common fox sedge (*Carex stipata*)	Brown	June-July	1-3'	6 per spot / 3 spots = 18 total
5. Fowl manna grass (*Glyceria striata*)	Tan	May-June	1-5'	6 per spot / 3 spots = 18 total
6. Fringed sedge (*Carex crinita)*	Brown	June-July	1-3'	6 per spot / 3 spots = 18 total
7. Virginia wild rye grass (*Elymus virginicus*)	Tan	July-Aug.	to 4'	6 per spot / 3 spots = 18 total
				72 grasses, rushes, & sedges
Wildflowers				
8. Blue vervain *(Verbena hastata)*	Blue	July-Sept.	3-5'	6 per spot / 2 spots = 12 total
9. Boneset (*Eupatorium perfoliatum*)	White	July-Sept.	to 4'	6 per spot / 2 spots = 12 total
10. Flat-topped aster (*Aster umbellatus*)	Cream	July-Sept.	4-5'	6 per spot / 2 spots = 12 total
11. Fireweed *(Epilobium angustifolium)*	Pink	June-Aug.	3-4'	6 per spot / 2 spots = 12 total
12. Mountain mint (*Pycnanthemum virginianum*)	White	July-Sept.	1-3'	6 per spot / 2 spots = 12 total

13. Purple meadow rue (*Thalictrum dasycarpum*)	Cream	June-July	3-5'	6 per spot / 2 spots = 12 total
14. Sneezeweed (*Helenium autumnale*)	Yellow	Aug.-Oct.	3-4'	6 per spot / 2 spots = 12 total
15. Zig zag goldenrod *(Solidago flexicaulis)*	Yellow	April-June	2-3'	6 per spot / 2 spots = 12 total
				96 wildflowers
Medium plant density = ~50 plants per 100 sq. ft.				***168 herbaceous plugs***

4. Low growing planting option:

a) Dry to medium (moisture conditions):

Plant type	*Flower color*	*Bloom time*	*Height range*	*Total plants*
Shrubs				
1. Northern bush-honeysuckle (*Diervilla lonicera*)	Yellow	June-July	.5-3'	2 shrubs
2. Pasture rose (*Rosa carolina*)	Pink	June-Aug.	2'	1 shrub
3. Sweet fern (*Comptonia peregrina*)	Red	May-June	2-3'	2 shrubs
				5 shrubs
				5 woody plants
Grasses, rushes, & sedges				
4. Little bluestem grass (*Schizachyrium scoparium)*	Green	June-Aug.	2-3'	6 per spot / 3 spots = 18 total
5. Path rush (*Juncus tenuis)*	Brown	May-Aug.	to 1'	6 per spot / 3 spots = 18 total
6. Purple love grass (*Eragrostis spectabilis*)	Purple	July-Sept.	1-2'	6 per spot / 3 spots = 18 total
7. Side oats grama grass (*Bouteloua curtipendula*)	Tan	July-Aug.	1-3'	6 per spot / 3 spots = 18 total
				72 grasses, rushes, & sedges
Wildflowers				
8. Arrow-leaved aster *(Aster sagittifolius)*	Blue	Sept.-Oct.	2-3'	6 per spot / 2 spots = 12 total
9. Black-eyed Susan *(Rudbeckia hirta)*	Yellow	June-Sept.	1-3'	6 per spot / 2 spots = 12 total
10. Calico aster *(Aster lateriflorus)*	White	Aug.-Sept.	1-2'	6 per spot / 2 spots = 12 total
11. Gray goldenrod (*Solidago nemoralis*)	Yellow	Aug.-Oct.	1-2'	6 per spot / 2 spots = 12 total
12. Harebell (*Campanula rotundifolia*)	Blue	June-Oct.	1-2'	6 per spot / 2 spots = 12 total
13. Hoary vervain (*Verbena stricta*)	Blue	July-Sept.	1-3'	6 per spot / 2 spots = 12 total
14. Golden Alexanders *(Zizia aurea)*	Yellow	May-July	2-4'	6 per spot / 2 spots = 12 total
15. Wild geranium *(Geranium maculatum)*	Purple	July-Sept.	to 1'	6 per spot / 2 spots = 12 total
				96 wildflowers
Medium plant density = ~50 plants per 100 sq. ft.				***168 herbaceous plugs***

b) Moist to wet (moisture conditions):

Plant type	*Flower color*	*Bloom time*	*Height range*	*Total plants*
Shrubs				
1. Meadowsweet (*Spiraea alba*)	White	July-Aug.	5-6'	2 shrubs
2. Steeplebush (*Spiraea tomentosa*)	Pink	July-Sept.	3-4'	2 shrubs
3. Swamp rose (*Rosa palustris*)	Pink	June-Aug.	4-5'	1 shrub
				5 shrubs
				5 woody plants
Grasses, rushes, & sedges				
4. Common rush (*Juncus effusus)*	Brown	May-July	1-2'	6 per spot / 3 spots = 18 total
5. Fox sedge (*Carex vulpinoidea)*	Brown	April-May	2-3'	6 per spot / 3 spots = 18 total
6. Northern sweet grass (*Hierochloe odorata*)	Tan	May-Sept.	1-2'	6 per spot / 3 spots = 18 total
7. Rattlesnake grass (*Glyceria canadensis*)	Tan	May-July	1-3'	6 per spot / 3 spots = 18 total
				72 grasses, rushes, & sedges
Wildflowers				
8. Blue flag iris *(Iris versicolor-north; Iris virginica-south)*	Blue	May-July	1-3'	6 per spot / 2 spots = 12 total
9. Great blue lobelia (*Lobelia siphilitica*)	Blue	July-Oct.	2-3'	6 per spot / 2 spots = 12 total
10. Meadow anemone (*Anemone canadensis*)	White	May-July	1-2'	6 per spot / 2 spots = 12 total
11. Northern bedstraw (*Galium boreale*)	White	June-July	2'	6 per spot / 2 spots = 12 total
12. Spikenard (*Aralia racemosa*)	Green	July-Aug.	3-4'	6 per spot / 2 spots = 12 total
13. Turtlehead *(Chelone glabra)*	Cream	Aug.-Sept.	1-3'	6 per spot / 2 spots = 12 total
14. Water horehound (*Lycopus americanus*)	White	July-Sept.	2'	6 per spot / 2 spots = 12 total

15. Zig zag goldenrod *(Solidago flexicaulis)*	Yellow	April-June	2-3'	6 per spot / 2 spots = 12 total
				96 wildflowers
Medium plant density = ~50 plants per 100 sq. ft.				***168 herbaceous plugs***

5. Deer resistant planting option (species not typically favored by deer):

a) Dry to medium (moisture conditions):

Plant type	Flower color	Bloom time	Height range	Total plants
Trees				
1. White spruce (*Picea glauca*)	Cones	May-June	90-110'	1 tree
				1 tree
Shrubs				
2. Common snowberry (*Symphoricarpos albus*)	White	June-July	2-3'	1 shrub
3. Sweet fern (*Comptonia peregrina*)	Red	May-June	2-3'	2 shrubs
				2 shrubs
				3 woody plants
Grasses, rushes, & sedges				
4. Common oak sedge (*Carex pensylvanica)*	Green	May-June	.5-1'	6 per spot / 3 spots = 18 total
5. Little bluestem grass (*Schizachyrium scoparium)*	White	June-Aug.	2-3'	6 per spot / 3 spots = 18 total
6. Prairie dropseed (*Sporobolus heterolepis*)	Tan	July-Aug.	2-3'	6 per spot / 3 spots = 18 total
7. Side oats grama grass (*Bouteloua curtipendula*)	Tan	July-Aug.	1-3'	6 per spot / 3 spots = 18 total
				72 grasses, rushes, & sedges
Wildflowers and ferns				
8. Big-leaved aster *(Aster macrophyllus)*	White	Aug.-Oct.	1'	6 per spot / 2 spots = 12 total
9. Common lady fern (*Athyrium filix-femina*)	Brown sori	n/a	2-3'	3 per spot / 2 spots = 6 total
10. Grass-leaved goldenrod *(Euthamia graminifolia)*	Yellow	July-Aug.	1-3'	6 per spot / 2 spots = 12 total
11. Hoary vervain (*Verbena stricta*)	Blue	July-Sept.	1-3'	6 per spot / 2 spots = 12 total
12. Prairie-smoke (*Geum triflorum*)	Pink to purplish	April-June	4-16"	6 per spot / 2 spots = 12 total
13. Purple giant hyssop *(Agastache scrophulariaefolia)*	Pink	Aug.-Sept.	3-5'	6 per spot / 2 spots = 12 total
14. Showy goldenrod *(Solidago speciosa)*	Yellow	July-Oct.	3-5'	6 per spot / 2 spots = 12 total
15. Wild columbine *(Aquilegia canadensis)*	Red	April-June	1-3'	6 per spot / 2 spots = 12 total
16. Spinulose wood fern (*Dryopteris carthusiana*)	Brown sori	n/a	2-3'	3 per spot / 2 spots = 6 total
				96 wildflowers and ferns
Medium plant density = ~50 plants per 100 sq. ft.				***168 herbaceous plugs***

b) Moist to wet (moisture conditions):

Plant type	Flower color	Bloom time	Height range	Total plants
Trees				
1. Tamarack (*Larix laricina*)	Cones	April-May [pollen shed]	40-80'	1 tree
				1 tree
Shrubs				
2. Beaked hazelnut (*Corylus cornuta*)	Reddish-brown	March-May	10-16'	1 shrub
3. Black chokeberry (*Aronia melanocarpa*)	White	May-July	6-8'	1 shrub
				2 shrubs
				3 woody plants
Grasses, rushes, & sedges				
4. Common fox sedge (*Carex stipata*)	Brown	June-July	1-3'	6 per spot / 3 spots = 18 total
5. Fox sedge (*Carex vulpinoidea)*	Brown	April-May	2-3'	6 per spot / 3 spots = 18 total
6. Indian grass (*Sorghastrum nutans*)	Brown	Aug.-Sept.	4-6'	6 per spot / 3 spots = 18 total
7. Prairie cordgrass (*Spartina pectinata*)	Tan	Aug.-Sept.	6-8'	6 per spot / 3 spots = 18 total
				72 grasses, rushes, & sedges
Wildflowers				
8. Blue vervain *(Verbena hastata)*	Blue	July-Sept.	3-5'	6 per spot / 2 spots = 12 total
9. Common ironweed (*Vernonia fasciculata*)	Violet / purple	July-Sept.	2-6'	6 per spot / 2 spots = 12 total
10. Great St. John's wort *(Hypericum pyramidatum)*	Yellow	May-July	4-6'	6 per spot / 2 spots = 12 total
11. Interrupted fern (*Osmunda claytoniana*)	Brown sori	n/a	4-6'	3 per spot / 2 spots = 6 total
12. Ostrich fern (*Matteuccia struthiopteris*)	Brown sori	n/a	3-4'	3 per spot / 2 spots = 6 total
13. Spotted Joe-pye-weed *(Eupatorium maculatum)*	Pink	July-Sept.	4-6'	6 per spot / 2 spots = 12 total
14. Stiff goldenrod *(Solidago rigida)*	Yellow	Aug.-Oct.	3-4'	6 per spot / 2 spots = 12 total
15. Wild bergamot *(Monarda fistulosa)*	Lavender	June-Aug.	2-4'	6 per spot / 2 spots = 12 total

16. Yellow avens (*Geum aleppicum*)	Yellow		2-3'	6 per spot / 2 spots = 12 total
				96 wildflowers and ferns
Medium plant density = ~50 plants per 100 sq. ft.				***168 herbaceous plugs***

6. Bare soil area planting option:

a) Dry to medium (moisture conditions):

Plant type	*Flower color*	*Bloom time*	*Height range*	*Total plants*
Trees				
1. Hill's oak / northern pin oak (*Quercus ellipsoidalis*)	Pink/red	May-June	55-65'	1 tree
				1 tree
Shrubs				
2. American hazelnut (*Corylus americana*)	White	March-May	6-8'	1 shrub
3. Speckled alder (*Alnus incana*)	Reddish-brown	March-May	20-26'	1 shrub
				2 shrubs
				3 woody plants
Grasses, rushes, & sedges				
4. Big bluestem (*Andropogon gerardii)*	Tan	Aug.-Sept.	5-7'	6 per spot / 3 spots = 18 total
5. Common oak sedge (*Carex pensylvanica)*	Green	May-June	6-8"	6 per spot / 3 spots = 18 total
6. Northern drop-seed (*Sporobolus heterolepis*)	Green	July-Aug.	4-6'	6 per spot / 3 spots = 18 total
7. Sideoats grama grass (*Bouteloua curtipendula*)	Tan	July-Sept.	2-4'	6 per spot / 3 spots = 18 total
				72 grasses, rushes, & sedges
Wildflowers				
8. Big-leaved aster *(Aster macrophyllus)*	White	Aug.-Oct.	1'	6 per spot / 2 spots = 12 total
9. Black-eyed Susan *(Rudbeckia hirta)*	Yellow	June-Sept.	1-3'	6 per spot / 2 spots = 12 total
10. Grass-leaved goldenrod *(Euthamia graminifolia)*	Yellow	July-Sept.	3-4'	6 per spot / 2 spots = 12 total
11. Hoary vervain (*Verbena stricta*)	Blue	July-Sept.	1-3'	6 per spot / 2 spots = 12 total
12. Pussy toes (*Antennaria plantaginifolia*)	White	April-June	1-2'	6 per spot / 2 spots = 12 total
13. Smooth aster *(Aster laevis)*	Blue	Aug.-Oct.	3-5'	6 per spot / 2 spots = 12 total
14. Showy goldenrod *(Solidago speciosa)*	Yellow	July-Oct.	3-5'	6 per spot / 2 spots = 12 total
15. Wild bergamot *(Monarda fistulosa)*	Lavender	June-Aug.	2-4'	6 per spot / 2 spots = 12 total
				96 wildflowers
Medium plant density = ~50 plants per 100 sq. ft.				***168 herbaceous plugs***

The role of native vegetation in slope stability:

- Interception - Erosion occurs when rainfall dislodges soil particles and carries them off a slope, forming rills and gullies that can trigger landslides. Raindrops hitting the soil surface can also seal the soil particles and make a crust that prevents infiltration and creates runoff. Trees and shrubs intercept precipitation before it hits the soil surface.

- Dewatering - Soil saturation can trigger erosion and landslides. Plants improve slope stability by removing water from the soil. Plants use water, absorbed through their roots, to perform basic metabolic processes such as photosynthesis. Plants release absorbed water to the atmosphere, by transpiring through pores on the leaves, much as a person sweats. Transpiration cools the plant and helps transport minerals up the stems. The rate of transpiration varies greatly, depending on the plant species, weather, and other factors. A single tree can transpire hundreds of gallons on a hot, dry day.

- Soil reinforcement - Roots physically reinforce soils, resist erosion, and increase infiltration of water into the soil. Roots form physical pathways (little tunnels) that help water infiltrate the soil. Deep, woody roots lock the soil layers together, and lateral roots connect many plants into an interlocking grid. Fine feeder roots form a network through the upper soil layer, preventing surface erosion.

- Ecologically healthier overall - Vegetation actively decompacts soil through the expansion of the root systems and the addition of organic matter to the site. Water absorbs more readily into uncompacted soil. Vegetation also encourages soil fauna to thrive.

6. Bare soil area planting option:

b) Moist to wet (moisture conditions):

Plant type	*Flower color*	*Bloom time*	*Height range*	*Total plants*
Trees				
1. River birch (*Betula nigra*)	Pink/red	April-May	45-75'	1 tree
				1 tree
Shrubs				
2. Red osier dogwood (*Cornus stolonifera*)	White	May-Aug.	5-10'	1 shrub
3. Speckled alder (*Alnus incana*)	Reddish-brown	March-May	12-24'	1 shrub
				2 shrubs
				3 woody plants
Grasses, rushes, & sedges				
4. Canada wild rye (*Elymus canadensis*)	Tan	June-Oct.	4-5'	6 per spot / 3 spots = 18 total
5. Indian grass (Sorghastrum nutans)	Brown	Aug.-Sept.	3-5'	6 per spot / 3 spots = 18 total
6. Little bluestem (*Schizachyrium scoparium*)	Tan	July-Oct.	2-3'	6 per spot / 3 spots = 18 total
7. Switchgrass (*Panicum virgatum*)	Tan	May-Sept.	3-4'	6 per spot / 3 spots = 18 total
				72 grasses, rushes, & sedges
Wildflowers				
8. Blue vervain *(Verbena hastata)*	Blue	July-Sept.	3-5'	6 per spot / 2 spots = 12 total
9. False sunflower *(Heliopsis helianthoides)*	Yellow	June-Oct.	3-5'	6 per spot / 2 spots = 12 total
10. Golden Alexanders *(Zizia aurea)*	Yellow	May-July	2-4'	
11. New England aster (*Aster novae-angliae*)	Purple	Aug.-Oct.	1-7'	6 per spot / 2 spots = 12 total
12. Spotted Joe-pye-weed *(Eupatorium maculatum)*	Pink	July-Sept.	4-6'	6 per spot / 2 spots = 12 total
13. Stiff goldenrod *(Solidago rigida)*	Yellow	Aug.-Oct.	3-4'	6 per spot / 2 spots = 12 total
14. Wild bergamot *(Monarda fistulosa)*	Lavender	June-Aug.	2-4'	6 per spot / 2 spots = 12 total
15. Yellow coneflower *(Ratibida pinnata)*	Yellow	July-Sept.	4-5'	
				96 wildflowers
Medium plant density = ~50 plants per 100 sq. ft.				***168 herbaceous plugs***

Step 3: site preparation:

Overview:

- ✓ Site preparation begins with eliminating non-native plants and lawn/turf grass from the area(s) where you are going to plant. Whichever technique you use to do this, be sure to avoid using heavy equipment because it will compact the soil and make it difficult for new plants to grow.
- ✓ Preparation for new planting may require up to a full growing season on difficult, weed-infested sites.
- ✓ Thoroughness and patience are essential for later success. You can prepare the site in several ways - some include the use of herbicides while others do not.
- ✓ Herbicides can eliminate problem species, but it can take nearly an entire growing season to remove some invasive plants. Herbicides can also be used with lawn grasses. The process will not be as time-consuming as it is for weed removal.

Eliminating turf grass / lawn – several options:

- ✓ The next step is to eliminate turf. This will give you more control over the native planting area and will help limit weeding problems.
- ✓ Many lakeshore property owners are reluctant to use chemicals to eliminate turf and to maintain their landscapes. They are uncomfortable exposing their families, neighbors, pets and other creatures to potentially harmful side effects, and don't want to risk having these chemicals enter the water.
- ✓ Alternatives to using chemicals to kill sod include: removing the sod with a sod cutter or shovel; covering the area with sheets of plastic or other material; planting plugs directly into the existing turf.
- ✓ One of the benefits of growing native plants is that they are not dependent on fertilizers, herbicides, or chemicals. Some lakeshore property owners feel that the temporary use of chemicals to restore their property to a permanent "drug-free" condition is worth the potential risk.

Use of a sod-cutter

- ✓ Sod-cutters avoid the use of chemicals but are labor intensive. Blade depth should be set deep to cut all grass roots. Be especially careful around tree roots. This usually creates a nearly weed-free surface.
- ✓ Cover the site with black plastic, old carpet, plywood, cardboard, or a thick layer of leaves or newspapers. Leave in place for a full growing season and remove in fall or the following spring. Plant into a prepared bed
- ✓ Keep in mind, though, that this area will be lower than the surrounding lawn and you may want to bring in extra topsoil to level. Clean, sandy loam topsoil is best; avoid peat, clay or heavy loam-based soil. Make sure the topsoil is not contaminated with weed seeds.
- ✓ Either compost the cut sod or use it to patch open areas in the lawn elsewhere on the property. Erosion damage is a possible problem. You can utilize an assortment of erosion control blankets (coir fiber; wood fiber blanket; straw mat), biodegradable landscape fabric, or clean (weed seed free) straw mulch immediately after removing the sod to protect the bare soil.

Smothering the turf grass / lawn with heavy duty black plastic:

- ✓ Smothering is less labor intensive but requires an entire growing season. After 5-6 months, it will be possible to plant directly through the dead sod. Cover the soil with heavy black plastic, old carpet, tarps or other opaque material for an entire growing season.
- ✓ Make sure to secure the cover tightly. Seams should overlap about 6 inches to ensure complete coverage. It needs to remain intact in order to kill weeds and seeds near the soil surface. Do not cultivate or till deeper than 1-2 inches with this method to avoid bringing up weed seeds that will compete with the natives.

Planting into turf grass / lawn:

- ✓ Plugs can also be planted directly into dead turf or patchy, lackluster grassed areas without removing it. By leaving the dead or patchy turf in place it will help to prevent soil erosion. Just make sure the live plants are planted into soil and not in dead thatch.

Application of herbicides:

- ✓ The quickest and most cost-effective method of turf elimination over the short-term is the application of herbicides.
- ✓ Organic herbicides made from naturally occurring fatty acids are one option for removing sod. They kill plants by dehydrating the foliage. You can also apply a chemical herbicide, such as a short duration glyphosate herbicide on upland areas. Obtain professional recommendations for a different formulation when working within 10 feet of the edge of the water. Use a glyphosate herbicide approved for use by water following the label directions closely.
- ✓ DNR permits are required for use on aquatic or shoreline plants. For more information, contact your local DNR fisheries office.

Step 4 - planting instructions:

The nursery where you purchase your plants will provide detailed instructions regarding planting. Here are some general considerations:

- ✓ Species selection - Plants should be selected from species lists of plant communities that are native to your county or region. Plants should further be chosen based on site soil, moisture, pH, texture, slope, and light conditions. In some cases, such as lack of plant availability, substitutions may be allowed.
    - Sunlight - Determine the quality of light on the site. If shade exists, note when the shade occurs. Afternoon shade or dappled, occasional sunlight provides a good environment for many savanna and woodland species. In contrast, hot afternoon or all-day sun is best suited to prairie or wetland species, depending on soil type.
    - Soil - Many native plants are generalists; they tolerate a wide range of soil types. However, there are some native plant species that thrive in dry, rocky soils but suffer in compost-rich soils. By considering your soil, its structure, fertility and pH, you will be able to choose an appropriate plant list (from above) for any soil type encountered.
    - Soil fertility - Get a general analysis of your soil with a basic soil test. Soil sample information forms are available at the University of Wisconsin – Madison, Soil Science Extension / Soil Testing Laboratories: < http://uwlab.soils.wisc.edu/lawn-garden/ >. When filling out the form select a general analysis.
    - pH - pH is a measurement of a soil's acidity or alkalinity on a scale where 7.0 is neutral. Results below 7.0 indicate an acid (sour) soil, and soils above 7.0 are alkaline (sweet). Many plants do well in one or the other environment, while wide assortments thrive in the pH range of 6.5 - 7.5. Basic soil tests also give a soil's content of macronutrients such as nitrogen, phosphorus and potassium. A more complete soil test yields levels of the micronutrients in the soil (boron, magnesium, and copper).
    - Testing water infiltration to determine soil types - To determine soil type and how quickly water drains through soil, do an infiltration test. First, dig a hole one foot deep and eight inches wide. Fill it with water and observe how quickly the water disappears. Note: do infiltration tests when soil is moist, the day after a soaking rain or watering.
        -If water drains within a few hours the soil is a well-drained sandy or loamy soil. Select dry-loving native plants.
        -If it takes 24 hours or more to drain, it is a poorly drained clay soil, typical of where native wetland species thrive. Choose plants tolerant of moist soils.
        -Soils that drain in less than six hours are considered satisfactory for growing most native plants.

- Soil texture - Another way to determine soil type is by feeling it with your hands. Hold a small wet piece of soil in your hand and rub it between your thumb and index finger.
  - -Sandy soil has obvious sand particles that feel and look like sand. It drains well because of a large particle size that is irregularly shaped. It feels coarse and doesn't compact easily. This soil type has low fertility because of its low organic content. Soil color typically is light tan.
  - -Clay soil feels sticky and forms ribbons when forced between your thumb and index finger. It has microscopic, flat-shaped particles. The shape and size of clay particles contribute to compaction, with little space for air or water movement. Because of this, clay soil has poor drainage and lower fertility. Clay soils often are described as being heavy. The characteristic color is reddish or grayish.
  - -Silty soil feels smooth and silky but does not form a ribbon like clay. It has particles much smaller than sand. Fertility is slightly higher than sandy soil. It drains relatively well and has a tan color.
  - -Sandy loam soil is considered the ideal garden soil for the widest range of plants. It is sold as topsoil. The soil color is dark-brown and particle size varies. It is among the healthiest of soil types since it is well-draining with ample air spaces, has good organic content and fertility and has an abundant population of beneficial soil organisms.
- Slope / stabilizing steep slopes - There are several brands of erosion control blankets available in garden centers. They typically are made of straw, wood shavings, coconut fiber or jute and are woven into a plastic mesh that usually is biodegradable. Avoid non-biodegradable or permanent fabrics because birds and reptiles get tangled in the mesh.
  - -0 – 10% slope: 2 foot or less drop in a 20 foot distance. Gentle slopes are ideal and easy to work with and do not require erosion control fabric.
  - -10 – 20% slope: 4 foot or less drop in a 20 foot distance. Steeper slopes can present a challenge and use of erosion control fabric should be considered.
  - -Above 20% slope: 5 foot or less drop in a 20 foot distance. Once the percent slope is above 20%, erosion control is recommended.

✓ Lay out plants - Lay out your plants (in their containers) on the ground to attain even spacing before planting. Use a grid pattern when planting larger areas. In hot sun keep plants watered as most plastic pots are black and absorb heat. Now is the time to rearrange plants to attain the best spacing.

✓ Planting densities - The table below describes the planting standards used for the two major shoreland types: a) woodland, and b) barrens / dry prairie / wet prairie. The woodland has a nearly complete canopy of trees while the barrens/prairie and wetland are more open. Plant numbers were to be calculated based on the area in square feet to be reestablished (I.e., 10' X 35') and the appropriate density. The area to be reestablished was calculated for each layer and these densities appear in the plant tables provided above.

Table 1. Shoreland Habitat Planting Densities

	Woodland		Wetland or Barrens/Dry Prairie/Wet Prairie	
Layer	**Minimum Number of Species[1]**	**Density**	**Minimum Number of Species[1]**	**Density**
Trees[2]	2	0.5 – 5 per 100 sq. ft.	0	0 - 0.2 per 100 sq. ft.
Shrubs	3	1 - 4 per 100 sq. ft. *If clumped, maintain min. 2 foot spacing*	2	0.2 - 0.5 per 100 sq. ft. *If clumped, maintain min. 2 foot spacing*
Herbaceous Cover[3]				
- Plant plugs	3	25 –75 plants per 100 sq. ft. *Soil must be mulched*	5	50 – 100 plants per 100 sq. ft. *Soil must be mulched*
- Seeding	3	Grass/Sedges: 4-8 oz. per 1000 sq. ft. Forbs: 2-4 oz per 1000 sq. ft.	5[4]	Grass/Sedges: 4-8 oz per 1000 sq. ft. Forbs: 2-4 oz. per 1000 sq. ft.

1 Select species from established plant lists for shoreland habitat. Trees, shrubs, and groundcovers may be transplanted from adjacent woodland or open areas outside the restoration area.
2 Trees must be at least 2 year old seedlings, 8 inches or taller.
3 The herbaceous cover layer shall be comprised of a minimum of 30% grasses and/or sedges.
4 Consider the use of plants rather than seeds in wet areas.

- ✓ Local "*genotype*" (note that not all plants of the same species are the same: Plants that have evolved in your locale often have genetic traits that make them particularly well suited for temperature, moisture, soil, and other conditions found in your local area).
- ✓ Planting dates / timing - The table below provides approximate dates for planting. Early spring or fall is the optimum time to plant. Weather and soil conditions, which vary year-to-year, determine the most appropriate planting time. Please note that adequate moisture levels are assumed due to required watering practices.

Table 2. Recommended Planting Dates

	North	Central	South
Seeded Herbaceous Covers *Seeding early favors cool season plants. Seeding after soil temperature increases above 55 degrees favors warm season plants. Seed after July 1 to reduce weed seed germination.*	May 15 – August 10 *Best dates: June 1 – July 15*	May 1 – August 31 *Best dates: May 10 – July 20*	May 1- August 31 *Best dates: May 5 – July 31*
Plugs (Seedlings) and Potted Herbaceous Covers *Plant after danger of frost is past, and up to first frost. Later plantings may require more frequent watering because of increased temperatures.*	May 20 – September 15	May 1- October 31	May 1 – Nov. 15
Bare-root Trees and Shrubs	Any time soil is not frozen and before leaf-out, or after leaves fall.		
Potted Trees and Shrubs	Any time soil is not frozen.		

- ✓ The planting densities and planting dates / timing followed are according to the Natural Resource Conservation Service. 2001. ***Wisconsin biology technical note 1: shoreland habitat.*** 34 pp.

- ✓ In the transitional zone where you are utilizing erosion control materials or other fabrics, plant within openings cut directly into it according to manufacturer specifications.
- ✓ In the upland zone, cover the area with shredded mulch and create small pockets within the mulch to plant the plugs, trees or shrubs. When planting large areas, a cordless drill equipped with a bulb auger can make the job easier and quicker. For each plant, simply clear away the mulch and drill a hole into the soil similar in depth to the plant plug. It works well to have one person do the drilling and others follow along and plant the plugs. Bulb augers can be purchased at your local nursery supply or home supply store. The cordless drill must be at least 12 volts. For those less inclined to go the power tool route, a hand trowel works well too.
- ✓ Plant upland species in spring or fall during cooler weather. Summer plantings can be successful if regularly watered.

- ✓ Plugs and containerized plants - Native plants are often grown in compartmentalized containers that accelerate their growth. Keep plants watered and in the shade until planted. Soak thoroughly before removing from the container to plant. After planting, dry roots tend to reject water. Tap container upside down to remove plant, and then gently pry the roots apart. Carefully remove each plant from its container. If roots are spiraling around inside the pot, cut the roots to prevent further spiraling. Remove loose potting soil from the top of the potting soil plug or ball. Insert each plant so the top of the potting soil is level or just below the top of the topsoil and fill in with loose topsoil. Lightly cap potting soil with a thin layer of topsoil. Firmly press down plant to remove air pockets. Cover topsoil with mulch and water immediately.
- ✓ Bare-root plants - Readily available in nurseries, these are trees and shrubs that have had the soil washed from their roots. Less expensive than container-grown plants, the bare-root plants need to be planted before they leaf out and while temperatures are still moderate. When planting a bare-root tree or shrub, spread the roots out carefully and fill in soil by hand, pressing gently but firmly to avoid leaving air holes. Mulch around the newly planted tree or shrub to keep competition down while it gets established. Don't pile up the mulch around the stem. The mulch should be shallow right at stem so that the correct ground level is maintained.

Source: Vermont Department of Environmental Conservation

- ✓ Correct planting depth - Place plants at the correct depth in the soil so that the top of the root ball is level with the soil surface. One of the most common causes of mortality is planting too deep. If the surface of the root ball/root collar ends up below the surrounding soil level, the stem is likely to rot and the roots may suffocate, stressing or killing the plant. Dig a wide, shallow hole; make it a little shallower than the root ball. The top of the installed root ball should be about half an inch above the surrounding soil; aim for a slightly mounded look with the surface of the potting soil exposed. This will mean that even if the plant sinks as the soil settles, the roots will not get buried too deep.
- ✓ Root disturbance - For container-grown plants, rough up the soil and roots on the outer inch of the root ball. Plants benefit from some root disturbance at planting time—it stimulates growth that helps plants become established. If there are circling roots, tease them outward and prune any that won't fit into your planting hole without crowding. Circling and cramped roots will not straighten themselves; they will expand in the position you leave them, crowding each other and possibly strangling the plant. Straighten and trim the roots and you're doing the plant a favor.
- ✓ Watering in - Deep soaking is necessary to reach the root system. During the first year, water upland plants once a week (unless there is rain). A good soaking (sprinkler for an hour) is better than frequent watering for briefer times. One of the great things about planting in the fall is that it rains frequently. At least it usually does. If your installation schedule coincides with a week of dry weather, irrigating your freshly installed plants is important. Plants are entering dormancy and are less vulnerable to water stress than in the spring or summer, but nevertheless anything that reduces transplant shock will improve overall survival and growth. If you have the option, irrigate!
- ✓ Labeling / plant tags - Label a few plants of each species to avoid mistaking them later for weeds. Labeling allows you to track the success of your planting program.
- ✓ Staking - The bottom line is if the plant will stand up without a stake, don't give it one. Stake a plant only when it needs support, and connect the stake to the stem as low and loosely as possible. Staking a plant interferes with its natural ability to support itself.

Evaluating plant health before planting:

What do you look for to judge the plants' health? If you find problems, are they severe or numerous enough to reject the plants? If you aren't sure, contact your local Cooperative Extension office for help with diagnosis.

- You'll have to get down and dirty to properly inspect plants - Looking over a block of plants is only the first step. As a whole, do the plants look healthy to you? Do they look wilted or fat and happy, despite their autumn die-back? Next, get in close and start poking and prying, peering and prodding.
- Examine the leaves, stems, and trunks - Starting at the top of the plant, look at the leaves or needles and work your way down. If the leaves of deciduous species look bad in the fall, don't worry. It's normal for deciduous leaves to get opportunistic infections, such as leaf spots, as they wither and die in autumn. These same infections are a concern in the spring or mid-summer or if they occur on evergreen species. Turn the leaves over and examine them, preferably with a magnifying glass or hand lens, for insects. A few aphids are no big deal but an infestation may be a concern.
  Now examine the stems and the main trunk. Broken branches can be cut off cleanly but broken trunks on a single stem tree may be cause or rejection, especially on conifers. Look for wounds, soft spots or depressions that could indicate canker or mechanical damage. Plants have the ability to wall off injuries, but until they do, damaged bark can invite infection and should be avoided.
- Examine the roots - Open a bundle of bareroot plants and look at the roots. Are they firm and moist, with pale growing tips? Dried-up, mushy, or totally brown roots are dead. Pull a random selection of containerized plants out of their pots and look at the roots. Are they root bound, with roots that circle around the bottom of the pot? These roots must be cut and straightened before planting. Plants that pull out of the pot leaving a pile of soil behind have been sold before they are ready. Roots that are brown, dried, slimy, or soft are not healthy. Some brown roots are normal for a container plant, but there must also be live, growing roots. This step in inspection is critical: healthy roots are vital to a plant's growth.

Step 5 - maintenance and project monitoring activities:

A natural shoreline management approach represents a significant reduction in maintenance time and costs when compared to conventional methods. However, all projects require some maintenance after implementation. Because every project is unique, you may require slightly different maintenance needs then what are listed here. This check list will help you understand some of the common maintenance activities that may be needed on your project. Project success cannot be expected without ongoing maintenance activities.

- ✓ The initial establishment period directly after planting requires more intensive maintenance, such as weeding and watering. Watering during the first few years will give the native plants an advantage over invasive plants. During the first year, weeding will also give native plants an edge over weeds. Avoid fertilizing since that encourages problem plants.
- ✓ During the second season, you should plan on only watering only during droughts. Weeding may only be necessary every three weeks.
- ✓ During the third season and beyond, cut out dried vegetation. Once a month, pull out weeds and invasive plants.
- ✓ Pruning should not occur until the plant has had one or two full growing seasons (with the exception of removal of broken branches). Pruning too early will weaken the plant. When pruning do so lightly so as not to stress the plant. Eventually you can prune regularly and selectively, keeping hedges low and encouraging trees to grow tall. Consult your local shoreland ordinance for direction on pruning within the buffer zone [the 35-foot area between the lake moving upland towards the house]. Utilize pruning to: remove damaged or dangerous branches; remove unwanted suckers; shape woody plants; promote reblooming of perennials or to rejuvenate shrubs; thin growth; or control height.
- ✓ Minimize human foot traffic and folks walking through your native planting area. Even a modest amount of foot traffic on loose, sandy soils can be problematic and cause erosion problems. A temporary fencing system (explained in detail below) can deter this foot traffic effectively.
- ✓ Docks, boats, lifts, and other equipment should not be stored on top of your new native planting; make sure you have a plan for where to store these items once your native planting is installed.
- ✓ No mowing should ever happen again in your native planting area. Further, allow leaves, broken twigs, and other downed woody material to accumulate in your native planting area; do not remove this organic material. It is reestablishing your duff layer and organic matter into the soil; thus, it is an important piece to what you are restoring.
- ✓ Insect problems - In general, native plants are not typically affected by insect damage. There are exceptions, however. Japanese beetles may devastate native roses, hazelnut and wild grapes in some years. It is only a matter of time before beneficial insects move in and control the problem naturally. So just be patient if an insect pest emerges. Use insecticides as a last resort for management.
- ✓ "*Cues to care*" – perceived care [as seen through the visual quality of our landscapes] is an important norm in our landscapes. Some of us have a greater tolerance for the perceived messiness of natural ecosystems than others. Perhaps you or your neighbors have this point of view. We can design and install our native plantings with this in mind by adding some "*cues to care*", small actions that allow us an easier time of visually accepting the look of a native planting. Taken together these "*cues to care*" provide a reassuring sense of order in nature and society that clearly connote an intentional landscape pattern that conveys the presence of caretakers. Examples include: drifts of

native flowers planted together in large clumps for color; landscape edging along the planting sides using stone or pavers; a decorative fence along the planting edge; specimen trees or shrubs; signage which shares your conservation story; use borders or paths to define the planting area; develop a focal point; etc.

"*Cues to care*" – a drift example

- ✓ Replacement - Replant as soon as possible when large gaps appear in planting areas. Expect and enjoy the changes that will occur over time.
- ✓ Geese - Discourage geese from feeding off the young plant shoots. Use bird scare tape or fencing to keep the geese away. Goose tape (bottom photo) made from a shimmering reflective material, can be hung and regularly spaced along a fence an effective countermeasure.

First year - maintenance and care activities:

- ✓ Watering – water your native planting regularly in the first two months after planting whenever the soil begins to dry out. Expect to water once a week in the absence of rainfall. A single deep soaking is better than numerous light sprinklings. Once the plants are well-established watering should not be necessary, except during periods of extended drought. At least 1-2" of water per week is recommended for good root establishment of your native planting.
- ✓ Weeding – check for weeds at least once every two weeks. Pull or spot treat weeds with herbicide as necessary and according to product label directions. Pay extra attention for weed growth near project edges and paths. If hand-pulling these weedy plants, be careful not to disturb your native plants or if you do disturb them, repack their roots into the ground and water immediately to avoid long-term damage.
- ✓ Plant identification – Become familiar with the native plants on your project. Also become familiar with the weeds. See the references at the end of this guide for help.
- ✓ Mulch – mulch plants as necessary throughout the growing season to prevent soil erosion, weed growth, and to hold in soil moisture. Utilize clean straw or other mulch examples (see UWEX for more information). Mulch the planting area with approximately one inch of weed free straw or marsh hay (do not use field hay as it contains weeds). Mulch can be laid by hand. The mulch will help control erosion on slopes and helps to retain soil moisture during the root establishment period for your new native planting. If working on gradual slopes or erosion prone sites, cover the mulch with a photodegradable plastic or natural mesh with one half inch openings to allow for unimpeded native plant development. Secure the mesh with landscape staples placed at one to two foot intervals and/or according to the manufacturer's specifications. Double-shredded wood mulches stand up to overland water movement better than single-shredded products because they are less likely to picked up and floated away. Ensure plant roots are firmly packed into the soil and not just in the mulch. Twice-ground leaf compost works well for mulching native perennials and grasses. If you mulch your area before planting, do not exceed the following general rules for mulching: deep cell plugs = 1.5"; quart-sized pots = 2"; gallon pots = 2.5"; and trees / shrubs = 3 inches. Also, do not leave soil on top of the mulch as this encourages weed growth.

SOUND NATIVE PLANTS

Mulches for restoration and mitigation projects

Mulching will improve most planting projects. The benefits of mulching can include soil moisture conservation, weed suppression, improved soil structure and nutrient regime, and reduction of surface run-off, soil erosion, and soil compaction. The benefits vary based on the kind of mulch you choose; the following table indicates the relative characteristics of the most common materials.

Material	Erosion control	Weed suppression	Nutrient provision	Availability	Longevity	Recommended depth	Sources	Installation cost	Typical material cost w/o delivery	Cost per sq. yard
Medium ground bark	Medium	High	Low	High	Medium-High	2-4"	Quarries, landscape suppliers, garden stores [1]	Medium	$26-30/ cubic yard	$2.16-2.50 (3" deep)
Hog fuel	Medium	High	Low	Medium	Medium-High	2-4"	Quarries, landscape suppliers, some hauling co's.	Medium	$7-10/ cubic yard	$0.58-0.83 (3" deep)
Wood chips w/ greens [2]	Medium	High	Medium	Variable	Medium	2-4"	Arborists, other tree services	Medium	Cheap or free	n/a
Straw	Medium	Low-Medium [4]	Low	High	Low	2-4" [5]	Feed stores, farm supply	Low	$5/2-string bale	$0.11 (3" deep)
Composted yard waste [3]	High	Medium	High	Medium	Low	2-4"	City or county composting programs, landscape suppliers [1]	Medium-High	$22-30/ cubic yard	$1.83-2.50 (3" deep)
Weed cloth (plastic) [6]	Medium	Highest	None	High	High	n/a	Wholesale and on-line distributors	Medium	$0.80-1.00/sq. yard	$0.80-1.00
Geotextiles	Highest	Medium-High	None	High	High	n/a	Wholesale and on-line distributors	High	$0.90-2.50/sq. yard	$0.90-2.50

Rev 4/13/09

1 Usually available through hauling companies
2 Allow freshly chipped wood to sit for four weeks before applying
3 If mushroom compost or biosolids are used instead, have these materials lab tested for the presence of pesticide residues or heavy metals
4 While straw does offer some weed suppression, it usually also has weed seeds (mostly grasses) that may germinate at the site
5 Straw application rate for 2" deep is 2-3 tons/acre, for 4" deep it's 4-6 tons/acre. One 2-string bale weighs 60-70 lbs.
6 Weed cloth must be removed once plants are established – it may hinder rhizome and stolon growth and will take decades to break down

Source: Sound Native Plants / < www.soundnativeplants.com > Mulches fact sheet

- ✓ Nutrients – Native plants typically don't need nutrient inputs to perform well. However, if your soil is particularly nutrient poor, you may want to add a handful of weed seed free compost to each hole as you plant.
- ✓ Consider temporary fencing – depending on what part of the state you find yourself in, the need for browsing protection from deer, rabbits, and other nuisance wildlife is an important consideration. Talk with your local county land and water conservation staff or WDNR wildlife biologist to gauge the browse pressure in your area. In general, in settings where neighbors feed deer on a regular basis a temporary fencing structure is a good idea to protect your native planting. A temporary fence allowed being in place for the first 3-5 growing seasons gives your native plants a chance to establish their root systems fully. After the 3 to 5 years, these plants are better suited to browsing pressure because they have substantial roots formed.
- ✓ Temporary fence example / specifications – a temporary fence system utilized in northeast Wisconsin includes the following approach and materials:
    - A UV resistant 7' deer fencing with a black mesh (easiest color to look past / through visually) of approximately 2" X 2";
    - Standard t-posts spread at a distance of 10-15';
    - Extender bars / sturdy piping often available in the conduit / electrical sections of hardware store;
    - Zip ties to fasten the fencing to the posts / extenders;
    - Clamps to fasten the extender bars to the t-posts;
    - 8" landscape staples to fasten fencing mesh to the ground;
    - Shock cord to run along the top of the fence that is tacked to existing trees when possible;
    - If rabbits are an issue, a line of chicken wire can be run along the bottom of the fence to protect from browse;
    - 2 X 4's for reinforcing the corner areas of you fencing area (see the pictures below for an example).

Deer fencing examples

Line of chicken wire at base of fence

Clamps can be used to attach extender poles

2 X 4's can be used to reinforce temporary fence corners

T-post example with extender pole and shock cord at the top

- ✓ Spray deterrents (product names like Plantskyd, Liquid Fence; etc.) can also be utilized; switching products every 4 to 6 weeks during the growing season can prove beneficial as different products have different active ingredients, so by alternating assorted products overtime you are keeping the browsers thinking with your deterrents. Some are blood meal based; others are based on garlic and putrid smelling ingredients like rotten eggs. Follow product directions for best success.

Second year – maintenance and care activities:

- ✓ Dead Vegetation – Cut back or rake dead vegetation if desired. This is only necessary if the appearance of the project is a concern. Leave dead vegetation standing in the fall to buffer the shore throughout the winter. The standing dried vegetation also provides winter interest, food, and cover for wildlife.
- ✓ Weeding – Thoroughly weed site as it begins to green-up. Check for weeds at least once every three weeks. Pull or spot treat weeds with herbicide as necessary..
- ✓ Water – During drought periods provide plants one inch of water per week.
- ✓ Supplemental planting – Plant replacement plants in spots with low survival.

Third year and beyond – maintenance and care activities:

- ✓ Dead Vegetation – Cut back or rake dead vegetation if desired in the spring. Leave dead vegetation standing in the fall.
- ✓ Weeding – Check for weeds once a month. Pull or spot treat weeds with herbicide as necessary.
- ✓ Supplemental planting – Plant replacement plants as necessary, continuous native vegetation cover is the goal. Expansion – Consider expanding the project into new areas of your shoreline.
- ✓ Monitoring – The project site should be monitored yearly. Monitoring should include notes on successful species, weed problems, disturbances issues (animal or human), and management needs. It is recommended you monitor one hour each month throughout the growing season and include written notes with photos of the project's progress.

Overview videos:

- ✓ Video link at: < http://www.extension.umn.edu/environment/water/shoreland/better-living-on-our-lakes-and-rivers/restoration/ > Outlines why natural shorelines help protect water quality and wildlife habitat, and introduces how shoreland property owners can restore natural functions to their shorelines. (Running time: 15:30).
- ✓ Keeping our shores: Shoreland best management practices – part 1 video < http://www.extension.umn.edu/environment/water/shoreland/better-living-on-our-lakes-and-rivers/best-management-practices/ > Introduces best management practices that shoreland owners can use to protect the water quality in a lake or river, including shoreline filter strips, proper septic maintenance, and appropriate lawn care practices. (Running time: 15:20).

What is a native plant?

- ✓ A native plant is a plant that is indigenous to a given geographic area in geologic time. Plants that existed on the North American continent before European settlement are North American native plants. This includes plants that occur naturally, or have existed for many years in the prairies, savannas and woodlands across this country.
- ✓ Whether you're gardening in a small space or restoring habitat, native plants support life and the practice of soil and water conservation. Even a few natives added to a garden can attract more birds and butterflies.

What are the benefits of using native plants?

- ✓ Native plants can add beauty to a garden, just as they do in natural landscapes. The great variety of plants native to any region give gardeners options that work well in any type of garden design. But native plants also do much more.
- ✓ Native plants that are well suited to the site conditions do not require soil modifications or fertilizers and once established can thrive without regular watering. In doing so, they reduce maintenance costs associated with irrigation, fertilizers and pesticides.
- ✓ Native plants are the foundation of the biodiversity that maintains our own life support systems. For example, they nurture important pollinators like bees, butterflies, and hummingbirds.
- ✓ Native plants create a distinctive sense of place, preserving the natural character of your region.

Which native plants do well in landscapes of this region?

- ✓ Growing natives can be as simple as adding a regionally native shrub or wildflower to an existing flowerbed or border, or planting native trees that will make a home more energy efficient by providing summer shade or blocking winter winds. It can mean protecting and restoring an area of native habitat—a fragment of prairie or forest, for example. Homeowners can also create a native planting from scratch by recreating the native habitat that once existed on their site. Even a 10' X 35" native planting can provide habitat and other natural functions like infiltration and nutrient recycling.
- ✓ Native plants can provide a variety of benefits to homeowners and the surrounding area but in order to be successful, they must be well suited to the growing conditions of the site. It is a common misconception that just because a plant is native to a region, it can grow anywhere in a garden. As with all plants, gardeners should consider the soil type, pH, sun and shade requirements and watering needs of native vegetation before planting.

Light requirements and sun exposure:

- ✓ *Full sun* – Whether the majority of the sunlight occurs in the morning or the afternoon, full sun locations receive 6 or more hours of direct, unfiltered sunshine.
- ✓ *Partial sun* – These locations receive 4-6 hours of direct sunlight and are lightly shaded much of the day. Dappled or filtered sunlight the entire day is also considered partial sun.
- ✓ *Shade* – Shaded locations receive little direct sun, fewer than 4 hours per day, and are heavily shaded much of the day. May also receive little to no reflected or indirect light.

Understanding lakeshore soil basics:

- ✓ It all starts with the soil: healthy soil is the foundation of any productive landscape planting. Good-quality soil holds water but drains well, is well-aerated, and is fertile enough to support plant growth. Soil serves many functions in a lakeshore landscape. Most importantly, it provides a medium for the exchange of water, nutrients and air among plants, the earth, and the atmosphere. Soil anchors plants to the ground and filters out many pollutants before they reach ground or surface water.

Soil descriptions – soil types and soil moisture determination:

- ✓ Native plants tolerate a variety of soils and moisture levels. It is important, however, to determine the general soil type and soil moisture for each area that you intend to plant, in order to select the plants best adapted to your soil conditions.
- ✓ Soil types – soils can be generally classified as sands, clays, and loams.

  Sandy or "light" soils – are comprised of large, loosely packed, soil particles that drain easily and are easy to work. Sandy soils also tend to be lower in nutrients and slightly acidic.

  Clays or "heavy" soils – consist of small, tightly packed, soil particles that drain poorly and are difficult to work. They can, however, be rich in nutrients and very productive.

  Loams or "mesic" soils, the intermediate soil type between sand and clay – are usually very fertile and are composed of a variety of different sized soil particles. This particle diversity provides good moisture holding capacity and drainage, which is an excellent medium for many native plants.

- ✓ Soil moisture – the soil moisture content varies according to the soil type and location of the soil relative to the groundwater level.

  Dry soils – are extremely well-drained sand, gravel or rocky soils that do not hold water and tend to dry out rapidly. A surprising variety of native plants will thrive in dry soils without soil amendment or irrigation. Many low growing plants do best on dry soils. They maintain a shorter stature due to reduced availability of moisture and nutrients on dry soils.

  Medium soils are loamy and clay-based soils with good drainage that do not experience standing water. A wide variety of both short and tall native plants thrive in medium soils.

  Moist soils tend to be regularly damp and may experience brief periods of standing water for a few days in spring or fall. The surface soil will usually dry out by late spring or early summer, but the subsoil will be moist at a depth of one to two feet. Rain gardens are designed to grow in moist soil conditions, where rainwater is captured in shallow depressions to encourage on-site infiltration and groundwater recharge.

  Wet soils stay damp nearly year round, and moisture is generally available within one foot of the soil surface, even in mid-summer. Wet soils are often flooded in spring. They can experience standing water for a week or longer in early spring, and for a few days after a summer downpour. Only the most moisture tolerant plants will thrive in wet soils.

Natural Resources Conservation Service (NRCS) – Web Soil Survey

- ✓ < http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm > Web Soil Survey (WSS) provides soil data and information produced by the National Cooperative Soil Survey. It is operated by the USDA Natural Resources Conservation Service (NRCS) and provides access to the largest natural resource information system in the world. NRCS has soil maps and data available online for more than 95 percent of the nation's counties and anticipates having 100 percent in the near future. The site is updated and maintained online as the single authoritative source of soil survey information.

Pesticides: a special concern on waterfront properties:

- ✓ Pesticides are chemical or biological agents, substances, or mixtures of substances intended for preventing, controlling, destroying or repelling insects, rodents, fungi, weeds, mollusks, algae, and other organisms considered to be pests. Plant regulators, defoliants and desiccants are also regulated under federal and state pesticide laws.
- ✓ Most insecticides, herbicides, and fungicides not absorbed by plants will break down into harmless compounds and elements through the action of sunlight, microbial activity, and other forms of natural degradation. However, some pesticides break down faster and more easily than others, and some pesticides can leach into the soil or be carried away by runoff before they can break down, especially if heavy rainfall occurs shortly after application.
- ✓ Pesticides can also end up in surface water because of misapplication, drift, and spills. Leaves from plants or grass sprayed with pesticides may blow into surface water before the pesticides have degraded. Pesticides that persist in the soil can make their way into water by runoff and erosion.
- ✓ Very small amounts of some pesticides can have significant impacts on water quality, as many microscopic animals important to the aquatic food chain, such insect larvae, are highly susceptible to even very low concentrations. Loss of these organisms can affect the efficient cycling of nutrients throughout the system and threaten the health of fish and other organisms.
- ✓ The State of Wisconsin regulates the application of pesticides; see the Department of Agriculture, Trade, and Consumer Protection web site for more information, training opportunities, and specialists to contact with your questions:
  < http://datcp.wi.gov/Plants/Pesticides/ >
- ✓ When applying fertilizers or pesticides on a property, always consider the environment around you and think about where your products may end up. Landscapers or pest control companies should be properly licensed with the State of Wisconsin Pesticide Control according to state regulations to apply any pesticide on lakeshore property, including organic or nontoxic pest-control products.

Post-planting maintenance and care – an important reminder:

- ✓ Lakeshore properties often change owners every 7 to10 years. As these native planting projects are important to lake health and water quality, we need to work together in passing them on to the next landowner who can become responsibility for its care and maintenance. So if you have a changeover of ownership for your project, please work with the new landowners, grant coordinator, local lake organization, county staff, and/or other partners to transfer the care of the project. Provide the new landowners with a project overview and other information to get them up to speed with taking over the conservation work involved with your native planting.

Native plants and utilizing local-genotype:

- ✓ "Native" merely means a species was present in the area before modern settlement of an area.
- ✓ "Local-genotype" however, means the strains are correct for the area. Those are very important details. Just because the *Ratibida pinnata* (Yellow coneflower) is native to your area doesn't mean the genotype you purchase is the correct one. The genotype from Texas isn't the same as one from Minnesota, and you probably don't want to plant it in your prairie there. It probably won't do as well in upper Midwest growing conditions – if it survives at all – or it may do too well and take over.
- ✓ Plants grown locally have adapted to local conditions over thousands of years. And by using a nursery that starts its production beds using seeds collected on many local sites, you can ensure this genetic strength. There are many other reasons to use local-genotype materials. From a cost point of view, materials matched to the conditions of your site have a better chance of success, avoiding expensive reseeding and replanting.
- ✓ Furthermore, by using seeds produced from parent stock that was collected on remnant sites in an ethical manner, you can provide value to the owners of those sites. This is crucial because if they see their land as useless, they may be tempted to sell or develop it, obliterating one more native ecosystem.
- ✓ Other areas of your site that are within pollen and seed-distribution range can be negatively impacted by non-local genotype plant material. Non-local genotype plant material can create hybrids that normally would not occur in nature—so-called "ill-fated" hybrids—by introducing negative traits that will lower the overall fitness and survivability of a particular plant population.
- ✓ Local genotypes can link fragmented populations. As urban sprawl continues, plant populations are becoming more isolated from one another. Use of local genotypes increases the possibility of transfer of genetic material between these islands of plant populations. Non-local genotypes that are genetically incompatible with local genotypes can create infertile hybrids, and may create a "population sink" for any viable incoming pollen by keeping it from reaching the viable population.
- ✓ The genetics within a plant species have huge implications on ecosystem interactions. Relationships have been formed over long spans of time between specific plants and other organisms. For example, certain insects have adapted to develop during the bloom periods of certain plants, or may be attracted by genetically based traits such as bloom color or scent.
- ✓ Any change to these traits also affects any organisms that interact with those plant species. This can have a domino effect throughout an ecological community, causing species after species to fail. In addition, plant-pathogen interactions often develop at the local scale. Non-local genotypes may not have appropriate defenses, which may lead to dramatic increases in pathogen populations.
- ✓ Local genotype plants and seeds can make the difference between success and failure of a project. Why risk your project—and your reputation—when local genotypes are available? These are the reasons people are adamant in providing local-genotype natives.

Finding your native plant material – several online listings of Wisconsin nurseries offering native plants:

- ✓ < http://dnr.wi.gov/files/PDF/pubs/ER/ER0698.pdf >
- ✓ < http://grandprairiefriends.org/nurseriesWI.php >
- ✓ < http://findnativeplants.com/midwest/wisconsin-native-plants/ >

Finding help from a native plant consultant, landscaper, and/or nursery professional – a listing for Wisconsin restoration consultants:

- ✓ < http://dnr.wi.gov/files/PDF/pubs/ER/ER0699.pdf >

Plant finder online tools:

- ✓ Langlade County: < http://lrrd.co.langlade.wi.us/shoreland/index.asp >
- ✓ Prairie Nursery "plant finder" tool: < http://www.prairienursery.com/store/advanced-search#.VDcFE7BOncs >
- ✓ Minnesota *Blue Thumb Program* "Plant Selector" Program: < http://www.bluethumb.org/plants/ >

Life at the water's edge:

- ✓ The water's edge is a busy place. Northern pike, bluegills, bass, and other fish spawn in the shallow water along the shore. Loons, ducks, geese, and other water birds nest along the banks. Wildlife such as frogs, otters, and mink live there, too. Shoreline areas—on land and into the shallow water—provide essential habitat for fish and wildlife that live in or near Wisconsin's lakes, rivers, and streams. Overdeveloped shorelands can't support the fish, wildlife, and clean water that are so appealing to people attracted to the water's edge.
- ✓ Unfortunately, that's exactly what's happening to many Wisconsin waterways. The problem is poorly planned shoreland development. Bit by bit, the cumulative effects of tens of thousands of waterfront homeowners "fixing up" their property are destroying one of our state's most valuable resources – its fragile lake and stream habitats.

Some examples of landscaping choices that are unfriendly to fish and wildlife include the following:

- ✓ Sand trucked in for swimming beaches covers underwater gravel or silt used by:

- Fish for spawning;
- Mayflies for burrows; and
- Frogs for laying eggs.

- ✓ Aquatic vegetation removed to create swimming and boating areas reduce shoreline stabilizing plants that are also habitat for:
  - Bass and other fish that hide among the plants and spawn in areas protected from waves;
  - Loons that nest on floating vegetation;
  - Waterfowl that feed on underwater plants; and
  - Insects that live among underwater vegetation.

- ✓ Shoreline shrubs and "unsightly" fallen trees are often removed to create manicured–type lawns, thus eliminating habitat for wildlife such as:
  - Songbirds that use these shrubs for nesting;
  - Ducks that lay eggs in native shoreline grasses, sedges, and rushes;
  - Turtles that sun on fallen logs; and
  - Bass and panfish that hide in the shade under toppled trees.

<u>"Clean" lawns can make dirty water</u>:

- ✓ Owners of shoreland property often bring with them the traditional landscaping ideas centered on the conventional suburban yard that strives for the "clean" look of a golf course or a beach. Yet, besides eliminating fish and wildlife habitat, this type of landscaping also creates problems for homeowners such as:
- ✓ Green water: a mowed lawn sends rain runoff carrying fertilizers, pet waste, and lawn clippings to the water, where they fuel algae blooms that make swimming less enjoyable;
- ✓ More erosion: water plants such as bulrushes, cattails, and coontail and shoreland shrubs like sweet gale, alder, and meadowsweet soften the erosive effects of waves along shores--removing these plants increases erosion; and
- ✓ Nuisance wildlife problems: manicured lawns attract geese, which are grazers--in just one week an adult goose can produce 15 pounds of slippery, smelly droppings.
- ✓ The combined effect of shoreland alterations by many property owners on a lake or river can significantly destroy contiguous habitat and cause declines in fish and wildlife populations. It's ironic that many waterfront property owners buy their lots because they enjoy nature and then unknowingly harm habitat by altering the natural landscape. Most species of fish and wildlife don't thrive along sandy swimming beaches or on mowed lawns. They do best within the tangles of aquatic plants (aka "weeds") and shoreline understory cover (aka "brush" and "downed wood") that waterfront residents frequently remove.
- ✓ A healthy lakeshore consists of many natural elements (grasses, sedges, rushes, wildflowers, ferns, woody plants, soils, rocks, decaying trees and logs) that function together to form a unique ecosystem. Shoreline alterations that damage or remove some of these components sever essential biological and physical connections between the upland and the water.
- ✓ Protecting natural vegetation, or re-establishing it either directly or through natural succession, is critical for a functioning shoreline buffer. The vegetative goal for the shoreline buffer is mature native forest or other natural vegetation. It typical has three layers of vegetation including a canopy of trees, a middle layer of shrubs and smaller trees, and a ground layer consisting of wildflowers, ferns, grasses, sedges, and rushes. A natural vegetated shoreline buffer generates important ecological and aesthetic functions. A vegetated buffer can: provide vegetative screening for structures; maintain physical conditions such as bank or shore stabilization; shade streams and lakes; minimize disturbances to the littoral zones of lakes; retain and transform sediments, nutrients, and pollutants; improve stream and lake habitat structure by allowing for contribution of woody habitat and organic matter to lakes and streams; provide habitat for some shoreline-dependent wildlife such as amphibians that utilize narrow corridors; and provide perching spots for fish-eating birds, grazing zones for water birds, and ambush sites for other shoreline predators.

<u>Natural shorelands: how they work</u>?

- ✓ It's a fact: natural, thriving shorelands can solve many water quality problems on lakes and waterways. The loss of natural shorelands is not only a threat to water quality; it also can create other troubles. For example:
- ✓ Erosion: Removing shoreland vegetation destabilizes the shoreline and can lead to loss of land. Shorelines must stand up to scouring currents, fluctuating water levels, moving ice, flooding, surface runoff from higher ground, boat wakes, and wind driven waves.
- ✓ Flooding: Land development leads to increased runoff from impervious surfaces such as roofs, roads, driveways, and parking lots. More water reaching lakes and rivers at faster rates can cause flooding during heavy rains.
- ✓ Unsightly algae blooms: Just as fertilizers make your lawn green, they make your lake or river green by feeding algae and aquatic weeds.
- ✓ Damage to fisheries: Clearing trees exposes water to more sunlight, raising water temperatures, lowering oxygen levels, and stressing fish and their food supplies.
- ✓ Loss of habitat: The water's edge is prime real estate for birds and other wildlife. Backyard bird feeders are no substitute for good plant cover and natural food.
- ✓ Loss of privacy: Boaters, anglers, water-skiers, jet-skiers, and swimmers all love Wisconsin's lakes and rivers. Shoreland vegetation screens homes from public view and helps to reduce noise from boats on the water. [Source: Wagner et al 2003].

Lakeshore plants as natural filters and stabilizers:

- ✓ Shoreline buffers are corridors of natural vegetation along rivers, streams, and lakes which help to protect water quality by providing a transition between upland development and adjoining public water. A shoreline buffer of natural vegetation traps, filters and reduces runoff. Buffers stabilize lake and river banks, offer scenic screening of shoreland development, reduce erosion, control sedimentation, and provide habitat for shoreline species.
- ✓ Buffers with natural ground cover, understory plants, and a forest floor layer are most effective in removing phosphorus from runoff. Native vegetation, with its deep root systems and natural duff layer, acts like a sponge to hold runoff and associated pollutants. If runoff is allowed to "short circuit" a buffer by concentrating and forming channels or rivulets, the chance for filtration of runoff is greatly reduced. The denser the vegetation is in a buffer and the higher the integrity of the understory, the better it will filter runoff.
- ✓ Vegetation plays a major role in filtering runoff of such things as organic and inorganic solids and the pollutants that travel with them. Filtration through ground cover, accumulated detritus, mulch, and various exposed parts of the plant or tree occurs as these obstacles get in the way of moving particles. Vegetation also reduces the energy of flow, thus slowing water down, spreading flow out and allowing gravity to settle particles too heavy to move at a reduced energy level. This energy reduction also cuts the erosive potential of runoff.
- ✓ The 'lawn to lake' shoreline allows 7 to 9 times more phosphorus to enter the lake than a more natural native vegetated shoreline. While absolute values of phosphorus entering the lake from a developed shoreline lot vary due to soil, slope, and other site specific conditions, a lot with a lawn extending to the lake has been estimated to average 0.2 pounds per summer compared to 0.03 pounds per summer for a lot with a native vegetated shoreline buffer. For many lots, the phosphorus yield to the lake due to the alteration of the shoreline buffer may exceed the phosphorus yield from all other sources. Phosphorus is a plant nutrient, and more of it entering the lake means more aquatic plants or algae resulting in lower water clarity (0.2 pounds of phosphorus can produce 100 pounds of algae). Soils around many lakes are usually naturally phosphorus rich. Excess nitrogen will also be transported to lakes from these land uses. Nitrogen will enter attached to soil particles, as organic matter, or dissolved in the form of nitrite, nitrate, or ammonia – forms that are readily useable by algae and rooted plants.
- ✓ Ground water under lawn areas can also have high concentrations of nutrients. Hydrologists have found nitrate and total phosphorus concentrations 3 to 4 times higher in ground water under lawn areas than wooded areas. Infiltration from lawns results in higher rates of nutrients leaching to the ground-water system, and subsequently to the lake, even if the runoff itself does not reach the lake. Researchers studied the interaction of runoff and shoreline buffers and found that the use of native vegetation buffers would increase the likelihood that high-intensity rainfalls would be filtered before entering the lake. Shoreline buffers are important because they enhance a site's ability to absorb water before it is conveyed to public waters.
- ✓ Restoration or maintenance of the quality of structural diversity of natural shoreline vegetation is as important as buffer depth. Natural vegetation is a critical component in lakeshore effectiveness, so it is important to protect existing native vegetation and reasonable to consider restoration of native vegetation.

Lakeshore plants as homes for native fish and wildlife:

- ✓ Nearshore vegetation provides habitat for many wildlife species. Waterfowl nest in shoreline grasses, while songbirds build their nests in trees and shrubs. Natural shorelines are wildlife highways, or travel corridors, for animals such as mink. Grasshoppers, ants, and other insects that live in shoreline vegetation are blown into the water, where they are eaten by bluegills and other fish.
- ✓ A tidy lawn and a sandy beach make great spots for sunbathing and swimming, but they provide little habitat for fish and wildlife. By leaving a buffer area of natural vegetation along the shoreline, property owners can reduce erosion, help maintain water quality, and provide habitat and travel corridors for wildlife.
- ✓ The width of the buffer strip depends upon the terrain. A significant body of research suggests that a 35-foot shoreland buffer is inadequate for several buffer functions. The wider the buffer the more wildlife habitat it can provide, especially for less common species. On a gentle slope, having at least 35 to 50 feet of natural vegetation between the water's edge and your mowed lawn will accommodate the needs of some shoreline wildlife. On steeper grades, leaving even more natural vegetation in place will stabilize soils and reduce the need for retaining walls or other erosion prevention. Trees and shrubs in the buffer strip can muffle noise from watercraft, provide increased privacy for residents, and provide nesting areas for songbirds.
- ✓ Avoid using pesticides or fertilizers in the buffer area, because harmful chemicals can leach into the water. Pesticides kill beneficial insects living in shoreline vegetation that are important foods for fish, birds, and other wildlife. The near-shore areas adjacent to lakes and rivers are considered one of the richest zones for aquatic organisms, mammals, and birds. In Wisconsin, large numbers of birds [Lindsay et al. 2002; Ginnett et al. 2005; Howe et al. 2005], amphibians and reptiles and mammals [Haskell 2009] use near-shore areas or those buffer transition areas. This area has an overlap of ecological zones between upland and aquatic habitats where species from both zones live. The tree canopy provides foraging and nest sites for many species of neotropical migratory birds. Water birds like bald eagles and ospreys rely on larger trees for nesting sites and perches. Native midstory small trees like Juneberry, pin and black cherries, blue beech, hawthorns and shrubs such as hazelnuts, chokeberry, northern bush-honeysuckle, dogwoods, alders, elderberries, and willows are used by assorted nesting birds. A robust midstory layer of vegetation also provides cover, foraging sites, and travel corridors for many mammals. Other birds, such as thrushes and ovenbirds, nest among the ground cover on the forest floor, while shoreline native grasses, sedges, and rushes provide forage and shelter for small mammals. Patches of native berries like blackberries, raspberries, and blueberries provide food and cover too while native vines like clematis and wild grapes add to the diversity.
- ✓ Even when vegetation dies, it continues to be a critical component of the shore habitat. Trees that grow alongside the lake or river often fall into the water due to factors such as natural mortality, beaver activity, and wind throw. Leaves from shoreline trees and shrubs also

accumulate along the lake bottom. These materials provide fish habitat, natural platforms for resting wildlife, and food for algae, aquatic insects and invertebrates.

We all live 'near the water':

- ✓ In a sense, we are all 'waterfront landowners' because we all live in a watershed—even that storm drain at the end of the driveway or street eventually leads to a waterway. Storm water flowing over roads, lawns, and yards picks up dirt, lawn fertilizers, pesticides, herbicides, toxic heavy metals, pet waste and other pollutants that do not belong in our lakes and rivers.
- ✓ Whether you own property on a large lake or a small stream, the water and shorelands are altered by what happens on your home turf. When natural shorelands are replaced, an important filtering system is lost, allowing polluted runoff to flow directly into the lake or stream.

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