General Implementation Feasibility

Many of the proposed restoration techniques require a long-term commitment for successful establishment and maintenance. Restoration on public properties will be managed, primarily, by City personnel. Implementation of the restoration techniques will best be accomplished if individual projects are prioritized, with selected projects scheduled as funding and labor are available.

Restoration on private properties should be incorporated into redevelopment plans. The City has several options on how restoration should be implemented on private lands, ranging from verbal or written encouragement during plan review, to revision of city ordinances to include specific restoration requirements for redevelopment. The city could use park dedication lands and/or fees to restore areas within private development. Tax or cash incentives may also be appropriate, especially for residential projects. It is likely that an intensive educational effort would be required if restoration on private lands remains voluntary. Whereas, regulatory requirements or easements would be binding and would likely result in more restoration projects being implemented. This would also require additional staff time to insure successful implementation.

Public Participation

This project provides a wonderful opportunity for hands-on outdoor education. Scout groups could be encouraged to construct a bluebird trail. Local gardeners could oversee establishment of community vegetable gardens, butterfly gardens, and even help create and maintain prairie plantings. Constructed wetlands could be monitored to evaluate plant and insect diversity. Wherever possible, local residents and employees should be invited to participate in restoration establishment, maintenance and outdoor education opportunities.

Details on Restoration Techniques

The following sections provide more detailed information on how to establish and maintain the restoration techniques proposed in the Upper Mississippi River Master Plan. Subjects range from site establishment to long term management. Specific plant lists are provided for each plant community type proposed for restoration.

Site Preparation and Establishment

Treatment and eradication of all undesirable vegetation found growing within the project limits is necessary prior to planting the desired plant community. Particular attention must be given to eliminating invasive species found in and around the site. Elimination of existing vegetation is a three-step process. First, areas to be restored should be burned to reduce litter and promote active vegetative growth. Second, approximately fourteen days after the burn, the actively growing vegetation should be chemically treated with a grass and weed herbicide such as Roundup[1]M. The recommended rate of application is 5

pints/acre or per label specifications. Areas within 50' of water should be treated with an alternative herbicide, such as RodeoTM, to minimize harm to the aquatic environment. The third step, tillage, should be completed for seedbed preparation. Additional herbicide treatments may be necessary if weed control is not completely successful or if weed seed germination has occurred prior to seedbed preparation.

Unlike turf grass plantings, which require rich black topsoil to germinate and grow, native plantings usually do best in the existing parent soils of most sites. Addition of topsoil is not recommended for prairie restoration or native plantings in open spaces. On the other hand, addition of topsoil is recommended for establishment of wetland areas. In this case, a thin layer (1" deep) should be added to the wet meadow fringe and to the emergent fringe that has a water depth of 18 inches or less. It is extremely important that the topsoil be free of weed seeds, especially reed canary grass. The thin layer of topsoil will act as a wick to help maintain the required moisture for the wet meadow vegetation. This will be in contrast to the dry to mesic conditions of plantings beyond the wet meadow zone.

In preparation for seeding, a proper seedbed can be created by lightly discing the area to a depth of no more than 4'. In sandy soils it may be necessary to simply drag the site in order to create the one to two inch seedbed depth. Once a seedbed has been created, the freshly tilled soils should be harrowed or raked to smooth out the site and create a firm seedbed.

Seeding should be completed during one of the two periods of the year that results in the most successful establishment. The first planting window is from early spring until approximately June 15th. The second planting period is from early August to late October; this would be dormant seeding that would germinate in the spring. Grass seeds should be drilled into the seedbed at a rate of 10 pounds pure live seed (PLS)/acre, or 16 pounds (PLS)/acre if broadcast. Seed that is drilled is quicker and easier for large areas (2 acres or more). One of the most noticeable detriments is that the seedlings grow in straight rows. Some restored prairies have visible rows 15 to 20 years after planting. Harrowing or racking should follow all grass seedings.

Wildflower seed should be installed in a distinctly separate seeding step, after the grass seed has been planted. Drilling wildflower seed along with grass seed is not recommended because the smaller wildflower seed requires a shallower planting depth. Wildflower seed can be sown evenly throughout the site, in appropriate microhabitats, or in selected high profile portions of the restoration area. Broadcasting is always the best method to incorporate wildflower seed, and can be done by hand or with a spreader. Harrowing or racking should not be done following wildflower seeding, as these practices may bury the flower seed too deep.

A cover crop is not recommended since it tends to compete with the native seeds planted. Rye, in particular, should not be used because it may inhibit germination of the seeds around them. A surface mulch should be used in areas where the slopes are 3 to 1 or greater. A thin layer, no more than one inch in depth, of weed-free oat or wheat straw is

acceptable. The use of a prairie grass mulch is preferred, since it would add additional seed to the planting and reduce the risk of contaminating the site with unwanted weed seed.

Immediately following seeding, seedlings (plugs) should be planted individually in appropriate microhabitats throughout the site and along walkways and trails where quick establishment is desirable. Use of seedlings will help increase plant diversity, since some species can only be purchased as established plants due to rarity or high seed mortality. Incorporating additional species helps to more accurately replicate the natural communities. Quick establishment using plugs also enhances visibility in high use areas. The area will look aesthetically pleasing and give a more manicured and managed appearance.

Local nursery grown seed sources should be used to the extent feasible. Seed should not be accepted that is of a varietal type or that does not grow within a 200 mile radius of the project site. Seed collected directly from wild stands or plants dug from the wild should not be accepted unless a salvage opportunity is available. It is also important that the installation be completed by experienced personnel, to insure that proper establishment techniques are followed.

Maintenance

Mowing will be needed to control annual weed development during the first growing season. Typically, annual weed species are very aggressive on disturbed soil and can have a negative affect on the native plant species. Mowing should be completed when plant height reaches 16 to 18 inches. Cutting height should not be less than 4 inches. A flail mower or hand weed whip may be used. Noxious weeds should be eradicated by pulling or carefully spot spraying with an appropriate herbicide. Fertilizers are not necessary when restoring native plant communities and in some cases are detrimental.

In the years following initial establishment, the management should include controlled burning, spot spraying, spot mowing, hand weeding and removal of volunteer tree and shrub saplings. It is of great importance to monitor and care for the prairie during initial establishment, which may take three to five years. Depending on the equipment available and the expertise of City maintenance personnel, maintenance activities may be completed by qualified private restoration firms. Additionally, many of the maintenance activities could be completed by local neighborhood volunteers.

Estimated Cost

Issues of cost and the cost of maintenance are always a concern during establishment of a restored landscape. For purposes of comparison, native plantings are more expensive to install than grass (by seed) and less expensive than sod. Once established, the cost to maintain a native planting is much less then the cost to maintain turf grass. Even though native planting take several years to mature, they may last for generations with few adjustments or alterations.

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The following cost estimate is based on current information from local restoration contractors and nurseries that specialize in native plants. A list of qualified restoration companies and nurseries may be found in Lakescaping for Wildlife and Water Qualit kCarrol Henderson et.el.).

Site Preparation
- Spraying $100 to $150/acre
- Burning $100/acre
- Tilling and Harrowing $100 to $150/acre

Seed
- Native grass $60 to $500/acre (3 species to 10 species)
- Wildflower $90 to $400/acre (12 species to 36 species)

Seeding $300 to $1000/acre
Mulching …$450 to $650/acre
Wildflower Seedlings (Plugs)
- Delivered and installed @ $1.00 to $2.00 per seedling
- Delivered and installed @ $3.00 to $6.50 per plant for 2 year old 4" to gallon pots.

Plant Community Species Composition
The ultimate long-term success of the restoration depends on how well the plants are suited to the site. The following is a list of species commonly found in specific communities and obtainable from local nurseries. The list is broken down to mixes for individual zones or communities. All tree species are of mixed ages since a range of sizes is preferred. The garden plant list, planting plug lists, and specific tree species are grouped by community type. The plant lists are designed to closely resemble natural, native plant communities. The plant lists are not all inclusive; additional species may be included, depending on availability and appropriateness for the given ecological community.

The Wet Meadow
This mix is for the wet meadow zone through the emergent zone of the wetland. The seeds are hand spread and not harrowed or raked in. This also means that the mix of both grasses and forbs may be combined and broadcast at the same time. The recommended seeding rate is 4 pounds per acre. Plugs should be hand planted and staked within the emergent zone if wave action is a concern.

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Forb, Grass and Sed e Seed Mix

Scientific Name	Common Name	Scientific Name	Common Name
Acorns calamous	Sweet Flaa	*Glvceria striata*	Fowl Manna Grass
Alisma subcordatum	Mud Plantain	*Iris versicolor*	Blue Flag Iris
Angelica atropurpurea	Angelica	*Juncos e isus*	Common Rush
Asclepias incarnata	Swamp Milkweed	*Lobelia cardinalis*	Cardinal Flower
Calama,grostis canadensis	Blue Joint Grass	*Lobelia siphilitica*	Great Blue Lobelia
Caltha palustris	Marsh Marigold	*Oenothera biennis*	Evening Primrose
Carer comosa	Bottlebrush Sedge	*Polvgonum sagittatum*	Arrow-leaved Tearthumb
Cares hvstercinia	Porcupine Sedge	*Saggitaria latifolia*	Common Arrowhead
Carer scoperia	Pointed Broom Sedge	*Scirpus atrovirens*	Dark-green Bulrush
Carex stipata	Awl-fruited Sedge	*Scirpus cyperinus*	Wool Grass
Carex stricter	Tussock Sedge	*Scirpus validus*	Great Bulrush
Carex vulpinoidea	Fox Sedge	*Sparganium eurycarpunt*	Great Bur Reed
Elvmus candensis	Canada Wild Rye	*Spartina pectinata*	Cord Grass
Eupatorium maculattnn	Joe-pye Weed	*Verbena hastata*	Blue Vervain
Glvceria grandis	Reed Manna Grass		

Trees and Shrubs

Scientific Name	Common Name	Scientific Name	Common Name
Acer spp.	Red and Silver Maple	*Ilex verticillata*	Winterberry
Abuts spp.	Speckled and Green Alder	*Larix laricina*	Tamarack
Antorpha fruiticosa	False Indigo	*Quercus bicolor*	Swamp White Oak
Aronia inelanocarpa	Black Chokeberry	*Salix spp.*	Pussy, Sandbar, Prairie, and Black Willow
Cephalantluts occidentalis	Buttonbush	*Spiraea alba*	Meadowsweet
Chamaedaphne cal vulata	Leather-leaf	*Viburnwn trilobum*	High-bush Cranberry
Cornus sericea	Red-osier dogwood		

Pin Mix

Scientific Name	Common Name	Scientific Name	Common Name
Acarus calannts	Sweet Flag	*Impatiens capensis*	Spotted Touch-Me-Not
Alisma plantago-aquatica	Water Plantain	*Iris versicolor*	Wild Iris
Asclepias incarnata	Marsh Milkweed	*Iris virginica shrevei*	Blue Flag Iris
Aster novae-angliae	New England Aster	*Lobelia siphilitica*	Great Blue Lobelia
Aster puniceus	Red-stalked Aster	*Lvcopus americanus*	Cut-leaved Bugleweed
Bidens cernua	Nodding Bur Marigold	*Lvsimachia ciliata*	Fringed Loosestrife
Boltonia asteroides	Boltonia	*Minndus ringens*	Monkey-flower
Caltha palustris	Marsh Marigold	*Penthorum sedoides*	Ditch Stonecrop
Epilobium angustifolitan	Fireweed	*Polvgonum pens vlvaniatmt*	Pensylvania Smartweed
Eupatorium maculattan	Joe-pye Weed	*Pontedetia cordata*	Pickerel Plant
Eupatorium perfoliatum	Boneset	*Scirpus fluviatilis*	River Bulrush
Euthamia graminifolia	Grass-leaved Goldenrod	*Verbena hastata*	Blue Vervain
Impatiens pallida	Yellow Jewelweed		

Dry Prairie/Open Spaces - Sunny Plant Community

This mix is for the prairie grass zone and open spaces. The grass seed should be drilled or broadcast and then harrowed or raked in. After the grass seeding, the forb and flower mix should be surface broadcast. Harrowing or raking are not recommended. The grass mix of grasses should be spread at 16 pounds per acre. The mix of wildflowers will be spread at 5 pounds per acre.

Grass Mix

Scientific Name	Common Name	Scientific Name	Common Name
Andropogon gerardii	Big Bluestem	*Elvmus virginicus*	Wild Rye
Andropogon scoparius	Little Bluestem	*Koeleria inacrantha*	June Grass
Bouteloua cut"tipendula	Side-oats Grama	*Panicunt virgattun*	Switch Grass
Bouteloua gracilis	Blue Grama	*Sporobolus heterolepis*	Northern Dropseed
Bronnis kabnii	Prairie Brome	*Sorghastrunt nutans*	Indian Grass
Elvntus candettsis	Canada Wild Rye		

Wildflower Mix

Scientific Name	Common Name	Scientific Name	Common Name
Achillea ntillefolium	Yarrow	*Mona,"da fistulosa*	Wild Bergamot
Alliutn cenuuun	Nodding Onion	*Parthenium integrifoliont*	Wild Quinine
Amorpha canescens	Leadplant	*Penstenion digitalis*	Foxglove Beardtongue
Asclepias tuberosa	Butterfly Weed	*Petalostemum candidunt*	White Prairie Clover
Aster ericoides	Heath Aster	*Petalostenuun purpureum*	Purple Prairie Clover
Aster laevis	Smooth Blue Aster	*Phlox pilosa*	Prairie Phlox
Aster oolentangiensis	Azure Aster	*Pvcnanthenutnt virginianum*	Mountain Mint
Aster sericeus	Silky Aster	*Ratibida pinnata*	Yellow Coneflower
Aster urophvllus	Arrow-leaved Aster	*Rosa arkansana*	Prairie Rose
Astragalus canadensis	Canadian Milk Vetch	*Rudbeckia ltirta*	Black-eyed Susan
Baptisia leucantha	White Wild Indigo	*Rudbeckia subtontentosa*	Sweet Black-eyed Susan
Camassia scilloides	Wild Hyacinth	*Rudbeckia triloba*	Brown-eyed Susan
Coreopsis palmata	Prairie Coreopsis	*Silphium integrifoliont*	Rosin Weed
Dodecatheon meadia	Midland Shooting Star	*Silphium laciniatum*	Compass Plant
Echinacea pallida	Pale Purple Coneflower	*Silpltiunt terebinthinaceunt*	Prairie Dock
Echinacea purpurea	Purple Coneflower	*Solidago nemoralis*	Gray Goldenrod
Ervngiunt vuccifolitun	Rattlesnake Master	*Solidago ptarmicoides*	Upland Goldenrod
Gentiana andrewsii	Bottle Gentian	*Solidago rigida*	Stiff Goldenrod
Gentiana flavida	Cream Gentian	*Solidago speciosa*	Showy Goldenrod
Heliopsis helian hoides	Common Ox-eye	*Tradescantia ohiensis*	Ohio Spiderwort
Heterotheca villosa	Golden Aster	*Verbena hastata*	Hoary Vervain
Lespedeza capitata	Bush Clover	*Veronicastrunt vir'inicuin*	Culver's root
Liatrus pvcnosrachva	*iII Blazin'! Star*	*ZlZitl aurea*	Golden Alexanders

The Oak Savanna - Shaded Plant Community

This mix is for the mixed height shady woodland prairie grass zone. This includes areas of light to heavy shade. The grass seeds are to be broadcast and then harrowed or raked in. After the grass seeding, the forb and flower mix is to be surface broadcast. Harrowing or raking are not recommended. The mix of grasses will be spread at 16 pounds per acre and the wildflower mix will be spread at 5 pounds per acre. Trees should be planted in small random groupings; they should not be evenly distributed.

Grass and Sedge Mix

Scientific Name	Common Name	Scientific Name	Common Name
Carex s rengelii	Long-beaked Sedge	*Elvntus virginicus*	Wild Rye
Bronuus purgans	Hairy Wood Chess	*Hvstrix patina*	Bottlebrush Grass
El vntus candensis	Canada Wild Rye	*Juncos tennis*	Path Rush
Elvntus villosus	Silky Wild Rye		

Wildflower Mix

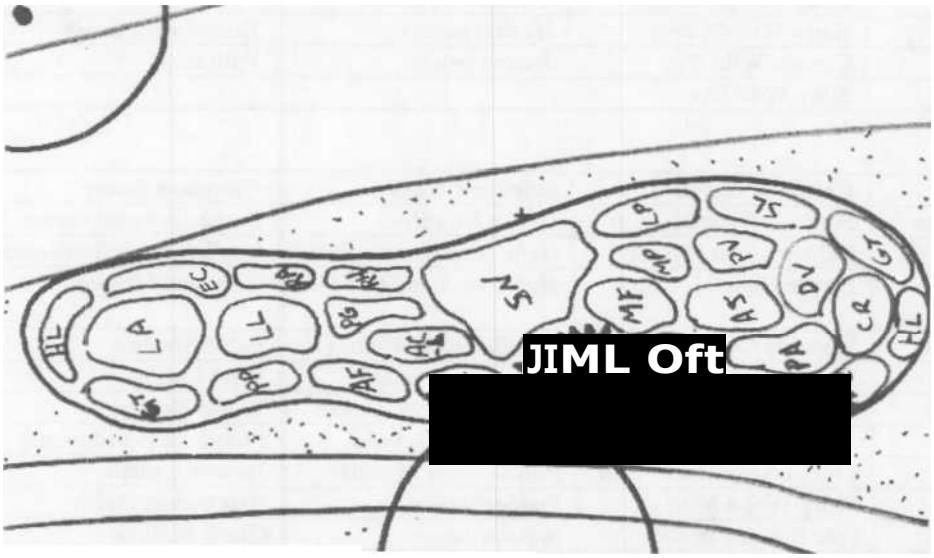
Scientific Name	Common Name	Scientific Name	Common Name
Agastache foeniculunt	Fragrant Giant Hyssop	*Gaura longiflora*	Large-flowered Gaura
Agastache nepetoides	Yellow Giant Hyssop	*Helianthus maximilliani*	Maximillian's Synflower
Agastache scrophulariaefolia	Purple Giant Hyssop	*Heliopsis helianthoides*	Common Ox-eye
Allhnn cernuum	Nodding Onion	*Kuhnia eupatorioides*	False Boneset
Anemone cvlindrica	Thimble Weed	*Lupinus perennis*	Wild Lupine
Aquilegia canadensis	Columbine	*Pedicularis canadensis*	Wood Betony
Aster novae-angliae	New England Aster	*Penstemon digitalis*	Foxglove Beardtongue
Aster prenanthoides	Crooked-stemmed Aster	*Polemonium reptans*	Jacob's Ladder
Blephilia hirsuta	Hairy Wood Mint	*Rudbeckia hirta*	Black-eyed Susan
Cacalia atriplicifolia	Pale Indian Plantain	*Napaia dioica*	Glade Mallow
Cacalia muhlenbergii	Great Indian Plantain	*Rudbeckia subtonentosa*	Sweet Black-eyed Susan
Cassia hebecarpa	Wild Senna	*Rudbeckia triloba*	Brown-eyed Susan
Coreopsis tripteris	Tall Coreopsis	*Silene stellata*	Starry Campion
Desmodium glutinasum	Pointed-leaved Tick Trefoil	*Solidago ulmifolia*	Elm-leaved Goldenrod
Echinacea purpurea	Purple Coneflower	*Taenidia integerrina*	Yellow Pimpernel
Epilobium angustifolium	Fireweed	*Thalictrum dioicnn*	Early Meadow Rue
Eupatorium purpureum	Sweet Joe-pye Weed	*Veronicastrum vi gi nculn*	Culver's root
Eupatoriumn rugosum	White Snakeroot	*Zizia aurea*	Golden Alexanders

Trees

Scientific Name	Common Name	Scientific Name	Common Name
Anorpha fruticosa	False Indigo	*Prunus serotina*	Black Cherry
Carva cordifornus	Butternut Hickory	*Quercus alba*	White Oak
Fraxuuus americana	White Ash	*Quercus ellipsoidalis*	Northern Pin Oak
Fraxinus pennsvlvamca	Green Xsh	*Quercus inacrocarpa*	Bur Oak
Populus grandidentata	Big-toothed Aspen	*Ulnas americana*	American Elm
Populus tremuloides	Quacking Aspen		

Plu Mix

Scientific Name	Common Name	Scientific Name	Common Name
-tndropogon gerardi	Big Bluestem	*Hieracunn longipdunt*	Hairy Hawkweed
Andropogon scoparius	Little Bluestem	*Liatris punctata*	Dotted Blazing Star
Asclepias tuberosa	Butterflyweed	*Penstemon grandiflorus*	Large-flowered Beard-tongue
Bouteloua hirsttta	Hairy Grama	*Sporobolus heterolepis*	Prairie Dropseed
Eragrostis spectabilis	Purple Love Grass	*Stipa spat-tea*	Porcupine Grass
Heliopsis helianthoidcr	Early Sunflower	*Viola pedata*	Bird's Foot Violet



Example of a Prairie Garden planting. The planting groups are identified based on the abbreviation of the scientific names in the following table.

The Prairie Garden

This planting is primarily for show and aesthetics; the garden areas do not represent true plant communities that would be found in nature. The Prairie Garden should be used in accent areas that have high visibility or in scattered areas within the prairie. The more manicured look of a prairie garden makes them especially appropriate for residential lots and commercial development. Prairie gardens can be used to exhibit native plants and to attract butterflies and humming birds.

Forb and Grass Mix

Scientific Name	Common Name	Scientific Name	Common Name
4gastache oeniculum	Fragrant Giant Hyssop	*Liatris punctata*	Dotted Blazing Star
Antorpha canescens	Leadplant	*Monarda sndosa*	Wild Bergamot
Andropogon scopariunt	Little Bluestem	*Monarda ptutctata*	Horsemint
Antennaria neglecta	Pussytoes	*Penstemon grandiflortts*	Showy Penstemon
Aster lateriflorus	Calico Aster	*Petalostemutn purpureunt*	Purple Prairie Clover
Aster inacrophvllus	Large-leaved Aster	*Petalosrenuon villosum*	Silky Prairie Clover

Campanula rotundifolia	Harebell	*Potentilla arguta*	Prairie Cinquefoil
Delphinium virescens	Prairie Larkspur	*Rosa arkansana*	Prairie Rose
Echinacea angustifolia	Pale Purple Coneflower	*Rudbeckia hirta*	Black-eyed Susan
Geum triflorum	Prairie Smoke	*Rudbeckia laciniata*	Green-headed Coneflower
Hedvotis longifolia	Long-leaved Bluets	*Silphium laciniatum*	Compass Plant
Liatris aspera	Rough Blazing Star	*Sor,ghastrum iuitans*	Indian Grass
Liatris ligulistylis	Meadow Blazing Star		

Green way Corridors and Rainwater Gardens

Greenway corridors are densely planted strips of land that connect larger areas of wildlife habitat or many areas of habitat along a linear orientation. The ability of these areas to provide habitat and connections for wildlife becomes invaluable. Rainwater Gardens are infiltration basins or swales that allow water to replenish the groundwater. These infiltration systems are densely planted with showy plants and shrubs. The garden effect is produced with the aesthetics of the plants in localized areas and which provide some wildlife habitat.

There are at least three different areas within the Upper Mississippi Plan where Greenway Corridors and other habitat improvements can be incorporated; those include residential development, parkland development, and business redevelopment. Within residential areas, the areas would consist of the side yard and backyards to create areas for wildlife and a screen between neighbors. This would provide the illusion that the homeowner is at further distances from others and living in a more rural or wooded area. The corridor would also provide areas for wildlife to move in relative safety and some more diversity for individual species.

Parklands are other areas that may be planted with native communities to provide habitat. These areas may include shoreland buffers, water treatment ponds, and butterfly gardens. All wildlife need to have access to water. The native plantings will encourage access that provides safety for wildlife and possible habitat for long term residents. These areas would become more than a corridor but a destination.

As for the private business developments, these areas may also be planted to encourage wildlife habitat and to provide corridors. Areas of interest may include parking facilities and landscaped areas. These areas could be enhanced using a variety of plant communities that are not only attractive to the human eye but to wildlife as well. For example, a parking facility may have the medians planted with native plants in a community setting. The Minnesota Landscape Arboretum has created successful examples of this.

Any of the plant lists developed for individual plant communities may be utilized or modified to fit with the specific location, characteristics and anticipated use. For example, the Dry Prairie seed mix with an emphasis on showy flowers may be appropriate for linear corridors that receive full sun and are visible for public viewing. The Wet Meadow mix would be appropriate for water infiltration swales or in areas where surface water may be present. Within the Rainwater Gardens, the plants used should be the showy shrub and tree species from the wet meadow and wetland lists, with

showy wildflowers and grasses that thrive under wetter conditions. For any greenway, a mixture of trees, shrubs and forbs would create the most diversity, visual interest and enhance the overall value for wildlife.

The wildlife value of these areas would be evaluated on the diversity of plant species as well as the size of the planted area. The larger and more diverse the area dedicated to wildlife habitat the more valuable it becomes to wildlife. Even though metropolitan areas are not generally considered wildlife havens, they can be enhanced to provide improved wildlife habitat for many species. When we approach open space design with creativity and a multifunctional approach, a win-win opportunity can be provided for wildlife as well as humans.