Development of Planned Management Roadside Design for Urban Highways in Illinois

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Roadsides on the urban expressway system were originally designed as parkways requiring intensive management for their upkeep. When the ability to perform those management practices was drastically reduced because of economics, fuel shortages, and other factors, the approach to roadside design had to be totally reevaluated. As a result of that reevaluation, planned-management roadside design, a maintenance-based design approach, was developed. This concept used landscape and turf design based on preplanned management of each portion of the right-of-way. Salt-resistant turf, native grasses, forbs, native trees, and shrubs were extensively used in the implementation of this concept. The goals of planned-management roadside design include reduced construction costs, reduced maintenance efforts, and improved public acceptance.

Planned-management roadside design in Illinois was developed in response to a major shift in roadside maintenance priorities away from the high order of maintenance originally conceived for the system.

When the Interstate system was developed in the 1950s, the available role models for roadside design and maintenance on this type of facility were the parkway systems of the eastern United States and Germany. Many of these early expressways were literally highways in a park designed to provide a pleasant driving experience visually as well as a safe and rapid trip, particularly for tourist traffic. The developing midwestern Interstate system, although more utilitarian in concept, borrowed the parkway style in its roadside design and maintenance. This style dictated park-like plantings and mowed weed-free turf, a generally manicured landscape worthy of any front lawn or city park.

Maintaining the appearance of such park-like roadsides required considerable input of resources. Frequent mowings were required, including the associated hand trimming and hand mowing. Herbicide application and tree spraying were performed extensively, as were hand pruning, fertilization, and cultivation of planting beds. Landscape designs of this period were planned to be managed in this intense manner, and staffing and other resources were adequately committed for the purpose.

Beginning in the late 1960s, rapidly escalating inflation had begun to increase the cost of manpower. As a result, budgetary limitations reduced the number of personnel available to do maintenance work. The fuel shortage of the early 1970s mandated an effort to conserve fuel for essential activities. The overall need to economize through tightened budgets, restricted fuel, and reduced manpower forced substantial cuts in nonessential activities. Roadside maintenance was deeply affected by these reductions, resulting in an inadequate maintenance policy on the roadside.

When care was withdrawn from the intensively managed landscape, a number of adverse impacts were manifested. When fertilization, regular mowings, and chemical weed control were terminated, the bluegrass turf began to lose vigor, allowing aggressive weeds, annual grasses, and brush to invade. The increased use of deicing salts adversely affected turf and trees, and without repairs and proper care erosion increased and plants declined noticeably. The lack of maintenance resulted in a deterioration of appearance, which signaled to the public that dumping and littering on the right of way was an acceptable activity. This perception, coupled with a reduction in the litter control effort, caused an increase in trash and litter. Taken together, all of these impacts contributed to an extremely poor appearance along the roadside.

In the late 1970s, plans were being advanced for a major rehabilitation project on Interstate 94, the Edens Expressway, one of the first parkway-style freeway routes in the Chicago metropolitan area, originally constructed in the 1950s.

This project involved complete pavement removal and replacement. All staging areas, including sites for processing the old concrete pavement into reusable granular material, would have to be located on the right-of-way because of the developed nature of the adjacent properties. The combined result of reconstruction and staging activities would thoroughly disrupt the majority of the existing roadside landscape, which would require complete restoration.

Previous parkway-style roadside design took into account concerns such as aesthetics, screening from view, texture, and color, but assumed that all necessary roadside maintenance would be provided for the entire right-of-way. Currently, the effort expended on postconstruction roadside maintenance is expected to be minimal. It is therefore necessary to consider future site management as the controlling element in any roadside design.

A concept was developed for maintenance-based roadside design that allowed the proposed future management of an area of roadside to guide the selection of the type of turf and plantings to be established there. To be successful, the concept, planned-management roadside design, had to produce a better-quality end result at an equal or lower construction cost than previous treatments. A degree of public acceptance of the roadside appearance and a lower input of maintenance

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resources than required in previous designs were other necessary requirements.

In order to implement the concept, the Landscape Architects of the Illinois Department of Transportation (IDOT) conducted a site analysis to determine which roadside areas needed regular management, occasional management, or highly infrequent management to preserve the aesthetic and operational characteristics of the highway facility. When the analysis was completed, various plant materials were selected that would be characteristic of the desirable properties needed in each management area to produce an appearance that is acceptable to the public and maintenance at a low cost.

The turf immediately adjacent to the roadway is normally the most intensively managed part of the right-of-way. This portion is normally mowed from one to four times per year for safety, sight distance, litter control, and drainage considerations. The area between the edge of the pavement and the ditch line is also the area of greatest salt concentration. This observation has been confirmed by studies done by the IDOT Environmental Resources Unit that show typical salt-laden spray falling within 20 to 25 ft of the pavement edge. This portion of the right-of-way required a turf mixture that would withstand variable salt concentrations, infrequent mowing, traffic damage, and general lack of care, yet would still maintain an acceptable appearance and resist erosion.

The varieties of grass used in this mix were identified as a result of salt tolerance research done by Howard Kaerwer of the Northup King Company (unpublished), to find companion grasses for salt grass (Fults Puccinella Distans or Fults alkali grass) in a salt-tolerant turf mix. Turf grasses found to have high salt resistance in that study were Dawson creeping red fescue; Kentucky 31 tall fescue; Scaldis hard fescue; Galway turf-type tall fescue; buffalo grass; blue gramma grass; Delray perennial rye grass; and Fults alkali grass. These grasses were formulated into the basic mixture, used beginning in 1979 on the Edens Expressway, which is now known as "Class 2A seeding" in Illinois' *Standard Specifications for Road and Bridge Construction*, 1988 edition. This mixture consists of the following components:

Variety	*Amount (lb/acre)*
Tall fescue	30
Delray perennial rye grass	10
Dawson creeping red fescue	10
Scaldis hard fescue	10
Fults alkali grass	30

Another variation of the basic salt-tolerant mix is also currently in use: a low-maintenance mix, known as Class 2B seeding, that has higher seeding rates of buffalo grass and Dawson red fescue, and no tall fescue, as follows:

Variety	*Amount (lb/acre)*
Buffalo grass	40
Fults alkali grass	20
Scaldis hard fescue	10
Dawson creeping red fescue	10
Delray perennial rye grass	10
Blue gramma grass	10

This mix produces a short grass under minimal maintenance. Also available is a salt-tolerant sod for boulevards and parking lots where immediate finished appearance and salt tolerance are desired. This sod, containing turf-type tall fescue, is now available on the commercial market, blends well with bluegrass sod, and retains good color during drought stress periods. It consists of the following:

TABLE 1 COMPARISON OF TURF COSTS BY BID PRICES ($/ACRE), 1989

Item	Sodding, Salt-Tolerant	Sodding
Sodding	16,068.80	14,520.00
Topsoil	5,711.20	5,711.20
Fertilizer	192.60	192.60
	Seeding, Salt-Tolerant	**Seeding, Native Grasses and Forbs**
Seeding	1,208.00	4,984.00
Topsoil	5,711.20	-0-
Fertilizer	192.60	-0-
Mulch[a]	4,501.20	825.00
Mow stakes	-0-	42.50
Total	11,613.00	5,851.50

[a]Excelsior blanket normally used.

Variety	*Percent of Mix by Weight (%)*
Buffalo grass	30
Galway fineleaf tall fescue	20
Dawson creeping red fescue	15
Scaldis hard fescue	15
Rugby Kentucky bluegrass	5
Fults alkali grass	15

In those right-of-way areas beyond the normal mowing limits, plantings are desired that will reduce routine maintenance to near zero, but which will be acceptable in appearance both to the traveling public and to the immediate neighbors. This goal is accomplished by using various mixtures of native forb and wildflower seed, along with native grasses and wildflower plants, for a combination of utility and natural beauty.

The IDOT Class 4 (modified) native grass mixture consists of the following:

Variety	*Pure Live Seed (lb/acre)*
Big blue stem	5
Indian grass	5
Little blue stem	15
Side oats gramma	5
Perennial rye grass	20

The IDOT Class 5 (modified) native forb and annual wildflower mixture consists of the following:

Annuals. One pound per acre total, not to exceed 25 percent of any species.

- *Coreopsis lanceolata*—lance-leaved coreopsis
- *Gaillardia pulchella*—Indian blanket
- *Ratibida columnaris*—upright prairie coneflower
- *Rudbeckia hirta* triploid—black-eyed Susan
- *Hesperis matronalis*—dames rocket
- *Chrysanthemum leucanthemum Pinnatifidum*—oxeye daisy

Forbs. The total mixture of forbs shall be applied at the rate of 10 lb/acre and the mix shall consist of not fewer than 25 of the following species:

- *Amorpha canescens*—lead plant and innoculant*
- *Anemone cylindrica*—thimbleweed
- *Asclepias tuberosa*—butterfly milkweed
- *Aster azureus*—sky blue aster
- *Aster laevis*—smooth aster
- *Aster novae angliae*—New England aster
- *Baptisia leucopaea*—cream Baptisia and innoculant*
- *Ceanothus americanus*—New Jersey tea
- *Cirsium hillii*—hills prairie thistle
- *Coreopsis plamata*—prairie coreopsis**
- *Echinacaea pallida*—pale purple coneflower
- *Erynigium yuccifolium*—rattlesnake master
- *Heuchera richardsonii*—alum root
- *Liatris aspera*—rough blazing star
- *Liatris pycnostachy*—prairie blazing star
- *Monarda fistulosa*—prairie bergamont
- *Parthenium integrifolium*—prairie quinine
- *Pedicularis canadensis*—prairie betony
- *Penstemon grandiflora*—large penstanmor
- *Petalostemum candidum*—white prairie clover and innoculant*
- *Petalostemum purpureum*—purple prairie clover and innoculant*
- *Potentilla arguta*—prairie cinquefoil
- *Ratibida pinnata*—prairie yellow coneflower**
- *Rubeckia subtomentosa*—sweet coneflower
- *Rudbeckia hirta*—black-eyed Susan
- *Siliphium laciniatum*—compass plant
- *Silphlum terebinthinaceum*—prairie dock
- *Solidago rigida*—stiff goldenrod
- *Tradescantia ohiensis*—spider wart
- *Veronicastrum virginicum*—culvers root

As indicated by a single asterisk, all legume seeds shall be innoculated with the proper *rhizabium* bacteria innoculum in the amount and manner required by the manufacturer of the innoculant before sowing or mixing with other seeds for sowing. The mix shall consist of not less than 10 percent of each species indicated with a double asterisk. The prairie forbs seed mixture shall not contain more than 10 percent of any one kind of seed.

Most native plants and wildflowers require no topsoil or fertilizer to establish, and are acclimated to weather conditions in the midwest. Because native forbs and grasses take 3 to 5 years to establish, annual wildflowers are included in the mixtures to increase public acceptance of the long-grass areas in the first few seasons. Information signing and selective mowing stakes are used to delineate the unmowed areas and to ensure public acceptance. The mowing lines are established on the plans to use the unmowed and wildflower areas as design elements. These areas will appear as well-defined, intentional shapes and forms in the landscape.

In areas not visible to the public, native grasses are often used alone and can provide a weed-free, nearly maintenance-free ground cover that will thrive on a wide variety of soil conditions and provide excellent erosion control. In highly visible areas, additional wildflowers are seeded, or placed as plants and bulbs, to lend color to the roadside and further enhance the appearance of the roadway. All of these techniques are intended to reduce or eliminate the need for mowing, erosion control, chemical application, and other maintenance from large areas of the roadside, and to reduce construction costs by using a method that is visually and environmentally satisfactory (see Table 1).

Many of the roadside management plans include ornamental plantings of trees, shrubs, and seedlings in appropriate areas. They are used as screening of and from adjacent properties, as reforestation for reduction of maintenance, and as landscape features that lend interest to the roadside. In 1981, student aids compared the original planting plans for various expressway projects from the late 1950s and early 1960s with current conditions. Noted were factors of survivability, growth, and general health. A short list of plants that could survive roadside conditions and lack of maintenance was then compiled, as follows:

- Thornless Honeylocust
- Hackberry
- Norway maple
- Green ash
- Crabapple
- Cockspur hawthorn
- Amur maple
- Zabel honeysuckle
- Common lilac

This list has since been amended because of availability of more native plants and improved establishment technology, as follows:

Shade Trees

- Honeylocust (several varieties)
- Ash (green and white), Hesse ash
- Hackberry
- Ginkgo
- Robusta poplar
- Norway maple
- Red maple, black maple
- Red oak, swamp white oak, hills oak
- Linden (American and littleleaf)
- Kentucky coffeetree
- Bald cypress
- Amur maple
- Crabapple (several varieties)
- Japanese tree lilac
- American plum
- Bradford callery pear (Chanticleer pear)
- Hawthorn (several varieties; thornless varieties may be desirable in some situations)
- Amur maple

Shrubs

- Redosier dogwood
- Gray dogwood
- Viburnum (several varieties)
- Clavey honeysuckle, Arnold's red honeysuckle
- Sumac (fragrant, smooth, and staghorn)
- American plum
- Van Houtte spirea
- Amelanchier

- Lilac
- Potentilla

Evergreens

- Black Hills spruce
- Juniper (several varieties)
- Austrian pine

Vines

- Virginia Creeper

As in the grasses, native plants seem to better adapt to the roadside environment, particularly because they are already acclimated to midwest soils, rainfall, drought, and other environmental factors. Based on research done by others, IDOT is moving away from using any soil amendments; it is using larger mulched areas, and, because of highly compacted, impervious soils, it is planting most plants higher than they were grown in the field to facilitate root establishment.

The native plants selected are mixed with nonnative plants that have proven hardy, in much the same way that warm- and cool-season grasses are blended, giving the landscape a broader-based tolerance to environmental factors.

Designs based on planned management can have a wide range of total management levels, from zero maintenance to intensive management. The level of management of a public right-of-way ideally approaches zero, requiring little input of chemicals, fertilizer, or manpower. With the goal of nearly zero management, the selection of plant material, whether it is turf grasses, wildflowers, or woody plants, should be a carefully conceived process using proven native plant material that will thrive with little care after planting.

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