research management
findings
Number 47 • January 2003

# The Definition and Mapping of Environmental Corridors by Three Regional Planning Commissions

By Matthew D. Murrell

R QUEEN

## Introduction

The term "environmental corridor" has been a controversial part of the lexicon of land use planners and property rights advocates. Philip H. Lewis, Jr., professor emeritus at the University of Wisconsin-Madison, brought attention to the term while working to protect natural resources in Wisconsin and Illinois in the 1960s and 1970s. Since then, environmental corridors have been defined and used in a variety of ways.

In general, environmental corridors encompass linear landscape features containing concentrations of natural and cultural resource amenities. Lewis (1996) defined environmental corridors as "spatial patterns of occurrence of any or all of the combined features of water, wetlands, and steep topography of 12.5% or greater found in an urban or urbanizing environment." The planning community has often modified or expanded this definition to meet state or federal planning requirements or to include scenic, recreational, and historic resources.

Various regulatory programs have influenced how planning entities define environmental corridors. For example, in the 1980s, Wisconsin promulgated administrative rules (ch. NR 121, Wis. Adm. Code) to implement planning provisions of the federal Clean Water Act. The rules for Areawide Water Quality Management Plans call for designation of "major areas unsuitable for the installation of waste treatment systems." These areas include: "wetlands, shorelands, floodways and floodplains, steep slopes, highly erodible soils and other limiting soil types, groundwater recharge areas, and other such physical constraints" (§ NR 121.05 [1] and [2], Wis. Admin. Code). The planning community has often referred to the resulting mapped areas as environmental corridors.

Planners and conservationists think of environmental corridors as particularly vital landscape patterns to protect because these areas are key to regional diversity—both biological diversity, which is central for ecological sustainability, and aesthetic diversity, which is vital for cultural sustainability. Lewis (1996) estimated that 85-90% of natural and cultural amenities fall within an environmental corridor pattern and stressed the importance of inventorying areas with the greatest diversity. The lack of a common definition, however, precludes inventorying, managing, or protecting these areas on a statewide basis.

While some communities have identified and mapped environmental corridors, Wisconsin's regional planning commissions (RPCs[1]) have shown the most interest in developing functional environmental corridor programs. In this study, I examine and document how three of these agencies define and map environmental corridors. The use of the environmental corridor concept will be dealt with in a future paper.

[1] RPCs are advisory regional planning entities created under § 59.091, *Wis. Stats.* Wisconsin has nine RPCs (Figure 1). Participation is optional; five southcentral Wisconsin counties have chosen not to be included in an RPC (Figure 1). RPCs conduct and prepare various types of studies and plans, including a master plan for the physical development of their respective regions (§ 66.0309[9], *Wis. Stats.*). RPCs provide advice and consultation to local governmental units within their respective regions and to other public and private agencies. They help local interests respond to the demands of state and federal programs, such as the state's comprehensive planning law (§ 66.1001, *Wis. Stats.*) and the federal Clean Water and Intermodal Surface Transportation Efficiency Acts. RPCs are also responsible for reviewing federal grant applications for consistency with adopted regional and local plans (§ 66.0309[13], *Wis. Stats.*).

## Methods and Study Areas

I selected three RPCs as study areas: Bay-Lake Regional Planning Commission (BLRPC), Dane County Regional Planning Commission (DCRPC), and Southeastern Wisconsin Regional Planning Commission (SEWRPC) (Figure 1). These RPCs have the most experience applying the environmental corridor concept. East Central Wisconsin Regional Planning Commission (ECRPC) has developed its own corridor definition, but was excluded from this study due to the relative newness of its process. Preliminary inquiries indicated that the other RPCs have limited or no experience with this planning tool.

I examined a variety of planning documents produced by the three RPCs to determine how each defines and maps environmental corridors. I then supplemented this literature review with personal interviews with RPC and state agency staff. A review of the RPCs' World Wide Web sites provided additional information.

## Results and Discussion

**Dane County Regional Planning Commission.** The DCRPC assumed water quality planning responsibilities in 1975. The agency's duties required it to outline areas suitable for sewer service. To determine areas for public sewer service expansion, the RPC first delineated the boundaries of urban service areas and then determined which areas within those boundaries were suitable for sewer service. Areas unsuitable for sewer service were termed "urban environmental corridors."

In 1979, boundaries for urban service areas were defined and the *Dane County Water Quality Plan* (DCRPC 1979) was adopted. This report noted that a "system of … corridors, centered around stream valleys, wetlands and lakes, is a concept with substantial water quality benefits." The next task, delineating and adopting environmental corridors within urban service area boundaries, was finished for areas within the Central Urban Service Area, as well as other areas in the county by 1986. The water quality planning process led to adoption of the following environmental corridor definition:

> *"Environmental corridors are continuous systems of open space in urban and urbanizing areas. These corridors include environmentally sensitive lands and natural resources requiring protection from disturbances and development, and lands needed for open space and recreational uses. They are based mainly on drainage-ways and stream channels, floodplains, wetlands, steep slopes, and other resource features, and are part of a countywide system of continuous open space corridors."*
>
> – DCRPC (1996)

**Figure 1.** *Statutory jurisdictions of Wisconsin's Regional Planning Commissions in 2002. The BLRPC, DCRPC, and SEWRPC are highlighted.*

The DCRPC uses eight features as criteria for defining environmental corridors and preparing environmental corridor maps. These include:

1. All waterways and water bodies, including lakes, ponds, intermittent and perennial streams, and drainage ways.
2. Vegetated buffer strips along drainage ways, streams, lakes, and wetlands.
3. 100-year floodplains.
4. Mapped wetlands (taken from the DNR's Wisconsin Wetland Inventory).
5. Steep slopes (those 12% or greater).
6. Woodlands.
7. Existing and proposed parks, greenways, conservancy areas, and storm water management areas.
8. Areas of unique vegetation or geology.

Using these features, the DCRPC has used geographic information system (GIS) technology to map environmental corridors throughout the entire county.

**Southeast Wisconsin Regional Planning Commission.** In 1966, the SEWRPC adopted an environmental corridor definition as part of *The Regional Land Use-Transportation Study* (Rubin and Emmerich 1981). That document defined environmental corridors as "areas in the landscape containing especially high value natural, scenic, historic, scientific, and recreational features."

Under the SEWRPC's definition, environmental corridors normally include one or more of the following seven elements:

1. Lakes, rivers, streams, shorelands, and floodlands.
2. Wetlands.
3. Woodlands.
4. Wildlife habitat areas.
5. Areas of steep slopes.
6. Significant geological formations and physiographic features.
7. Wet, poorly drained, and organic soils.

These elements are part of the Natural Resources Base in SEWRPC's GIS. In addition to the Natural Resource Base elements, there are four additional "Resource-Related" elements that the SEWRPC considers:

1. Existing outdoor recreation sites.
2. Potential outdoor recreation and open space sites.
3. Historic sites and structures.
4. Significant scenic areas and structures.

Using a weighted system, the SEWRPC classifies each natural resource area as either a primary environmental corridor, secondary environmental corridor, or isolated natural area. Primary environmental corridors are linear landscape features that contain at least three of the above 11 elements. Primary corridors occupy an area of at least 400 acres, have a minimum length of 2 miles, and a minimum width of 200 feet. Secondary environmental corridors encompass one or two of the resource elements, occupy at least 100 acres, and have a minimum length of 1 mile. Isolated natural resource areas are at least 5 acres in size, more than 200 feet wide, and contain at least a couple of the features (UW-Extension and SEWRPC 1996). Consistent with these designations, the SEWRPC has mapped environmental corridors throughout its entire 7-county region.

**Bay-Lake Regional Planning Commission.** The BLRPC used, among others, the DCRPC and SEWRPC definitions as models to craft one of the most comprehensive definitions for environmental corridors used currently in the state.

The BLRPC uses the overarching title, Environmental Feature, to define and map areas meriting resource protection. Environmental Feature is broken down into two components:

1. Environmentally Sensitive Areas - used for sewer service area planning under NR 121, Wis. Admin. Code.
2. Environmental Corridors - for all other community planning work.

Using these distinctions, the BLRPC defines environmental corridors as, "linear features in the landscape which represent a composite of the best remaining elements of the natural resource base" (BLRPC 1999). This definition is based on a standard set of digital data that includes:

1. Lakes, ponds, rivers, streams, flowages.
2. Wetland areas of 2 acres or greater.
3. 100-year floodplains.
4. Areas of steep slope (those 12% or greater).
5. 75-foot setback from navigable waters.
6. 25-foot wetland buffers.

Environmentally sensitive areas are delineated using the same features, but sewer service area planning under ch. NR 121, Wis. Admin. Code, is conducted at the local level and the definition is modified to meet the needs of each community (BLRPC 1999). The BLRPC piloted this definition in Manitowoc and Sheboygan counties and is currently working on applying the definition in the remaining counties of the region, with the goal of completing the entire region by 2004 (Mark Walters, BLRPC, pers. comm. 2001).

**Table 1.** *Comparison of environmental corridor features.*

| Feature | DCRPC | SEWRPC | BLRPC |
|---|---|---|---|
| Lake, perennial river, or stream | ✔ | ✔ | ✔ |
| Perennial shoreland (lake, river, stream) | ✔ | ✔ | ✔ |
| Intermittent stream | ✔ | ✔ | ✔ |
| Intermittent shoreland | | ✔ | ✔ |
| Shoreland buffers | ✔ | ✔ | ✔ |
| Floodway | | ✔ | |
| 100-year floodplain | ✔ | ✔ | ✔ |
| Wisconsin DNR wetlands | ✔ | ✔ | ✔ |
| Wetland buffer | ✔ | | ✔ |
| US Army Corps wetlands | | | ✔ |
| Woodlands | ✔ | ✔ | ✔ |
| High value wildlife habitat | | ✔ | ✔ |
| Medium value habitat | | ✔ | ✔ |
| Low value wildlife habitat | | ✔ | ✔ |
| Significant geological feature | ✔ | | ✔ |
| Steep slope (20 percent or greater) | ✔ | ✔ | ✔ |
| Steep slope (12 to 19 percent) | ✔ | ✔ | ✔ |
| Prairie | ✔ | ✔ | |
| Existing rural open space site | ✔ | ✔ | |
| Existing park or recreation site | ✔ | ✔ | ✔ |
| Passive park and open space areas | ✔ | ✔ | |
| High value potential park | ✔ | ✔ | |
| Medium value potential park | ✔ | ✔ | |
| Low value potential park | ✔ | ✔ | |
| Historic structure | | ✔ | ✔ |
| Historic cultural site | | ✔ | ✔ |
| Scenic areas and vistas | | ✔ | ✔ |
| State scientific area | | ✔ | ✔ |
| Natural area of statewide or greater significance | | ✔ | ✔ |
| Natural area of countywide or regional significance | | ✔ | ✔ |
| Natural area of local significance | | ✔ | ✔ |
| Hydric and organic soils | ✔ | | |

Adapted from Bay-Lake Regional Planning Commission, 1999.

M MURRELL

*Recreational resources, like this trail, are sometimes included in environmental corridors.*

**Comparison of Definitions.** Table 1 provides a comprehensive list of features included in the environmental corridor definition used by each of the three RPCs. All three have definitions with similar components; common features include surface waters, wetlands, floodplains, steep slopes, and shoreland buffers. The greatest differences are the inclusion/exclusion of cultural resources and recreation opportunities, and the size and type of shoreland buffers (a result of county-level shoreland zoning authority).

These RPCs have retained the option of tailoring their adopted regional definitions to individual communities. This flexibility allows the RPC to meet the distinctive needs of a community and provides for better correlation between corridor maps and existing land use or comprehensive plans. Some communities choose to adopt stricter standards than others do.

**Data Sources and Standardization.** When mapping environmental corridors, consistency between regions requires data standardization. This is complicated by the independent and different mapping procedures used by each RPC. Increased data availability and use of GIS can improve consistency when data come from the same sources. When base information comes from the same source and is interpreted in the same manner, planners can create data layers that are similar in scope and, therefore, application.

Table 2 identifies data sources used by each RPC to delineate and map environmental corridors. In most cases, the three RPCs derive a mapped feature from the same data source. In some instances, however, different data sources are used by the RPCs, often including information derived from local experts and citizens.

**Table 2.** *Comparison of environmental corridor data sources.*

| Feature | DCRPC | SEWRPC | BLRPC |
|---|---|---|---|
| Lakes and ponds | 1:24,000 USGS topographic maps | 1:24,000 USGS topographic maps | 1:24,000 USGS quadrangle maps, local base maps |
| Perennial streams | 1:24,000 USGS topographic maps, supplemented by aerial photographs | 1:24,000 USGS topographic maps, supplemented by aerial photographs | 1:24,000 USGS quadrangle maps, local base maps |
| Intermittent streams and drainageways | 1:24,000 USGS topographic maps, supplemented by aerial photographs | 1:24,000 USGS topographic maps, supplemented by aerial photographs | 1:24,000 USGS quadrangle maps, local base maps |
| Open channel (constructed) drainageways | Aerial photographs or municipal storm sewer maps | Not used | Not used |
| Shoreland buffer strips adjacent to streams and drainageways | 1:24,000 USGS topographic maps, supplemented by aerial photographs with 200-foot total buffer | 1:24,000 USGS topographic maps, with 75-foot buffer | Local ordinances |
| 100-year floodplains | Federal Emergency Management Agency Flood Insurance Rate Maps | Federal Emergency Management Agency Flood Insurance Rate Maps | Federal Emergency Management Agency Flood Insurance Rate Maps |
| Wetlands | Wisconsin DNR Wisconsin Wetland Inventory Maps | Wisconsin DNR Wisconsin Wetland Inventory Maps and SEWRPC Land Use Inventory | Wisconsin DNR Wisconsin Wetland Inventory Maps |
| Wetland buffer strips | Wisconsin DNR Wetland Inventory with 75-foot buffer | Not used | Wisconsin DNR Wetland Inventory with 300-foot buffer |
| Woodlands | Aerial photographs | SEWRPC Land Use Inventory | BLRPC land use inventory, Manitowoc County Soil & Water Conservation Department, digital aerial photography, WISCLAND land cover |
| Unique vegetation or geology | Wisconsin DNR Natural Heritage Inventory maps and discussion with experts | Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin | Wisconsin DNR, US Fish & Wildlife Service |
| Steep slopes | USGS contour maps or detailed topographic maps | USGS contour maps or detailed topographic maps | USDA, Natural Resources Conservation Service |
| Existing parks, greenways, conservancy land | Aerial photographs, Land Use Inventory Maps, zoning maps, various community plans | Regional Park and Open Space Plan for Southeastern Wisconsin: 2000 | Wisconsin DNR, county, city, town, village officials |
| Proposed parks, greenways, conservancy land | Preliminary Subdivision Plats, Community Plans, Adopted park and open space plans, City of Madison Official Maps, University of Wisconsin-Madison Campus Development Plan | Regional Park and Open Space Plan for Southeastern Wisconsin: 2000 | Not used |
| Historic and archaeological sites | Not used | Wisconsin State Historical Society files | Wisconsin State Historical Society files, published archaeological surveys |
| Other unique natural features | Not used | As identified | As identified |
| State identified scientific and natural areas | Not used | As identified | Wisconsin DNR |
| State/federal wildlife areas | Not used | As identified | Wisconsin DNR, US Fish & Wildlife Service |

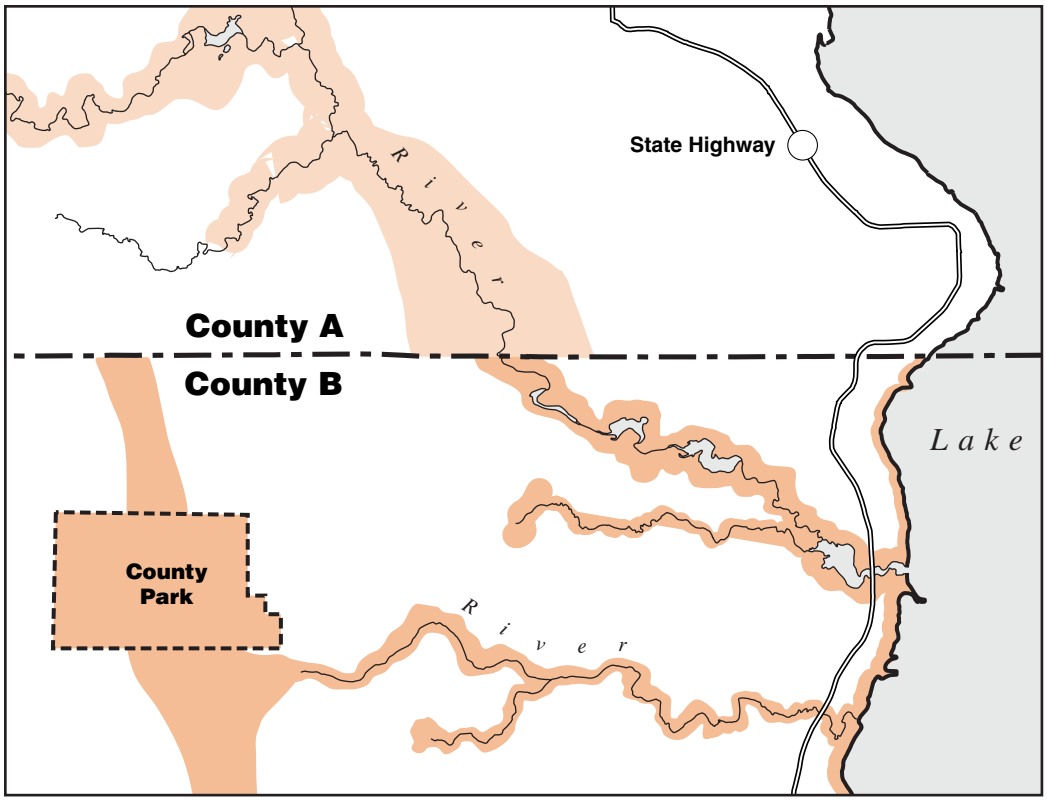
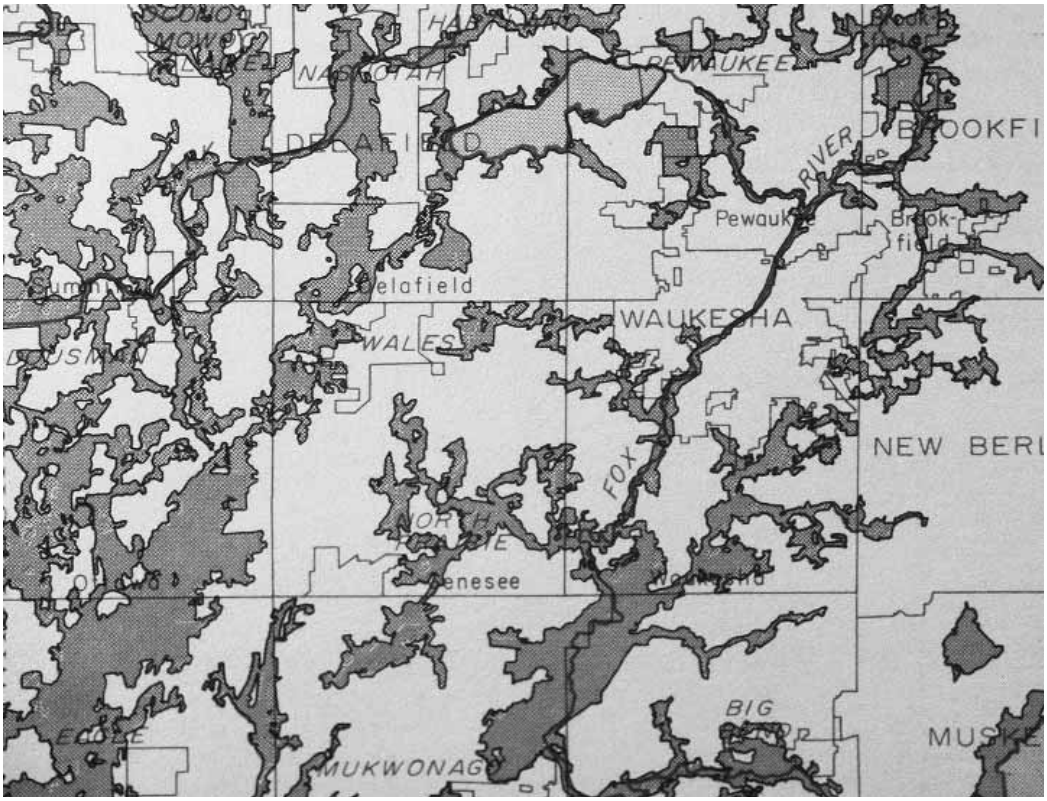



**Figure 2.** *Map showing environmental corridor delineation of two communities along an RPC border.*

Because the landscape is constantly changing, so must the data that represent it. Many of the maps and data sources used by the three RPCs are relatively old. For example, the U.S. Department of Agriculture's Natural Resources Conservation Service publishes soil surveys for each county. Many of these were completed in the early 1900s, however, and few have been updated since 1980. The SEWRPC has worked to ameliorate this problem by updating information for specific sites when evaluating the potential for environmental corridors (UW-Extension and SEWRPC 1996). The SEWRPC uses extensive field work and site inventory to adjust existing data to better reflect current conditions. The SEWRPC completes this work on a case-by-case basis. Updating the entire data pool similarly, though, would amount to a significant workload. Other RPCs have not yet tackled this issue.

**Boundaries and Overlap Issues.** Consistency at adjacent borders creates concern when mapping environmental corridors that cross regional boundaries. Corridors, being natural features, rarely respect the human-defined regional boundaries. Since the three RPCs use different definitions and different mapping techniques, the likelihood of corridors lining up along boundaries is slim. For example, we can look at a corridor that crosses the boundary between two RPCs. The definition of the first RPC may cause the corridor to be mapped with a 75-foot width, while the adjacent RPC may have mapped the same corridor within its boundaries at a 300-foot width. Thus, when the two maps are aligned, edges of the region-crossing corridor do not align (Figure 2). Differences in defining environmental corridors can create complicated scenarios as well. For instance, one RPC may have mapped a corridor that continues across its border into an adjacent RPC, where the same area may not be considered or mapped as a corridor at all. The management and protection of significant resources can be hampered in these situations, especially when multi-jurisdictional cooperation is not routine business for some communities.

**Definitions and Regulations.** Problems may arise when an RPC definition used to delineate environmental corridors in a sewer service area plan includes more than the categories listed in ch. NR 121, Wis. Adm. Code. Definitions of this type may exceed the administrative definition for "areas unsuitable for the installation of waste treatment systems." Features not included in the NR 121 definition or not based solidly on water quality protection may be subject to challenge, if a community uses those features to exclude sewer collection systems.



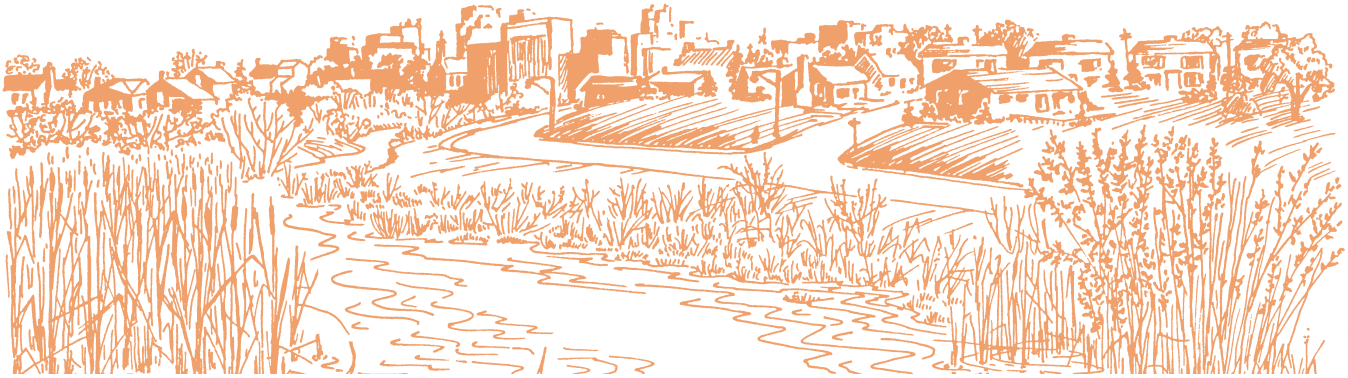

R QUEEN

*RPCs derive mapped features from a variety of data sources.*

**Summary**

Environmental corridors are linear landscape features that contain concentrations of natural and cultural resource amenities. Their delineation, mapping, and use in Wisconsin have primarily occurred at the regional level of planning. Specifically, three RPCs (Dane County, Southeastern Wisconsin, and Bay-Lake) have applied the concept. Significant variation in corridor definitions exists between the three RPCs. Different elements are included in each definition, and in some cases, the RPCs tailor these definitions to meet local needs, resulting in further inconsistencies.

The disparity between definitions results, in part, from the use of different data for similar features. Problems with corridor management and protection can arise because of the varying definitions and the resulting delineations. A standardized definition may alleviate some of the boundary overlap and inconsistency issues, but would likely receive resistance from organizations with a history of using the environmental corridor concept. Environmental corridor designation will continue to play an important role in protecting and managing significant concentrations of natural and cultural resources. The concept's application should be further examined with a goal of consistency between various organizations.



J McEVOY

## Literature Cited


Bay-Lake Regional Planning Commission. 1999. *Environmental Corridors: A Pilot Project to Identify Issues in Defining Environmental Corridors for Manitowoc and Sheboygan Counties*. Unpubl. Rept. Green Bay: Bay-Lake Regional Planning Commission.

Dane County Regional Planning Commission. 1989. *Central Urban Service Area Analysis.* Madison: Dane County Regional Planning Commission.

Dane County Regional Planning Commission. 1996. *Environmental Corridors.* Madison: Dane County Regional Planning Commission.

Lewis, P.H., Jr. 1996. *Tomorrow By Design: A Regional Design Process for Sustainability.* New York: John Wiley and Sons, Inc..

Rubin, B.P. and G.H. Emmerich. 1981. Refining the Delineation of Environmental Corridors in Southeastern Wisconsin. *Technical Record* V4.2, 1-22. Waukesha: Southeastern Wisconsin Regional Planning Commission.

University of Wisconsin-Extension and Southeastern Wisconsin Regional Planning Commission. 1996. Plan On It! *Environmental Corridors: Lifelines of the Natural Resource Base.* Waukesha: UW-Extension and Southeastern Wisconsin Regional Planning Commission.


### Websites

http://www.baylakerpc.org/
http://www.co.dane.wi.us/rpc/rpc.htm
http://www.eastcentralrpc.org/
http://www.sewrpc.org
http://www.dot.state.wi.us/dtim/bop/planning-rpc-contacts.htm


## Acknowledgments

I thank the following individuals for providing information and insight into current environmental corridor definitions and mapping practices: L. Helmuth, DNR; K. Mesbah, DCRPC; D. Schilling, SEWRPC; D. Siebert, DNR; B. Stauber, SEWRPC; and M. Walter, BLRPC.


## About the Author


Matthew Murrell is currently a Program and Planning Analyst in the DNR's Bureau of Integrated Science Services. He has worked on land use issues for the DNR since the fall of 1999. He completed his BA at Texas Tech University and MS in Urban and Regional Planning at the University of Wisconsin-Madison. Matthew's work has focused primarily on Wisconsin's "Smart Growth" and comprehensive planning legislation.

Address: DNR Bureau of Integrated Science Services
P.O. 7921, Madison, WI 53707-7921
Telephone: (608) 267-0579
E-mail: Matthew.Murrell@dnr.state.wi.us



Editor: Dreux J. Watermolen
Layout: Michelle E. Voss



The Wisconsin Department of Natural Resources provides equal opportunity in its employment, programs, services, and functions under an Affirmative Action Plan. If you have any questions, please write to Equal Opportunity Office, Department of Interior, Washington, D.C. 20240.

This publication is available in alternative format (large print, Braille, audio tape. etc.) upon request. Please call (608) 266-0531 for more information.



*Bureau of Integrated Science Services*
*Wisconsin Department of Natural Resources*
*P.O. Box 7921*
*Madison, WI 53707*

*Printed on recycled paper.*

PUB-SS-747 2003