16 Ecobelts: Reconnecting Agriculture and Communities

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INTRODUCTION

"Why do you insist on working the land on Sunday and creating all this noise and dust that disturbs our barbeque party? And the smell from your cattle and hogs is really gross! I'm sorry I live by a farm!" says an irate city resident who lives near the city limits.

"That's part of farming, and we were here first, of course. I sure wish you would keep your dogs out of our pasture and quit throwing your grass clippings and leaves over the fence. This really causes us problems with our livestock and machinery! I'm sorry the city grew out this way," replies the farmer across the property line.

Introduction to Ecobelts

The interface between agriculture and city is one site of major conflict between urban and rural residents. This physical place often is occupied by people with two completely different sets of goals, lifestyles, and daily activities that can lead to problems. In almost every situation, farms were there first, and farmers can rationally

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argue that their longevity, ownership, and land use take priority over those of people who arrived later on the scene. Homeowners contend that the growth of cities is inevitable, and that progress is measured by housing starts, local population, economic growth, and the infrastructure that comes with urbanization. "If this is zoned residential, then I have every right to expect a comfortable place to live without interference from the problems of a nearby farm," a resident on the edge of the city might argue.

Historically, landscapes were graded from an urban center to more scattered villages, to a diverse mosaic of farmlands and woodlands. This gradient allowed both a visual and physical land use transition while ecologic, economic and social connections were maintained within the larger landscape. Today, massive urban developments abut equally massive agricultural enterprises, creating not only an abrupt and sometimes harsh visual and physical interface, but also one that is highly charged politically (Bull et al., 1984). Many times, the human interactions and ecologic consequences at the interface are at odds with each other and the larger watershed (Moll et al., 1995). Continuing urban growth, dramatic increases in large lot developments for people escaping the city, and ease of transportation for those who want to live in the country and work in the city are accelerating the conversion of agricultural lands into urban or semi-urban environments. Over the past two decades, land put into development per new resident has been at least twice as much as the land per person used for development before that time (Olson and Lyson, 1999).

Despite people's close proximity, part of the conflict in this zone of rural and urban boundaries grows from an urban population that has become increasingly distanced socially from their agrarian neighbors. In the past, many urban residents had agrarian relatives who provided a tangible connection to agriculture. However, with increasing job specialization and agricultural production efficiency, fewer and fewer people have this familial connection. In addition, the escalating concentration of U.S. farming on basic crop commodities and the dominance of processing and advertising by vertically integrated major food companies have accented this distance from field to households, resulting in even less involvement and limited concern by urban neighbors about where and how food is produced. There is growing dissatisfaction in city populations that see tax revenues spent for expensive federal farm programs when they also see food surpluses, cheap products in the supermarket, and food of all types available every day of the year. The predominantly urban population is fast becoming distant from the natural environment also, as people become accustomed and adapted to a built-up cityscape.

The focus of most initiatives to address this "zone of tension" has been a we-or-they approach, with projects designed to meet the objectives of one or the other, but not both. Urban objectives for this interface often are met by creating vegetative barriers or greenbelts that are protected from further encroachment of the city, and which can mask the effects of farming from adjacent housing. Approaches to protect agricultural interests in this zone include special zoning or tax codes that provide exemption for farmers if they continue to make productive use of the land instead of selling it for development. In each case, the area between farm and city is viewed as one of conflict, of competition for space and resources, and of no-win compromise solutions that neither side may view as optimum from its point of view. The social and increasingly important ecologic needs to reconnect these two sectors demand a more proactive

planning approach for the interface that should link rather than separate these two land uses and peoples.

The use of tree-based buffers, linear arrangements of "working trees," in the landscape is not a new concept. From the ancient hedgerows in Europe and the shelterbelts in the Great Plains created to provide services in the agroecosystem, to the greenways or linear parkways in the center of urban establishments, these tree-based plantings have been used to meet objectives of rural and urban residents. The U.S. Department of Agriculture (USDA) National Agroforestry Center, located in Lincoln, Nebraska, promotes a number of tree-based buffer programs: Working Trees for Agriculture, Working Trees for Communities, Working Trees for Wildlife, Working Trees for Livestock, Working Trees for Treating Waste, and Working Trees for Snow Management. Working trees are the right trees planted in the right place for a specific purpose. With the ability to conserve and develop natural resources while increasing economic diversity at both the site and community levels, these multipurpose greenways can create an appealing entity in which the rural and urban neighbors can interact physically, and which can foster the information-sharing and consensus-building needed to rebuild the connection between these two groups. Through the planned use of tree-based buffer practices in this interface, the authors propose a redefinition and redesign of this zone of conflict into one of shared ownership and use (Francis and Schoeneberger, 1998), in which both groups see the area as one of positive social, economic, and ecologic interaction (Figure 16.1). Although only a few examples of this approach exist, the authors consider it a valuable model for the future and one that should be explored for the interface between farm and city. They define this as the concept of "ecobelts."

We–They: Defining the Challenge

The most obvious problems between farm families and neighboring city homeowners at the rural–urban boundary revolve around their differences in goals, life experiences, expectations, and tolerance. Many activities, and even discomforts, on the farm are an accepted part of that way of life for farm families. These same situations may be highly uncomfortable and unexpected by a family that has always lived in an urban setting before moving to the city limits. Likewise, many challenges faced by city dwellers may be an accepted part of their environment, but completely foreign and out of step with people in the countryside. These challenges may provide a source

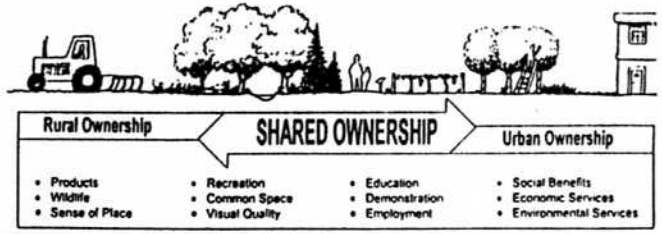


FIGURE 16.1 The rural–urban interface: a zone of shared ownership

TABLE 16.1
Problems and Different Perspectives at the Rural–Urban Interface

Problem	Farm Family Perspective	City Family Perspective
Agricultural-Induced		
Livestock odors	Natural part of farm environment	Unnatural and disgusting
Dust from fields	Normal to farm operations	Hazard to motorists
Noise from equipment, livestock	Accepted part of farming	Disturbs outdoor activities
Slow-moving equipment	Essential to reach fields	Road hazard, slows traffic
Insects from livestock	Normal farm environment	Nuisance to families
Herbicide spray drift	Hard to eliminate or control	Kills yard plants, lawns
Insecticide spray drift	Unfortunate, part of farming	Dangerous to people and pets
Urban-Induced		
High-speed traffic	Dangers to children, animals, tractors	Normal commuter challenge
Dogs in fields	Harmful to livestock	Dogs need open space to run
Snowmobiles, hiking	Compact soil, harm crops, open gates	People need recreational space
Garbage in/near fields	Interferes with operations	Over-the-fence, out-of-mind
Need to lock doors, equipment	Complication that costs time	Accepted way of life
Complaints to authorities	Interrupts farm operations	Normal approach to solving problems

Source: Stokes, S. N., Watson, A. E., and Mastran, S. S., *Saving America's Countryside*, 2nd edition, Johns Hopkins University Press, Baltimore, 1997.

of annoyance for farm families on the other side of the fence. Social tensions at the boundary have been described in other publications (Stokes et al., 1997).

Among the key problems that confront the urban immigrants to the border are odors, dust, noise, and insects (Table 16.1). Although the farm family may accept these minor discomforts as necessary parts of their way of life, they are often new and unacceptable nuisances to the city family next door. Herbicide spray drift may cause the loss of bedding plants or new trees, and insecticide drift is dangerous for people and pets. Equipment that must be run at night or on weekends, that also generates dust that flows across the boundary, may seem inconsiderate of other people's comfort or need to sleep. That same, perhaps wide, equipment driving down the road impedes traffic as it moves from one field to another, which is a source of frustration for the impatient driver trying to commute to a distant office. For a city family, these may be negative components of moving to the edge of the community and an endless source of confusion, danger, and anger.

Across the fence is a farm family coping with all the risks and stress of a difficult occupation and uncertain business. Some of their problems are listed in Table 16.1. Their operations are more dangerous because of increased traffic and higher speeds of vehicles on the road, perhaps driven by people not used to moving over on the shoulder to avoid a tandem disk or wide planter. Dogs may cross the fence to disrupt plantings or chase livestock. People accustomed to using nearby open space feel free to hike, ski, or drive a snowmobile across fields. Garbage tossed over the fence can hamper field operations by clogging equipment or damaging crops. Farmers now need to lock their doors and secure equipment, adding cost and interruption to their operations. Farm families accustomed to solving their differences by talking with neighbors may face legal challenges from city dwellers who are accustomed to dealing with grievances in a more impersonal way. Add to this the uncertainty about continuing to farm on land whose development value has inflated far beyond what is feasible for farming, and a sense of total frustration may emerge on the farm side of the fence.

In addition to social tensions between neighbors, there is an ecologic disconnectedness between these two sectors, compromising the health of the watershed on which both of these groups depend. Despite the abrupt land use change at the interface that seems to separate them physically, the urban and rural biophysical elements are still intimately tied and interact to determine the health and sustainability of the lands (Moll et al., 1995). Actions in one sector will affect the environment in the other and, regarding water, this is fast becoming a bone of contention between these two groups. For instance, in the interest of getting excess water off the land more quickly, vegetation is removed, and channels, storm sewers, tiling, and other drainage systems are put into place. Urban development exchanges large expanses of land that would otherwise retain most of the rain where it fell for new, predominantly impervious surfaces such as parking lots, roads, and buildings. As a consequence, the occurrence and intensity of stormwater flooding has dramatically increased, as has the physical damage to adjoining properties. In addition, this increased runoff or discharge carries with it chemicals, sediment, and other pollutants from both lands, impairing water quality for consumption, recreation and other ecosystem support (i.e., aquatic habitat). With little thought to the role that natural terrain plays in managing ecosystem health, agricultural and urban development has had numerous adverse impacts on the environment ranging from water, soil, and air quality to animal populations and beyond. Neither group necessarily feels the responsibility to bear the burden of correcting these problems. Furthermore, proposed solutions may then place the burden on their neighbors rather than on themselves (Box 16.1).

Box 16.1 Stormwater Flooding: Who's to Blame? Who's to Fix It?

The Beal Slough has become a zone of tension between urban and rural residents in Lancaster County, Nebraska. The 8-mile-long slough and tributary of the Salt Creek suffers from significant flooding and erosion problems due to urban development. Stormwater volumes have increased with the escalating urban development in the subwatershed and now exceed what the slough was expected to carry, resulting in several flooding events that have damaged homes adjacent to the slough. Initial proposals to address the problems from the perspective of the homeowners called for construction of flood-control structures upstream in the basin on rural lands that would have had deleterious consequences to the rural landowners. One rural resident would have had her land essentially covered by a large flood control pond. Luckily, the conflict that ensued has brought the two impacted groups together and has resulted in the unanimously approved Beal Slough Stormwater Master Plan that better meets both their objectives.

Source: Hain, J. Christopher, "Beal Slough plan wins final OK" p.3A *Lincoln Journal Star* (6/6/00).

It is easy to see how a zone of frustration can be created at the boundary of a city, with families on each side of the boundary embracing different objectives and expectations.To complicate the situation, the boundary most frequently is not fixed, and there often is discord in the farming community between those willing to sell their land and others determined to continue farming in the same place. The boundaries often are highly irregular, with leapfrog development of parcels not contiguous with the existing city and the sale of small parcels for acreage development. Such development drastically increases the linear boundaries between farms and small properties for home sites, and further complicates the relationships between rural and urban people. The complexity of farmland loss and the magnitude of this change over the past several decades are described well in the recent book by Olson and Lyson (1999).

This confrontation situation is repeated thousands of times in different ways across the United States, where communities along the major highway routes are expanding into the adjacent rural countryside. Is this a temporary challenge that will be solved for the current protagonists when development moves one more mile out from the city center, and a whole new cast of players meets across the fence on the new front line, or can more permanent solutions be found with the establishment of firm boundaries and ecobelts?

POTENTIALS OF WOODY BUFFERS

Tree-based buffers provide more than just shade and beauty, bike trails and linking parks. By adding structural diversity to the landscape, these tree-based linear plantings perform ecologic functions that can have significance far greater than the relatively small amount of land they occupy (Box 16.2). These ecologic functions are described in greater detail elsewhere (Dramstad et al. 1996; Forman and Godron 1986; Johnson et al., 2000). The five functions described in Box 16.2 operate simultaneously and fluctuate with time, season, and weather. By manipulating the composition, arrangement, and placement of these plantings within the landscape, we can alter the level of expression of these ecologic functions in an attempt to attain the environmental outcomes we desire.

Of the five basic agroforestry practices (tree-based buffer practices recognized for their deliberate integration of trees and cropping or livestock production systems), four have applications in the rural–urban interface:

Box 16.2 Ecologic Functions Created by Tree-Based Buffers

- *Habitat:* provides resources (e.g., food, shelter, reproductive cover) to support an organism's needs.
- *Conduit:* conveys energy, water, nutrients, genes, seeds, organisms, and other elements.
- *Filter/Barrier:* intercepts wind, wind-blown particles, surface/subsurface water, nutrients, genes, and animals.
- *Sink:* receives and retains objects and substances that originate in the adjacent matrix of land.
- *Source:* releases objects and substances into the adjacent matrix of land.

- *Riparian forest buffers* are natural or planted streamside plantings composed of trees, shrubs, and grasses that buffer nonpoint source pollution of waterways from adjacent land use. They also provide bank protection, protect aquatic environments, improve wildlife habitat, and increase biodiversity.
- *Windbreaks* are planted strips of one to multiple rows of vegetation. Normally serving as upland buffers, these strips intercept the wind, creating a modified microclimate downwind. Windbreaks are planted to prevent soil erosion and to protect crops, livestock, buildings, work and recreation areas, roads, or communities.
- *Forest farming* is the cultivation of high-value specialty crops under a forest canopy that has been modified to provide the correct light conditions for the crops. Crops such as ginseng, shiitake mushrooms, and decorative ferns are sold for medicinal, culinary, or ornamental uses. Forest farming provides an added income while trees are grown for high-quality wood products or to provide an aesthetically pleasing site.
- *Special applications* is a catchall category for different practices that can address the many opportunities to use trees and shrubs for specific agricultural or community concerns, such as disposal of animal or municipal wastes and irrigation tail water filtration, while producing a short- or long-rotation woody crop.

The predominantly linear arrangement of these systems provides many of their services by establishing a screen or barrier. By creating barriers to the wind and reducing windspeeds, windbreak practices can increase crop and livestock production, improve irrigation efficiencies, enable the production of wind-sensitive row, cereal, vegetable, orchard and, vine crops that otherwise would not survive, and reduce energy costs (i.e., expense for heating buildings). Windbreaks in urban areas can modify environments around hospitals, schools, homes, recreation areas, parking lots, and industrial parks, creating more pleasant living and working areas. This wind breaking function also can be used to alter snow deposition in targeted areas. Strategically placed near access roads and emergency routes, these plantings work as living snow fences to reduce dangerous crosswinds, trap blowing snow, lower snow removal costs, and increase driving safety. In fields, they can be designed to enhance the deposition of snow by capturing moisture either through a more uniform distribution across a crop field or as a concentrated collection for filling ponds. Windbreaks serve as living barriers to screen and buffer residential areas from unsightly or loud areas and from dust associated with roads, industry, organized sports, businesses, landfills, or farm operations. They can filter and trap particulates generated from upwind areas, enhancing air quality.

Riparian plantings also are predominantly linear plantings used to intercept, filter, and trap sediment and chemical runoff from adjacent upland sites. By reducing the speed and energy of the water flows, and by increasing the retention of water in these areas, they provide valuable flood control for areas further downstream. A properly designed waterbreak can provide numerous benefits during flood conditions by trapping debris, reducing sand deposition and scouring, increasing bank stability,

protecting levee systems, and reducing damage to roads and ditches. At the same time, during nonflood conditions, they can provide additional benefits such as timber and nontimber products, hunting, and other recreational opportunities.

Special applications include tree plantings used to capture excess nutrients produced by rural and urban operations. This natural alternative for using nutrients from livestock and farm operations, municipalities, and industries is able to turn waste into a product by applying it to the trees rather than processing it through expensive waste treatment systems. A direct economic opportunity from these systems involves the wood products from short-rotation systems, which can provide wood chips, fuelwood, and mulch to long-rotation systems that can provide veneer, lumber, paneling, molding and other specialty products.

These "working" tree plantings can provide a wide array of ecologic, economic, and social benefits (Table 16.2), which are necessary to meet the multiple and diverse objectives demanded of these private lands by the landowner and society. The structural diversity created by these linear plantings automatically creates additional habitats and corridors for wildlife. The plantings generally are more aesthetically pleasing and provide better recreational opportunities than the more developed rural and urban systems. The products produced from these tree plantings may include those used by the landowner for personal enjoyment, or they may provide a significant alternative income to help diversify the landowner's income and risk. For instance, a riparian buffer on a farm may produce specialty products, protect stream banks, and provide an aesthetically pleasing view or hunting opportunity to the landowner or to others. In addition to generating recreational/hunting fees for the landowner, these same plantings may reduce nonpoint source pollution of the water by filtering the runoff, stabilizing the stream banks, and altering the energy of water flow, thus protecting the lands and water resources for consumptive and recreational use by communities downstream. By providing additional social and economic returns to the private landowner, along with ecologic services, working tree buffers can create a win-win situation for the private landowner who must try to balance productivity and profitability with environmental stewardship (Boxes 16.3 and 16.4).

Many ecologic processes that contribute to the sustainability of the land, such as water quality and wildlife habitat, become fully expressed only at the landscape level. The actions of each landowner determine not only the health of his or her own land, but also that of the adjacent lands, the larger ecosystems, and the surrounding watershed. Although conservation practices on private lands tend to be applied in a piecemeal fashion, the cumulative functions of the activities of all the "neighbors" living on the landscape really determine the ultimate health of that system. This demands an "all lands" approach in land use planning.

The performance of a linked network of upland and riparian tree-based buffers will be optimized when buffers are planned and designed on a landscape scale. Therefore, designing these systems will be a task of creating strategic configurations across ownerships. What better place to start than at the rural–urban interface to restore and reconnect ecologic processes, and to create education and demonstration opportunities in which both groups can see their connections to the watershed?

TABLE 16.2
Environmental Functions Provided by Selected Working Tree Practices for Use in the Rural–Urban Interface and the Resulting Potential Co-benefits

Working Trees Practice	Environmental Function[a]	Urban Co-benefit	Agricultural Co-benefit
Windbreak	Modify microclimate	• Filter dust, agrichemical drift, odors • Create more favorable microclimate for homes, schools, recreational areas • Keep roads, emergency routes, parking lots open • Reduce home energy costs	• Protect crop • Enhance yield • Protect livestock • Reduce wind-blown soil erosion • Enhance irrigation efficiency • Reduce home energy costs • Increased capture of moisture for crops and livestock • Keep roads, emergency routes, parking lots open
Riparian buffer	Modify hydrology	• Reduce bank destabilization • Reduce stormwater volume • Reduce stormwater damage • Filter urban-generated pollutants (i.e., lawn chemicals, petroleum deposits) • Enhance aquatic habitat	• Reduce bank destabilization • Enhance aquatic habitat • Filter/trap/process field runoff • Reduce flooding damage to adjacent lands
Forest farming	Modify light environment	• Produce nontimber and timber products	• Produce nontimber and timber products
Special applications	Modify air quality Modify nutrient cycling Modify habitat	• Treat municipal waters • Enhance aesthetic value of view • Enhance wildlife • Provide recreational opportunities • Reduce noise	• Treat animal wastes • Enhance aesthetical value of view • Enhanced wildlife • Provide recreational opportunities

[a] Each of these practices will have all the major ecologic functions going on simultaneously but to different and varying degrees. They all therefore have the potential to impact more than just the targeted desired outcome and to serve multiple purposes (i.e., a windbreak designed for crop production [rural benefit] and to screen dust/chemical drift/visuals [urban benefit] also will impact wildlife populations by altering the habitat and conduit).

Box 16.3 Riparian Buffers for Agricultural and Urban Gain: South Carolina

One of the fastest growing counties in the country, Horry County in South Carolina, is home to Myrtle Beach and its massive recreation infrastructure, as well as vast acres of productive croplands, forests, and coastal wetlands. Between fall of 1997 and spring of 1998, over 1500 acres of buffer strips have been installed through the Conservation Reserve Program (CRP) for the purposes of filtering sediment, pesticides, and animal waste from crop- and pastureland. The fast growth in the area has already stressed water resources, and, given that the runoff from these areas drains to the popular beach area and valuable coastal wetlands, there's a tremendous amount of interest as to how these buffers can offset the problems created by the agricultural and urban development. Landowners who have installed these riparian buffers have already noted additional benefits in terms of enhanced wildlife, from turkey and deer to bobcat and fox, that use the buffers as habitat and corridors through the corn/soybean fields.

Source: USDA Natural Resources Conservation Service: South Carolina: economic benefits, riparian areas, in *Collection of Buffer Success Stories from the NRCS: Summer 1999*, Available: http://www.nhq.nrcs.usda.gov/ccs/Soutcar.html, Accessed: June 12, 2000.

Box 16.4 Riparian Buffers for Agricultural and Urban Gain: Illinois

High nitrate levels in the water from field runoff. Floods in Villa Grove, a town of 3000 people about 20 miles south of Champaign-Urbana, Illinois. Two seemingly unconnected problems with a common solution . . . How? These water-related problems in Champaign County are being co-addressed by the placement of riparian buffers along the Embarras River and its tributaries. Using Conservation Reserve Program (CRP) funds, farmers, like Don Koeberlein, are planting riparian forest buffers for the purposes of filtering field runoff before it can contaminate surface and ground water resources. These same buffers also serve to provide floodwater retention for downstream cities such as Villa Grove.

The mayor of Villa Grove notes a greater concern and involvement regarding the issues of flooding and water quality: "We have enough concerned farmers thinking conservation through the area. Mike Mooney [another producer planting riparian buffers in this area] wouldn't mind losing a couple of rows of corn for clean water, for wildlife, or for downstream. This younger generation seems more concerned about Villa Grove. Now, we both care about each other."

Source: USDA Natural Resources Conservation Service, Illinois: environmental and economic benefits, Conservation Reserve Program (CRP), in *Collection of Buffer Success Stories from the NRCS: Summer 1999*, Available: http://www.nhq.nrcs.usda.gov/ccs/ill 1 envir.html, Accessed: June 12, 2000.

POTENTIAL ROLE OF ECOBELTS

As described previously, with proper planting of trees and understory plants, it is possible to screen off some of what urban neighbors perceive as unpleasant consequences of farming shown in Table 16.1: dust from cultivation and harvest, odors from livestock, drifting chemicals from pesticide application, noise from equipment, or chemical runoff during a hard rain. Although this band-aid approach may solve some immediate problems, or at least put them out of sight or hearing, it could be argued that the placement of a woody barrier between urban and rural people creates additional types of distance: reduced human communications, partial solutions to serious differences, and reinforced "us versus them" opinions. With farmers increasingly dependent on votes and other support from consumers, it is essential to seek new and creative solutions to problems at the interface between these two cultures.

Given these challenges at the interface, how can buffers or other mixed types of plantings be envisioned and designed to help solve some of the obvious physical problems that create conflict? Can they in fact be designed to create positive linkages between urban and rural people? The first step has been accomplished: the definition of specific sources of disagreement listed and described earlier. In exploring a range of potential solutions, from isolation to barriers to greater physical separation of the activities, some options can be found that lead to win-win scenarios.

In conceptualizing the buffer area as one of shared ownership and concern, all parties must buy into the importance of this area to their economic well-being, property values, and quality of life (Box 16.5). Through education about the ecologic

Box 16.5 Where Private Forests Belong to All: Oslo, Norway

Common law in Norway that goes back more that 1000 years allows public access to private forests and other lands. Formalized into law in 1957, the *Allemansretten* (all man's right or law of access) says that any person is allowed to enter and roam freely on foot or skis through private forests. You may also picnic, camp out, ride a horse or cycle, pick berries, mushrooms, or flowers from this land, whether the owner knows you are there or not. You may not cut firewood or trees, or hunt animals; you also may not pick edible items from the forest within 100 m of a house. A person who enters the forest is expected to leave the place as he or she found it, and people in this culture respect the law and there is rarely any conflict.

Due to a strict zoning around cities that limits housing and commercial building from moving into either forest or agricultural land, it is obvious around Oslo and other cities that the boundary between community and rural areas is preserved and respected. This coupled with the public access to all private lands results in less pressure for people to want to acquire land and push up prices so they can move housing beyond the areas that are zoned for that purpose. The result is a planned culture that preserves wild areas near cities, ideal for hiking and skiing, and that at the same time preserves most of the ecosystem services the forest and agroecosystem lands provide to society.

Source: Francis C. and Meltzer, H. M., Case study 22: forests belong to everyone: public use of private lands in Norway, in *Under the Blade: The Conversion of Agricultural Landscapes*, Olson, R. K. and Lyson, T. A., Eds., Westview Press, Boulder, 1999, p. 450-452.

functions of buffers and how they can provide a series of recreation, ecosystem, economic, and social services, the interface or ecobelt can transform the area of current conflict into a zone that is mutually beneficial to everyone.

Some obvious uses of buffers are to alleviate or minimize many of the challenges described in a preceding section. They can be designed to perform these functions. But more importantly, they can be designed and used as places for recreation: hiking, biking, canoeing, picnicking, and observing birds, flowers, and other wildlife in a near-natural habitat. With the right guidelines and control, the area could be used also for limited economic activities.

Beyond visits to an area to enjoy the natural environment, there can be access to education about agriculture if the adjoining farmland is designed as a living laboratory for people to learn more about modern, ecologically safe farming practices. The design of integrated and diverse crop–animal systems can be demonstrated at this interface, bringing more knowledge and appreciation to the urban audience about the complexities and potentials of current and future food production systems.

The use of economically productive species could further enhance the value of the ecobelts and attract urban and rural people for a broader range of activities (Box 16.6).

Box 16.6 Community Resources' Urban Nontimber Forest Product Project

The "hidden bounty" of tree-based buffers in communities goes far beyond aesthetics and scenic bike and walking trails. They can provide a myriad of environmental services, from air and water quality to soil stabilization, climate modification, and wildlife habitat, and, as documented by Community Resources, simultaneously provide economic returns in the form of nontimber forest products. Alternative income opportunities from these tree-based linear buffers include aromatics, cooking wood (smoke/flavor wood), weaving and dyeing materials, decorative cones, Christmas trees and greens, medicinals (i.e., ginseng), edibles from fruit to nuts and fungi, floral products (i.e., pussy willows and ferns), and other ventures. From a 2-year study in the Baltimore urban forests, Community Resources found the following:

- Individuals and organizations currently collect over 103 products from 78 species.
- Collections were by a wide diversity of ethnic and socioeconomic groups.
- The net economic value of 60 products was calculated to be (1) direct net economic values ranging from $0.30 per pound for pokeweed to over $10 per pound for seeds and mushrooms, and (2) net annual per tree values ranging from $4 per year for an average mulberry tree to over $100 per year for mature Chinese chestnut, apricot, and peach trees.
- The potential value of these products was on par with the per acre values suggested for the environmental services such as energy savings and pollution prevention.

Source: Community Resources, *Exploring Urban Nontimber Forest Products: The Hidden Nutritional, Economic, Cultural, and Educational Resources of the Urban Environment,* Available: http://www.community resources.org/ntfp.htm, Accessed June 12, 2000.

Growing their own Christmas trees or other decorative woody species could provide people with limited economic return and further strengthen their's links with the areas. Agreements could be reached about harvest and replant of a tree each year. Economic species yielding such crops as fruits and nuts could be part of the buffer, and their benefits could accrue to the neighbors. Some young people could find jobs in managing, harvesting, and marketing these products. Many wood species can supply raw materials for crafts and projects, with limited harvest of plant material and great benefit to the neighbors. These activities of mutual interest and benefit would ensure that the ecobelts would be maintained and used, and that they would be renovated as necessary.

The case studies (Boxes 16.7 and 16.8) that follow describe several types of ecobelt systems, along with their places of application and the challenges they can help to solve. Although this concept has not been implemented entirely in any specific place, components of the system are used for similar objectives. The authors illustrate the use of ecobelts consisting of woody and mixed plantings to stimulate people in many communities to examine this option and look for solutions to their unique challenges at the local level. Through planning and design, ecobelts can address many of the problems and opportunities at the urban–rural interface.

Box 16.7 Maunulanpuisto Central Park in Helsinki: A Linear Analog to an Ecobelt

Imagine a linear forest and park running north–south for more than 10 miles through the center of an urban metropolis of one half million people. Then add hiking, jogging, and biking paths; a series of lighted cross-country ski trails; patches of small family garden plots; football practice fields; horse trails and stables; a creek and places to gather mushrooms; and even a pet cemetery embedded into the context of the landscape. Standing in the middle of this ecobelt, it is difficult to see the apartments or businesses that line the park boundary. Only the rumble of a distant train or muted sound of traffic disturbs this tranquil escape from the busy life of a surrounding city.

This is the Maunulanpuisto Central Park in Helsinki, an uninterrupted stretch of forest that connects the heart of downtown with distant suburbs, and a place that attracts grateful outdoors enthusiasts at all times of the year. Nordic peoples have lived close to the environment for centuries, and this linear park preserves the outdoor tradition. Ski trails are lighted for evening use because the sun sets between 3 and 4 p.m. during the winter months at 60 degrees north latitude. Garden plots are in great demand by apartment dwellers who have no space of their own at home. Even in the center of a large city in Finland it is safe for young people to go into these wild areas for the same adventure that helped many of us develop independence as children. Central Park provides a model of public ownership, multiple use, easy accessibility, and ecosystem services that can be copied in the development of ecobelts in our own cities. They bring together some of the components needed to establish zones of shared activity and responsibility that can define the boundary between urban and rural.

Box 16.8 The Town Forest in Weston, Massachusetts

A northern European heritage was obvious in the designation and management of town forests in many parts of New England in the early days of colonization. As part of this cultural tradition, town forests and their important wood resources were protected through the commons system for local citizens to use them for grazing, firewood, and timber rights. Everyone owned the forest, and there were careful regulations on who could cut trees and use them (Donahue, 1999). This pattern evolved into one of private ownership by the end of the seventeenth century, and by the mid-1800s most of this land had been cleared for farming. At this same time, there was a growing concern about loss of local forests and a move toward re-establishing them. A decline in agriculture throughout the region helped promote the reforestation and raised interest in community ownership.

The Town Forest in Weston is currently managed by Land's Sake, a nonprofit organization that is concerned with the cultural landscape as well as sustainable use of this renewable resource. Although there is continual debate about the level of harvesting that can be sustained, and in fact some people prefer to leave the forest untouched, there is community consensus that the forest belongs to all and that all should benefit from its services. This is a model for ecobelts, established for multiple purposes and managed for the benefit of all citizens. There is support from both a cultural history of common land and use, as well as a sustainability imperative that can be enhanced by community participation in planning and decision making in the town forest, or in future ecobelts.

Source: Donahue, B., *Reclaiming the Commons: Community Farms and Forests in a New England Town*, Yale University Press, New Haven, 1999, p. 217-277.

DESIGNING ECOBELTS

Planning Framework

Agricultural and urban landscapes are complex assemblages of interactive components, which are continually being modified by humans to produce goods and services. The ecologic and social dimensions of landscape structure, function, and change demand a multiscale and interdisciplinary approach to the designing of ecobelts. The planning and designing of a comprehensive ecobelt network requires a flexible but holistic process that invites community participation. This section presents an open structured framework for designing ecobelt networks that accomplish multiple objectives and provide win-win solutions for both farm and city residents (Figure 16.2).

The framework is divided into three basic phases: setting goals, designing ecobelts, and implementing and managing ecobelts. Each phase is guided by a series of questions that assist rural and urban residents in creating a comprehensive ecobelt plan (Box 16.9). A question-based approach is used because questions are effective at providing specific but flexible guidance for analyzing resources and developing plans (e.g., Smith and Hellmund, 1993; Steinitz, 1990). This list of questions is by no

FIGURE 16.2 Ecobelt planning framework

means complete, but rather offers a starting point for ecobelt planning. In many cases, the questions in Box 16.9 will lead to other, more detailed questions that will need to be answered during the planning and design process. It is the responsibility of the design team to tailor the process to local ecologic and social conditions and requirements.

A key component of the process is community participation throughout the planning, design, implementation, and management stages. As described in earlier sections, the interface between farm and city is often one of conflict (Table 16.1). One valuable aspect of the ecobelt planning process is face-to-face dialogue between farm families and neighboring city homeowners to build understanding and trust. Rural and urban residents need to learn about the commonalities and differences in their goals, life experiences, expectations, and tolerances. Through this interaction, a shared vision, ownership, and management of the ecobelt network can be established. In essence, the design and implementation of ecobelts is as much about creating functional relationships between city and farm dwellers as about creating physical features in the landscape.

One of the best ways to initiate the planning process and dialogue between residents is through a quick watershed tour, known sometimes as rapid resource appraisal. The Social Science Institute of the Natural Resources Conservation Service (NRCS) has published a short handout on how to conduct a rapid resource appraisal with stakeholders (Box 16.10). A watershed tour or rapid resource appraisal is valuable because it removes the issues from an ambiguous context and places them in a real setting, allowing for discussion among rural and urban residents. From this foundation, the questions in phase 1: setting goals can be addressed.

For phases 2 and 3, emerging technologies offer many opportunities for planning and designing ecobelt networks, such as geographic information systems (GIS) and visualization programs. Computer-based, GIS facilitates inventory and analysis of resources and allows for what-if scenarios to be developed and evaluated. With the increasing availability of digital resource data, the use of GIS technology is a

Box 16.9 Ecobelt Planning Framework

Phase 1: Setting Goals

- Based on public perception, what are the key issues affecting the zone of tension between agriculture and urban areas?
- Are there other key issues the general public has not identified?
- How are the various resource issues interconnected?
- What ecologic and social processes are influencing the issues identified?
- How might these issues be rephrased as desire future conditions?
- How should the objectives of the ecobelt system vary with location across the planning area?

Phase 2: Designing Ecobelts

- Are there significant ecologic or cultural resources that should be protected, enhanced, or restored by a network of ecobelts?
- Where should ecobelts be proactively planned?
- Where can ecobelts be retrofitted into the landscape (i.e., along canals, right-of-ways, etc.)?
- What are the design characteristics necessary to achieve the desired future conditions?
- Where should ecobelts be located and designed to provide the ecologic and social functions of filter/barrier, sink, source, conduit, and habitat?
- Where can ecobelts be located to provide a means to educate residents about urban and agricultural land uses, impacts, and benefits?
- Are there priorities for developing different segments of the ecobelt network?

Phase 3: Implementing and Managing Ecobelts

- What are the potential mechanisms for shared ownership and management of ecobelts (i.e., acquisition, easements, incentive programs, etc.)?
- How will residents share implementation tasks?
- How will residents share management tasks?
- Based on monitoring and evaluation, do objectives, designs, or management practices need to be adjusted?

realistic option for ecobelt design. However, it is important to point out that ecobelts can be designed with limited information. A key concept of ecobelts is adaptive management, which allows for changes to be made as experience is derived from implementation and management of the ecobelts. To aid in communicating design ideas and alternatives, various visualization methods are available such as hand-drawn sketches, computer-produced illustrations, and photo simulations. For instance, inexpensive home landscaping software can be used to generate photo-realistic images illustrating vegetation types and composition as well as other structural features of the ecobelt.

Conceptual Ecobelt Systems

The following sketches (Figures 16.3 and 16.4) illustrate a conceptual ecobelt plan for a small mixed-use watershed surrounding and incorporating a community. This

Box 16.10 Planner's Toolbox

Conservation Corridor Planning at the Landscape Level: *Managing for Wildlife Habitat,* 2000. Published by the USDA Natural Resources Conservation Service (NRCS), National Biology Handbook 190-vi–Part 614.4. Available from NRCS State offices or for download at http://gneiss.geology.washington.edu/~nrcs-wsi/products.html

Landscape Ecology Principles in Landscape Architecture and Land-Use Planning, 1996. By W. Dramstad, J. Olson, and R. Forman. Published by Island Press. Available to order from http://www.islandpress.com/

Ecology of Greenways, 1993. Published by University of Minnesota Press. Editors D. S. Smith and R. C. Hellmund. Available to order from http://www.upress.umn.edu/

Partnership Handbook, 1996. Published by the Water Resources Research Center, College of Agriculture, University of Arizona, Tucson, AZ. Available for download at http://ag.arizona.edu/partners/

The Law of the Land [Legal Alternatives for Land Designation & Acquisition], 1999. By A. Olson. Published by Westview Press, Boulder, CO.

Exploring the Value of Urban Non-Timber Forest Products, 2000. A study of urban forest products published by Community Resources. Available to order from http://www.communityresources.org/index.shtml

TreePeople. An organization dedicated to urban watershed management. Information and resources for retrofitting urban landscapes available at http://www.treepeople.org/

USDA National Agroforestry Center. A multi-agency organization promoting agroforestry practices a variety of rural and urban landscapes. Resources available from http://www.unl.edu/nac/

Greenway: A Guide to Planning, Design, and Management, 1993. By C. Flink and R. Searns. Published by Island Press. Available to order from http://www.islandpress.com/

NRCS Social Science Institute. An agency organization providing social sciences technology resources to assist in equitable and environmentally sound use of natural resources. Resources available from http://people.nrcs.wisc.edu/SocSciInstitute/Default.html

Center for Watershed Protection. An organization dedicated to urban watershed management. Information and resources available at http://www.cwp.org/

Conservation Easement Handbook, 1996. By J. Diehl. Published by Land Trust Alliance. Available to order from http://www.lta.org/

Rural by Design, 1994. By R. Arendt. Published by the American Planning Association Planners Press. Available to order from http://www.planning.org/

American Farmland Trust. An organization dedicated to protecting farmland. Resources available from http://www.farmland.org/

Saving America's Countryside, 1997. By S. Stokes, A. E. Watson, and S. Mastran. Published by John Hopkins University Press. Available to order from http://www.press.jhu.edu/press/

Guide to Community Visioning, 1998. By S. Ames. Published by the American Planning Association Planners Press. Available to order from http://www.planning.org/

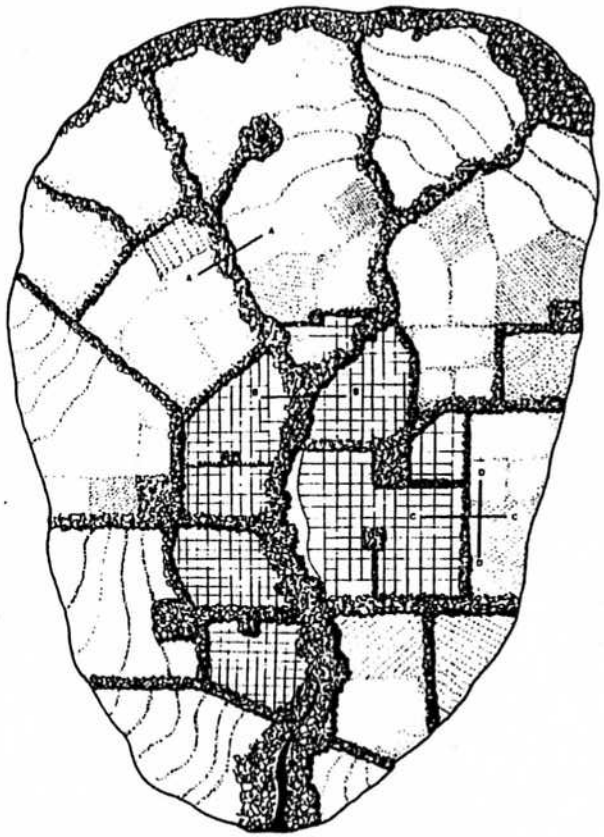


FIGURE 16.3 Conceptual ecobelt planning

example demonstrates how the location of the ecobelt within a watershed will play a key role in determining the objectives and design parameters for a particular segment of the ecobelt. For instance in Section A–A, the ecobelt is designed to address agricultural runoff by filtering runoff through a dense native vegetative buffer that also provides a habitat and conduit for wildlife. This ecobelt also allows for passive recreation through a greenway trail, exposing urban residents to agricultural environments. In contrast, Section B–B illustrates an ecobelt in a more urbanized section of the watershed. Because stormwater flow is concentrated, a constructed wetland is designed in the ecobelt system to treat the stormwater before it flows into the stream. More active recreation areas also are included in the ecobelt, providing a firebreak to protect homes. Although wildlife may still benefit from this ecobelt, this objective plays a lesser role than in Section A–A because of its landscape context.

An ecobelt between an agricultural field and residential area is presented in Section C–C. This ecobelt, which serves primarily as a common garden for both rural

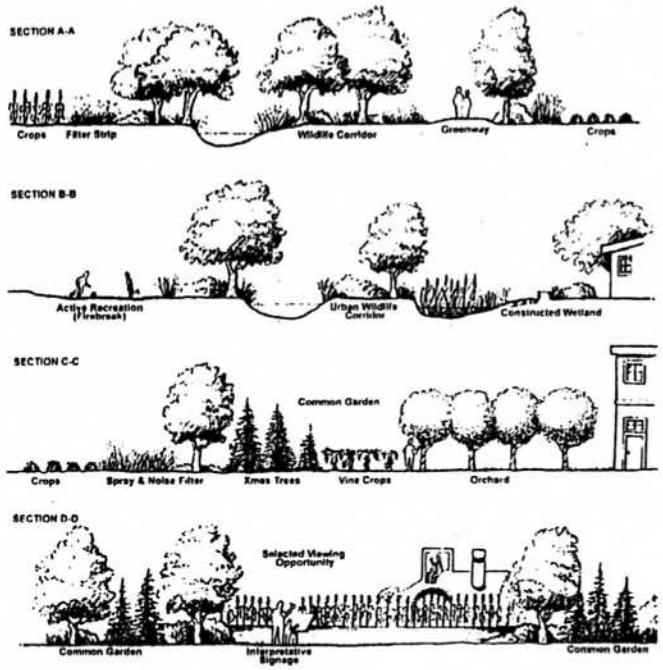
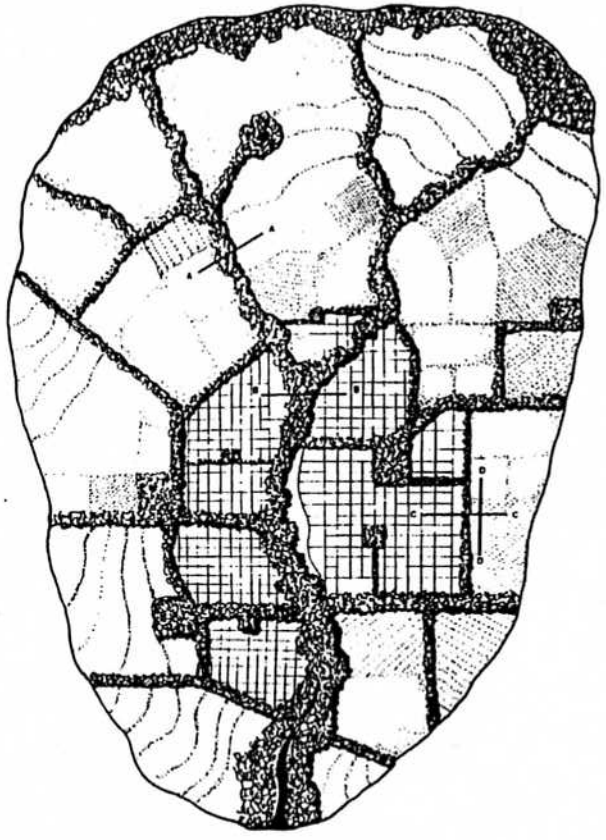


FIGURE 16.4 Ecobelt cross sections

and urban residents, is protected from noise and spray by a vegetative
Products such as fruits, nuts, Christmas trees, and floral items can be harvest
the ecobelt, providing residents the valuable experience of maintaining and
ing products. Section D–D illustrates how this same ecobelt can provid
between land uses at selected points.

In addition, interpretative signage has been incorporated into the ecobelt
cate residents about different land uses and benefits as well as conservation m
to protect natural resources. Although these conceptual illustrations are not d
scale, they clearly demonstrate how objectives and design characteristics char
location.

This brief description of the planning method provides a foundation o
to build an ecobelt system. Box 16.10 provides a list of valuable resources f
ners and other individuals interested in planning and designing ecobelts
watershed. There are many and varied options available for implementing
belt plan including community land acquisition, conservation easements,
and state programs, zoning, voluntary participation, and transfer of devel
rights, among others. The resources in Box 16.10 can provide more info
on the many options available for urban and rural residents creating
plans.



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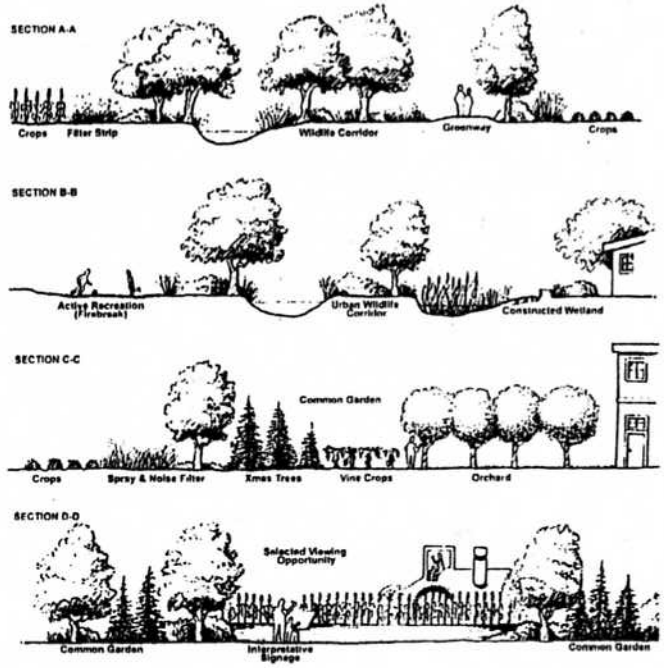

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CONCLUSION

Ecobelts as described in this chapter are not yet a reality. However, various components and applications of the concept are practiced in a number of U.S. communities. What we recommend is bringing these pieces of the puzzle together into a pleasing picture for the future, one that will help to meet the needs of both rural and urban citizens (Figure 16.5). The multiple-use ecobelts or linear areas through a community or connecting a community with nearby recreational areas outside its boundaries (see Afterword) are important, yet the most useful application of the concept comes at the interface between farming and urban residences.

The authors propose that the we–they mentality currently existing at the interface because of the many aforementioned conflicts can be converted into a consensus on land use and ownership that benefits people on both sides of the boundary. This will require the dedication of careful attention and considerable energy to a planning process that

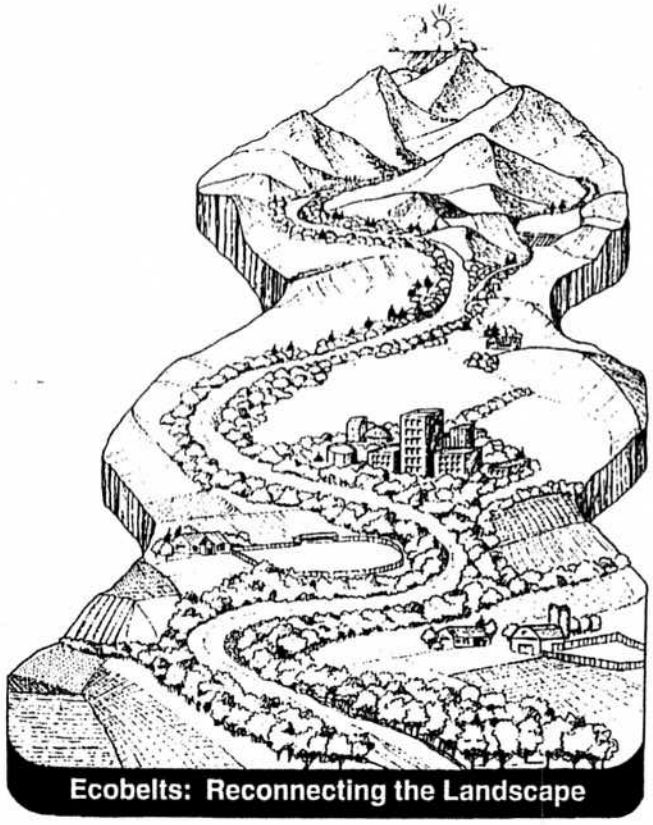

FIGURE 16.5 Ecobelts: reconnecting the landscape

builds ownership of and identity with the program, and thus a lasting commitment to implementation of the plans. Location and design will require compromise, a difficult result to achieve in a culture so dedicated to individual needs and perceived desires as well as the feeling of independence that comes with ownership of land. Perhaps the best approach is to identify more successful models already in place across the country, and to use these as demonstration sites showing what is possible. This approach has been successful in selling the concept of bike trails through rural areas, where farmers and ranchers have often been opposed to the program until they have learned from other places that this can be successful and positive for them and for society.

The multiple functions of woody plantings have been realized in conservation plantings and other multiple-use areas in the rural landscape. They also are well-recognized as an integral part of our parks and recreation areas. It will be useful to bridge these already-accepted applications of buffer strips and tree plantings into the new concept of ecobelts. These areas can provide an effective barrier for solving some of the obvious problems at the rural–urban interface. They also can serve as a habitat for wildlife, a sink for carbon and a filter for undesirable materials moving from farm to community and vice versa, and a source of both recreation and limited economic activity. The educational benefits of learning from both farms and wooded areas adjacent to the city are difficult to quantify but important to establishing connections for the next generation of urban youth. For all these reasons, the authors consider ecobelts to be a viable concept for the future, one that will provide immense benefits for the co-owners and management of the areas while resolving conflicts between rural and urban people.

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17 Afterword: An Optimistic Future Scenario

Charles A. Francis

Inspired by Jackson, 1980; Piercy, 1976; and Thayer, 1994.
Setting: Lincoln, Nebraska,
A Saturday in late July, Year 2020.

"C'mon dad! If we wait much later it's gonna be too hot and the fish won't bite." Julie Thompson wheeled her 24-speed bike out of the shed. She had just finished lubricating the chain and hubs with soybean-based oil and bicycle grease and wiping down the frame with cloth made from milkweed, a perennial crop grown nearby.

"Don't forget the sandwiches and fishing gear. And be sure to get our bike helmets. Tell mom we're leaving. I'm just turning this last compost pile." Julie's dad, Brook, works with the regional office of State Farm Insurance, but today he's the 10-year-old's biking companion, and he's anxious to be outdoors. For now, the lush garden with ripening tomatoes and snap beans on tree-branch supports will be left behind. More mulching of vegetables can wait until later.

Their bikes roll down the path past butternut squash and green melon plants that replaced all the grass in their backyard. Protected by young trees and berry strips, these vegetables have given the family fresh produce and reintroduced Julie and her older brother Tim to the connections between food and environment. It's helped them discover some new roots!

"Bye Charlie," calls Julie to their resident cardinal who lives in the shrubs that line their lot. A complex mix of native shrubs and trees, these plantings shade the house and provide berries and cover for birds and small mammals, even right in the city of Lincoln. Their bikes turn onto the common path that goes through Tierra Park and gives access to a city network of trails that reach parks, schools, and the city center, never having to cross a city street.

Heading west on the bike trail, the bikers found the air to be cool, mainly because of the nearly closed tree canopy that shaded the path. "These trees were planted before you were born, Julie. Now you can enjoy them!" Brook called ahead to his daughter. As they rode along the level path, converted from an old railroad right-of-way, rabbits and squirrels darted across their route.

"Where do all these animals build their nests?" asked Julie. "I can see the squirrel nests up in the cottonwoods, but how about the rabbits, the possums, even the skunks?" She was mystified when these creatures appeared each spring, even

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Cover photograph courtesy of André Muelhaupt of Basel, Switzerland.

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