USDA
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Changing Landscapes

Land use planning curriculum for natural resource professionals

P rinciples, people, and policies
L and planning and pressures
A pproaches
N atural resource planning tools

N7: Minimizing Parcelization, Fragmentation, and Sprawl

There are a number of practices and planning approaches that contribute to the unchecked expansion of suburbia. (Photo: Ryan Hagerty, U.S. Fish and Wildlife Service)

Overview

No single action creates sprawl, parcelization, and fragmentation. There are, however, a number of practices and planning approaches that contribute to the unchecked expansion of suburbia and resulting ecological consequences. This factsheet discusses some of the public and private land use practices that have contributed to parcelization, fragmentation, and sprawl development and familiarizes readers with tools that are being used to address it.

Sprawl

Sprawl is a disorderly pattern of lower density land development that spreads out from urban and village centers along highways and into the rural countryside. It converts large tracts of open space, farmland, and forests into smaller parcels of disconnected, developed land that no longer serve their traditional roles or natural function. A typical characteristic of sprawl is its dependence on the automobile and lack of pedestrian connectivity. Sprawl is most recognizable as strip development along major roads; isolated, large-lot subdivisions in rural areas; unconnected suburban office parks; and shopping malls with expansive parking lots.

Parcelization

Parcelization is the division of larger tracts of land into smaller parcels under different ownerships. It usually involves the conversion of working land to private, nonindustrial ownership. Most industrial and public landowners are committed to sustaining a variety of natural resource values, including forest productivity, biodiversity, and recreation. Parcelization occurs when developers purchase and subdivide large tracts of land and then sell individual lots for residential development at a profit. Conversion of larger tracts of land to smaller, random, or irregular parcels occurs gradually over time as land passes from one owner to the next and is further subdivided.

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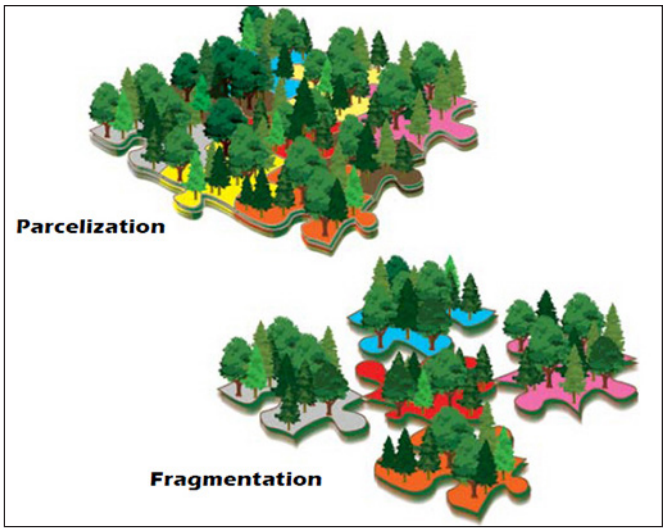
Fragmentation

Fragmentation is the process by which large, contiguous blocks of naturally functioning land are divided into smaller parcels. Forests and open land that once provided contiguous habitat become small islands isolated from each other. This negatively affects the ability of plant and animal species to persist in the fragmented landscape as they lose vital connections to shelter, food, and even other species needed to replenish the gene pool. Parcelization is a main contributor to fragmentation, although there are a variety of human actions that contribute to it as well. These include the construction of roads, pipelines, and rights-of-way for utilities.



Parcelization is the division of larger tracts of land into smaller parcels under different owners. Fragmentation is the division of large, contiguous blocks of land into smaller parcels that are no longer connected. (Illustration: http://na.fs.fed.us/pubs/misc/snap_shot/ss.pdf)

Conversion

Conversion of forested and other natural landscapes to commercial and residential use is increasingly affecting the provision of ecosystem services to people. This is particularly true for private rural lands in the United States. Predicted increases in population growth and associated development will most likely result in a reduction of goods and services derived from both public and privately owned forests (Small and Lewis 2009).

Impacts of Sprawl

Sprawl separates the places that people live from where they work, shop, and recreate. It can also segregate different groups of people from each other (i.e. young, elderly, wealthy, poor). For example, subdivisions on the fringe of cities and in the rural countryside are not readily affordable to low-income families. Essential services such as schools and hospitals tend to be located far from housing, which increases auto dependency and expands the road network. Workers have longer commutes, spend more time in traffic, and have less time at home or being involved in community activities. This lack of engagement in community can have detrimental impacts on community character, sense of place, and civic pride.

Sprawl separates the places that people live from where they work, shop, and recreate. (Photo: The Center for Rural Massachusetts, University of Massachusetts–Amherst)

Increased development density associated with sprawl can force a community's limited resources to be allocated to maintaining and improving roads, water, and sewer facilities built for new development. Critical tax revenue is lost as people move into newly developed areas and away from established cities and neighborhoods where infrastructure already exists.

Sprawl leads to the loss of public access and recreational opportunities. Ownership changes can cut off recreational access to community amenities because new landownership prevents access to or across land. Sprawl also impacts scenic views and access to cultural and historic features in the landscape, reducing the value of the landscape experience and the economic impacts that come with it.

Sprawl also has great environmental impacts. Perhaps the most significant impact is loss of biodiversity due to the division and destruction of critical habitat. It increases predation and mortality and decreases species populations, particularly for wide-ranging species such as bears and mountain lions. Loss of contiguous forests and open space puts great pressure on the functioning of ecological systems within smaller tracts of land. It provides opportunities for exotic plants, insects, and diseases to be introduced and further harm native species, thus adding additional stress to already compromised ecosystems. Changes in forest size, forest edge, plant species composition, and health increase fire risks.

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Factors that encourage sprawl, parcelization, and fragmentation include:

- Increasing populations and cultural and demographic shifts
- Greater availability of large tracts of land for development due to economic downturns
- Changes in consumer trends and market forces
- Expansion of interstate highway and roadway systems
- Expansion of water, sewer, and utility infrastructure
- Economic policies, local taxation, and land use regulation that favors land conversion and development

Rationale for Smart Growth

Smart growth is a widely accepted planning and design solution to sprawl. Advocates of smart growth emerged nearly 20 years ago and have helped codify the concept in Federal and State planning policy. Many communities have adopted smart growth principles into zoning, stormwater, and other land use regulations.

Smart growth implies a sustainable approach to development. It supports local economies, protects the environment, promotes social equity, and increases quality of life. The 10 principles of smart growth encourage developing existing open lots and compact development density, which help reduce the impacts of sprawl. Each principle promotes design that manages growth; protects open space; creates tangible environmental improvements; and offers choices in housing, transportation, shopping, recreation, and jobs while stimulating economic growth and preserving community quality of life. Communities can use a variety of regulatory tools to carry out the principles of smart growth, which are described in the following section.

Tools for Minimizing Parcelization, Fragmentation, and Sprawl

Although Federal and State governments provide communities with the authority to regulate land use through enabling legislation, the most important decisions about growth and development take place at the local level. Local governments create plans, establish ordinances that define where and how development occurs, and issue permits for residential and commercial construction. As such, it is important that local governments use tools that will help their community grow in a sustainable and ecologically sensitive manner. There are a variety of strategies, ordinances, programs, and policy tools that local governments can use to translate smart growth principles into action to limit or control sprawl.

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Cluster Subdivision (or Conservation Subdivision)

Cluster subdivision is a type of land subdivision that clusters groups of homes on small lots to permanently protect open space and valuable land. The portion of the parcel that is not developed can be restricted by a conservation easement, owned by the homeowner association or some other entity, or used for common space. Ownership by a homeowner association often limits public access. Many municipalities use cluster subdivision and public ownership in an accessible and planned open space system.

Cluster Subdivision Benefits

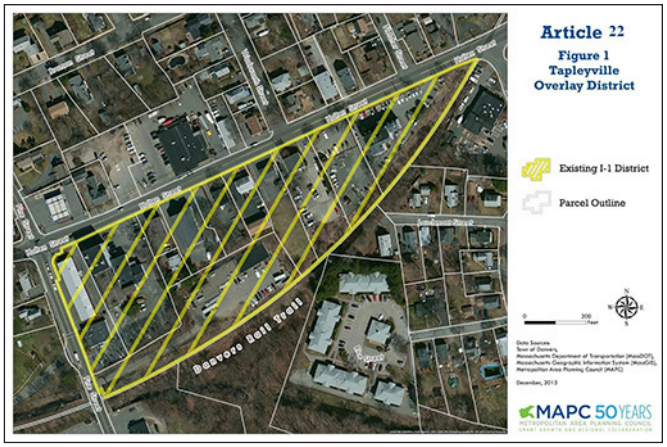
- Encourages creative and flexible site design that is sensitive to the land's natural features and adapts to the natural topography.
- Encourages the preservation of a property's natural assets, including existing vegetation.
- Avoids placing development in areas subject to environmental constraints and hazards.
- Maintains larger blocks of land that preserve ecological values.
- Preserves the visual quality of agricultural, forested, and rural areas in the landscape.
- Reduces the cost of installing and maintaining infrastructure by reducing the distance that utilities, such as water and sewer lines, need to be extended.

Impact Fees

To meet the challenge of funding new services and accommodating infrastructure demands from a new development, the State can authorize municipalities to charge developers a one-time fee to offset the cost of expanding services for the new development. Impact fees are typically spent on capital improvements that are not within the development's boundaries but are impacted by the development. They can be wide-ranging and extended to any municipal capital expenditure required to meet the needs of population growth caused by the new development, including the development of needed parks, schools, roads, sewer, water treatment plants, utilities, libraries, and public buildings. The fee cannot be used to cover normal operation and maintenance or personnel costs. Impact fees are illegal in some States such as Pennsylvania.

Overlay Districts

Adopted as part of a zoning bylaw, overlay districts are land use districts superimposed over one or more basic zoning districts. Overlay districts alert developers to issues and additional requirements they need to address when applying for development permits. Overlay districts establish development restrictions or extend development incentives on properties within a defined geographic area or on land characterized by specific physical features or site conditions (i.e. steep slopes, wetlands, and riparian areas). They are intended to discourage development in unsuitable areas and protect certain critical features and resources (i.e. wildlife, floodplains, and rare species agriculture, among others).



Overlay districts are land use districts superimposed over one or more basic zoning districts. (Photo: http://planning101.mapc.org/2014/02/danvers-town-meeting-unanimously-passes-tapleyville-overlay-district-article/)

Planned Unit or Planned Residential Development Ordinances

Planned unit development (PUD) regulations can be provided through an amendment to subdivision and land development ordinances as an alternative to conventional, single-lot subdivision. PUD ordinances allow developers to plan a large development parcel as a single entity, but provide flexibility, creativity, and innovation in the planning and design. PUDs encourage a mix of uses, housing types, and densities, such as those found in traditional town and village centers, new town centers, and other designated growth centers. They also require a large amount of open space preservation—up to 50 percent of the parcel. Because developers can customize the project to the specific land under consideration, environmental disturbance can be minimized and important natural features can be protected.

Conditional (Special) Use Permits

Conditional use permits allow local governments to consider land uses that may be essential or desirable to a particular community, but that are not allowed as a matter of right within a zoning district. Communities may also use conditional use permits to control certain uses that could have detrimental effects on the community. Conditional use permits require a public hearing and extra conditions that a developer must satisfy to build a project. They often require the approval of elected officials. Many communities find that a conditional use permit is a flexible regulatory tool for accomplishing a variety of community land use goals. A conditional use permit can also ensure that certain uses do not adversely impact important community resources such as public facilities, road capacity, parking, steep slope development, and community character.

Adequate Public Facilities Ordinance

An adequate public facilities ordinance ties development approvals to the availability and adequacy of public facilities such as roads, sewer systems, schools , water supply, and public safety. A community must define and adopt the levels of service or system capacity to be maintained prior to issuing a permit. The application of this kind of ordinance must also be tied to a funding source (capital budget or capital improvement program) that seeks to plan for or remedy the problems associated with growth. If a proposed development cannot be supported within the existing capacity, the developer must either pay for or build the required infrastructure, or wait until adequate facilities become available. Adequate public facilities ordinances help communities guide growth in a proactive manner that can prevent sprawl, parcelization, and fragmentation. To see Maryland's model guidelines for such an ordinance, go to http://www.mdp.state.md.us/PDF/OurProducts/Publications/ModelsGuidelines/mg24.pdf.

An adequate public facilities ordinance ties development approvals to the availability and adequacy of facilities such as schools.

Transfer of Development Rights

Transfer of Development Rights (TDR) is a program established by local zoning ordinance. Its intention is to relocate potential "right to develop" from areas where proposed land use or environmental impacts are undesirable (the "sending" site) to another site (the "receiving" site). The receiving sites are usually in higher density areas, downtowns, or growth centers where growth is promoted through the transfer of development density. TDRs are often used to protect open space or environmentally sensitive areas such as wetlands, farmland, forests , or critical wildlife habitat.

TDRs protect land permanently while still keeping it in private ownership. Landowners can retain their equity by selling development rights. Participation in a TDR program is usually voluntary. While the seller of development rights still owns the sending area land and can continue using it, a conservation easement is placed on the property that prevents or strictly limits further development. TDR contracts are more permanent than traditional zoning regulations and can accomplish multiple goals at once, such as protecting farmland, preserving environmentally sensitive areas, developing compact urban areas, promoting downtown commercial growth, and preserving historic landmarks. To learn more about TDRs in Pennsylvania, visit this Web site sponsored by the Pennsylvania Land Trust Association: http://conservationtools.org/guides/show/12-Transfer-of-Development-Rights.

Transfer of development rights can be used to protect environmentally sensitive areas such as forests.

Urban Growth Boundaries

Urban growth boundaries (UGB) affect the velocity and density of development. UGBs are delineated on a map and adopted in a comprehensive plan to identify where future development can occur over a set period of time (usually 20 years). Through the use of rural resource or other zoning districts, new development and expansion of water and sewer cannot occur beyond the established urban growth boundary. Land outside the boundary remains primarily for agriculture, forestry, or limited low-density residential development while land within the boundary is used to accommodate new growth.

It is important that zoning regulations for areas within the UGB allow a mix of residential, commercial, industrial, and institutional development at densities sufficient for the expected amount of growth over the specified time period. This ensures that anticipated growth and development are permitted and that compact development patterns are promoted.

Care should also be taken in defining the UGB. If the area within the boundary is not large enough, the cost of existing developable and already-developed land could increase beyond reasonable values, forcing development to other nearby communities. UGB programs must therefore be reviewed periodically to ensure that adequate land remains within the boundary to accommodate expected growth. Transfer of development rights is often used in conjunction with UGBs to allow property owners to receive the value of land outside the boundary with development restrictions.

Planners need to make sure that the area within an urban growth boundary allows a mix of development uses and is large enough for the expected growth.

The Nation's first formal example of an urban growth boundary occurred in Lexington/Fayette County, Kentucky, in 1958. Since then, a number of States and localities throughout the country have established urban growth boundary programs. Oregon established one of the most well-known, state-mandated urban growth boundary programs in 1973. The State created enabling legislation that required all cities to define urban growth boundaries to separate areas intended for development from those expected to remain in agricultural or forest use. To learn more about urban growth boundaries and Oregon's notable program, go to http://www.oregonmetro.gov/urban-growth-boundary.

Transportation Planning and Design

Coordinating transportation and land use planning is an important component of smart growth. Sprawling land uses create increased traffic and congestion. Increased traffic creates the need for new and wider roads, which allow people to travel farther and faster. New roads create opportunities for land development and growth in outlying areas, and the cycle continues. It is important that communities plan for roads and highways in a manner that supports sustainable communities rather than reacting to growing demand.

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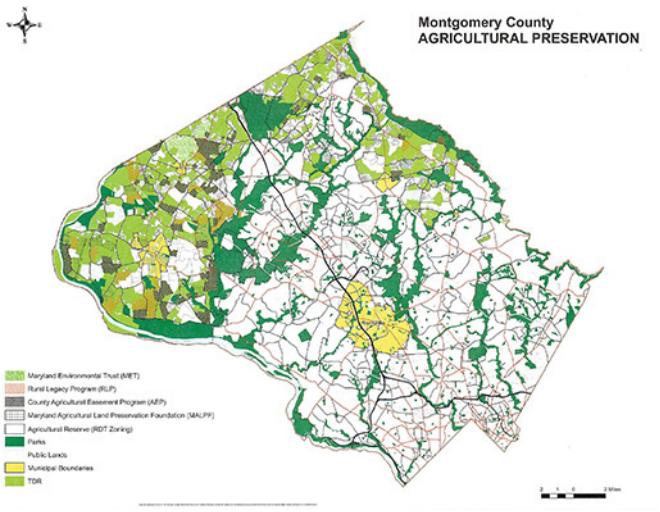
Federal, State, and local governments can work collaboratively to maintain and reinforce existing road networks that encourage development of existing open lots and redevelopment. Communities can also adopt policies that allow flexibility in roadway design, which incorporates safe, attractive, and comfortable access for all users. This includes pedestrians, transit users, and bicyclists, not just motorists. The Safe and Complete Streets Act of 2011, which was introduced in the House and Senate for consideration in early 2011, would require States to adopt principles for safe, accessible, and healthy streets. Many States have already passed complete street policy or legislation.

Creating attractive, safe, and convenient travel corridors for all users can:

- Encourage walking and bicycling
- Reduce automobile dependency
- Improve the efficiency and capacity of roads
- Better manage and allocate infrastructure costs
- Make development more attractive in urban areas

Case Study — Montgomery County, Maryland's Agricultural Land Preservation Program

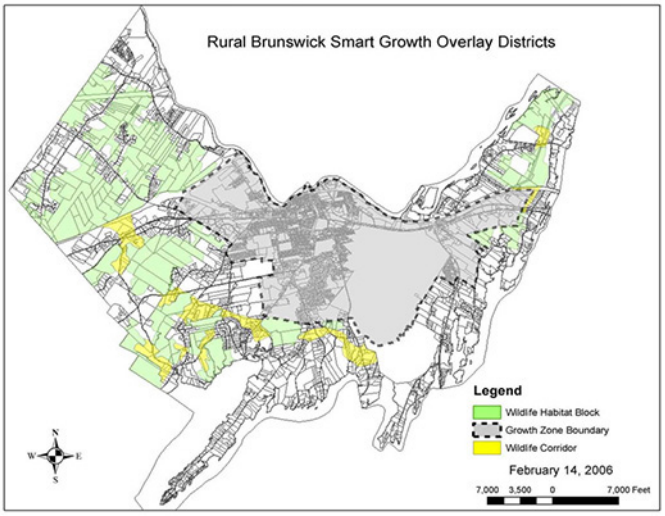
Montgomery County, Maryland, has one of the most successful farmland preservation programs in the United States, which began in 1980 to counter the loss of farmland from suburban sprawl. Landowners can choose from seven preservation programs set up by the county, such as the Legacy Open Space Program or the Montgomery County Transfer of Development Rights (TDR) Program. Each program will place an easement on the property to protect it from future development. Of the 72,000 acres of farmland protected in the county, more than 52,000 acres has been preserved through the TDR program alone. This is the highest percentage of preservation easements in the Nation. For more information, go to http://mda.maryland.gov/about_mda/Pages/md-land-preservation.aspx.



Map of Agricultural Preservation lands in Montgomery County, Maryland, as of 2010. (Map: Montgomery County Farmland Preservation Annual Report FY1980 – FY2010)

Case Study — Rural Brunswick Smart Growth Overlay Districts

In 2006, the Town of Brunswick, Maine, adopted Rural Brunswick Smart Growth Overlay Districts as part of its zoning ordinance to minimize fragmentation of large habitat blocks. Applicants proposing development within this Smart Growth Overlay District must meet certain mitigation requirements, which include identifying areas of disturbance and permanently protecting other land in the same block or corridor as the disturbance. The amount of mitigation required is related to the amount of habitat block or corridor that is being disturbed. For more information, see the Town of Brunswick Zoning Ordinance at http://www.brunswickme.org/wp-content/uploads/2014/08/Brunswick.Zoning.Ordinance.8.6.14.pdf.



Map of Rural Brunswick Smart Growth Overlay Districts as of February 14, 2006. (Map: Town of Brunswick Zoning Ordinance, October 20, 2010)

Relevant Factsheets

A1 – *Using Smart Growth Principles to Plan Sustainable Communities* – Introduces the principles and strategies of smart growth to create communities that are walkable, affordable, and offer more opportunities to manage growth in concert with conservation.

N3 – *Regulatory Approaches to Protecting Natural Resources* – Explains the difference between regulatory and nonregulatory approaches that protect natural resources and provides an overview of important Federal policies that drive them. Discussion centers on some of the more commonly used local regulatory tools and how they are used in the early phases of the development process.

N4 – *Nonregulatory Approaches to Natural Resource Conservation* – Discusses nonregulatory tools that have been used to preserve/conserve open space and other natural resources. It discusses how regulatory and nonregulatory tools can be used together and makes the point that nonregulatory tools can be just as effective as regulatory tools in planning for natural resources.

N5 – *Planning for Healthy Forests and Timber Operations* – Discusses the authorities that States have in regulating forestry activities and how municipal zoning ordinances are used to protect forests in States that do not have these authorities.

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