

Designing Subdivisions to Save Land

by Randall Arendt

Overview

This chapter describes a technique known as conservation subdivision design (CD) which involves co-ordinated improvements to existing comprehensive plans, subdivision regulations, and zoning ordinances. When properly implemented, this approach offers the potential for municipalities to protect interconnected networks of conservation lands by requiring significant percentages of the buildable land to be preserved, in addition to all of the constrained wetlands, floodplains, and steep slopes. Although higher percentages of conservation land is a key goal, the quality and configuration of those lands are also of great importance, to ensure they preserve the most critical resources and minimize resource fragmentation. Conservation design, at its best, is also accompanied by stewardship plans for each property, specifying the roles and responsibilities of various parties for continuing maintenance and management.

With these improvements, CD represents a quantum leap from previous approaches such as clustering and planned residential developments (PRDs). An important part of this approach involves improvements to the process in which subdivisions are designed, reviewed, and approved. Among those improvements are requirements for highly detailed site analyses, site walks, conceptual sketch plans, and a special four-step design process, all described later in this chapter. Although the conservation subdivision approach is a technique designed for lower-density rural and semi-rural areas that are typically unsewered, where conventional lot sizes generally range from two to five acres, it can be adapted for sewerred areas with higher densities. However, such adaptations, which protect lower percentages of open space, should not be classified as conservation subdivisions. To avoid confusion, a different term such as “open space developments” would be more appropriate.

Conservation design enables municipalities to work with developers to create attractive neighborhoods while preserving natural resources, respecting cultural features, and enhancing community character. It can be used to supplement other land protection efforts in a simple, cost-efficient way by complementing programs to purchase land or development rights or to transfer development rights. It utilizes and integrates many of the techniques discussed in a number of preceding chapters such as those on greenways, the green infrastructure network, farmland preservation, managing stormwater, and treating wastewater. CD is also the subject of residential case studies in the next two chapters. Several of these case studies demonstrate how this design approach can be successfully blended with the new urbanism (discussed in Chapter 8). Because this approach has been fully discussed in three previous books, this chapter provides a relatively brief introduction and points the way to further reading where details regarding design, regulations, implementation, and benefits to all parties are described (Arendt 1996, Arendt 1999, and McMahan 2010).

As mentioned above, CD works very well to achieve many of the desired results discussed in previous chapters. At a very practical level, it allows the most suitable soils on any parcel to be designated for wastewater treatment with individual (or group) drainfields located either on-lot or in the common open space, outperforming large-lot platting for this important reason. It allows larger areas of permeable soil to be designated for stormwater infiltration and groundwater recharge, while avoiding soil compaction by heavy equipment in the conservation areas covering half or more of the development site. (Such compaction, caused by site grading with large machinery, creates dense “pans” that severely limit the soil’s ability to infiltrate stormwater, thereby increasing runoff. Furthermore, “Natural soil structure is usually destroyed by these activities; not only are soils made abnormally dense, but there are no longer any natural channels or planes of weakness for roots, water, and air to penetrate.” (Daniels, 2011)

<http://landrehab.org/UserFiles/DataItems/3034764F7459304F4F67673D/Daniels,%202011%20Managing%20urban%20soils.pdf>

Conservation design also provides greater opportunities to protect significant parts of the green infrastructure, including farmland, upland forests, wooded wildlife habitat, historic structures, and aquifer recharge areas. (Fig. 19-1) It can also be used to restore degraded landscapes and habitats, from woodlands and meadows to fisheries, greatly improving existing conditions (Fig. 19-2). Historic and cultural features can also be preserved in this manner (Fig. 19-3).



Figure 19-1: Resources protected in conservation subdivisions can take many forms, such as a forest preserve at Fieldstone Estates (North Kingstown RI); a fruit orchard in the Ponds at Woodward (Kennett Twp., PA), and wiregrass and longleaf pine habitat at Centerville Farm (Centerville FL). (RA all)

The open space it preserves and protects is often available to neighbors for informal or organized recreation, with trails that can ultimately link with open space in other similar subdivisions, creating connected networks of footpaths and conservation lands, thereby extending community greenway planning objectives. It allows greater buffers to be created along streams, around waterbodies and other sensitive areas, and next to existing parks, preserves, or other resource lands, including farmland. (Such buffers can be used to provide extra margins of safety around potentially dangerous natural features such as sinkholes in limestone areas and around utilities such as wastewater treatment facilities, electrical transmission lines, or even oil and gas wells – the latter use of conservation design being illustrated in the 2002 strategic master plan for Wise County in north Texas.) This design approach can also be used to protect scenic viewsheds along roads where maintaining rural character is a policy goal, as is specifically done in Newcastle County, Delaware. And it can be accomplished at a very wide range of densities from urban to rural, in a manner that could reflect new urban design principles when applied to walkable mixed-use neighborhoods in areas with urban infrastructure.

This is not a strictly low-density technique, as the infill examples in Chapter 21 illustrate (but in those cases the resulting development, with lesser percentages of preserved land, should be called something else, such as “open space subdivisions”). However, its most common application is in the suburban fringe, in areas where other land-saving techniques (such as UGBs, TDRs, and effective agricultural zoning) are not politically feasible. Interestingly, several counties which have adopted ultra-low density agricultural zoning also utilize conservation design, but limit its use to locations inside or within a few miles of urban service areas. In much of the Northeast and Midwest, where many counties possess little or no zoning authority, where land-use is regulated at the town or township level, conservation design is a particularly relevant tool.



Figure 19-2: Sometimes conservation subdivisions involve more than land protection: they restore degraded or vanished landscapes. Seen here is reforestation at Lamborn Hunt (London Grove Twp., PA), restored prairie at Hawksnest (Delafield WI); and rehabilitated trout habitat at the Ranch at Roaring Fork (Carbondale, CO). (RA all)

Twenty-one case studies in Chapter 20 describe how conservation subdivision design can be used to protect many kinds of natural resources. Fourteen examples protect rural viewsheds, eleven conserve woodland habitat, nine involve historic building restoration, eight protect farmland, three safeguard cultural features, two involve wholesale nurseries, two involve equestrian facilities, and one protects a working orchard. Two further examples involve grassland (prairie) restoration, and one involves trout habitat restoration. Chapter 21 contains 15 case examples in areas with urban infrastructure and higher densities, while Chapter 22 describes five large-scale mixed-use projects with significant conservation components; several of these utilize new urban form in their developed areas.



Fig 19-3: Historic and cultural features can also be easily protected, as illustrated above. A stone fence separating two former pastures runs through the center of an elongated neighborhood green at Brown's Farm (South Kingstown RI). A "trace" marks the line of an ancient footpath worn through the forest floor by Native Americans and early settlers at Lakeland Green in Lakeland TN. The limestone hop house, c. 1875 (right), restored by Siepmann Realty in Woodfield Village (Merton WI) contributes to the roadside cultural landscape. (RA all)

Two dozen examples of special features protected through this design approach are also described and illustrated in an on-line photo-essay: *Cultivating Natural and Cultural Landscapes through Conservation Subdivision Design* (<http://terrain.org/articles/18/arendt.htm>)

Fortunately for communities interested in securing a greener future, this approach does not require public funding (as do PDRs) or depend upon altruism or private charity (as do land trust easement donations) because it is "density-neutral", allowing landowners and developers to create as many houselots as in conventional layouts. It does not involve complicated density transfers which are often politically challenging due to concerns of residents living near "receiving areas" being densified. In fact, the CD approach is relatively straightforward and easy to administer, particularly when time-tested model codes are followed. However, although it is very effective in preserving local resources and protecting open space networks, employing CD alone will not achieve broad landscape-scale conservation goals, for which much stronger measures (such as UBGs, TDRs, and effective agricultural zoning) are required.

Short History

Perhaps the earliest documented example, in this country, of development designed with common open space owned and maintained by neighborhood residents is Louisburg Square on Boston's Beacon Hill. Laid out in 1826, it occupies the site of a former cow pasture where 28 lots and a central green (measuring about 100 by 300 feet) now occupy 2.3 acres. Gramercy Park in Manhattan, created five years later and covering two acres of former swampland, is another early example of private urban squares, which were more common in London and Edinburgh.

Suburban or rural examples are said to have begun with Llewellyn Park, designed in 1853 by Andrew Jackson Davis on 750 acres in West Orange NJ, where large multi-acre estate lots were laid out around a 50-acre central, commonly-held open space called the Ramble. Preserving open space in joint tenancy remained uncommon during the 19th century, the next notable suburban example being Arden, founded in 1900 several miles north of Wilmington DE (described in chapter 8), where all the houselots are leased for 99 years. Common open space re-emerged as a central design feature in several notable projects during the first half of the 20th century, including Sunnyside Gardens in Queens (1924), Radburn in Fairlawn NJ (1928), Chatham Village in Pittsburgh (1930), and Baldwin Hills Village in Los Angeles (1941), all designed by Clarence Stein and Henry Wright (Stein, 1957). (A case study of Chatham Village, an excellent example of conservation design in an urban area, can be found in the first edition of this book, and Radburn is described in Chapter 20.)

Designing with community open space owned by the residents occurred infrequently during the next quarter-century, until the advent of "planned unit developments" in the mid-1960s, but this approach and related "clustering" rarely preserved special features. Instead, they often became a developers' tool to avoid wet or steep parts of their property while maintaining overall density. Consequently, most of the open space preserved was unusable as well as unbuildable. Although this was a worthy accomplishment before wetlands received federal regulatory protection, this history tarnished the

image of “clustering” and led some planners to eschew that term when devising a superior approach based on the same fundamental principles. The much-improved approach, which protects and preserves significant resources that would otherwise be developed, has come to be known as “conservation design” (CD).

The Planning and Regulatory Framework

In a training document prepared in 2001 for municipal officials, staff at the Natural Lands Trust in Media PA prepared the following summary of the basic principles contained in conservation design regulations.

Subdivision regulations must require:

- Dialogue between the applicant and municipality at the outset of the process
- A context map, showing all natural and manmade features surrounding the site.
- A site inventory of existing features upon which to base design decisions
- A site visit by the planning commission members accompanied by the developer (with abutters invited), where the site inventory map guides the site walk
- A four-step design process in which the conservation areas are determined first, before houses, streets and plot lines are established.
- A conceptual sketch plan before costly engineered layouts are prepared, even for so-called “preliminary plans” (This is an essential step. If necessary to avoid a three-plan procedure, procedures could be changed to require a Concept Plan and a Detailed Plan, instead of a “preliminary” and “final” plan”.
- Standards for the configuration, location, and future management of the conservation lands.

Zoning Ordinances must contain, at a minimum:

- The ability for an applicant to obtain full-density through a “by-right” permitted use approval process, but *only* when a conservation option is selected.
- Density determination either through a “yield plan” of conventional lots or by formula, both approaches based on net buildable acreage
- A requirement that protected lands comprise at least 50 percent of the buildable ground, (plus constrained acreage) whenever the underlying density is one unit per acre or lower.
- Strong disincentives to discourage conventional development, usually by reducing the density by at least half, or classifying conventional layouts as conditional uses.
- Permanent easements ensuring that the conservation lands are perpetually restricted from further development.
- A management plan for maintaining the open space.

Although a number of jurisdictions mandate conservation design (at least in certain districts), this approach can be politically difficult to adopt. Two alternatives exist. One involves classifying conservation design as a by-right permitted use and also classifying conventional layouts as conditional uses. The condition required for approval is that a clear and compelling case be made at a public hearing, showing how a development without open space *better* implements key comprehensive plan policies (such as preserving farmland or protecting woodland habitat). A second approach is to allow full density only in conservation subdivisions, and to restrict conventional layouts to half that number of houselots. This does not constitute a “taking”

because applicants have the option of achieving full density through CD.

The process of updating codes to include a conservation design focus should begin by reviewing existing plans and land use regulations to identify gaps and weaknesses. Before changing regulatory language, comprehensive plans and /or open space plans should first be updated to expand their conservation goals and to recommend specific ordinance changes (such as those noted above). Part of the plan update might include a *Map of Potential Conservation Lands* to identify future community-wide open space networks, comprised of both unbuildable areas (such as wetlands, floodplains and steep slopes) and developable uplands (such as farmland and forests with no environmental constraints). The former are known as “primary conservation areas” (PCAs), while the latter are called “secondary conservation areas” (SCAs as illustrated in Fig.19-4. Because this type of update focuses only on these issues, it can usually be accomplished relatively quickly and at minimal cost. Such planning builds a legal and political foundation for subsequent regulatory improvements.

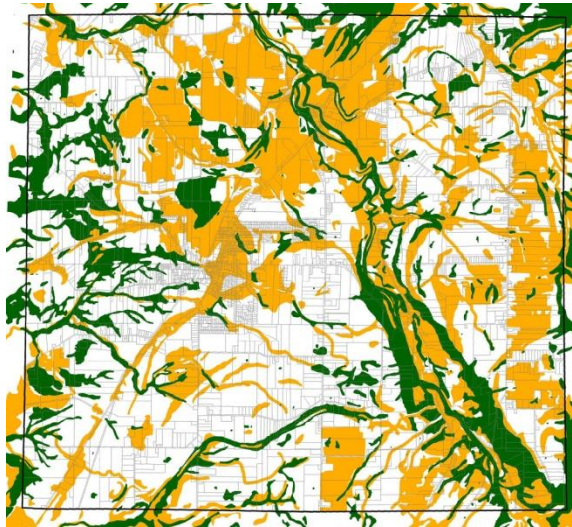


Figure 19-4: This map of Primary Conservation Areas (green) and Secondary Conservation Areas (yellow) in Edén NY illustrates the resources that typically form the basis for community-wide maps of potential conservation lands. Source: Town of Edén NY and South Arrow Consulting

The Four-Step Design Process

To simplify the design process so it can be understood by the largest number of people, the methodology is divided into four basic steps beginning with the identification of areas worthy of conservation. As shown in the accompanying graphics, designing conservation areas during the first step virtually ensures that the site’s ecological integrity will be protected, regardless of the configuration of houselots and streets that follow (which could be informal and curvilinear or formal and rectilinear). In other words, once the big picture of conservation has been brought into focus, the rest of the design process essentially involves lesser details, addressed in the last three steps.

The drawings in this section were originally prepared for the Sussex Conservation District with funding from the US EPA to demonstrate a better model for development in the Inland Bays region of southern Delaware (Arendt, 1993). These waterbodies are particularly

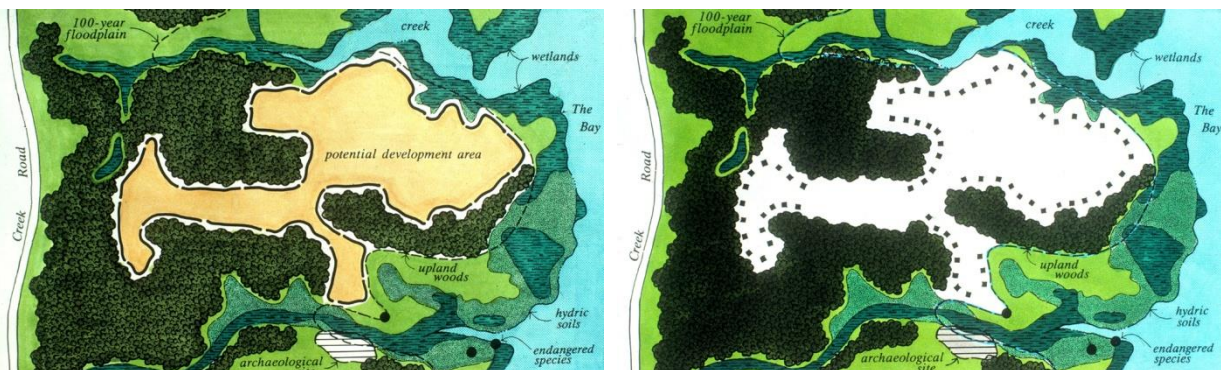
vulnerable to pollution due to their shallowness and limited flushing action. This site was selected because it contains significant upland forest habitat that is relatively rare in this region.



Figures 19-5 A and B: Predevelopment Situation and "Yield Plan". The land prior to development, shown in Fig. 19-5A, consists of roughly 80 percent upland, almost equally divided between farmland and forest, with the remainder being wetlands and floodplains. The conventional layout of 72 houselots (Fig. 19-5B) also serves as a "Yield Plan", demonstrating the number of houselots the property would ordinarily support in a standard plat with no usable open space. Source: Arendt 1993

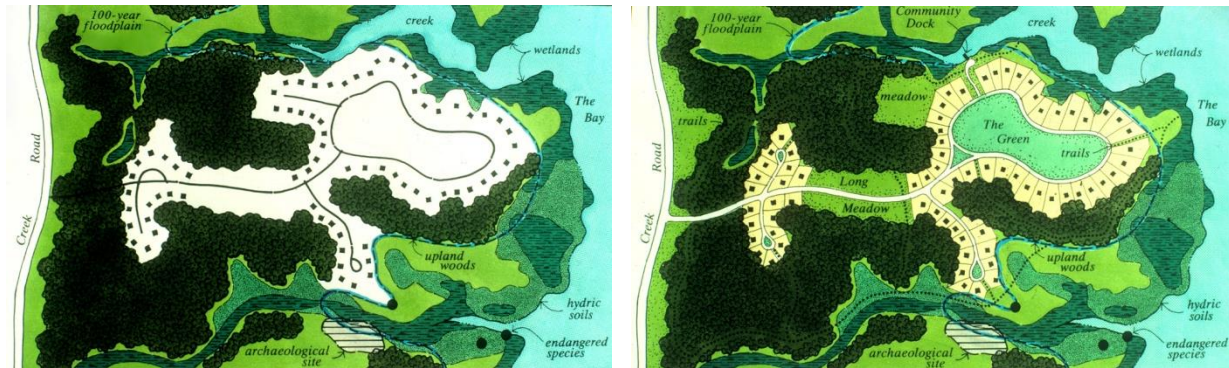


Figures 19-6 A and B: Step One, Identifying Primary and Secondary Conservation Areas. The first step involves identifying Primary Conservation Areas (Fig. 19-6A, limited to wetlands, floodplains and steep slopes), and Secondary Conservation Areas (Fig. 19-6B) including those unprotected elements of the natural and cultural landscape that deserve to be spared from clearing, grading, and development. In this example the mature upland forest habitat is of critical environmental importance, while the farmland's ecological value is negligible. Source: Arendt 1993



Figures 19-7 A and B: Potential Development Areas and Step Two, Locating House Sites. Delineating

conservation areas first automatically defines “Potential Development Areas,” (Fig. 19-7A) which occupy the balance of the site. The second step involves locating the approximate sites of individual houses (Fig. 19-7B) which, for marketing and quality-of-life reasons, should be placed at a respectful proximity to the conservation areas, with homes backing up to woodlands or hedgerows for privacy or looking out onto a central common or wildflower meadow. Care must be taken to ensure that stormwater management or sanitary sewer facilities do not intrude into fragile conservation areas such as woodlands. In a full-density plan, the number of house sites will be the same as that shown on the “Yield Plan” (72 in this example). Source: Arendt 1993



Figures 19-8 A and B: Step Three, Aligning Streets and Trails; and Step Four, Drawing in the Lot Lines. The third step consists of tracing a logical alignment for local streets to access the 72 homes and for informal footpaths to connect various parts of the neighborhood, providing recreational space while building community among residents (Fig. 19-8A). The final step involves drawing in the lot lines, perhaps the least important part of the process. Successful developers of open space subdivisions know that most buyers prefer homes in attractive park-like settings, and that views of protected open space enable them to sell lots or houses faster and at premium prices (Fig. 19-8B). Such homes also tend to appreciate more in value, compared with those on lots in standard “cookie-cutter” developments offering neither views nor nearby open space Source: Arendt 1993

Following the above sequence generally maximizes political acceptance, as the logic of the design process and its results are easily appreciated. Adopting this approach in local plans and regulations ensures that conservation subdivisions will become the default position for future development (at least within certain districts), that these neighborhoods will be designed around the central organizing principle of protecting open space, and that the open space will be intelligently related to community-wide greenway network planning.

The results of applying the four-step approach to a 260-acre parcel of land in Walworth County WI are illustrated in Fig. 19-9. After walking the property with the applicant, town and county planning staff members, and the developer’s environmental consultants, the site designer worked collaboratively with the group to identify primary and secondary conservation areas. After this critical first step had been agreed upon the location of the 51 home sites followed easily, as the next goal was to provide attractive views from each house. Instead of driving the design, streets were aligned in accordance with the conservation areas and house sites, and then lot lines were added. Due to the low overall density in this zoning district (one du per five acres), this project was able to achieve an unusually high open space ratio, close to 70 percent.

<http://sugarcreekpreserve.com/vision/>



Figure 19-9: Sugar Creek Preserve, in southeastern Wisconsin, is a textbook example of applying the four-step design process. Step Three is pictured here, just prior to drawing in lot lines. The vast majority of woodlands were preserved, and much of the former farmland has been restored to prairie habitat. The lake, with its beach, dock, and limestone pavilion, is surrounded by protected open space. Source: Keefe Real Estate and RA photo

The four-step design process is also a highly effective teaching tool for municipal officials, planning staff, developers, and engineers, who have typically received little or no prior training in laying out residential neighborhoods according to open space conservation principles. Following heavily-illustrated powerpoint presentations, staff at the natural Lands Trust in Media Pennsylvania engage workshop attendees in a participatory hands-on design exercise where people learn by doing. Each table of four to six people is given a base map of a property on which landscape features common in the region have been identified.

Participants are informed that the density regulations under current zoning allow say 36 houselots to be created, with half of the buildable land (and all the constrained land) preserved as permanent open space. In this example, each table is given 36 M&Ms to move about the base map to avoid impacting areas to be conserved (greenlining them is the first step). At the end of an hour each table presents its design solution to the entire group; participants leave the workshop knowing that conservation design is an intuitive, easily-understood approach that is not difficult for developers to follow. (See Fig. 19-17)

Open Space Networks

To counter the negative impact produced by the build-out map (Fig. 2-10), an image projecting a positive future will help to prevent residents from becoming cynical or hopeless. A positive image also helps to generate support for zoning improvements by showing people how much more of their valued rural surroundings could survive the development process, if conventional approaches were to be replaced with more creative design techniques.

One of the best ways of projecting a positive image is to use another highly visual device: a community-wide map illustrating a “greener vision” for preserving interconnected networks of open space, made possible through conservation design, and supplemented with strategic land purchases and easement donations. Officials in Pike Township in Berks County PA worked with NLT staff to create the conservation opportunities map shown in Figure 19-10, as a broad-brush guide to identify areas where development must be designed carefully and compactly, in order to minimize land consumption and environmental impacts

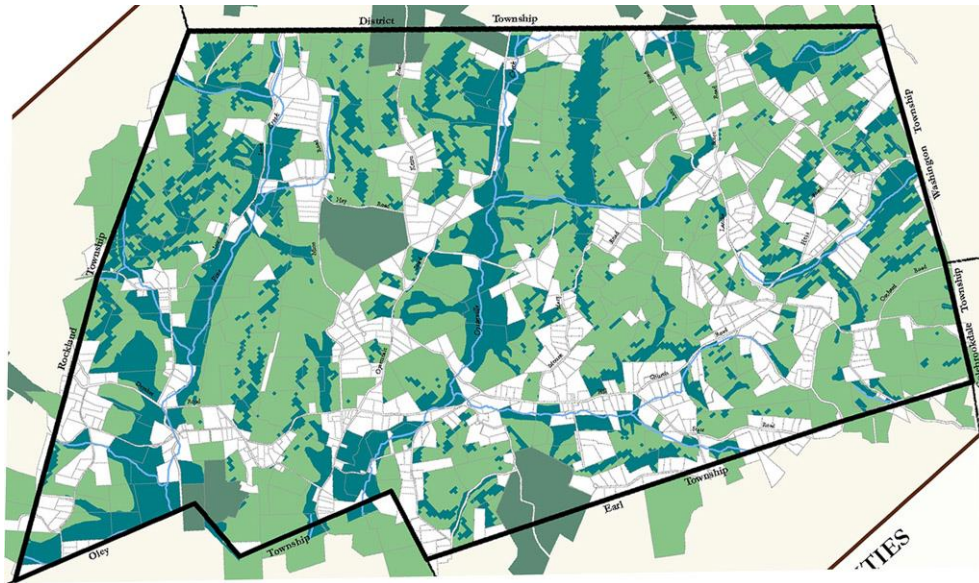


Figure 19-10: This conservation opportunities map of Pike Township in Berks County PA highlights not only the unbuildable greenway core (wetlands, floodplains, and steep slopes, shown in blue) but also the less constrained uplands where a majority of land in every new subdivision could be designed around and permanently protected (green). The darkest color represents already protected parcels, typically parks and preserves. Source: Natural Lands Trust

This was essentially the approach taken in the Washington Valley area of Bridgewater Township, NJ, where municipal officials prepared a large-scale map showing where development and open space should be located on every parcel along the stream corridor (details in Chapter 15). In another central New Jersey township, consulting landscape architects and planners are hired on a regular basis to work with applicants at the sketch plan stage to ensure that an appropriate amount and type of open space is set aside in each new subdivision, and that these green areas are designed to connect with each other in adjoining developments. (Further described in the "Alexandria Trilogy" case example in Chapter 21.)

This kind of graphic can be taken to the next level in a "Map of Potential Conservation Lands" which also locates areas most suitable for development. This more detailed map, which identifies specific landscape types and environmental constraints, should be included in municipal comprehensive plans and also incorporated as a regulatory feature of zoning and subdivision ordinances (See Figure 19-11.) Landowners and intending developers would then be aware of both the constraints and the opportunities existing throughout the community and would be able to determine which parts of their land will be required for conservation purposes and which will be allowed to be more intensively developed.

Development applicants would be required, under zoning, to utilize flexible conservation design techniques to keep houselots away from areas recommended for preservation, locating new homes and streets on other parts of their properties. Building density would be calculated on the basis of the amount of developable land on any given parcel (or through a conceptual "yield plan" for such a parcel). This approach allows blocks of habitat and farmland to remain more whole. It is also a powerful tool for greenway planning, enabling a continuous ribbon of open space to be created along streams, for example, as each riparian parcel is subdivided.

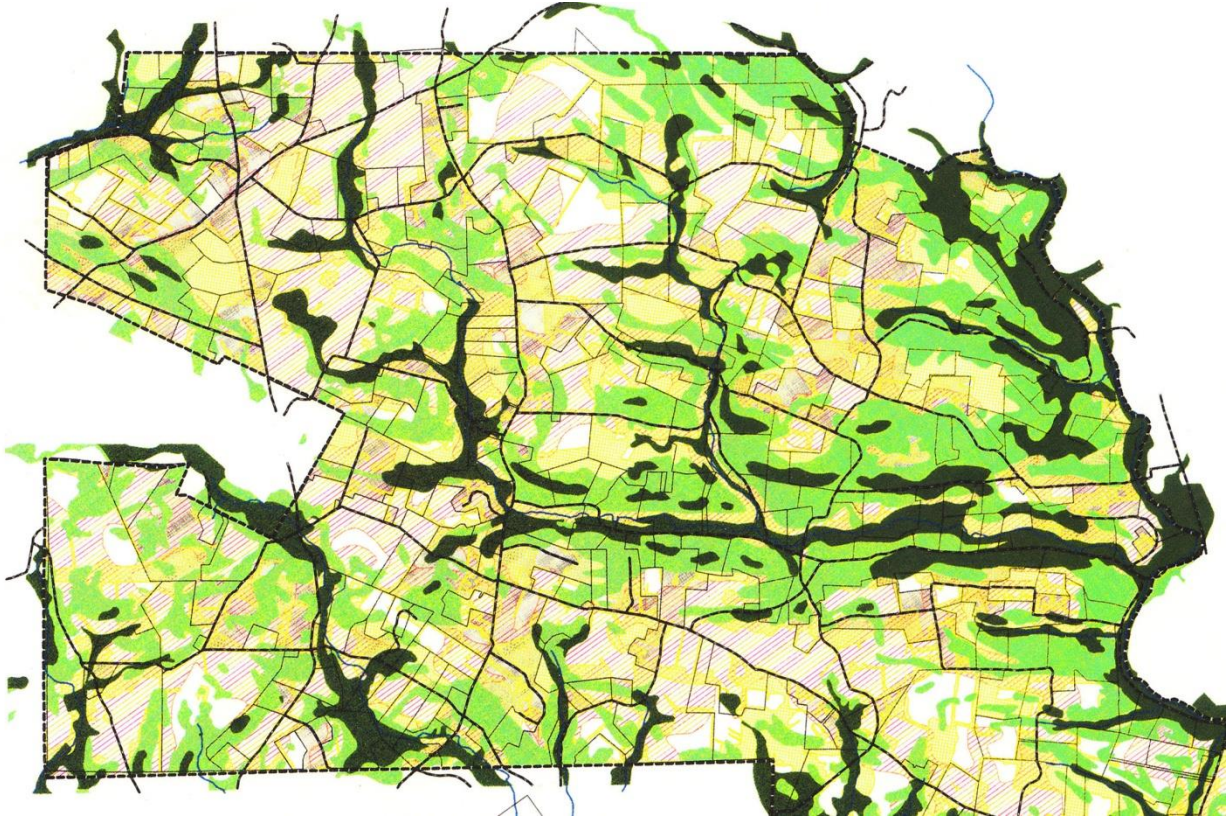


Figure 19-11: Map of Potential Conservation Lands. Land that is unsuitable for development is shown in very dark green (wetlands, floodplains and steep slopes), and is called Primary Conservation Areas. Land that is buildable but moderately constrained is shaded medium green and is classified as Secondary Conservation Areas. Yellow areas and hatched areas represent the least constrained land, upland forest being colored yellow, and hatched areas representing farmland. Some communities have policies to protect farmland, while others guide development away from wooded habitat, which typically possesses the greatest biodiversity and ability to buffer water quality. This map is from West Vincent Township, Chester County, PA. Source: Natural Lands Trust

The idea of mapping potential conservation areas in advance of development was imaginatively refined by officials of West Manchester Township in York County, Pennsylvania. After completing a "build-out" map illustrating the sprawl pattern that existing zoning would ultimately produce, township officials used tax parcel maps to draw a broad-brush map outlining recommended growth areas and preservation areas on individual properties. This enabled them to avoid inadvertently coloring any parcels entirely green, for an important goal was to demonstrate that meaningful conservation could be accomplished without committing a "taking" that would require compensation (see Figure 19-12). Through this process, each parcel of vacant land was quickly evaluated for its conservation and development potential. Township planners often identified areas with trees, such as riparian woodlands and hedgerows as areas for conservation in this predominantly open, agrarian landscape.



Figure 19-12: West Manchester Township, Pennsylvania, gives guidance to landowners and developers about where open space should be located on their parcels when they are eventually subdivided. Township officials engaged a consultant to draw, on the official tax parcel maps, boundaries of the new open space system as it crossed various properties, showing how areas required to be preserved in each new development could be located to connect with each other. Source: Arendt 2010 and Natural Lands Trust

This level of guidance was provided by township officials to help landowners and developers visualize the approach that would be needed on each property to ensure that an interconnected system of open space would result from application of the ordinance. Although many of the localities mentioned in this section are characterized by zoning densities of one to two acres per dwelling, standard lot sizes in West Manchester are 20,000 SF, reflecting the community's proximity to the county seat and the availability of public water and sewerage. The goal of the ordinance is to protect 45 percent of each property as open space by limiting lot sizes to 10,000 SF. In the two decades since this provision was adopted there have been no legal challenges, and most developers have followed the green-line recommendations on the township maps, although several have requested that the open space be relocated to different parts of their properties.

Preservation areas might typically include (in addition to wetlands and floodplains), farm fields, pastures, stone walls, stone-lined dug wells and cellarholes, steep slopes, ridgelines, hilltops, aquifers for public drinking water supplies, significant wildlife habitats, shorelines (alongside lakes, rivers, or the ocean), settings for historic buildings, and locations comprising scenic views or scenic view corridors. To the maximum extent feasible, new development should be *required* to be located outside such areas and allowed to be arranged at higher net densities on other parts of an applicant's property. In essence this is simply an internal density transfer involving the same number of dwellings.

However, when the features to be protected are particularly sensitive to encroachment, or when they cover all or most of an individual's land, mechanisms should be readily available to enable and encourage inter-parcel density exchanges (such as the "landowner compacts" described in Chapter 17 and Howard County's "density exchange option" described in Chapter 18). In other words, a miniature version of "TDR" (transfer of development rights) should be facilitated by the creative zoning regulations. Other methods of protecting the land can and should be employed to

supplement such regulatory measures, such as "PDR" (the selective purchase of development rights) and "limited development" (subdividing land into fewer, upscale properties).

In the past it has been traditional to include conservation "wish list" maps in municipal comprehensive plans and open space plans, but they have typically been no more than hopeful statements about what lands might be saved if landowners voluntarily restricted development on them, if public or private bodies had sufficient funds to purchase them for parkland, or if developers could be persuaded to utilize conservation design techniques when laying out subdivisions. It should no longer be necessary for planners to color maps green and cross their fingers. The critical difference in the type of map described here is that it would be an official regulatory document, like the map of zoning districts. In actuality, it would function as a map of overlay districts, in which the concept of conservation design would become obligatory for developers, or so effectively encouraged by the ordinance that this approach is followed nearly all the time. (One such way is to halve the density allowed in conventional layouts, creating a "density penalty" for not designing a full-density CD that better implements key comprehensive plan goals, as described below in "Density Bonuses and Penalties")

Open space reserved in conservation subdivisions in three Massachusetts towns (Westford, Hopkinton, and Westborough) have reached a point where they have begun to form interconnected open space networks, with trails linking these neighborhoods with other protected properties owned by the town or a local land trust (Fig. 19-13). In Westford, lands preserved in five conservation subdivisions join with three town-owned preserves enabling a 2.75-mile trail to be created. In one area of Hopkinton, six adjoining conservation subdivisions have created a block of 215 preserved acres, which also connects to the Hopkinton State Park. In a second area, four subdivisions with 149 acres of open space link with one another and also with 130 acres that Hopkinton acquired with state and local funds, some of it for public drinking water supply wells. (Fig. 19-13). This block of 279 acres is being enlarged by an additional 500 acres from a major mixed-use development on former nursery land, where development will occupy 230 acres of the 730-acre tract (email from Elaine Lazarus, Hopkinton town planner, 3.3.13) The Westborough experience is described in Chapter 15. Westborough's successes in preserving open space networks are described later in this chapter and are illustrated in Fig. 15-13.

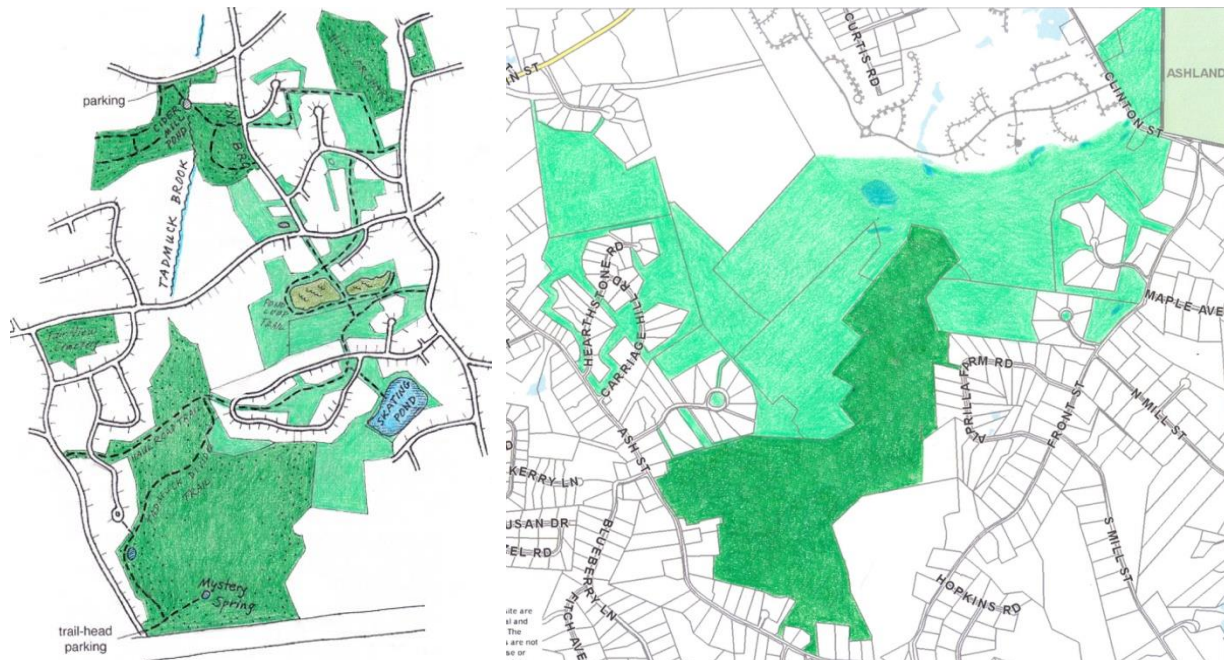


Figure 19-13 : The “Long Trail” In Westford MA (left) connects Mystery Spring with Cider Mill Pond along a route through five conservation subdivisions (light green) and three preserves owned by the town (darker green). In Hopkinton MA (right), 149 acres of open space in four conservation subdivisions (light green) connect with one another and with 130 acres acquired by the town to protect public water supply wells (darker green). These 279 acres are being enlarged with 500 acres of open space in an adjoining mixed-use development. Sources: Westford Conservation Trust and the Hopkinton Department of Land Use and Planning

In the Milwaukee area, the Southeastern Wisconsin Regional Planning Commission (SEWRPC) has for several decades advocated for progressive intermunicipal planning to create connected trail and open space networks. An excellent example of its work is the 2004 Hartland-Merton Cluster Development Plan which contains a map of parts of two adjacent municipalities showing how subdivisions could be laid out on nearly two dozen contiguous properties to create a network of footpaths and bikeways. http://www.sewrpc.org/SEWRPCFiles/Publications/mr/mr-163_hartland-merton_cluster_dev_plan.pdf A map in that plan illustrates the concept of delineating the open space in basic cluster subdivisions to create trail connections across entire communities. Another approach would be to blend new urban design with greenway planning as described in Chapter 8. In southeastern Wisconsin the best example of this is the ~~town~~ **Village** of Greendale, dating from the 1930s (Fig. 8-5). In the Hartland-Merton plan, more than 20 adjoining properties were conceptually platted with substantial open space to demonstrate the street, trail, and open space connectivity that could be created if each developer followed basic design standards in that plan. Continuous trails could easily cross the two communities in both north-south and east-west directions. Similar connectivity could be achieved by utilizing more rectilinear street-and-block patterns instead, as in Greendale.

In addition to several illustrative maps showing how this concept could be applied to specific properties (accounting for site constraints), the Hartland-Merton plan contains design guidelines to ensure connectivity and to encourage the retention of “country character” (such as requiring informally landscaped buffers 100-200 feet deep along major public roadways, consisting of trees, shrubs, rail fences, and low stone walls. Notably, the proposed greenway network begins at the northern end of the planning area in Merton, where the Woodfield Village conservation subdivision (described as a case study in Arendt, 1994, *q.v.*) first introduced this design approach

to the community in the early 1970s. An excellent roadside buffer from that development, which does not rely on suburban berming, is illustrated in Figure 19-14)



Figure 19-14: This paddock and area for informal games preserves rural character and provides a deep buffer between Rybeck Road and the homes in Woodfield Village South, in Merton WI, without suburban berming or lines of evergreens along the roadside edge. (RA)

These and similar approaches can help protect interconnected networks of conservation lands. The most comprehensive results can potentially be achieved in states where counties exercise land-use controls, or where regional agencies have such powers. In other states, where zoning is implemented only by smaller jurisdictions (typically towns and townships), the challenges of achieving landscape-scale solutions with site-specific techniques are greater, but not insurmountable. As with other progressive planning techniques, results will vary in their degree of success, particularly as long as conventional subdivisions remain an option, for many developers will continue to create them, interrupting network continuity.

Calculating Density

Density must be determined fairly according to a clear and equitable method. When "cluster" developments were first being encouraged during the 1970s, it was not uncommon for municipalities to adopt a simplistic approach based upon gross acreage. However, ordinances that calculate density based on gross tract acreage are fundamentally flawed, as houselots could not possibly be created in unbuildable areas, such as wetlands. Allowing unbuildable land to be counted fully in density calculations is also unfair to applicants who have bought the same amount of acreage

but who paid more for it because it is dry and usable, not wet or partially submerged. Common sense and basic land economics should apply. For example, farmers pay the same for 300 acres of land of which only 200 have agricultural potential as they pay for a 200-acre property containing no unusable land. Allowing developers to include hazardous floodplains, wetlands, or submerged land in density calculations artificially inflates the legal lot count, and often fuels abutter opposition

The clearest and fairest method of determining density is through "yield plans": conceptual sketches of conventional layouts drawn realistically with every lot meeting standard criteria for frontage, area, and minimum percentage of land suitable for homes and yards. In unsewered neighborhoods, applicants should be required to submit evidence that 10 percent of the lots could support septic systems (with local officials selecting the most dubious lots for testing). Failing lots are eliminated at once, with another 10 percent being tested until all those in the current sample pass muster. Proposed streets are also examined to ensure that they meet local standards (especially for maximum gradient). The resultant "lot yield" would determine the number of units permissible in a conservation design.

Developers opting not to prepare conceptual sketch plans demonstrating the density potential of their sites could use a "netting-out" formula in the zoning ordinance, which should be carefully calibrated to ensure fairness. In West Bradford Township, Chester County, Pennsylvania, planning commissioners field-tested proposed density formulas through "reality checks," applying them to previously approved conventional subdivisions to ensure that the percentages for discounting various types of environmentally sensitive land would not have produced significantly more or fewer units than were approved. The goal is to create formulas that are density-neutral, compared with conventional layouts.



Figure 19-15: Eighteen lots are shown on the conventional "Yield Plan" on the left (at a two-acre size) and on the conservation design in the center with one-acre lots, where half of the buildable land has been preserved as permanent open space (in addition to the unbuildable soils and slopes). Double density is shown on the right, with 36 quarter-acre hamlet lots, where 70 percent of the buildable land has been conserved. Density increases generally obligate applicants to provide special benefits to the community, such as significant increases in open space, land dedication to the municipality or land trusts, and/or affordable housing. Source: Arendt 1999 and Natural Lands Trust

Density Bonuses and Penalties

Density bonuses are sometimes offered to developers to encourage them to follow CD principles. However, unless the financial incentive is substantial, most developers will not be willing to change from their conventional and familiar "cookie-cutter" approach (which is often the *only* form

they have experience using). When incentives become too large it becomes difficult to preserve much buildable land as open space. Also, larger bonuses are risky because many people object to "giving" developers any extra units, not even a modest increase.

These opponents miss the point: the resulting provision of open space is far more important to their community in the long run than the additional public costs associated with a marginal increase in the number of new residents living in the subdivision. Once land is checkerboarded into "wall-to-wall houselots," it is nearly impossible to retrofit greenways, trails, parks, and neighborhood playing fields into the established pattern.

Large density incentives are more likely to be politically acceptable in areas where the legal development density is very low to begin with, since greater increases can be permitted without severely compromising the rural resource. A zoning provision in the Bozeman area of Gallatin County, Montana, illustrates this approach. In those rural areas where land may be split into 20-acre parcels, zoning encourages more compact development by offering a substantial density bonus. To qualify for the extra lots, they are limited to one acre in size and the balance of the development must be preserved as open space. A sliding scale for the density bonus determines the number of one-acre lots that are allowed, and the open space is the land remaining after those lots have been created. In one case, a developer with 120-acres created nine one-acre lots (a 50 percent bonus), allowing the remaining land (about 116 acres) to be protected as an area used by elk every spring for calving. (email from Sean O'Callaghan, Gallatin County Planning, 3.18.13)

An alternative to using density bonuses to encourage more compact development forms is to employ density *penalties* for squandering important resource land in large-lot plats. On the Olympic peninsula in Washington, Clallam County's commercial forest transition zoning encourages developers to group their houselots on between one-quarter and one-half of their land area. It achieves this by lowering densities for conventional design, i.e, by requiring minimum lot sizes of 80 acres, but permitting densities of one du per 19.6 acres in one district and one du per 4.8 acres in another district, with retention of a minimum of 75percent of land in a forest reserve. The two forest transition zones are situated between more restrictive long-term commercial forest land (where this approach is not allowed) and zoned areas.

Forty-four townships in Pennsylvania have adopted ordinances using the Growing Greener model (discussed below) in which the usual density is attainable only through conservation design. Conventional layouts are disincentivized by reducing density by half for layouts that do not follow these preferred design principles. This does not constitute a "taking" because applicants can achieve full density through the by-right option for conservation design.

Addressing Public Concerns

Most open space in conservation subdivisions is owned and maintained by homeowner associations, unless parts are offered to a local land trust or municipality (usually for use as public trails or sports fields). This arrangement has worked well for decades in thousands of developments because of two basic requirements: membership in the association is automatic upon property purchase, and the association is legally authorized (in its bylaws) to place liens on members who fail to pay their dues. (This rarely happens due to peer pressure.) Recapturing unpaid dues before a property can be legally resold ensures that associations are never short-changed.

Citizens must also be reassured that the open space will be permanently protected through conservation easements co-signed by local governmental bodies *and* by private nonprofit organizations (such as land trusts). The two parties can easily prevent easement changes simply by declining any future requests to amend the document to allow further development. Easements are far superior to deed restrictions, as they are more broadly enforceable.

Concerns about the effects on property-tax revenue must also be addressed. Conservation design is tax-neutral because it changes neither the number of houses nor the total acreage assessed. Every down-sized lot is assessed together with a proportionate share of the common land. To use an analogy, municipal assessors do not discount the value of small lots near golf courses because they recognize the added value that proximity to the open space confers on those lots.

Public uneasiness about septic system installation at perceived "higher densities" is also common. Fortunately, it can be fairly easily shown that the tremendous site design flexibility inherent with CD usually allows for *better* disposal solutions than can be achieved with rigid checkerboard lot layouts (see Chapter 14, particularly the section on off-lot individual drainfields).

Maintenance and liability concerns can also impede public support, but they can be dealt with to most people's satisfaction when certain safeguards and requirements pertaining to homeowners' associations (HOAs) are explained (see the "Ownership, Maintenance and Liability Issues" section later in this chapter).

Concerns by abutters can be eased by inviting them at the beginning to participate in the site visit with local staff and officials, where they can see the logical areas for conservation and development and appreciate the benefits of this design approach. (Fig. 19-16). With detailed site analysis map in hand, staff, officials, abutters and the applicant should the property to determine which features should be designed around and preserved. Without the benefit of experiencing the property in a three-dimensional manner (rather than viewing a two-dimensional abstraction in a meeting room) at a very early stage in the process -- even before a *Sketch Plan* is submitted -- it is extremely difficult to offer informed suggestions as to the preferred locations of conservation areas and development areas, and to evaluate the proposed layouts. The site walk should become a standard operating procedure, and part of the job description for all relevant staff and officials). It should ideally occur at the front end of the process, prior to *Sketch Plan* submittal. Sometimes those who walk the property remain together to spend several more hours sketching a conceptual layout that designs development areas around the special features identified during the walk. This kind of immediate feedback and design work generally leads to a smoother and speedier review process. (Arendt, 2014)



Figure 19-16 : Site walks are an invaluable tool to introduce planning board members to a property to see its opportunities and constraints first-hand, before expensive layouts have been prepared. It also provides an opportunity to introduce abutters to the design process so they better understand its benefits. Seen here are site walks in Allen TX, Willington CT, and Sheridan WY. (RA all)

Ownership, Maintenance and Liability Issues

Most open space in conservation subdivisions is owned and maintained by homeowner associations. [It is estimated that 231,000 neighborhoods with 47,000 residents are governed by such associations. (Kohn, 2004)]. This arrangement has worked well for decades in thousands of developments because of two basic requirements: membership in the association is automatic upon property purchase, and the association is legally authorized (in its bylaws) to place liens on members who fail to pay their dues. (This rarely happens due to peer pressure.) Recapturing unpaid dues before a property can be legally resold ensures that associations are never short-changed. Alternatively, all or part of the open space could be owned by the municipality, which might want certain lands for trail networks or parks, if the developer is agreeable. (The model regulations contain provisions enabling municipal officials to offer a density bonus to encourage such a land donation.) A third alternative is for some of the conservation land to be retained by the original farmer for continued agricultural, horticultural or silvicultural use. Or it could be sold by the developer for such uses, which might include equestrian activities.

Complete ordinances also require that management plans be drafted for municipal review and approval to clarify the responsibilities of caring for the conservation land. In Lower Merion Township, Montgomery County, PA, for example, the community’s “model” management plan is typically adapted by each subdivision applicant, who tailors it to his own situation. That document identifies a dozen different kinds of conservation areas (from woodlands and pastures to ballfields and abandoned farmland that is reforesting) and describes recommended management practices for each one. Whether stewardship is conducted by a homeowner association, land trust, municipality, or other entity, several steps are essential. After determining which areas are to be maintained, by whom, and how frequently, individual tasks should be identified (by season) and prioritized. Some involve restoration, while most typically involve periodic monitoring, invasive vegetation removal, and routine maintenance. Farmland is typically leased by HOAs and land trusts to local farmers, who often agree to modify some of their agricultural practices to minimize impacts on nearby residents. Although ballfields and neighborhood greens require weekly mowing, conservation meadows typically need only annual mowing. Woodlands generally require the least maintenance: trimming bushes along walking trails, and removing invasive vines around the outer edges where greater sunlight penetration favors their growth. Readers new to the concept of open space management have a

ready resource in the *Stewardship Handbook* prepared by the Natural Lands Trust (NLT), and available for free downloading, at www.natlands.org/handbook. Its 220 pages address how to prepare stewardship plans, restore forests, manage invasives and deer impacts, conduct controlled burns, and establish native meadows and grasslands, among other topics. Although it is based on decades of experience in southeastern Pennsylvania, much of its content is applicable to other parts of the country and, at a minimum, serves as a detailed checklist of issues that are important to consider.

As noted in Chapter 15 on greenways, all 50 states have enacted laws protecting landowners from lawsuits filed by non-fee paying visitors who use their property for recreational purposes. This broad protection applies to conservation areas within subdivisions as well. According to one researcher at the U.S. Forest Service, "in most states the claimant must prove at least gross negligence in order to establish a basis for suit under the Recreation Use Liability Statutes" (Hronek, 1989). For example, in Pennsylvania the Recreation Use of Land and Water Act protects owners of undeveloped land from liability for negligence if the landowner does not charge a fee to recreational users. A tree root or rock outcropping along a trail that trips a hiker will not constitute landowner negligence. To be sued successfully in Pennsylvania, landowners must be found to have "willfully or maliciously failed to guard against a dangerous condition." This is a much more difficult case for plaintiffs to make. Even so, to cover themselves against such situations, owners of open space in conservation subdivisions typically purchase liability insurance policies similar to those that most homeowners maintain. Due to the small number of claims, these policies are generally inexpensive.

Consumer Preferences

According to studies comparing conventional subdivisions with those designed with conservation features, a distinct consumer preference exists for the latter. In a study conducted in Iowa, two-thirds of respondents were willing to pay more for neighborhoods containing open space. In addition, conservation subdivisions were found to appreciate at higher rates than conventional ones. In their concluding comments, the authors state that "The evidence suggests that open space/ conservation in subdivision developments have the potential to increase returns to developers (in terms of potentially higher revenues and more consistent sales) and to cities (in the form of tax revenue based on assessed home value)." (Bowman, et al., 2009)

Contrasting developments with comparable house sizes, a study of subdivisions with significant open space in Hamburg Township, MI revealed that house prices there rose twice as fast as those in conventional subdivisions, even though lots were half the size (Stanford, 1999). These results are greater than those found in some previous studies such as one conducted by the Center for Rural Massachusetts which found that, over a 21-year period, homes in a very dated cluster subdivision with minimal and highly fragmented open space appreciated 12.7 percent faster than similar homes in developments without open space. The faster-appreciating development featured 36 acres of open space with two ponds, a tennis court, a baseball diamond, a playing field/village common, and a nature trail. In contrast, the conventional subdivision offered little more than larger lots (half acre, versus quarter-acre) and a small amount of open space (Lacy, 1990).

Developer Issues

For developers who are concerned that innovative subdivision designs pose financial risk, research indicates otherwise. In a scholarly article examining price premiums, investment costs, and absorption rates for lots in conservation subdivisions *versus* those in conventional ones in Rhode Island, results showed that lots in the former command a premium, are less expensive to build, and sell more quickly than lots in conventional subdivisions (Mohamed, 2006). Specifically, lots in conservation subdivisions examined in the study cost about \$7,400 less to produce, on average, than lots in conventional subdivisions, and sold in about half the time as lots without open space.

These results have been confirmed by a more recent study of home sales in more than 200 developments in five Colorado counties, where sales prices were 20 to 29 percent higher for homes in conservation subdivisions when compared with conventional rural residential projects. (Hannum, 2012). This research was funded by the National Association of Realtors and CSU's School of Global Environmental Sustainability at Colorado State University.

Perhaps the greatest obstacle to any kind of innovative development (CD, new urban, etc.) is the length of time required to obtain regulatory approval. This is why it is so important that communities classify these better project types as by-right permitted uses, rather than as conditional uses which are subject to discretionary decision-making that adds to costs and increases uncertainty for applicants. Since conventional development demonstrably and consistently fails to meet key comprehensive plan goals and objectives, developers taking that route should have to face the obstacle-ridden conditional use process currently applied to more innovative approaches.

Conservation Design in Sewered Areas

Although conservation subdivision design was initially created for use in rural areas relying on wells and septic systems, this design approach can be adapted and used in higher-density areas served by public utilities. However, when overall densities quadruple from say two acres/dwelling to two dwellings/acre, the percentage of open space necessarily falls. In such cases the Southeastern Wisconsin Regional Planning Commission suggests **at least** 40 percent of the total acreage **remain open**, although a better goal would be 40 percent of unconstrained land (plus unbuildable acreage). In order to avoid confusion, these developments with lesser percentages of preserved land should be called something other than conservation subdivisions, perhaps "greenway" or open space developments. Examples of combining the conservation design technique with the new urbanism, at these nonrural densities, are discussed in Chapter 8. Many of the infill examples illustrated in Section 20.1 are worthy of emulation. Although they cannot properly be termed "conservation subdivisions", they possess numerous positive attributes, as do many of the examples in *Crossroads, Hamlet, Village, Town* (Arendt, 2004).

Notable Initiatives and Achievements by States, Counties, and Municipalities

In what is perhaps the largest-scale study of developments designed to conserve land, Milder and Clark (2011) examined 3,338 examples of various types of conservation developments across the United States. Of these, they classified 477 as being conservation subdivisions. Developments in this category averaged 80 acres in size, were built at an average density of 0.45 dwelling units per acre, and protected an average of 57 percent of the site. Extrapolating from the surveyed

sample, Milder and Clark estimated that conservation subdivisions have resulted in the protection of more than 177,000 acres of land across the United States (email from Jeff Milder, 1.23.14) (It should be noted that this study included developments where at least 40 percent of the total area was protected, including constrained lands, which is a lower threshold than used in this volume, or in the author's other books.)

Leadership is key to success. Where support for conservation design ordinances exists among influential elected or appointed officials, such regulations are more speedily adopted. After this concept was embraced by leading members of local government in Wallace Township, Chester County PA, and in Richmond RI, ordinances were drafted and adopted within several months and became the official policy of those communities. Commitment to the concept by local officials ensured that extra efforts were made to explain the details and to promote conservation design as a very smart way of shaping rural development patterns. At the county level, strong leadership by two successive planning directors in Hanover County VA and Monroe County PA has made all the difference in the success of these ordinances

In Hanover, more than 5,500 acres of land have been preserved through this simple technique over the past 12 years, and in Monroe 18 of the county's 20 municipalities have adopted these regulations, ensuring that most rural subdivisions follow this design approach. However, in other counties with similar growth pressures in these states, where county leadership has not effectively promoted conservation subdivisions, little progress has occurred, underscoring the need to build solid support among elected and appointed officials for such programs to achieve their full potential.

The most extensive results have occurred when state agency or university programs have dedicated staff resources to promoting this concept and when county planning departments have focused on advocacy and implementation. Among the states that stand out in this regard are Massachusetts, Rhode Island, Pennsylvania, Ohio, and North Carolina. Occasionally a real estate development company plays a major role in creating subdivisions with substantial open space within its region (as in the Milwaukee area).

In a study of land-conserving subdivisions in eleven western states, it was found that more than 30 percent of counties had adopted such legislation, mostly between 2003 and 2013, the peak year being 2008 (Reed, Sarah, et al., 2014). About one-third require 41-60 percent of the land to be conserved, with another 40 percent requiring 61-80 percent. However, only 13 percent of the ordinances required ecological site analysis, and just 8 percent recommended consulting with ecological experts in designing the conservation areas, a common deficiency meriting improvement in other regions as well.

Massachusetts

Following the publication of a major book on conservation subdivisions in 1988 (*Dealing with Change in the Connecticut River Valley: A Design Manual for Conservation and Development*), staff at the Center for Rural Massachusetts (CRM) toured the commonwealth with a slide show, making presentations in more than 100 towns and introducing model ordinance language to local planning boards. This effort was initially funded by the Rural Caucus of the state legislature, which appropriated money to the Department of Landscape Architecture and Regional Planning at the University of Massachusetts/Amherst for this purpose. As a result of this initiative a group of state and regional agencies, nonprofits, and developers created the Green Neighborhoods

Alliance which held further workshops and published a model code downloadable at <http://www.greenneighborhoods.org>. A third initiative, by the Massachusetts Executive Office of Environmental Affairs and the Metropolitan Area Planning Commission, produced a 38-page booklet (entitled the *Conservation Subdivision Design Project*) to help towns codify this design approach. This publication explains what conservation design is and is not (distinguishing it from outdated clustering) and contains seven sections describing various elements of this kind of regulation from procedures and density determination to dimensional requirements, design guidelines, and incentives.

These efforts led to a number of communities adopting or improving their regulations. According to the Green Neighborhoods website, 78 towns have adopted its model Open Space Residential Development (OSRD) regulations, and 143 other towns that had earlier clustering provisions; have updated and improved them. (These communities account for 60 percent of all local governments in the state.) Although no totals exist for the number of acres preserved by this initiative, the results in four communities stand out in particular: Amherst, Westford, Hopkinton, and Westborough. These impressive results demonstrate the progress that can be made even in home rule states where all land-use regulation is adopted and administered at the sub-county level. In three of these communities, protected lands have begun to interconnect in conservation subdivisions that either adjoin one another or abut public parks and preserves.

The town of Amherst (population 37,819) has preserved approximately 270 acres through a variety of residential development methods. CD is required in farmland conservation overlay districts, over and around an aquifer providing some of the town's public water supplies, and within the watershed of a surface water reservoir. Within the farmland conservation overlay district, design standards require developers to site houselots away from areas most suitable for crops and livestock, and to maintain existing roadside views whenever possible.

In Westford (population 21,951), 29 conservation subdivisions protect about 650 acres. In half of them, the Westford Conservation Trust (WCT) administers the open space jointly with the municipal conservation commission. As described in the *Westford Trails* booklet published by WCT, the "Long Trail" links open space in five conservation subdivisions with three town-owned properties, on a 2.75-mile walk (Fig. 19-13). The town requires subdivision applicants to submit two sketch plans, one conforming to its open space residential" provisions. The planning board reviews both and decides which one is best for the community, taking into account all regulations and the comprehensive plan.

In Hopkinton (population 14,925), which requires that landscape architects prepare conceptual designs for conservation subdivisions, 36 such developments have been created over the last two decades, saving 875 acres of land. Of this total, 254 acres are owned by the town, 307 are held by homeowner associations, and 314 acres have been given to land trusts. When this design concept is applied in a community over a period of years, numerous open space linkages begin to occur (see Fig. 19-13). Since 1996 the town has been implementing a similar open space requirement in its commercial and industrial zones.

Similar successes in creating interconnected open space networks with conservation subdivisions have been achieved in Westborough (population 18,272), where 448 acres of land have been preserved in 23 subdivisions. Significantly, the town adopted an open space plan in 1996 to identify

areas to be targeted for conservation. A number of conservation subdivisions now connect with each other, and to municipal open space, land trust preserves, and state parkland through a 22-mile loop trail known as the Westborough Charm Bracelet Trail. A network of secondary trails links these greenspaces to various schools and neighborhoods. (Fig. 15-13).

Pennsylvania

In Pennsylvania several land trusts in the Philadelphia region have actively promoted conservation design since about 1990. The most extensive effort has been by the Natural Lands Trust (NLT) in Media, which for 15 years received annual funding from several state agencies and foundations for its Growing Greener: Conservation by Design program, led by Ann Hutchinson AICP, a landscape architect. This initiative has provided technical assistance to 30 percent of the 385 fastest-growing communities in the state, one-third of which have adopted rigorous versions of the model ordinance package. A review conducted in 2009 found that these regulations had conserved 2,343 acres (of 3,850 acres developed) in 65 conservation subdivisions in 44 municipalities, and had reduced the development footprint by 61 percent, on average. Significantly, the cost to communities was only that of ordinance adoption, a fraction of the money needed for purchasing land. (Land acquisition costs range from \$5,000 per acre in rural areas to \$35,000 per acre in affluent suburbs.). (Hutchinson, 2013).

The technical handbook created by trust staff for this program was modified for a national audience and published in 1999 by Island Press as *Growing Greener: Putting Conservation into Local Plans and Ordinances* (Arendt, 1999). This is the resource manual used in NLT's Growing Greener program. The technical assistance provided under this program (which could be emulated elsewhere) has included preparing detailed assessments of existing ordinances with specific improvement recommendations, conducting workshops explaining this technique (often paired with hands-on design exercises, as described earlier in the chapter and as depicted in Fig. 19-17), conducting tours of conservation subdivisions to show local officials what these places look like on the ground, drafting new regulatory language, attending planning commission meetings, walking potential subdivision sites, and preparing conceptual layouts on demonstration properties or on parcels proposed for development. Another aspect of its work is training fellow professionals to perform this work in their communities, typically beyond the Philadelphia region. In a series of special workshops entitled "Buy the Best, Zone the Rest", communities learn the economic value of conserving land in municipal acquisition program, coupled with conserving some of "the rest" with conservation design, allowing officials to focus strategically on purchasing selected high-priority parcels, and to connect the remainder with conservation subdivision greenway land. (An example of how that has been accomplished is described in Chapter 15, in a sidebar on London Grove Township.)



Fig. 19-17: Participants in hands-on design exercises, which follow powerpoint presentations describing how the four-step process is used when designing conservation subdivisions, quickly learn all the fundamentals. M&M's are typically used to make it easier to test potential house locations, after the initial step of greenlining the conservation areas has been taken. The next step involves aligning streets and trails, and finally drawing in the lot lines. (Source: RA)

This program has been most active in two counties: Chester and Monroe. In Chester County, where land was being lost to development at the rate of one acre per hour during the late 1980s, voters overwhelmingly approved a referendum to raise and spend \$50m to acquire land and to improve municipal planning and regulations. An important innovation required municipal *Open Space, Recreation, and Environmental Resources Plans* funded under the program to analyze zoning and subdivision ordinances, identify their shortcomings related to land conservation, and recommend specific improvements. Municipal adoption of these plans, which also identified and prioritized conservation opportunities, was a prerequisite for land acquisition grants from the county. In Monroe County in the Pocono Mountains region, the significance of steady leadership by three successive county planning directors, who charged staff with implementing conservation design, cannot be overstated. As of early 2013, such codes are nearly complete in 18 of the county's 20 municipalities. As in Chester County, Monroe County has wisely funded ordinance work as well as acquisition. The Growing Greener model code, ten case studies, and the Growing Greener booklet are all available at <http://www.natlands.org/publications/publications/>

Rhode Island

An excellent and well-illustrated, reader-friendly resource book called *the Rhode Island Conservation Development Guidance Manual* describes a detailed ten-step site planning and design process, modeled on the four-step approach pioneered in *Conservation Design for Subdivisions* (Arendt, 1996). For ease of use by local officials, it is keyed to the conservation site planning and design process established in the state's official land development and subdivision regulations. This approach makes the process very predictable for applicants and simplifies integrating the recommended procedures into existing municipal codes. An appendix clarifies the legal requirements for the benefit of both planning board members and development applicants.

Of 39 municipalities in Rhode Island, 28 have been deemed to be most appropriate for conservation subdivision design by staff at the state Department of Environmental Management (RIDEM), which published the manual. Of those 28, 24 (or 86 percent) have either adopted conservation design or have drafted a pending ordinance, as of February 2014. . Seventeen towns have adopted regulations closely following the state model, representing 61 percent of the eligible towns in the state. (email from Scott Millar, Chief, Sustainable Watersheds Office, RIDEM, 1.17.14)

RI DEM has provided technical and financial assistance to communities to help them adopt the model regulations, significantly assisting implementation. Working closely with the Narragansett Bay National Estuarine Research Reserve's Coastal Training Program, RIDEM staff trained approximately 400 community officials, site planners, engineers, landscape architects and planners on use of the manual and the benefits of conservation design. This program has been a huge success, having been embraced by community planners and the state building industry. In one town, more than 2,700 acres have been protected following implementation of these regulations.

Conservation subdivision design is also being encouraged by RI DEM as an effective way for towns to comply with the state's stormwater regulations requiring towns to utilize low-impact development (LID) approaches (as described in Chapter 13) as the primary means dealing with stormwater. The manual can be found at <http://www.dem.ri.gov/programs/bpoladm/suswshed/pdfs/condev.pdf>

Maine

During the early 1980s, staff at the Southern Maine Regional Planning Commission wrote new model zoning regulations that significantly increased the amount of unconstrained, buildable land required to be protected under rural clustering provisions. Notably, these rural clustering provisions also became basic requirements (no longer simply optional) in designated rural zoning districts, effectively ending large-lot sprawl. Among the towns that adopted these or similar regulations were Arundel, South Berwick, Kennebunk, Readfield, Cumberland, and Freeport. These regulations became the starting point for the model promoted by the Center for Rural Massachusetts beginning in 1989, and for the Growing Greener model ordinances developed in Pennsylvania in the mid-1990s.

In Readfield, subdivisions of ten or more lots must be designed with open space unless the applicant satisfactorily demonstrates to the planning board that this approach would not preserve important natural features, including valuable wildlife habitat. South Berwick's zoning takes this farther, requiring applicants to submit two conceptual subdivision plans and specifically authorizing the planning board to require the open space design after considering "the impacts that a nonclustered approach would have on the noted natural, historical and cultural resources. In reaching its decision, "the board and applicant shall refer to the Comprehensive Plan, the Town Open Space and Recreational Planning Map, the Salmon Falls River Greenbelt Plan, and any other relevant documents, including the applicant's own environmental analysis of the site. The Board and applicant shall also examine the existing built environment of the area proposed for development, analyzing historical structures, working landscapes, architectural design and land use....The board shall require that the plan be clustered if the benefits of the cluster

approach as outlined in the purpose section above, and taking into account comments from various boards and the applicant's own site analysis, will prevent the loss of natural and historical features without increasing the net residential density of the subdivision.” This kind of strong, clear language links key planning documents to municipal regulations in a way that most communities fail to do, and allows local officials to decide which design approach better implements comprehensive plan goals, objectives, and policies. To maximize conservation potential, lot sizes in the one-, two-, and three-acre districts are allowed to be reduced to 15,000, 20,000, and 30,000 SF.

Cumberland effectively requires open space design, but allows developers to propose a conventional large-lot layout. However, its codes require that applicants present two sketch plans to the Planning Board and explain why an open space design would *not* work, which is usually impossible. As a result, nearly all subdivisions are designed with substantial open space, which also reduces infrastructure costs. .

In Freeport, open space design is not mandatory, but is used often, because the ordinance actively discourages large-lot development by halving the density permitted for such proposals. Fees collected in lieu of land dedications have been used to finance an ice skating rink and trail development.

Brunswick (population 20, 278) has pioneered a related approach to preserving certain resource lands, specifically wildlife habitat, that does not require conservation design per se. Building on the *Beginning with Habitat* program (described in Chapter 16), town staff and officials crafted an ordinance in 2004 that takes an “avoid, minimize, mitigate” approach after designating key unfragmented forest blocks and connecting corridors in overlay zones. Because “most subdivision ordinances, if they include requirements for open space set asides, do not include clear guidelines as to what types of land should be set aside and how these open spaces should be configured on the landscape, the dedicated open space often becomes fragmented with limited conservation value. This ordinance is intended to clearly define up front where open space should be targeted.” (www.beginningwithhabitat.org/toolbox/land_overlay.html). According to council member Steve Walker, who developed this program during his “day job”, Brunswick’s Wildlife Habitat Overlay District ordinance identifies conservation goals from the start and incentivizes conservation subdivision design (email from Steve Walker, 10.31.12). In doing so, it maintains ecologically functional landscapes while accommodating development.

To guide ordinance implementation, Brunswick planning staff delineated blocks of unfragmented backland forest at least 150 acres in size, the minimum threshold judged necessary for most woodland mammals, birds, reptiles, and amphibians in the community. These blocks were drawn with buffers of 200 to 300 feet between them and existing roads and development areas. In addition, wildlife travel corridors were identified based on a number of factors, including distances between habitat blocks, development intensity, number of road crossings, and percentage of existing woody cover. Winter field checks were conducted to evaluate corridor usage by examining wildlife track density and diversity, according to a public information sheet prepared by planning staff prior to ordinance adoption.

Ohio

Progress in implementing conservation design regulations in the Buckeye State has been supported by staff at the Community Planning Program (CPP) within Cleveland State University's Maxine Levin School of Urban Affairs. Originally begun as the Countryside Program of the Western Reserve Resource Conservation and Development Council in 1996, CPP staff provides education (through workshops, presentations, and individual discussion sessions), offers technical assistance (on planning, zoning, development, and conservation projects), conducts and participates in research, and serves as a resource and information clearinghouse. Led by Kirby Date AICP, a landscape architect, the CPP provides outreach on best local land-use practices under Ohio's Balanced Growth Program and, as such, also assists with other important community objectives, such as downtown revitalization. Since its inception the program has conducted more than 300 workshops and over 200 technical assistance projects, and has produced a comprehensive handbook of best land-use practices, *Linking Land Use and Ohio's Waters* (available online), which includes extensive information, resources, model regulations, and case studies on conservation development and fourteen other recommended practices. The site contains a number of other resources including a bibliography of research documenting economic benefits and a video featuring developers and elected officials discussing how these practices have benefitted their projects and communities.
<http://www.balancedgrowth.ohio.gov/BestLocalLandUsePractices/BestLocalLandUsePractices2012.aspx>

In addition, the CPP has published an award-winning handbook called the *Conservation Development Resource Manual* with model ordinance language, plus an educational video. The manual may be downloaded at <http://urban.csuohio.edu/cpp/resources>. The CPP website provides a very extensive compendium of information related to conservation subdivisions (<http://www.urban.csuohio.edu/cpp/>) Among its features are articles on 25 topics including calculating density, planning for and maintaining common open space, woodland protection, meadow creation, and wastewater treatment\.

CPP staff report that 39 conservation subdivisions with more than 40 percent open space have been created in northeastern Ohio; it has also identified another 44 notable developments with somewhat lesser open space but possessing conservation aspects worth emulating. As of 2005, 33 communities in that corner of the state (where data have been collected) had adopted conservation subdivision ordinances, a fifty percent increase over the number in 2001.

New York

New York is the only state which has enacted legislation specifically enabling local governments to adopt local laws authorizing their planning boards to require that subdivision applicants submit conservation designs, such as those described in this chapter. [Town Law §278 (2)(b) and Village Law §7-738(2)(b)]

(<http://landuse.law.pace.edu/landuse/documents/laws/reg2/NYTownLawS278.doc>).

Interestingly, these two brief statutes were enacted in response to requests by officials in two towns on Long Island's eastern end, who desired clear authority from the state legislature allowing them to require clustering. (In other states the enabling legislation is silent on the issue of whether local governments may require clustering and, in the absence of any specific prohibition against it in state law, most communities have assumed they have this power because it has not been restricted by statute.

Municipalities in New York are also authorized under these brief two-page statutes, enacted in 1982, to require that applicants subtract the undevelopable land from their density calculations when determining lot yield. (New York State Department of Environmental Conservation and Department of State, 2004) Towns and villages may require clustering in all or some of their residential zoning districts, and may establish thresholds relating to the parcel size or number of lots. The statute also authorizes local governments to regulate uses permitted in the open space, and to establish minimum percentages of open space. For example, in the town of Rhinebeck, the minimum required open space set asides range from 80 percent open space in the RA10 (Rural Agricultural) district to 20 percent in non-residential districts (NY Dept. of State, 2011) Interestingly, the state enabling statute authorizing "mandatory clustering" applies broadly to all kinds of subdivisions including residential, commercial and mixed use subdivisions. In the town of Cazenovia, subdivisions in the Agricultural Overlay district, and subdivisions with nine or more unconstrained acres in other districts, are required to comply with the community's conservation design standards. To maximize the conservation land, no lot size minima are specified. A very helpful feature of this ordinance is a set of graphics illustrating existing conditions, constrained land, and how density is calculated. Four further graphics illustrate a conservation analysis inventory map, a conceptual layout, and two ways of configuring open space easements. It also contains nine page of siting standards with 17 additional sketches. <http://townofcazenovia.org/content/Generic/View/41:field=documents;/content/Documents/File/384.pdf>.

New Hampshire

In the Granite State, the Regional Environmental Planning Program within the New Hampshire Department of Environmental Services encourages conservation subdivision design and includes a lengthy section on this topic in its 2008 publication. *Innovative Land Use Planning Techniques: A Handbook for Sustainable Development*. Created after the state's enabling statutes were amended by the legislature to include various innovative land use controls, this reader-friendly document provides detailed information about conservation subdivision design, including illustrative examples and model code language.

http://des.nh.gov/organization/divisions/water/wmb/repp/documents/ilupt_chpt_1.4.pdf

Michigan

In Livingston County, the county planning department published a 70-page design manual for conservation subdivisions (called "PEARL", for "Protecting the Environment, Agriculture, and the Rural Landscape") in 1991 addressing typical issues of concern to municipal officials when reducing lot sizes from two acres to $\frac{3}{4}$ -acre to conserve 50-60 percent of properties as open space. It recommends that CDs be required in various resource-related overlay districts, but includes a "safety valve" provision permitting local planners to approve standard large-lot layouts in exceptional cases: "only where it can be shown that PEARL is not feasible on the site". This was followed in 1996 by an award-winning 230-page booklet called *Open Space Planning*, providing a fuller discussion, several case studies, and model ordinance language (downloadable at http://www.livgov.com/plan/Documents/Open%20Space%20Planning_Book.pdf

The greatest interest has been shown in four townships in the southeastern corner of the county (Hamburg, Green Oaks, Genoa, and Brighton). Following this approach, nearly 750 acres of open space have been preserved in Hamburg, in 40 conservation subdivisions (see case study of Solitude Pointe and Hunter's Pointe in Chapter 22).

Another Michigan-based resource is the website of LandChoices (www.landchoices.org), a nonprofit promoting conservation subdivision design. It contains an abundance of articles and information sheets on this technique, representing an excellent source of such material.

Wisconsin

In the Milwaukee area, the Southeastern Wisconsin Regional Planning Commission (SEWRPC) has for many years been a strong advocate of conservation subdivision (which it called “rural clustering” for many years), partly because it is a very effective way to preserve resource lands in the Primary Environmental Corridors that it has designated (discussed in Chapter 16 in the green infrastructure). As part of its educational efforts it published a *Rural Cluster Development Guide* in 1996 containing much information and model regulations. The model, updated in 2002, is designed to be applied to parcels of 35 acres or more and requires that all new residential development be grouped to preserve a minimum of 60 percent of the site as common open space at a density of one dwelling per five net acres. Applicants wishing to develop a conventional subdivision must apply for a rezoning to a district allowing developments without open space, or with less open space.

In the southwestern corner of the SEWRPC region, Walworth County’s Land Use and Resource Department reports that, in addition to encouraging the creation of several very notable open space subdivisions, its conservation design ordinance provisions have greatly elevated the design of many planned residential developments (PRDs) which frequently almost meet the full standards required for conservation subdivisions. This significant and unexpected improvement has been a side benefit of the ordinance, which is seen by many developers as enabling them to create a superior product more appealing to homebuyers. Although the county ordinance does not require developers to submit conservation designs, several towns (such as Lyons and LaGrange) do.

Perhaps uniquely in the country, one regional real estate firm has had an enormous impact in conserving the rural landscape in its service area. Starting in the mid-1960s, Siepmann Realty has preserved 1,670 acres of land in 38 subdivisions in southeastern Wisconsin, mostly in Waukesha County. Every one of its developments has contained permanent, quality open space. Four have conserved between 50 and 100 acres, and five have preserved between 100 and 200 acres. The Preserve at Hunter’s Lake, described in chapter 21, protects 187 acres, or 60 percent of the total property. Among the historic structures it has preserved are a farmhouse, a stone barn, and a hop-drying house. Based on its experience, the firm believes that the best management plans are those that include simple, attainable resource conservation goals, including control of invasive vegetation. It has also found that split-rail fencing is an effective way to mark boundaries between lot lines and adjacent open space, to prevent encroachment. Most of its conservation areas are managed by homeowner associations which have performed very well for decades, and in two of its developments the protected land has been deeded to a regional land trust. Lot sales in Siepmann’s subdivisions have outperformed those in conventional developments during the Great Recession, with their Broken Hill neighborhood posting the strongest sales record in the Milwaukee metro area in 2013, according to local appraisers.

A detailed study of flexible developments (including a wide range of clustering, PUDs, and conservation subdivisions) in Waukesha County has documented a number of significant environmental and open space benefits, compared with results in conventional development. Specifically, flexible design reduced the platting of environmental corridor land from 76 percent to just 13 percent; high-value wildlife habitat loss declined from 80 percent to only four percent (Gocmen, 2013), a huge improvement. This researcher's connectivity analysis also found that, of the roughly 2,500 acres of land protected as common open space in the flexible subdivisions she studied, more than 700 acres are adjacent to both environmental corridors and wildlife habitats. Furthermore, high percentages of the common land adjoining environmental corridors and wildlife habitats consist of contiguous woodlands or naturally vegetated lands (as opposed to lawns or turf, which have less environmental value). For the corridors the figure is 48 percent; for habitats the figure is 61 percent. The researcher offered several insightful and helpful suggestions to improve the state of the art. One involves improving ordinance standards regarding the need for greater emphasis on designing developments around key environmental features, including wildlife habitat and travel corridors. To achieve this, layouts should ideally be more compact, avoiding longer streets that increase resource fragmentation. She also recognized the importance of open space management, noting that "in jurisdictions where the local ordinance specified how common land should be maintained (e.g., prairie restoration, farming, no clear cutting), the proportion maintained as mown grass was significantly lower than in jurisdictions where local ordinances did not have such specifications" (Gocmen, 2013).

Interestingly, the Wisconsin Realtors Association advocates for conservation subdivisions and posts an on-line article promoting this approach at <https://www.wra.org/WREM/Jun07/ConservationSubdivisions/>

North Carolina

Beginning in the late 1990s, staff at the Forestry and Environmental Outreach Program at North Carolina State University have advocated for conservation subdivisions design at numerous workshops conducted for professional planners around the state. In 1996 the state Association of County Commissioners published an *Open Space Guidebook* featuring designs for three demonstration sites and containing basic model regulatory language. Two of the counties with demonstration sites adopted CD ordinances soon thereafter (Currituck and Orange). In Orange County, although the first conservation design ordinance classified this approach as a by-right permitted use, few developers opted for it, generally preferring to continue with more familiar conventional layouts. After several years officials improved zoning to require that applicants provide a flexible conservation design with each subdivision concept stage submittal. They may provide a conventional layout as well, if they wish. Staff makes a recommendation to the planning board on which design best achieves the ordinance's conservation objectives. Invariably, staff suggests the conservation design and the planning board concurs.

In 2011 NCSU published a 32-page *Conservation Subdivision Handbook* explaining what they are, how the open space is managed, and their multiple benefits in terms of protecting land and wildlife, improving real estate values, reducing infrastructure costs, enhancing quality of life for homeowners, and recharging stormwater. Two sections describe perceived barriers to adopting such ordinances in North Carolina, how to overcome them, and how various communities have successfully promoted them. It presents four case studies and analyzes why they were successful, and ends with a short (eleven page) model ordinance. This excellent resource is downloadable at <http://www.ces.ncsu.edu/forestry/pdf/ag/ag742.pdf> Like Pennsylvania, North Carolina is one of several states where this design approach has been promoted by state agencies, with notable results:

more than half the counties have adopted conservation subdivision ordinances, and 26 projects had been completed as of 2012. <http://www.ces.ncsu.edu/forestry/pdf/ag/ag742.pdf>. Conservation design is the favored form of development in the rural, unsewered areas of Davidson, and eight have been built in Weddington since the first one (Stratford Hall, designed by the author) was approved in 2003.

Maryland

On the Eastern Shore, Calvert County started to encourage creative development design with permanent open space as early as 1967, and by 1993 began requiring all residential development on parcels greater than 20 acres to follow open space design principles. Minimum open space percentages vary according to the underlying density. In the Residential District it is 30 percent (with a base density of four acres per dwelling). Within the Rural Community District it is 50 percent (where the base density is generally 20 acres per dwelling); and in the Farm and Forest District it rises to 80 percent (at the same base density as in the RCD District). Within the RD and RCD districts, density can be increased by using development rights transferred using TDR provisions. To help facilitate better design, the planning department created a *Rural Design Manual for Subdivisions* in 1996. Ten years later zoning was amended to require significant open space in all subdivisions, with certain exceptions such as in TDR receiving areas, critical area district overlays, subdivisions with five or fewer lots, and developments where lots are at least 20 acres in area. Over the years 7,765 acres of open space have been preserved in subdivisions using flexible design techniques.

Virginia

In Isle of Wight County, substantial open space set-asides are encouraged by a sliding-scale approach in the regulations, allowing the gross density to rise if the net area consumed by development is reduced. In other words, if open space rises from 50 percent to 60 percent, landowners are allowed a 20 percent increase in the number of houselots (e.g., 12 instead of 10, on a 100-acre tract). Maximum lot size also declines from 5 acres to 3.3 acres each.

Preserving 70 percent of the parcel earns an additional eight lots, subject to a maximum area of 1.5 acres each. The only exemptions from the above standards are when 20-acre (or larger) parcels are created, intended for agricultural use and prohibited from further subdivision by covenants.

While this example utilizes densities and lot sizes that might not be applicable in many suburban communities, it is notable as a much more creative alternative to standard platting, which had previously been the predominant development form. Prior to the current ordinance, the base density had been between one and two acres per dwelling. In short, Isle of Wight's approach resulted in density reductions to preserve rural character, while permitting small lot sizes to satisfy the interests of its farming community

In Hanover County more than 5,500 acres of land have been preserved in 34 conservation subdivisions since ordinance adoption in 1997. This is among the higher county totals in the country, and reflects departmental leadership in recognizing the potential of this technique and initiating workshops and demonstration projects. The first such development in the county, the Fields at Cold Harbor, is detailed in Chapter 21. The ordinance provides a significant density incentive to developers who wish their land to be reclassified from the A-1 agricultural district to the RC resource conservation district, allowing them one dwelling per 6.25 acres, instead of the ten-acre lots otherwise required. (This process involves rezoning, but is usually not onerous.) Following the

success of this approach in its rural areas, the county created parallel provisions in all three of its suburban and mixed-use districts.

Since the late 1980s Fauquier County has set base residential density in its rural district (covering about 90 percent of the county) at one dwelling per ten acres, with a sliding scale to determine lot yield. That scale basically maintains a 1:10 density for parcels up to about 40 acres, but gradually lowers it so that at 75 acres it is 1:15, and at 200 acres it is 1:20. Above 205 acres, the density remains constant at 1:50, meaning that for every additional 50 acres the property is eligible for one more house/lot. Additionally, on properties of 30 acres or more, development is not permitted to consume more than 15 percent of any parcel. The remaining 85 percent is placed in a non-common open space easement for 25 years. Following that period, if the property still has available density (unused in the original subdivision), the owner may request permission to transfer the non-common open space to another parcel and develop the original property with the remaining density. The amount of protected open space is therefore protected in perpetuity. As of early 2013, over 98,000 acres had been placed in permanent conservation easement, representing just under one-quarter of the county's total land area.

In neighboring Clarke County, rural subdivision lots in the Agricultural Open Space Conservation District may not exceed three acres in area. Sliding-scale regulations allow, for example, two dwellings on 30 acres, four on 100 acres and six on 200 acres. Using the conservation design principle, only 18 acres are taken out of a 200-acre parcel, leaving approximately 90 percent as permanent farmland. In the Forestal Open Space Conservation District, a similar sliding scale controls density. Furthermore, any parcel of 40 acres or larger must leave a residual lot, after subdivision, of not less than 60 percent of the original tract size. For example, on a 100-acre-parcel eligible for four dwellings, one house would occupy a 60-acre residual lot and the other lots could be any size above three acres. This approach provides flexibility for property owners but also retains a larger undivided area for timber management and open space.

Georgia

Georgia has incentivized conservation design through its Community Greenspace Program, whose eligibility criteria for greenspace acquisition funds include a requirement that counties must review their ordinances to identify regulatory impediments to creating this kind of land-saving development. As a result, a number of counties have revised their codes to allow and encourage conservation design, adopting new ordinance language based on the model drafted by the University of Georgia School of Law for the Georgia Department of Community Affairs. In 2008 Jasper County adopted a mandatory open space design requirement with a 50 percent open space minimum for all subdivisions encompassing five or more acres, unless all of the proposed lots would be greater than ten acres in area. Earlier ordinances in some other counties have been used dozens of times, but those older codes often set open space percentages relatively low, as did many cluster regulations from the 1980s. In Cherokee County, 48 developments with open space have been identified by county planning staff, totaling 1,374 acres of preserved land, but none of these examples met the 50 percent threshold, and less than one-quarter of those 48 preserved more than 40 percent of their acreage.

Mississippi

Pearl River County actively promotes conservation design through its “Twice Green” program (meaning green both environmentally and financially). Its excellent web brochure can be viewed at <http://www.pearlrivercounty.net/planning/files/PRC%20Web%20Brochure.pdf>. At Wildwood, in Carriere, the county’s first conservation subdivision preserved a 330-acre hardwood stand covering about half the property by focusing development areas within the overgrown pine plantations, which would largely be cleared. Seven miles of trails are planned to thread through these mature deciduous woodlands, generally following stream valleys. In addition, more than 20 acres of park-like open space have been preserved as well. A permanent easement held by the Land Trust for the Mississippi Coastal Plain permanently protects this acreage.

Washington

In the early 1990s Clallam County lowered allowable density in conventional subdivisions to five and ten acres per dwelling to discourage residential platting without significant open space. It has four rural open space zoning districts. In the Rural Character Conservation 3 and 5 Districts, densities increase to a maximum of one du per 2.4 acres and one du per 4.8 acres for conservation subdivisions, as an alternative to ten-acre lots. In the Rural Low Mixed and Rural Neighborhood Conservation zones, densities rise to 1 dwelling per 2.4 acres compared with five-acre conventional lots. Although the open space design option has not been used much in the agricultural zone, it has been implemented to a greater degree in rural and commercial forest zones eligible for open space design, especially on transition forested lands owned by large timber companies, helping to minimize fragmentation of forests, environmentally sensitive areas, and other rural land. The result has been conservation subdivisions where 55 to 70 percent of the resource land is preserved. (email from Steve Gray, 3.6.13) A parallel restriction has been adopted for commercial forestland.

California

San Luis Obispo County’s ordinance provision allowing for conservation design to save farmland, adopted in the mid-1980s, has preserved more than 9,000 acres in several large, low-density subdivisions containing just 230 lots. This remarkably successful program is further described in chapter 17.

In certain parts of unincorporated Marin County, north of the San Francisco Bay area, the 2007 countywide plan encourages conservation design to provide “effective protection to open space and environmental resources”. Several planned zoning districts require conservation design to achieve the county’s objectives of preserving agriculture and open space, and locating new homes in the most geologically stable and least visually prominent portions of the site. Homesites on grassy hillsides are required to be placed so that buildings “will be screened by existing vegetation, rock outcroppings, or depressions in topography.” Although grouping homes is especially important in such locations, a greater scattering of buildings may be preferable on wooded hillsides to save trees. Ridgelines are protected by prohibiting construction there, and requiring homes to be located below ridgelines on the least visible portions of the site. (Corser, 1992).

In farming areas, new dwellings and other non-agricultural development is limited in size and is required to be grouped in building envelopes covering no more than five percent of the property, or as determined through a site specific analysis of agricultural resources and environmental constraints, with the remainder preserved for food production. Although farmland that is preserved through-conservation designs is not considered to be accessible for recreational uses, the county encourages trail easements where need can be demonstrated. Occasionally, developers will offer, and the county will accept, fee-simple open space areas for public use. The county

requires new development to be located close to existing roads and prohibits changes significantly lessening food production, grading inconsistent with the natural topography, removal of significant vegetation, or diminishing the rural character. (email from Ben Berto, Marin County Community Development Agency, 3.11.13)

Utah

Beginning in 2003, more than 100 municipal workshops were conducted by the Center for Green Space Design, a Salt Lake city nonprofit founded by Sumner Swaner, to explain the “CEDAR” methodology for identifying and protecting potential conservation lands, within a development framework. (The “CEDAR” acronym signifies the cultural, ecological, developmental, agricultural and recreational elements of the landscape.) At these workshop meetings, participants are encouraged to place paper chips representing conservation and development in those areas of the community that participants feel should be preserved or developed. A powerpoint presentation describes the conservation subdivision design process, so that participants understand that the choice is not solely between pure preservation and total development. This process, which awakens citizenry and officials to the possibilities of attaining a greener future, has in several instances resulted in more progressive municipal ordinances being adopted.

Canadian Provinces

New Brunswick

In order to protect wetlands and other environmental resources, the New Brunswick provincial government proposed an initiative in 2006 to inform local officials, developers, and interested residents about the conservation design concept known there as “Sustainable Community Design” (SCD). This effort involved the publication of a detailed 600-page workbook prepared by Daniel Savard of the New Brunswick Department of the Environment and Local Government, numerous presentations at conferences and in municipalities, and a free on-line seminar based on the workbook accessible at:

http://www2.gnb.ca/content/gnb/en/departments/elg/environment/content/sustainable_community_design.html The province also conducts two-day seminars to teach potential project coordinators how to implement the concept within their communities, working together with builders, developers, bankers, real estate agents, municipal staff and elected officials, and professionals such as surveyors, civil engineers, and town planners.

As of early 2014, six projects were at different levels of implementation. Among them is Le Village en Haut du Ruisseau in the city of Dieppe. Compact design has allowed three-quarters of the 30-acre site to be preserved as open space, while accommodating 217 dwellings. This sustainable urban infill project, which is being built at a higher density than the pre-existing zoning had allowed, has received an award from the Gulf of Maine Council on the Marine Environment, as well as a Sustainable Communities Award, and an Environmental Excellence Award for Greater Moncton.

Manitoba

A conservation subdivision design manual (*Managing Change in Rural Manitoba: A Manual for Conservation Subdivision Design*) was published in early 2014 by a provincial agency (Manitoba Local Government) partnering with a regional planning board serving six municipalities near

Winnipeg (the Red River Planning District). This ___-page booklet, prepared by the author, addresses all the major issues surrounding this design concept, and includes both model regulatory language and a concept plan illustrating of how such a development could be developed on a typical site in southern Manitoba.

Stewardship and Large Scale Conservation in the West

Conservation subdivisions in western states are often very large, providing greater conservation opportunities. For example, Sand Creek Ranch, located at the base of the Bighorn Mountains near Buffalo, Wyoming preserves 737 of the property's 836 acres of this working ranch. The 99 homeowners, who live in 36 small neighborhoods strategically sited to minimize resource impacts, jointly own the conservation land, most of which remains in farming. (Kimball, 2011.)

However, unless ordinances require applicants to inventory the natural resources and to design around them in a way that avoids undue fragmentation, tracts can be cut up in ways that diminish their value for continued ranching or wildlife habitat. Such opportunities were overlooked at the Marabou Ranch, located five miles from Steamboat Springs in Colorado's Routt County. Although it meets all of the county's standards, and has preserved 1,325 acres as open space, on this 1,717-acre development the scattered 62 homesites create extensive edges and fragment resource lands, including sensitive habitat areas. (Wortman-Wunder, 2012)\

In fact, a 2010 study by the Center for Conservation Development at Colorado State University to evaluate county zoning ordinances and their ecological consequences found that although one-third of the 414 counties surveyed had regulations promoting some form of conservation development, "many did so in ways unlikely to preserve critical wildlife habitat or other natural values. Few promoted land stewardship, or ensured that open space parcels were contiguous within or among developments." (Wortman-Wunder, 2012) However, it is important to note that some of these ordinances are several decades old and that many were older-style cluster regulations not meeting the more rigorous definitions and standards for "conservation subdivisions" detailed in books such as *Conservation Design for Subdivisions* and *Growing Greener* (Arendt, 1996, 1999).). Important findings of this study included the fact that habitat for wildlife species of ecological interest was not preserved, and only very common species were found, even though an average of 70 percent of the land in 347 subdivisions examined in the study had been designated as permanent open space. Part of the problem is that only 13 percent of the surveyed ordinances require developers to study the ecological attributes of their properties, and that few ordinances require any sort of post-development oversight. "In addition, few ordinances provide guidelines regarding the design and configuration of the protected lands, and few encourage contiguity with other nearby protected lands. Less than one in ten ordinances requires consultation with a biological expert or preparation of a conservation plan." (Reed, 2013 2014). Key recommendations of this study are that CD ordinances should require ecological site analyses and that their results should guide the location of conservation areas to minimize their fragmentation and encourage their connections to other protected lands. The "Beginning with Habitat" approach used in the Rural Smart Growth program in Brunswick, Maine (discussed above in the state-by-state discussion) offers one possible course of action that other communities could emulate.

Not surprisingly, the projects that have performed best in terms of protecting ecosystems are those that are largest. The Santa Lucia Preserve in California protects 18,000 of its 20,000 acres. At Highlands Ranch in Colorado, 13,000 acres are preserved, including an 8,200-acre backcountry wilderness with an elk herd, on this 22,000-acre property. At the Galisteo Basin Preserve near Santa Fe, only 700 of its 13,522 acres are developed.

These three developments protect functional expanses of habitat and connect with other natural areas in state parks and national forests, and private lands protected through conservation easements. Habitat stewardship is a priority. For example, the Santa Lucia Conservancy manages conservation lands at the Santa Lucia Preserve with endowment funds generated by the Preserve. The Galisteo Basin Preserve conducts monitoring and restoration efforts in conjunction with two nonprofit groups and community volunteers. And the Highlands Ranch employs three full-time natural area managers and seasonal rangers. (Wortman-Wunder, 2012)