

Open Space Preservation in Rural Residential Development

by

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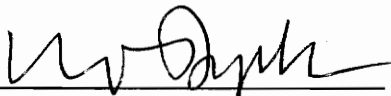
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ABSTRACT

OPEN SPACE PRESERVATION IN RURAL RESIDENTIAL DEVELOPMENT

by

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Under conventional residential development practices, minimum lot sizes are established by zoning ordinances. Under these requirements, a piece of property is subdivided into as many lots as allowed. This results in suburban development where all land is committed to individually owned parcels. The objective of this thesis is to defend the preservation of open space as a necessary component of rural residential development and to establish a set of criteria that are fundamental to open space design. Concerns for developers, planners, and homeowners in response to the open space preservation movement are identified and addressed. In addition, the three major alternative development approaches, in which the preservation of open space is a fundamental priority, are detailed. From these alternative development approaches, a list of criteria are developed to be used in the evaluation or preparation of open space site designs. A 96 acre site in the Tom's Creek Basin of Blacksburg, Montgomery County, Virginia is used as a case study for the preparation of an open space site design that fulfills the requirements of a proposed rural residential zoning ordinance for Blacksburg.

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In a culture that views *ecology* as the antithesis to *economy*,
it is difficult to think clearly about how we live in relation to
where we are.

James Howard Kunstler
The Geography of Nowhere, pg 249
1994

Chapter One:

Introduction

Problem Statement

According to the Natural Lands Trust, current zoning and subdivision ordinances “... [set] rules for the orderly conversion of virtually all land that is dry, flood-free and flat to moderately sloping, into developed properties ” (1995, 1). These zoning regulations have produced a “ ... ‘one size fits all’ approach ... which frequently results in ‘checkerboard’ layouts of nearly identical lots covering the entire parcel” (Natural Lands Trust, Inc. 1995, 4). When residential zoning creates ‘open space’, it is held in private hands, such as suburban yard space, or in holdings too small for community use or environmental benefit (Ewing 1994, 4).

Many local laws governing land subdivision and development are based on the flawed assumption that land is a boundless resource, and for the most part, zoning ordinances and regulations emerging from these laws have yet to be rewritten to reflect a better understanding of current issues relevant to land preservation (Lancaster County Planning Commission 1994, 1-4). Of the 86.4 million dwelling units in the United States in 1980, almost two-thirds consisted of a single-family dwelling unit surrounded by an ornamental lawn (Jackson 1985, 6). In *Rural by Design*, Arendt refers to conventional zoning as “planned sprawl” (1994b, 17). This spreading pattern of development,

including the conversion of farmland and natural open space, is devastating rural character and further compromising an already beleaguered farming industry (Yaro, Arendt, Dodson and Brabec 1988). As Scheider (1970, 69) notes “... it is physically impossible to preserve large open spaces in reasonable proximity to people when millions of people are spread out in uniform low densities. The barrack-like development of land leaves people with the monotony of urban space and form at the scale of the street and yard” (as quoted in Ewing 1994, 4).

While leapfrog development (development outside the fringe of a community which skips the more costly land directly adjacent the community) theoretically leaves parcels of undeveloped open space, this land fails to be functional: it is usually held in private ownership unavailable for public use. Or, as in the instance of farmland, the “impermanence syndrome” causes farmers to prematurely abandon farming operations in anticipation of future development (Ewing 1994, 11).

Large-lot residential zoning is often incorrectly thought of as technique to preserve rural character and open space. Large-lot zoning refers to zoning ordinances that require a minimum lot size of anywhere from 2 or 5 acres up to, in some cases twenty or forty acres (Arendt 1994; Mantell, Harper, and Propst 1990). Large-lot zoning stems from people’s desire for large, private open spaces, as well as from a desire to preserve rural character (Arendt 1994b; Yaro, Arendt, Dodson, and Brabec 1993). However, while these larger lot sizes can reduce negative impacts on environmentally sensitive areas, they also encourage low-density sprawl rather than preservation (Mantell, Harper, and Propst 1990). This development pattern increases the cost of infrastructure services and dissects

rural areas and farmland (Stokes 1989). Additionally, zoning requirements for lot sizes with a minimum of even two acres can raise development costs so that it is not economically feasible for the developer to retain a portion of the overall development parcel as protected open space.

While large-lot zoning does, in some cases, provide visual open space, this open space is divided among individual land owners. Unless restrictive covenants exist, these land owners are free to use and maintain their property as they see fit. This can lead to a variety of results, including the conversion of natural areas into “suburban yard space” (Natural Lands Trust, Inc. 4). Even when such covenants exist and protect visual open space, access to the open space is limited to the owner and his/her guests.

The objective of this thesis is to defend the preservation of open space as a necessary component of residential planning. This becomes more essential as development expands into what were rural and agricultural lands all over the United States. Additionally, this thesis will establish a set of criteria that are fundamental to open space site design. These criteria are developed from the literature review. Both single and multi-family approaches incorporating open space preservation are becoming more popular in many communities as alternatives to conventional residential development. When the preservation of contiguous open spaces becomes a priority for development in America’s communities, residential uses will more and more be creatively dispersed around conservation areas.

Methodology:

Chapter Two, the literature review, defines open space; discusses the history of open space; and summarizes concerns and controversies which have evolved for planners, developers, and homeowners in response to the open space preservation movement. These concerns and controversies are presented in a format which highlights the problems confronting open space preservation in rural residential development and include: developer's fear of reduced economic return; community lack of understanding of the concept and effects of density trade-offs; difficulties in obtaining municipal approval; and a lack of training for designers in innovative design techniques that preserve open space; lack of understanding by planners of the need for public education and involvement.

Chapter Three describes in detail the three major alternative development approaches in which open space preservation is a fundamental priority: cluster development, rural landscape planning, and open space design development. From these alternatives, a list of criteria for the design and evaluation of open space site plans is developed, drawing upon the major points from the literature. The criteria can be used as a foundation for the evaluation of a proposed, or existing, site plan, or as a basis of design for the preparation of an open space site plan. The discussion has been limited to these three approaches because currently they are the only developed alternatives found in the literature.

In Chapter Four, the design principles developed in Chapter Three are applied to a case study of a 96 acre site in the Tom's Creek Basin, Blacksburg, Virginia. The site plan illustrates how these principles can be integrated with the applicable zoning to produce an open space site design. A breakdown of the application of each of these criteria in the production of the site plan is provided for additional clarification.

Chapter Five concludes this work with a brief summary of its intent, results, and implications for other planners and communities. A brief presentation of possibilities for additional research is also included.

Chapter Two:

Literature Review

This Chapter begins with a review of current definitions of open space and presents the definition of open space for the purpose of this work. Following this is a discussion of the history of open space, including the early use of open space as a public gathering place; the role of open space in urban models of the early twentieth century; and the evolution of our current use of open space in residential development. Chapter Two concludes with a presentation of problems confronting open space preservation in rural residential development. These problems represent the viewpoints of planners, developers, and homeowners and each problem is followed by a discussion from the relevant literature.

Definition of Open Space

At first glance the phrase 'open space' appears to be a straight-forward, descriptive reference to a piece of land that has yet to be developed. However, this characterization of open space as "... quite simply, land or water surface open to the sky" neglects the many unique qualities inherent in our rural, open land (Zisman 1968, 4). The following listing of definitions reflect the diversity associated with open space, and reflect the importance of establishing it as an integral concept of rural residential development.

- Open space is “a relatively undeveloped green or wooded area provided usually within an urban development to minimize the feeling of congested living” (Steiner 1991, 324).
- Open space can be seen as “blobs of green, some large, some small, floating in a sea of suburban streets” (Little 1990, 32).
- Open space is “a certain area of a development site set aside to be left in its natural condition” (Kone 1994, 141).
- Open space is an area within a development “permanently reserved and maintained as landscaped park or recreational space, provided to serve homeowners within the development” (Sanders 1981, 9).
- Open space is “... land with non-development or minimum development types of uses ...or land left undeveloped for aesthetic, or environmental, health, welfare, or safety, reasons” (Open Space Planning 1993, 1).
- “Open space is an area either unoccupied, or predominately unoccupied by buildings, having use for parks, recreation, agriculture, conservation, preservation of water resources, historic or scenic purposes; or which, by its existence helps to shape the character, form, and timing of an urban development” (Broward County Area Planning Board 1970, 1).
- Open space is an “undivided block of land permanently restricted to farming, forestry, watershed management, wildlife habitat, informal recreation, or some combination of the above” (Arendt 1994b, 21).

- “Open space implies places that are readily available, places where entry is not restricted. Access, accessibility, and alternative opportunities are critical” (Girling and Helphand 1994, 17).
- Open space is a “seemingly void zone between two vertical elements, [that] can be perceived as being positive, productive, planned, and functionally supportive, or as negative, wasted, unstructured, and deleterious” (Porterfield and Hall 1995, 18).

As seen by the variety of definitions, “[o]pen space is an ambiguous concept, having different connotations in different contexts” (Platt 1972, 2). Interestingly, many works which deal directly with rural conservation and sustainable communities use the term open space but do not establish a working definition, assuming that the concept of open space is understood by the reader (Stokes 1989; Yaro, Arendt, Dodson, and Brabec 1993; Van der Ryn and Calthorpe 1986.) The reality that “[t]here is no simple or commonly accepted interpretation” tells us a great deal about the difficulties encountered in establishing open space as a valid objective of development (Girling and Helphand 1994, 17).

For the purpose of this work, open space is defined as:

a portion of a development site maintained primarily in its natural state. Left in public ownership, it is permanently reserved. Open space provides the opportunity for social interaction, including passive recreation opportunities, and

helps shape the character of a community. From an ecological standpoint, open space acts as a buffer between humankind and the environment. It is designated in such a way as to prevent development in environmentally sensitive areas, and aids in the preservation of water quality and plant and animal habitat, as well as the preservation of the rural character and resources of a community.

Historical Overview

Historically, open space refers most often to an urban, public gathering space rather than to the rural, green space for which the term is currently used. However, the foundation of the phrase is still significant. Open spaces were originally seen as places to be shared by the community as a whole, and they were essential to the make-up of the city (Kato 1980). A shift away from the urbanized open space to the rural, green open space lies in the European tradition of shared rights to certain forests, pastures, and bodies of water (Girling and Helphand 1994). When transplanted to the New World, these areas became a common grazing area, market, and parade ground; later flanked by the community church. This common area further evolved into a crossroads and a business center for the community, losing its openness (Girling and Helphand 1994). A re-introduction of physically open space in early community design schemes is seen primarily in one renowned suburb: Riverside, Illinois.

Riverside was designed by landscape architects Frederick Law Olmsted and Calvert Vaux in 1869. Concerning the project, Olmsted wrote, “In true suburbs, urban

and rural advantages are agreeably combined” (cited in Girling and Helphand 1994, 50). Forty four percent of Riverside’s 1,600 acres is public open space, with three miles adjacent to the Des Plaines River preserved as a park, and smaller parks located throughout the community. Olmsted planned walkways to connect the River to the streets and smaller parks. Although Riverside was not an immediate success, it grew steadily to a population of 1,551 by 1900 (Girling and Helphand 1994).

The notion of open space as a necessary component of a successful living environment is also found in the writings of Ebenezer Howard, Frank Lloyd Wright, and Le Corbusier, three of the “seminal urban idealists” of the twentieth century, as well as in the evolution of the City Beautiful Movement (Platt 1972, 10; and Porterfield and Hall 1995).

Ebenezer Howard fathered the Garden City movement with his 1898 book *Tomorrow: A Peaceful Path to Reform* (re-published under the title *Garden Cities of Tomorrow*). Howard sought to create new towns offering the economic and social advantages of the city combined with tranquillity, a healthful environment, and a closeness to nature (Levy 1991). His design proposed a total development area of 6,000 acres, with 1,000 acres serving as the urbanized core. The major innovation of Howard’s design was the surrounding belt of agriculture and recreational land, or ‘green belt’. This green belt of 5,000 acres would be owned communally by the city it surrounds, and be retained as perpetual open space (Platt 1972). Howard was concerned with the consequences of placing this land in private ownership, “... for as the town filled up, the agricultural land would become ‘ripe’ for building purposes and the beauty and

healthfulness of the town would be quickly destroyed” (Howard 1898, 140 quoted in Platt 1972, 24).

Beginning in the early 1930’s, architect Frank Lloyd Wright began to develop a model for a future city he called Broadacre City. The essence behind Broadacre City as a physical planning concept is decentralization, with land being allocated to the masses on a basis of at least one acre per family. Restrictions on this land eliminate any use except “agronomy”, abolishing the right of the family to capitalize on land value and assuring that the openness of the land would be retained (Platt 1972). Wright envisioned Broadacre City not as a city where landscapes are an amenity, or a suburb where people live in a park, but as a rural city with the character of a working countryside (Girling and Helphand 1994).

Le Corbusier, in 1922, also developed models for the future city, such as that seen in his Radiant City. Perhaps the antithesis of Wright’s plan, Le Corbusier focused on a vertical city plan with high-rise towers surrounded by a park-like setting. His city would be inter-connected with elevated expressways, leaving the entire surface devoted to pedestrian use. Le Corbusier’s plan retains ninety five percent of the city land area allocated for communal open space (Levy 1991; Platt 1972).

A common foundation unites each of these idealists: their visions for the future city are conceived as a direct response to the decayed and over-crowded industrial cities of their experience. They theorize that open space is the solution to the problem (Platt 1972). In accessing how each uses open space as a tool, similarities exist between Le Corbusier and Howard’s large percentages (ninety five and approximately eighty three,

respectively) of prescribed communal open space, while Wright prefers individual ownership with use restrictions.

While Howard was creating his vision of the future city on paper, architect Daniel Burnham and urban designer Frederick Law Olmsted, Jr. were designing the fairgrounds for the 1893 Colombian Exposition in Chicago. This Exposition is thought of as the beginning of the City Beautiful Movement, with the fairgrounds for the exposition designed to provide a careful integration of buildings and landscaped areas serving as an exemplar of what is possible in civic design (Levy 1991). The City Beautiful Movement is credited with creating the design ideal of using sweeping vistas, lush boulevards, and green, open spaces as focal points (Porterfield and Hall 1995).

While some communities evolved from both Howard's vision and the City Beautiful Movement (Greenbelt; Maryland; Greendale, Wisconsin; and Greenhills, Ohio), a more pragmatic view of development followed World War I which judged lush open spaces as frivolous (Porterfield and Hall 1995). The years following World War II saw an even more dramatic shift away from planned open space as popular land use zoning schemes gave form to "suburbia". During this time period the only open space present in developing communities was that area left between leap-frog suburban developments. Park use was separated out and only active recreation was given consideration, usually in the form of ball fields at the local school. Evolutions in traffic engineering such as the advent of the freeway, along with homogenized franchise architecture, further stifled the inclusion of open space as the demand for suburban homes increased, and the price decreased (Porterfield and Hall 1995). Efficiency became paramount (Adler 1995). Any

open space was considered to be unused space, even if in a productive use such as agriculture; particularly if it was in the path of urban growth. Building development of whatever form or quality was generally considered the “highest and best use” of the land (Zisman 1968).

Though it is difficult to select a specific event which catalyzed the re-introduction of open space in residential design, one notable plan was produced in 1963 by Ian McHarg and David Wallace. Their *Plan for the Valleys* mandated clustering of development on wooded side slopes in order to preserve as open space the bottomlands of two river valleys near Baltimore (Arendt 1994b). Although local governments did not adopt this mandate of clustering to preserve open space, some made other efforts to preserve the quality and character of bottomlands.

In the early 1970’s Ian McHarg was involved with another notable plan. As part of the planning firm Wallace McHarg Roberts and Todd (WMRT), McHarg worked on the design for The Woodlands, Texas. The Woodlands is a master-planned community, which in addition to residential development, also contains retail, office, and institutional uses. As part of the “Ecological Plan” drafted for The Woodlands, approximately twenty-five percent of its 25,000 acres is retained as open space, including a natural drainage-way. WMRT used overlays to determine which areas of the site were most suited to which type of development, employing a method McHarg calls “physiographic determinism” (Girling and Helphand 1994, 159). The first phase to be developed contains parks and open space located deep within the housing areas, and a trail system that links the residential areas to other parts of the community. More recently, in the

1980's and 1990's, the developer began moving away from the original "Ecological Plan", toward more conventional development patterns (Girling and Helphand 1994).

With the "rediscovery of center city community space" such as waterfront re-development and the rise of the environmental movement with its increasing pressure to preserve open space, the last fifteen to twenty years has seen a change in attitude toward planned open space in general (Porterfield and Hall 1995, 169; University of Michigan Law School *Journal of Law Reform* 1986). Two forms of suburban open space have particularly increased in popularity: 1) active recreation space for organized sports, and 2) open space resulting from the preservation of environmental hazards such as floodplains, wetlands, and steep slopes (Porterfield and Hall 1995).

Many current planning experts are trying to expand this view of open space. *The Livable Communities Handbook*, produced by the Lancaster County (PA) Planning Commission, calls for the inclusion of "decisive open space" in its model of a "livable community" (1994, 1-36). The Lancaster County model for open space serves a broader function of allowing individuals the opportunity to interact with each other as well as both natural and built environments. In the Connecticut River Valley, in the New England region of the United States, as well as in Lancaster County, Pennsylvania the preservation of prime agricultural lands continues to grow in importance as communities realize that once this resource is developed, it can not be re-converted (Lancaster County Planning Commission 1994; Yaro, Arendt, Dodson, and Brabec 1993). Both of these regions look beyond the strictly productive use of their agricultural open space and recognize its cultural significance as well.

Open space preservation through cluster zoning first appeared in the early 1960's. Although resistance to the clustering concept has been substantial, some experts in land use fields hail it as a sound alternative (Knack 1990). Other alternative development approaches have begun to appear more recently. These approaches emerged primarily in the northeast as a response to the increasing development of rural land, and include Rural Landscape Planning and Open Space Development Design (Yaro, Arendt, Dodson and Brabec 1988; and Arendt 1994a and 1994b). These approaches will be discussed in depth in Chapter Three.

Problems Confronting Open Space Preservation in Rural

Residential Development

As part of an extensive investigation into open space preservation in residential development, it is advantageous to be familiar with the concerns of planners, developers, and homeowners involved with, and affected by it. These concerns, and often controversies, represent potential problems preventing the attainment of quality open space preservation in site planning. In addition, the idea that America offers "unlimited open space" is a fundamental belief that must be overcome as pressure from urbanization mounts (Zisman 1968). If a problem is not perceived, a solution will not be sought out or embraced. Additionally, the notion that the "highest and best" use of land is to maximize its development potential must also be overcome (Zisman 1968). This belief is so well founded that officials of less prosperous communities often view preserved open space simply as a waste of potential tax revenue (Platt 1972). Prior to furthering the discussion

of problems confronting open space preservation, first it is important discuss the functions and benefits associated with preserved open space.

Functions and Benefits of Preserved Open Space

Stemming from the “unlimited open space” belief is the fact that the open spaces we currently have are often taken for granted. The biological functions provided by these spaces are not well understood by the general public. A brief discussion of these functions and benefits is included in the following paragraphs.

The areas most often included in an open space designation are fragile ecosystems such as floodplains, steep slopes, and wetlands. The protection of these areas from development provides direct health and safety benefits, as well as environmental benefits (Mantell 1990; Kaiser, Godshalk, and Chapin 1995). The inclusion of natural buffers that lie adjacent to these sensitive areas into preserved open space further increases the protected area available for wildlife habitat (Arendt 1994a).

Additionally, a residential development with a large percentage of open space and less developed area has a lesser impact on existing storm water flow patterns, and reduces the area required for storm water management. Natural open space provides a natural filter for pollutants, including silt, as well as increasing the potential for water to be absorbed into the soil before reaching the storm water management facility (Arendt 1994a). In this way, both surface and aquifer water quality is protected (Mantell, Harper, and Propst 1990).

Residential developments that incorporate open space offer greater opportunities for environmentally sensitive sewage treatment and disposal systems, including land treatment, spray irrigation, and wastewater reclamation and reuse (Arendt 1994a). Open space based design also allows greater flexibility for individual septic systems by allowing for the location of individual or communal subsurface septic systems in the areas of the site best suited for them (Arendt 1994a).

Preserving natural vegetative buffers adjacent to streams furthers the ecological benefits by providing regional connections in the form of corridors and greenways (Little 1990). These regional connections allow for more natural wildlife migration patterns, and benefit the community as a whole by buffering water supplies from possible contamination. Open space greenways surrounding a community help reduce air pollution through trees and other vegetation aiding in the removal of carbon dioxide and other particulates from the air (Brabec 1994).

Social benefits associated with open space are understood even less than ecological benefits. These include the provision of opportunities for neighbors to meet casually in the community spaces. This opportunity is enhanced by the smaller individual backyards not only reducing the amount of time spent in maintenance, but also encouraging people to take advantage of the community facilities such as walking trails rather than spend their outdoor time in their private backyards (Arendt 1994a). In addition, people with similar interests can convene temporarily within the open space; or at least observe similar activities side by side (Lynch 1990). Open space greenways provide linkages for people and places, allowing community members to participate in

the built and natural environment, and providing a range of opportunities for social interaction (Lancaster County Planning Commission 1994).

On a community wide scale, open space enhances 'quality of life' (Brabec 1994, 283; Broward County Area Planning Board 1970; Untermann 1977). Brabec cites a Governors' Committee on the Environment report in which five New England governors officially recognize open space as a key element in the quality of life that brought rapid growth to the region (1994). Open landscapes create scenic vistas and help separate and maintain the distinct identity of communities (Mantell 1990). Open space can also be attributed with helping shape urban form. The use of buffer areas such as greenbelts, open space wedges, and corridors gives imageability to a community (Kaiser, Godshalk, and Chapin 1995).

Problems Confronting the Implementation of Open Space Planning

Developer's fear reduced economic return:

Much of the opposition to preserving land as open space can be reduced to the economics of such an action. This argument has historically been difficult to overcome, primarily because of the difficulty in quantifying a qualitative feature such as the natural landscape. Lacking a direct market value, the landscape may wrongly be assumed to have no value (Yaro, Arendt, Dodson, and Brabec 1993). However, open space protection in rural residential development goes beyond protecting only the landscape. Economic resources such as agriculture, livestock grazing, forestry, and mineral deposits can also be protected through the use of innovative development approaches (Mantell, Harper, and

Propst 1990; Kaiser, Godshalk, and Chapin 1995; Yaro, Arendt, Dodson and Brabec 1988). The consideration of natural process data in the site planning process can reduce initial development costs, as well as future maintenance costs (Untermann and Small 1977).

Furthering economic based concerns is the assumption that open space requirements are responsible for increased housing prices (Mantell, Harper and Propst 1990). However, residential developments designed to incorporate open space can offer measurable economic advantages over conventional subdivisions. Infrastructure costs are often lower in open space design because minimum lot widths for single-family house lots are reduced, decreasing the linear footage of roads and utilities required to adequately service the subdivision. The reduction of impervious material in turn reduces the size and cost of storm water management facilities (Arendt 1994a; Town of Amherst Planning Department 1988). The creation of a design that is more responsive to the environment by grouping the developed portions in appropriate areas can reduce the number of costly stream and wetland crossings, as well as the costs for earthmoving.

Potential sales and marketability problems present another challenge to the expansion and acceptance of clustered development (Urban Land Institute 1968). If people are not willing to accept this pattern of development, no matter how innovative or environmentally sensitive, it will not be a success. The development of clustered community has also, at times, coincided with economic recessions, leaving developers with disappointing sales and financial returns (Jarvis 1993).

A study conducted in Amherst, Massachusetts focused on two subdivisions built at the same time with similar homes selling originally at similar prices. One subdivision offered half-acre lots with little community open space, while the other offered quarter-acre lots with 36 acres of preserved open space with meadows, trails, woodlands, and recreation facilities. After twenty years the homes in the open space subdivision resold for a thirteen percent greater price than the conventional subdivision homes (Arendt 1994a; 1994b). This faster value appreciation can also be used as a marketing tool.

Cost savings are found throughout the project life cycle, from initial municipal review through future resale. Marketing and sales campaigns benefit from the amenities provided within an open space development. An environmentally oriented marketing strategy can highlight the positive aspects of living in a community that values the natural environment. Arendt points out that “when given a choice, consumers have demonstrated their clear preference for buying homes that look out onto farmland or other open space, rather than houses where the only view is of their neighbor’s picture window or backyard” (1994a, 8). In addition, Ewing cites a body of empirical work showing that buyers are willing to pay more for land close to public open space, whether water bodies, parks, or green belts (1994, 5).

A final economic advantage is from the local municipalities perspective: preserved natural areas and other recreational amenities offered privately can reduce the demand for public parks and recreation facilities (Arendt 1994a). Additionally, communities will benefit economically from many of the environmental advantages of

open space developments such as cleaner water and more attractive surroundings (Arendt 1994a).

Community lack of understanding of the concept and effects of density trade-offs:

Density trade-offs are an essential component of open space design, and this is often a primary source of public conflict. Density trade-offs refer to the clustering of small lots on a portion of a development site while preserving the remaining portion of the site, allowing an increase in allowed density on the developed portion with the overall site density not being increased. These trade-offs are an essential part of open space preservation design because they allow a developer to maintain the allowed number of total units on the site under conventional development. In this manner, developers have more incentive to consider innovative site design. The lack of a comprehensive understanding of this type of density increase, primarily on behalf of the general public, including the fact that overall site density is not increased, along with previous poor examples of increased density developments can contribute to the public's apprehension (Arendt 1994a).

Public resistance to the clustering of development stems largely from a fear of the unknown; or resistance to change. Many people believe that clustered development simply means increased density and multi-family housing. Additionally, people often associate smaller lot sizes with lower quality homes (Jarvis 1993). Land owners of adjacent properties often fear a loss of property values if clustering permits less expensive

homes on adjacent property (Arendt 1994a; Stokes 1989). Additionally, some communities fear that clustering will result in uncontrolled growth (Jarvis 1993; Whyte 1964).

Potential homeowners frequently raise a concern about their privacy being sacrificed because of the reduced lot sizes which are common in developments which focus on preserving open space. In actuality, often times a conventional larger-lot development does not offer a much larger separation between houses. This is because generally the area making the lot larger is to the rear of where the house is located, and lot widths are kept to the allowed minimum to control infrastructure costs (Arendt 1994a). Landscaping and buffering can be used to create greater privacy on any size lot.

Additionally, higher density, grouped development can reduce the distance between destinations, and potentially reduces the number of vehicle trips per day. This is especially true in mixed-use communities where it may be possible to eliminate the commute via automobile (Brabec 1994).

The open space resulting from density trade-offs can present a problem for both reviewing authorities and potential residents in the form of concern over maintenance and liability. Most communities allow for either public or private agreements which generally fall into one of the following three categories: (Arendt 1994b; Sanders 1981; Whyte 1964).

1. **Offer of Dedication**- the municipality may, but shall not be required to, accept ownership of undivided open space, provided the land is accessible to

all residents; there is no cost of acquisition other than costs associated with transfer of ownership; and the municipality agrees to maintain such lands.

2. **Homeowners Association**- the association is responsible for maintenance, insurance, and taxes on undivided open space. Membership in the association must be mandatory for all purchasers within the development, and the association is organized by the developer with a description, including bylaws, of the association being provided to the municipality. Currently, this is the most common type of maintenance agreement (Arendt 1994b).
3. **Transfer of Easements to Private Conservation Organization**- with permission of the municipality, easements may be transferred to a private, non-profit, conservation organization. The transferee must be a “bona fide” conservation organization with perpetual existence; the conveyance must have a reverter clause; and the maintenance agreement must be acceptable to the municipality.

Difficulties in obtaining municipal approval:

Another array of concerns is centered around the municipal approval process for site plans. The primary problem is the uncertainty associated with the review and approval process itself, and the time and difficulty involved with seeing a plan through the review process that does not readily meet the explicit requirements of the zoning and/or subdivision ordinances (Arendt 1994b). Although rezoning and variances are possible for unprecedented proposals, these are costly in terms of time and money. In

other cases, current zoning may have provisions for development plans that propose a percentage of open space by reducing the minimum lot size requirement, but often these ordinances impose higher standards on clustered development that make the development financially unfeasible (Arendt 1994a; Jarvis 1993). Examples include requirements for costly public water and sanitary sewer systems, limits on houselot numbers, or excessive buffers (Arendt 1994a).

In the past, problems often resulted when references to clustering in an ordinance were vague enough to present future problems for a developer intending to develop under them. As a project proceeded through the review process, zoning boards sought significant changes, throughout the review process, for the “public interest”. The developer was left without any course of action except compliance or withdrawal (Urban Land Institute 1968). Poor examples of cluster development, including inappropriately designed homes and site plans that ignore the natural features of the land, caused some communities to rescind existing cluster ordinances (Jarvis 1993). Following the path of least resistance lead to the continuation of conventional subdivision development and sprawl.

In areas where innovative zoning allows density trade-offs, open space designs can expedite the review procedure because site designers often take into consideration concerns that could otherwise become time consuming (Arendt 1994a). This is primarily due to open space design’s emphasis on minimizing the visual and environmental impacts of new development on critical resources (Arendt 1994a). Whether or not zoning allows or encourages innovative design approaches, a cooperative effort among planners and

developers is necessary to achieve an artful blend of conservation and development (Yaro, Arendt, Dodson, and Brabec 1993). These two roles are traditionally oppositional and must be addressed if the provision of open space in residential development is to become a standard.

Lack of training for designers in innovative design techniques that preserve open space:

As Arendt states in his *Designing Open Space Subdivisions* handbook, “Despite all that has been written about land-use planning and environmental protection in recent years, nowhere does there exist a practical ‘how-to’ publication explaining just how these ideas could be put into practice ... ” (1994a, I). Chapter Three addresses this problem by presenting the existing literature and using it to create a set of evaluation criteria that can be used by both site planners and municipalities.

Lack of understanding by planners of the need for public education and involvement:

Since much opposition to open space planning concepts centers around the public’s lack of understanding, it is necessary to implement a program to educate the public about what open space planning and design entails and the benefits they will accrue from it. This is evidenced by the resistance generated by the issues of density trade-offs, and the fear of reduced property values near small lot development. Planners

must openly address this at the forefront of any campaign to implement an open space planning program. I offer possible public involvement techniques in Chapter Five.

Chapter Three:

Alternative Development Approaches

There are three current open space preservation approaches found in the literature (cluster development, rural landscape planning, and open space design development).

For each of these I present a working definition of the terminology; identification of benefits specific to the approach; and, in order to fully illustrate the differences between cluster and conventional development, a review of a representative example of zoning ordinance provisions for the approach. A brief discussion of how each of the three approaches is incorporated into the site planning process is also provided.

As part of the conclusion to Chapter Three, evaluation criteria are established based on material found in the three alternative development approaches. They are presented as a model of an assessment method for evaluating the validity of a proposed site plan in terms of how well it fulfills the intent of open space preservation.

Cluster Development

Definition

Although cluster development is an often used phrase, there are many differing interpretations on its meaning. Before evaluating cluster as a viable option to conventional development, a sample of the many working definitions is provided to establish a foundation for discussion:

- A cluster development is “... a residential development in which the buildings and accessory uses are clustered together with reduced lot sizes, into one or more groups. The land not included in the building lots shall be permanently preserved as open space. (Town of Amherst Planning Department 1988, 34)”
- “Cluster subdivisions (or cluster developments) provided legal loopholes that allowed developers to create areas of clustered higher-density development in exchange for preserving open space, all within a single development (Girling and Helphand 1994, 111).
- Clustering is “... a land development technique that groups structures and lots to provide useable open space and more cost-effective development” (*Higher Density Housing* 1986, 151).
- “Residential cluster development ... is a form of development that concentrates buildings in specific areas on a site, usually the most easily built upon portion, to allow the remaining land to be set aside as permanent open space (Kury and Geniesse 1994, 2).
- Cluster development is seen as a “... tighter grouping of homes on most buildable portions of site, leaving balance in open space. Cluster concepts can be applied to both attached and detached homes (Jarvis 1993, 29)”

- “Cluster development is the grouping of buildings and lots on a small portion of a tract, which can be an effective way to allow limited development in rural areas” (Stokes 1989, 144).
- Cluster development allows the “... flexibility to group houses, respond to a difficult site, and reserve portions of the property” (Girling and Helphand 1994, 111).

These definitions share some common elements: the grouping of structures; creating higher density than otherwise allowed on a portion of a development tract; concentrating development on the most suitable portions of the site; and preserving the remainder of the tract as useable open space. While there is general consensus as to the meaning of cluster development, there is often dissension in the design interpretation (see *The Livable Communities Handbook*, Lancaster County Planning Commission 1994). This dissension often includes concerns about the appropriate intensity of development; if families of differing income levels should be separated or mixed; and if a rural cluster development means houses should be isolated from neighbors.

However, cluster development is viewed as a more economical use of land as well as an environmentally sound form of site design (Sanders 1981). Clustering allows full development yield on a parcel of land, which is often not possible under conventional development because a portion of a majority of development sites are unsuitable for building. By concentrating cluster development on the most buildable portions of a

development site, the preservation of natural systems, and open space, is possible (Sanders 1981). However, the cluster concept remains underutilized.

Historical Perspective

The roots of clustering stem back to primitive cultures when the village was often defined by the organization of individual dwelling units into groups. The purpose of these groups was to encircle a community space and simultaneously form a defensible enclosure (Kury and Geniesse 1994; Untermann and Small 1977). The Greenbelt towns of the early 1930's incorporated the cluster principle. These communities were, and still are, quite successful, however, they remained outside of the main stream development pattern (Whyte 1964).

Clustering by current definitions appeared in the early 1960's as a reaction against the sterility of the "bedroom community", and as a way to design communities that did not "obliterate all of the land's natural features" (Jarvis 1993, 15). These early cluster developments took the form of attached homes that enabled developers and builders to achieve highly compact development while reserving the maximum amount of land for open space and community use (Jarvis 1993). The 1960's also brought the publication of a seminal book on the subject: *Cluster Development* by William H. Whyte (1964).

Whyte stated that cluster "... is a counter revolutionary movement..." and "... on the verge of becoming the dominant pattern of new residential development ..." (1964, 11). By stating that cluster was counter revolutionary, Whyte was referring to the conventional development patterns of the previous decade in which "new subdivisions

homogenized the land with lots strung out as far apart as income or pride could enforce” (1964, 11). In 1968 the Urban Land Institute stated that “ ... a cluster development, whether single or multi-family, has as its aims the improved utilization of land, which is basically improved street layout, improvement of traffic and the flow of traffic, and, most importantly, the improvement of the environment” (7).

Clustering did not achieve the initial success predicted by Whyte. Many obstacles were presented by developers, neighbors, municipal planners, and zoning boards, and many of these obstacles still exist. In fact, resistance to the concept of cluster development is well documented, although some hail cluster development as producing “... developments that are pleasanter, cheaper, and environmentally sounder” (Knack 1990).

Benefits of Cluster Development

Generally, the benefits of cluster development mimic the benefits of open space site design described in response to problems and concerns in Chapter Two. In addition, clustering can allow for the production of more houses for the money than conventional development (Whyte 1964). Primarily this is found in instances where developing a parcel of land under a zoning ordinance cluster provision allows multi-family, or attached housing in a zone otherwise restricted to single family. In addition, ordinances that allow for a mixture of housing types within a cluster development provide an opportunity to increase the availability of affordable housing in areas otherwise unvaried in housing type (Town of Amherst Planning Department 1988).

Some communities view clustering as a significant enough improvement over conventional subdivision development that they offer increased density as a bonus to entice developers to choose the cluster option. For example, the *Teton County (WY) Comprehensive Plan and Implementation Program* allows developers who place a conservation easement on at least fifty percent of their parcel to receive a density bonus up to one hundred percent. Teton County, adjacent to Grand Teton National Park, has recently seen tremendous population growth and development demands on its once plentiful ranchland, and is concerned with protecting its natural resources (Stokes 1989).

Zoning Ordinance Provisions for Cluster Development

In many ordinances, cluster subdivision provisions are found in supplementary regulations and are available as an option through rezoning, beyond the otherwise applicable zoning district (Sanders 1981). The cluster zoning provision typically begins with a statement of purpose. This statement, usually a paragraph, explains the objectives of the cluster zone within the municipality (Sanders 1981). For example:

The purpose of this [option] is to provide permissive, voluntary, and alternative zoning provisions and thereby provide for desirable and proper open space, tree cover, recreation areas, or scenic vistas; all with the intent of preserving the natural beauty ... while at the same time maintaining the necessary maximum dwelling unit density limitations of the particular residence district. [Ch. 1003, Zoning Ordinance, St. Louis County, MO, Sec; 1003.183- Amendments through August 2, 1979]

The purpose statement is generally followed by location and size requirements.

The location requirement lists the zoning districts in which the cluster option is allowed.

Typically, cluster developments are limited to larger lot single family developments, however some ordinances allow multi-family zones to be clustered (Sanders 1981). Size requirements detail the minimum area of land that shall be included within the cluster development (Town of Amherst Planning Department 1988). These requirements range, roughly, from a five acre minimum, up to 20 acres; and are sometimes listed in terms of a minimum number of units rather than acres.

Since permitting a reduction in minimum lot size is what allows land to be available for open space, allowable lot reductions are enumerated in the cluster zoning provisions. Generally speaking, greater reductions are allowed for larger lots, and less for smaller lots (Sanders 1981). Modifications of other lot dimensions, such as minimum lot widths, depths, and setbacks, are also usually allowed by cluster ordinances. Some ordinances establish allowable reduction levels for lot dimensions, while others permit the developer to propose them during the preliminary site review (Sanders 1981).

In addition, many ordinances stipulate that provisions for the future be established. These provisions include use and access controls to ensure that the open space will remain accessible when set aside for recreation, and that it will remain undeveloped when set aside for conservation (Sanders 1981). Ownership and maintenance provisions are usually also required to be established prior to approval of a proposed project.

Review criteria, or a description of the review and approval process, are often part of the cluster zoning option. The purpose of listing these criteria is to guide reviewers

and to insure that the purpose and intent of the cluster provision are being met (Sanders 1981).

Site Planning for Cluster Development

In 1977 Richard Untermann and Robert Small published *Site Planning for Cluster Housing*, written to detail the “process of physically designing cluster housing environments” (preface). According to Untermann and Small’s book, the site planning process begins with a site analysis including geology, soils, climate, hydrology, vegetation, and wildlife. This site analysis is to guide the designer in allowing for the consideration of natural process, and is an integral part of open space development. Areas appropriate for conservation are excluded from potential development.

Once the site analysis is completed, the concept development stage begins. This stage assures that both functional and pleasurable requirements are satisfied by the design. Untermann and Small list four factors that are at the foundation of the concept development (1977, 201):

1. What future residents desire in the way of a home: how much privacy, open space, identity, and yard; what activity needs to satisfy; how many cars to park, etc.
2. What the “character of site” suggests. Opportunities and constraints to development must be used to enhance the quality of the overall project.
3. What can be afforded. With rising costs this is becoming a great problem in site planning. Any designer can “create” a masterpiece with a large budget, but most people who need housing don’t have large budgets.
4. What the local government will allow to be built, including density, setbacks, mix, height limitations, and open space requirements. This requires

judgmental assessment, for many restrictions can be traded for other advantages.

A development program is generally given to the site planner by the developer, or produced from a collaboration between the planner and developer. This program will summarize the developers expectations for the project, including: approximate number of units; approximate ratio of residential, guest, and recreational parking spaces; anticipated household mix; desired community feeling; and recreation and service facilities to be included. It is important that the developer remain flexible on these issues as the concept takes form.

The concept development stage allows for the identification of site planning program requirements, development concept, circulation patterns, open space locations, and approximate cluster types and locations. The identification of appropriate community structure is included, as well as the identification of the appropriate circulation pattern for the site. This determination should be site specific and throughout the concept development stage the future needs of the residents and the character of the site should aid in all decision making. (Untermann and Small 1977, 208).

The site refinement stage takes the concept plan into greater detail. The refinement process consists of identifying and designing each cluster; the space and relationships between clusters; each individual unit; the internal circulation system; and the overall open space plan (Untermann and Small 1977).

Determining the location of individual site elements also occurs during the site refinement stage. This includes such features such as mailboxes, swimming pools or

other active recreation areas, and trash collection facilities. The following factors should be taken into consideration in determining the appropriate location of site elements: convenience; safety; sociability; noise; activity; long-term use; identity; and quiet use (Untermann and Small 1977, 262).

As the site plan takes shape it is necessary to deal with legal and technical situations related to its implementation. The most cost effective and environmentally sensitive delivery of site utilities; and dealing with zoning and ownership regulations are a part of the final stage of the planning process (Untermann and Small 1977). Once these items have been satisfactorily addressed, the plan is ready to be submitted to the local municipality for review.

Rural Landscape Planning

Rural Landscape Planning is the focus of *Dealing With Change in the Connecticut River Valley: A Design Manual for Conservation and Development* (Yaro, Arendt, Dodson, and Brabec 1988). The Design Manual was produced by the Center for Rural Massachusetts as a solution to the problem of unplanned growth that was beginning to overtake the “fertile farm fields, scenic views, and centuries-old character” of the Connecticut River Valley (Yaro, Arendt, Dodson and Brabec 1988, iii). The Center for Rural Massachusetts received a grant from the Massachusetts Department of Environmental Management to develop guidelines for protection of the rural landscape.

Definition

Rural Landscape Planning (RLP) is a blend of landscape architecture and regional planning designed to deal directly with development issues in the countryside. RLP proposes to modify standard zoning and subdivision practices requiring one- or two-acre minimum lot sizes in order to allow for “...creative strategies that artfully blend conservation and development...” (Yaro, Arendt, Dodson and Brabec 1988, 8).

Lot sizes are reduced by approximately fifty percent, and the resultant open space is permanently protected by conservation restrictions (Yaro, Arendt, Dodson and Brabec 1988). Buildings are located within existing woodlands, at the fringe of farm fields, or screened from the fields by newly planted landscape buffers.

Rural Landscape Planning proposes modifications to standard zoning and subdivision practices in critical ways to achieve more harmonious residential development design, allowing “... a large proportion of new homes to be sited so as to command uninterrupted views across long, open fields or pastures, permanently protected from future development” (Yaro, Arendt, Dodson and Brabec 1988, 14). This balanced approach has the potential to “save what needs to be saved, and build what needs to be built (Robert Lemire as quoted in Yaro, Arendt, Dodson and Brabec 1988, 15).”

Benefits of RLP

Benefits common to residential developments in which open space is preserved are applicable to RLP. For example, economic advantages for the developer from reduced infrastructure costs are possible.

Benefits specific to RLP are experienced by many individuals. Farmers who typically sell their farmland for retirement money are allowed to retain a portion of their original farm while a developer purchasing the remainder profits as well. The portion retained as farm land is placed under a conservation easement while houselots smaller than the typical minimum size are developed on its fringes, providing homeowners with a preserved rural setting. Local governments interested in conservation easements as a way to maintain open space and rural character do not have to purchase the land themselves, or implement a complicated transfer of development rights plan (Yaro, Arendt, Dodson and Brabec 1988). The authors state:

This approach has been specifically designed for implementation in small towns, where local officials and residents are looking for land conservation options that involve little public expenditures, are easy to administer, allow full equity for rural landowners, and are not unfair to developers (Yaro, Arendt, Dodson and Brabec 1988, 14).

Zoning Ordinance Provisions for RLP

The Design Manual recommends a “Farmland/Open Space Conservation and Development Bylaw” designed to simultaneously preserve farmland and significant open space, while allowing landowners full equity value for residential subdivision of their land (Yaro, Arendt, Dodson and Brabec 1988, 172). Prior to the implementation of the zoning bylaw, appropriate zoning districts must be identified and designated. Two possible types of districts exist: farmland protection districts or open space protection districts.

Farmland protection districts include existing farmland, usually the areas most suitable for farming in the community. Open space protection districts include land that is not intensively farmed but has scenic or natural resources worthy of protection. These areas may include large tracts of undeveloped land; aquifer recharge areas and areas of scenic beauty or of historic or cultural significance (Yaro, Arendt, Dodson and Brabec 1988).

The bylaw begins with a statement of purpose, identifying the intent of the bylaw as well as identifying to what types of development the bylaw applies. The authors recommend that the creation of three or more residential lots on one property or contiguous property under one ownership, within a five year period be allowed only under Special Permit granted by the planning board in accordance with this bylaw (Yaro, Arendt, Dodson and Brabec 1988).

Farmland and Open Space Protection Districts are established as overlay zoning districts and should be designated by map. Permitted uses within these districts are listed in the recommended bylaws and include activities such as agriculture; the construction of one or two residential dwellings or lots; and timber cutting for public safety, personal use, or as permitted by a forest management plan. Special permit uses include the creation of three or more residential lots within a five year period (Yaro, Arendt, Dodson and Brabec 1988).

Recommendations for criteria for development under the Farmland/Open Space Development and Conservation Special Permit include (Yaro, Arendt, Dodson and Brabec 1988, 171):

- minimum land area for a special permit of six acres;
- total number of dwelling units permitted be determined at the rate of one unit per every two acres of buildable land, after excluding all wetlands and flood prone areas;
- residual farmland or open space be at least fifty percent of the total buildable land area;
- residual land be used for conservation, recreation, or agriculture;
- ownership of residual land be specific, and further development of the land be prohibited (Yaro, Arendt, Dodson and Brabec 1988, 171).

Design guidelines are provided to ensure that the proposed development meet the intent of the bylaw. These guidelines suggest that dwellings be grouped so that, on average, they employ no more than one acre of land per dwelling, including roads. Lot layout is guided by a list of objectives such as the protection of fertile soils suitable for agriculture; the encouragement of the location of development along the fringes of open fields and within wooded areas; and the protection of scenic views (Yaro, Arendt, Dodson and Brabec 1988, 172).

Additional requirements of the Farmland/Open Space Conservation and Development Bylaw include specifics such as a minimum lot frontage along existing public roadways of one hundred and fifty feet. Lots not served by public sewer shall be a minimum of 30,000 square feet and have a road frontage of not less than fifty feet in a proposed subdivision. Individual lot setbacks are not listed, but a minimum distance between buildings of sixty feet is required, as well as a minimum landscaped buffers of seventy-five feet between residential and agricultural uses (Yaro, Arendt, Dodson and Brabec 1988).

Open Space Development Design

Open space development design (OSDD), an alternative development technique founded by Randall Arendt, is the focus of *Designing Open Space Subdivisions* and *Rural by Design* (1994a and 1994b). Arendt developed OSDD as a response to what he describes as “... conventional approaches to subdivision development [which] ultimately produce nothing more than houselots and streets ... [which] eventually ‘checkerboards’ currently rural areas into a seamless blanket of ‘wall to wall subdivisions’ ” (Arendt 1994a, 1).

Definition and Benefits of OSDD

Arendt’s creation of the OSDD concept stems largely from his belief that “ ... most townships and counties have adopted zoning ordinances whose principal purpose is to set rules for the orderly conversion of natural lands into developable properties” (1994a, ii). OSDD retains a basic commitment to accommodating the amount of development that would otherwise be legally possible under conventional design, while allowing the balance of the property to be permanently protected from development. Arendt’s commitment is to producing “Alternative methods of designing for the same overall density while also preserving 50% or more of the site ... and create more attractive and pleasing living environments that sell more easily and appreciate faster than conventional ‘houselot-and-street’ developments” (Arendt 1994a, 1).

The advantages associated with OSDD are common to those identified for other residential development techniques focusing on the preservation of open space. This

includes economic benefits associated with reduced infrastructure costs; marketing and sales advantages, and property value appreciation; environmental benefits due to reduced intrusions in environmentally sensitive areas, less impervious surfaces, the provision of vegetative buffers, and greater flexibility in sanitary sewer design; and social benefits from providing opportunity for casual meetings between neighbors and reduced maintenance demands, allowing more time to enjoy site amenities (Arendt 1994a).

OSDD stipulates a “density-neutral” approach in which the overall number of dwelling units provided not be less than the number allowed under conventional zoning. Development is prohibited in primary conservation areas (PCA’s) including wetlands, floodplains, waterbodies, and slopes over twenty-five percent; and restricted in secondary conservation areas (SCA’s), including woodlands, upland buffers around wetlands and waterbodies, prime farmland, natural meadows, critical wildlife habitat, and sites of historic, cultural or archaeological significance (Arendt 1994a).

After deducting PCA’s from the total site acreage, calculations are made to determine the number of dwellings allowed by conventional zoning on the remaining portions of the site, including SCA’s. This number of units is then located around, but not within, the SCA’s. This results in a density-neutral subdivision with significant upland open space that would normally be developed. Of the open space that remains, at least one half should be retained in its natural state, while one half may be converted into a more formal open space, such as for active recreation (Arendt 1994a).

Site Planning for OSDD

Arendt divides the process of designing open space developments into two broad phases: basic information collection and analysis; and organization of the information and decision making on the physical shape of the development (1994a). The first phase is primarily objective, while the second is primarily subjective and “... should usually be based upon certain design principles providing a defensible rationale” (Arendt 1994a, 21).

The information collection and analysis phase involves four distinct steps (Arendt 1994a):

1. Understanding the locational context in order to determine the layout and pattern of a proposed development.
2. Mapping special features as part of a site analysis of natural and cultural resources.
3. Prioritizing objectives of the proposed development.
4. Integrating the information into layers in order to determine which areas of the site are most appropriate for development, as detailed below.

Once all the pertinent features have been identified, located, and evaluated in terms of individual significance they should be integrated into information layers. This process combines factors into layers that can be used as overlays to determine the overall pattern of potential conservation areas. Buildable land will emerge from those areas not limited by identification as Primary Conservation Areas. Once the Primary Conservation Areas have been identified, information layers containing information on Secondary Conservation Areas can be added to further define the buildable land.

During the process of integrating layers, often the entire parcel will be covered by one or more resources, or potential conservation factors. The prioritization of objectives becomes necessary to refine the determination of buildable land area. Priorities should be based on an understanding of “ ... what is more special, unique, irreplaceable, environmentally valuable, historic, scenic, etc., compared with other similar features, or compared to different resources altogether” (Arendt 1994a, 34). This process requires subjectivity, and a rating system can help reduce inconsistent and arbitrary choices.

Once the basic information collection and analysis phase has been completed the design phase, involving organization of the information and decision making on the physical shape of the development, can begin. Determining the maximum allowable density should be done at this time. Density can be determined in two ways: based on the applicable zoning ordinance; or, if that is not possible, based on a “yield plan”. A yield plan is a conceptual sketch of a conventional subdivision layout, providing maximum build-out of the site (Arendt 1994a, and 1994b). The yield plan is drawn realistically, so that every lot meets local regulations. The resultant lot yield determines the allowable site density for the clustered site.

The design phase consists of four sequential steps, beginning with the identification of all potential open space areas. This step is a continuation of the prioritization step from phase one, and defines all areas which should potentially be conserved. This open space

... consists of the unbuildable wetlands, floodplains and steep slopes (the Primary Conservation Areas), to which are added that part of the buildable uplands that are

most sensitive environmentally, most significant historically or culturally, most scenic, or which possess unusual attributes that cause them to stand out from the rest of the property, areas that the average observer would miss most if they disappeared under new houselots and streets (Arendt 1994a, 36).

The second step involves the actual location of the house sites. It is economically important to create as many “view lots” as possible, as well as to ensure that usable open space is located within walking distance from all houselots (Arendt 1994a, 37). The simplest way to maximize the number of view lots, or lots that directly front open space, is to begin with the minimum lot width allowed, and to maximize the livability of these homes through “creative adaptations”. Creative adaptations can include a windowless side wall located as closely as possible to the side lot line, with another sidewall containing windows opposite this facing a larger side yard (Arendt 1994a). Zero-lot line homes, if allowed, achieve this effectively.

Arendt advocates the use of “flag lots”, especially in odd corners and at the end of cul-de-sacs, because they are more efficient than the alternative triangular “pie lot” (1994a, 37). Additional recommendations include limiting flag lots to no more than fifteen percent of the total lot number, and requiring buffering at the common front/back property line.

The individual lot lines have not yet been drawn, which allows for the careful avoidance of smaller natural features worth preserving which have not been included within the conservation areas. Since it is unlikely that each lot will be a view lot, the provision of small village greens can increase the number of lots with a view to at least a minor open space.

Step three, concerning site access, occurs once green spaces have been identified and houselots tentatively located. In areas with level or rolling topography, the major considerations are avoiding wetland crossings and minimizing the length of new access streets. Environmental considerations include avoiding mature trees or wildlife habitat areas within the development area.

From an aesthetic and speed control perspective, long straight streets should be avoided. Curving roads, or shorter straight segments connected by 90-degree and 135-degree bends are preferable. Reverse curves are desired, however they should be used with relatively long horizontal curve radii, at least 250 feet, and on streets with traffic speeds not in excess of 35 mph. Interconnected streets provide easier and safer access, and distribute traffic in a more equitable manner, therefore the use of dead-end streets should be minimized (Arendt 1994a).

Step four, the final step in the design phase, consists of drawing lot lines. The most significant aspect of the development, from the viewpoint of the future residents, is how their houses relate to the open space, to each other, and to the street. The challenge of maintaining livability increases as lot sizes decrease (Arendt 1994a, 39). The issue of appropriate lot depth is directly related to the presence or absence of open space along rear lot lines. When open space is located directly behind houselots, the lot depth can be reduced because the open space visually extends the perceived depth of the backyard (Arendt 1994a).

Zoning Ordinance Provisions for OSDD

In *Designing Open Space Subdivisions*, Arendt recommends model ordinance provisions, beginning with allowing an option for estimating the permitted development density (1994a). Density can be determined on the basis of mathematical formulas contained within the zoning ordinance, or on the basis of the “yield plan”. The yield plan consists of conventional lot and street layout, conforming to zoning regulations and excluding Primary Conservation Areas.

The model ordinance provisions suggest a density bonus, for the sole purpose of endowing the open space maintenance fund. Spending from the fund should be restricted to expenditures of interest, in order that the fund principal remain intact. Density bonuses can also be allowed for the dedication of land for public use, including trails and active recreation. Bonuses can be computed on the basis of one dwelling unit per five acres of publicly accessible open space (Arendt 1994a, 135). The decision to accept the offer to dedicate open space is reserved for the reviewing municipality. Open space shall consist of a minimum of fifty percent of the total tract area, after deducting the unbuildable land areas (Arendt 1994a, 136)..

Open space shall be comprised of two types of land areas: Primary and Secondary Conservation Areas. Full density credit is allowed for otherwise buildable land designated as Secondary Conservation Areas . This is to keep development potential from being minimized by this designation. Although land designated as Secondary Conservation Areas may comprise more than half of the remaining land parcel, no more than fifty percent shall be required to be designated as open space.

In general, residential uses shall be designated around conservation areas, with the undivided open space being directly accessible to the largest number of lots practicable. Evaluation of the proposed development plan will be based on whether or not the design is appropriate for the site's natural, historic, and cultural features, and meets the purposes of the zoning ordinance (Arendt 1994a, 139).

Recommended procedures for the application and review process are also presented in *Designing Open Space Subdivisions* (Arendt 1994a). This process begins with a pre-application discussion between the site developer, designer, and reviewing municipality. This discussion is recommended to introduce all parties to the zoning and subdivision regulations and procedures, and to discuss the developers objectives in relation to official policies. Following the preparation and submittal of a site analysis identifying Primary and Secondary Conservation Areas, an "on-site walkabout" is scheduled (Arendt 1994a. 142).

The purpose of the walkabout is to familiarize officials with the property's special features and to provide an informal opportunity for them to offer guidance to the developer and designer. A pre-submission conference is suggested to allow the developer and designer to meet with the reviewers to discuss how the planning process for designing open space subdivisions could be applied. The walkabout and pre-submission conference may be combined (Arendt 1994a).

A conceptual preliminary plan is then submitted to the zoning officer and is reviewed to secure agreement on the overall pattern of streets, lots, conservation areas,

and trial linkages, prior to final engineering. Once the preliminary plan is accepted, a “preliminary engineering certification” can be applied for. This certification is used to assure that the proposed plan can be accomplished within the current regulations (Arendt 1994a, 143)..

Encouraging OSDD

Making OSDD legal does not necessarily make it a preferred development alternative from a developer’s standpoint. Experience has shown that removing legal and procedural barriers typically results in a ten to fifteen percent use rate (Arendt 1994b).

Therefore, incentives are recommended to encourage developers to select OSDD.

Density bonuses can encourage the selection of OSDD. However, unless financial incentives are substantial, developers are usually reluctant to vary from their conventional pattern of development. In addition, there is often popular resistance to allowing density increases of any size (Arendt 1994b). Incentives such as allowing reduced street widths and center-line radii; waiver of curb and catch basin requirements; and allowing for increased road gradients can reduce development costs while not jeopardizing public safety (Arendt 1994b).

In *Rural by Design*, Arendt discusses a “mandatory-voluntary” approach in which an applicant for plan approval is required to prepare and submit an inexpensive conceptual sketch plan showing how a proposed subdivision could be laid out under

OSDD provisions (Arendt 1994b, 226). The developer is free to reject this conceptual open space plan and pursue a conventional subdivision layout.

Summary of the Three Alternative Development Approaches

Each of the alternative development approaches provides for full development yield of a parcel of land, while providing a portion of the site as preserved open space. This is based on a reduction in minimal lot sizes, usually with the smaller lots clustered together on the most suitable portions of the site. Cluster development focuses on a general clustering of lots on the appropriate landform. Rural landscape planning uses this same basic technique to emphasize the preservation of farmland, suggesting that home sites be tucked along the edges of existing farmland rather than placed on top of it. Open space design development is also a more general open space design preservation tool, but the implementation techniques have been carefully detailed with the emphasis on the careful designation of conservation areas.

Evaluation Criteria

Important open space issues are discussed by the alternative development approaches. In this section, evaluation criteria designed to reflect my assessment of which parameters are most significant are presented. They are designed to be easily used

by a planner to evaluate a proposed site plan in terms of how well it fulfills the intent of open space preservation.

Specific recommendations listed under each criteria have evolved from a synthesis of the pertinent literature. These criteria can be used as design guidelines during the site plan preparation process, or as a basis for consistent evaluation of proposed site plans. For convenience, the criteria are grouped into the following sub-headings: open space; site plan; primary conservation areas; and secondary conservation areas. Following each criterion is a justification for it based on the literature review. In some cases value judgments are necessary on behalf of the user as to which of the individual criteria are most important because achieving all may not be possible. Each of the twenty-one criteria is described below, and following these descriptions, Table 3.1 presents them in a useable format.

Open Space:

1. **A minimum of fifty percent of the entire development parcel should be preserved as open space.** While fifty percent is a recommended guideline, a minor tolerance should be allowed depending on specific site circumstances. The minimum area requirement for open space is typically listed in zoning ordinances which allow clustered site development by-right. Often this amount is at least equal to the total amount of reduction in individual lot areas (Sanders 1981). Generally, Rural Landscape Planning (RLP) proposes that all new development on open fields or pastures be designed such that no more than fifty percent of the farmland is consumed by streets and lots (Yaro,

Arendt, Dodson and Brabec 1988). Open space development design (OSDD) refers to residential subdivision design in which "... half or more of the buildable land area is designated as undivided, permanent open space" (Arendt 1994a, 4).

2. **Twenty-five percent of the fifty percent open space shall be suitable for active recreation.** Arendt suggests that at least twenty-five percent of the minimum required open space be suitable for active recreation while no more than fifty percent be used for such (1994a, 136). Additionally, cluster development emphasizes the usability of the preserved open space (Higher Density Housing 1986).
3. **Open space shall be permanently protected and legally acceptable; provisions shall be implemented to ensure further subdivision of residual land be prohibited** (Yaro, Arendt, Dodson and Brabec 1988, 171). The evaluation criteria recommend that provisions be in place to ensure that the open space is permanently protected from any future development. These provisions may be in the form of a permanent conservation easement, and must be in a form acceptable to the reviewing municipality (Arendt 1994a).
4. **Open space shall be reasonably contiguous.** A connected network of open space helps provide ecological corridors which can reconnect remnant wildlife

habitats (Little 1990). Therefore, the evaluation criteria recommend that fragmentation of open space be minimized, to the extent possible, so that resource areas are not divided into numerous small parcels located throughout the development (Arendt 1994a).

5. **Open space shall be publicly accessible.** Many ordinances go beyond a minimum amount of open space requirement to include use and access provisions to ensure that the open space will remain useable and accessible when set aside for recreation (Sanders 1981). Additionally, public accessibility discourages the development of elitist neighborhoods excluding those that can not afford to pay for access to open land. Open space should be accessible to the public, except in instances where the open space is farmed or used for other productive uses.

6. **Length:Width ratio shall not exceed 4:1.** In order to prevent unusable strips of undeveloped land making up the majority of the required open space within a development, Arendt suggests that open space areas shall consist of no less than three acres, and generally have a length-to-width ratio not exceeding 4:1 (1994a, 138). The ratio shall be maintained as much as possible, except in areas designated as greenways, trail links, or buffers.

Site Plan:

7. **Site plan shall respect locational context/rural character.** Locational context is important in determining the layout and pattern of a proposed development. New development, within or adjoining small towns or villages should reflect and extend the historic streetscape and street pattern, especially in terms of regularity and inter-connectedness (Arendt 1994a). Relationships between dwellings and streets are important in terms of setbacks, sidewalks, and street tree plantings. In more rural locations and on outlying parcels it may be more appropriate to follow a more “organic” approach; implementing an informal or irregular layout pattern (Arendt 1994a). Untermann and Small refer to this locational context as the community structure (1977, 208). They go on to state that the fundamental essence of the site should determine how the site might be best developed, mimicking community structure and road layout. The pattern of the proposed development should reflect and extend the site surroundings.

8. **A pedestrian circulation system shall be provided.** At a minimum, safe and convenient pedestrian access shall be provided from all lots not adjoining open space (Arendt 1994a). Additional trail systems are encouraged to provide access throughout the site, including bicycle trails.

9. **“Full-equity” value shall be provided.** In order to sustain itself, an open space design shall provide the developer “full-equity value” for the development site (Yaro, Arendt, Dodson and Brabec 1988, 14). Therefore the site design should provide as many lots as possible under standard zoning, in a manner consistent with this literature. Reduced lot sizes are the primary means by which this achieved. In OSDD, Arendt refers to this as a “density-neutral” approach to subdivision planning. With density neutral referring to the overall number of dwelling units allowed not being less than would be allowed in a conventional subdivision (Arendt 1994a). Density bonuses may be used to encourage additional open space or community amenities by the developer.

10. **Site plan shall respect site geography.** In *Site Planning for Cluster Housing*, Untermann and Small discuss two site layout patterns that have a direct relationship to existing topography (1977, 216-217):

1. Linear- units in a row, either parallel or perpendicular to contours. Since access from adjacent roads or parking is direct, this pattern suggest individuality and dependence on the car.
2. Focus- court or cul de sac arrangements organized around a shared space. This pattern helps create a sense of community.

Extensive earthmoving should be avoided and the site plan should respect the site topography.

Conservation Areas (Criteria 8-21):

The site planning process detailed under all three alternative development approaches begins with a site analysis including geology, soils, climate, hydrology, vegetation, and wildlife. The purpose of this analysis is to allow the site planner to use “natural processes as design determinants” (Untermann and Small 1977, 183). Untermann and Small describe a “subtractive process” which determines what portions of the site should be developed by subtracting the lands identified in the site analysis stage as being too steep, or containing other natural process (1977, 203). In OSDD Arendt refers to natural and cultural resource areas to be subtracted as “Primary Conservation Areas” and “Secondary Conservation Areas” (PCA’s and SCA’s) (1994a). Evaluation criteria 11 thru 21 follow Arendt’s lead by defining both types of conservation areas. Primary areas are restricted from residential development completely (items 8 through 11). Secondary areas are included in the preserved open space to the extent possible (items 9 through 18). The subtracted land becomes the community open space.

Primary conservation areas (development prohibited):

11. **Floodplains:** Although, in some coastal areas and river valleys, development is allowed on elevated piers within slow moving floodways, it is not recommended within the 100-year floodplain as designated and mapped by the Federal Emergency Management Agency (FEMA) (Arendt 1994a). For the purpose of open space design under the evaluation criteria, development other

than stream crossings or yard space, with an easement restricting development, is prohibited within floodplains.

12. **Wetlands:** Both tidal and freshwater wetlands should be identified, together with dry, upland buffer areas to help protect the environmental quality of the wetland areas (Arendt 1994a). The U.S. Fish and Wildlife Service publishes National Wetlands Inventory Maps however, site specific evaluation and mapping may be necessary for smaller scale projects. Exclude wetlands from any development activities that will alter their existing conditions.

13. **Waterbodies:** As in the case of floodplains and wetlands, the evaluation criteria exclude existing waterbodies from any development activities.

14. **Slopes over twenty-five percent:** Slope maps can be produced based on site surveys or U.S. Geological Survey topographic maps (Arendt 1994a). Due to the high potential for erosion and lack of stability, slopes over twenty-five percent should be excluded from development (other than roadways where necessary). They may be part of private yard space with easements restricting development.

Secondary conservation areas (development limited):

15. Mature woodlands: To the extent possible, existing woodlands should be designated as Secondary Conservation Areas. Aerial photography often available from the U.S. Soil Conservation Service can provide information on the extent of existing hedgerows and woodlands. While a site survey may be more appropriate at smaller scales. Rural Landscape Planning recommends that development be located within any woodland contained in the parcel, or along the far edges of the open fields adjacent to any woodland to reduce impact on agriculture, to provide summer shade and shelter from winter wind, and to enable the new construction to be visually absorbed by the natural landscape features (Yaro, Arendt, Dodson and Brabec 1988, 171). Some environmentalists in farming areas feel that development on farmland is preferable to woodlands because the woodlands provide a more diverse plant and animal habitat, as well as reduce the applications of heavy agricultural chemicals. However, in areas with viable commercial agriculture development should be discouraged (Arendt 1994a). The development of residential lots should be located around the edges of existing woodlands, not deep within them to minimize the clearing made necessary.

16. Buffers around wetlands and waterbodies: Buffer areas of 100' in width are recommended adjacent to wetlands and waterbodies to help protect water quality (Arendt 1994a). These buffers help minimize the negative effects of

development on the natural ecosystem by filtering storm water before it reaches water courses.

17. Prime farmland: Residential development should be located on the least fertile soils for agricultural uses, and in a manner which maximizes the usable areas remaining for such agricultural use (Yaro, Arendt, Dodson and Brabec 1988, 171). Farmland protection districts can be identified with overlay maps of suitable soils or by mapping land that is currently being farmed. It is recommended that the opinions of local farmers be considered as well (Yaro, Arendt, Dodson and Brabec 1988). Prime farmland should be included within secondary conservation areas. In areas where there is a direct conflict between the preservation of existing woodlands and prime farmland, site specific determinations will be necessary based on the intended use of the preserved open space.

18. Critical wildlife habitat protected: Wildlife habitats for threatened or endangered species form part of the Primary Conservation Area (Arendt 1994a). Other areas likely to be used as corridors for the movement and breeding of wildlife should be designated as Secondary Conservation Areas to aid in minimizing fragmentation of wildlife habitat.

19. **Historic, cultural, archaeological sites:** In most areas, historic, archaeological, and cultural features are not restricted from demolition (Arendt 1994a). However, in order to help preserve the integrity of the area, these features should be identified and designated as Secondary Conservation Areas.
20. **Ridgetops and Scenic Views:** Typically, developers wish to maximize views out from the development site while the public desires that the development be as visually inconspicuous as possible (Arendt 1994a). In areas of the development site containing visually prominent ridges, the ridgetops may be designated as Secondary Conservation Areas, pushing development below the crest; or woodland buffers can be retained to help buffer rooflines. Vegetative clearing should be limited to thinning of lower limbs to create “view holes,” rather than clear-cut panoramas (Yaro, Arendt, Dodson and Brabec 1988, 171). In addition, development should be placed in locations least likely to block or interrupt scenic vistas as seen from nearby public roadway(s)
21. **Slopes fifteen to twenty-five percent:** To further protect sensitive areas, slopes between fifteen and twenty-five percent should be avoided whenever practical (Arendt 1994a). These areas are best included in yard space restricted from development rather than as an entire residential lot, however in some areas this may not be possible.

Table 3.1
Evaluation Criteria for Open Space Site Designs

<i>Open Space Site Design Criteria:</i>	<i>Site Plan Meets</i>	<i>Site Plan Does Not Meet</i>	<i>Not Applicable</i>
<i>Open Space:</i>			
1. Minimum of 50% preserved			
2. 25% of 50% open space suitable for active recreation			
3. Permanently protected			
4. Reasonably contiguous			
5. Publicly accessible			
6. Length:width ratio not exceeding 4:1			
<i>Site Plan:</i>			
7. Respects locational context/rural character			
8. Pedestrian circulation system provided			
9. "Full-equity" value provided			
10. Site plan respects site geography			
<i>Primary Conservation Areas Protected:</i>			
11. Floodplains			
12. Wetlands			
13. Waterbodies			
14. Slopes over 25%			
<i>Secondary Conservation Areas Protected:</i>			
15. Mature woodlands			
16. Prime farmland			
17. Buffers around wetlands and waterbodies (100' preferred)			
18. Critical wildlife habitat			
19. Historic, cultural, archaeological sites			
20. Ridgetops/Scenic Views			
21. Slopes 15-25%			

Table 3.1 allows a quick analytical format for an open space site planning designer or developer. An example of the use of these evaluation criteria as the basis for the preparation of an open space site plan is presented in Chapter Four.

Chapter Four.

Residential Development in the Tom's Creek Basin

Recently, development pressure has begun to threaten the integrity of the Tom's Creek Basin. Chapter Four discusses the Tom's Creek Basin in Blacksburg, Virginia and presents a site plan for a 96 acre parcel which incorporates the open space design approaches detailed in Chapter Three. Additionally, an explanation of how the site plan fulfills the evaluation criteria developed in Chapter Three is provided.

Blacksburg

The Town of Blacksburg, located in southwestern Virginia, is the largest incorporated Town within the Commonwealth of Virginia with an estimated population of 35,000, including Virginia Tech students. The Town lies on a plain between the Blue Ridge and Allegheny Mountains and is noted for its natural beauty and outdoor recreational opportunities. The Town of Blacksburg's original open space plan recognizes open space as being a positive method of achieving an ecological balance between urban and natural environments and protecting against the "... negative externalities of urbanization" (1971, 3).

The Tom's Creek Basin

The Tom's Creek Basin, which represents "... the last swath of essentially undeveloped land in Blacksburg ..." lies at the foot of Brush Mountain in the northwest corner of Blacksburg (Foster 1995f, NRV-1). Major features include Tom's Creek, its tributaries and surrounding flood plain. The landform is rolling terrain with slopes increasing near the base of Brush Mountain. The Basin is identified in a rezoning report as "... a unique resource in the Town of Blacksburg" (Tom's Creek Basin 1995, 1).

Low intensity agricultural uses, such as rolling pastures with grazing livestock, dominate the area and contribute to its scenic beauty and sense of "openness" (Tom's Creek Basin 1995, 1). Single-family residences dot the Basin, primarily along the existing roads. Nearly ninety percent of the Basin is comprised of land parcels in excess of five acres, and eighty percent of the Basin is comprised of land parcels greater than ten acres (Tom's Creek Basin 1995).

At a public meeting held at the end of April, 1995, residents of the Basin listed saving the rural character of the area as their primary concern for the Basin's future. Other important issues cited include retaining open space, preserving the woodlands, and keeping out development (Foster 1995f).

Proposed Rezoning

The Tom's Creek Basin is currently zoned primarily for agriculture and limited residential uses with a minimum lot size of one-acre. The Town is considering the implementation of three conservation districts through rezoning: Rural Residential; Rural

Residential 2; and Creek Valley. This conservation zoning was introduced to the community through the viewing of a video produced by Randall Arendt, (*Conserving Rural Character*), to “sum up the sentiments” of the Town (Foster 1995f, NRV-1). For each parcel of land exhibited in the video, alternatives are presented showing conventional development versus conservation development, in which the preservation of open space is a priority. Arendt uses the alternatives to explain that “... there are smarter ways to grow than to spread the homes out ...” (Foster 1995f, NRV-1).

The stated purpose of the Rural Residential district is “... to provide for development at a scale intended to conserve the rural character of the Tom’s Creek Basin” (Town of Blacksburg October 6, 1995; Rural Residential District 1). The goals of the Rural Residential district are to conserve agricultural and forest lands; to conserve natural resources; to conserve unified open space within a permanent conservation easement; to create residential developments on a traditional rural scale; and to allow flexibility and creativity in the design of residential subdivisions. The ordinance proposes to implement a one unit per acre development density with no minimum lot size. Instead, a floor area ratio (FAR) is proposed at 0.25 for lots less than or equal to 1/3 acres and 0.30 for lots larger than 1/3 acres. A minimum open space preservation requirement of fifty percent for the entire development parcel is proposed, including a fifty foot perimeter buffer.

The Rural Residential 2 district is planned as a floating zone, designated by a request for rezoning. The purpose of the Rural Residential 2 district is to encourage high-quality planned residential development; to preserve agricultural and forest lands; and to

maximize the conservation of scenic and recreational open space through the use of open space design and a density bonus system (Town of Blacksburg October 6, 1995; Rural Residential 2 District 1).

The minimum district size is 10 acres with a maximum gross density of one dwelling unit per acre, excluding any density bonuses which allow the maximum gross density to be increased to two units per acre. The minimum open space requirement is fifty percent, with the provision of additional permanent open space, either on or off site, qualifying the developer for an increase in density. Additionally, the provision of recreational facilities; dedication of greenways/parks; provision of architectural controls; and/or provision of off-site improvements can allow for an increase in density.

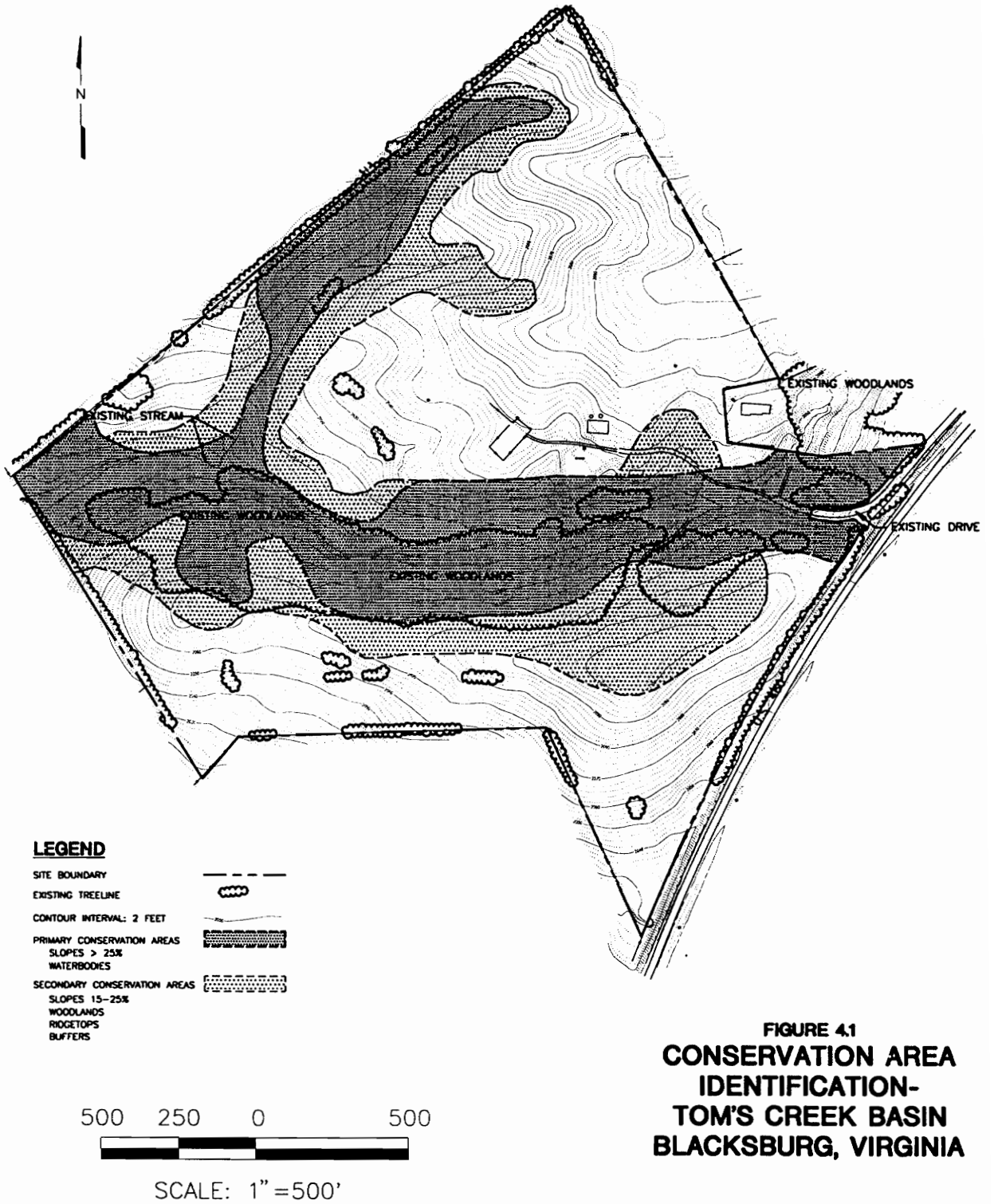
The Creek Valley district is designed as an overlay district to “ ... regulate land use and development on lands adjacent to scenic streams ... ”(Town of Blacksburg October 6, 1995; Creek Valley District 1). Areas included in the Creek Valley district include Tom's Creek and its 100 year flood plain; all areas of fifteen percent slopes or greater adjacent to the Creek, or within fifty feet of the Creek; all wetlands contiguous to the Creek or steep slopes; and all land within a corridor defined by a boundary fifty feet, plus four additional feet for each percent of slope measured perpendicular to the stream bank. No residential uses are allowed by right in the Creek Valley district.

Proposed Site Plan

The site chosen for this study is a 96 acre parcel located in the eastern corner of the Tom's Creek Basin, near the intersection of Tom's Creek Road and US 460, see

Figure 4.1. The proposed rezoning for the Basin includes this area in the Rural Residential zoning classification. The first step in preparing the site plan involved identifying the locational context in order to help determine the appropriate layout and pattern of the proposed development. The Tom's Creek Basin consists primarily of single family residences on lots over five acres in size. The majority of these residences lie adjacent to the existing roadways in the basin. Following these constructs, an organic design approach has been identified as appropriate for this site.

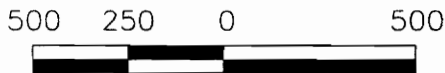
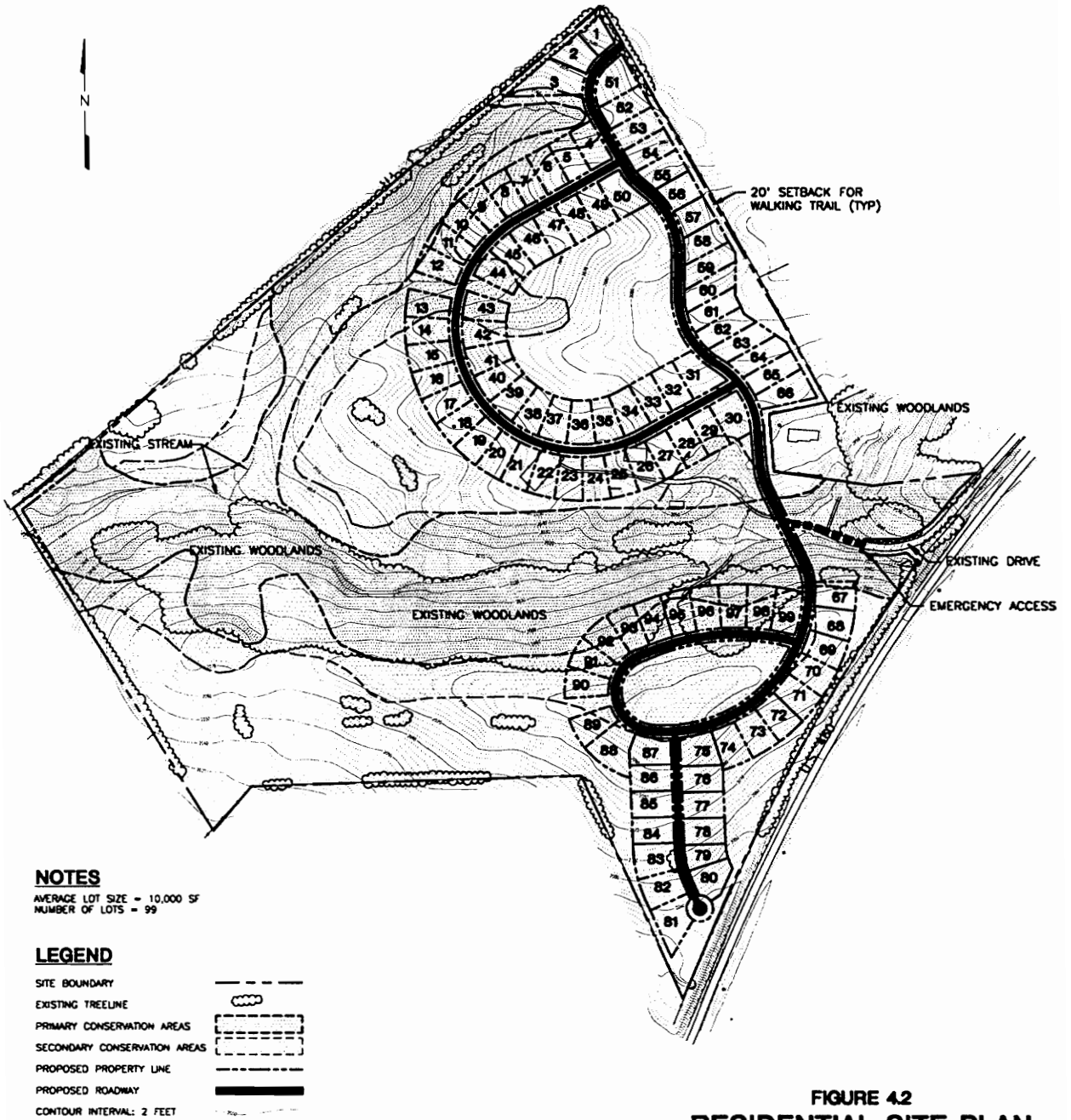
Primary and secondary conservation areas (PCA's and SCA's) were then identified and mapped. PCA's on the Tom's Creek site include two existing streams and areas adjacent to the streams exceeding twenty-five percent in slope. The PCA's are delineated in Figure 4.1 with a dark shading pattern, approximately 30 acres are included in the PCA's. There are no identified wetlands or floodplains on the site. SCA's on the site include mature woodlands, 100' buffer areas around the existing streams, ridgetops for the protection of critical views, and slopes between fifteen and twenty-five percent. SCA's are identified in Figure 4.1 by a medium shading pattern, approximately 22 acres are included in these SCA's.



Once buildable areas were identified (all areas in Figure 4.1 not covered by a shading pattern) possible lot and street layouts were addressed. The first step in this process was to establish the minimum lot size appropriate for the site, since the proposed Rural Residential zoning does not have a minimum lot size requirement. The minimum lot size selected is 10,000 square feet. While this lot size is considerably smaller than existing development in the Basin, reduced lot size is a necessary component of a successful open space design. Alternatively, the 10,000 square foot minimum lot size could be criticized as being too large to be afforded by many potential home buyers. Development costs for the site will be minimized by the grouping of the development on the most accessible and appropriate portions of the site. The 10,000 square foot minimum lot size can be further justified in that the preservation of rural character is an integral part of a successful open space development and smaller lots would begin to create the perception of higher density and disrupt the rural character of the area.

Figure 4.2 illustrates the proposed site plan for the Tom's Creek Basin. This site plan was designed based on the open space planning design approaches presented in Chapter Three, as described above, and the Evaluation Criteria for Open Space Site Designs presented in Table 3.1, page 62. The site plan also adheres to the requirements of the proposed rezoning for the Basin.

Overall proposed density for the site is 1.04 units per acre, with seventy percent of the site available for permanent preservation as open space. While the proposed ninety nine lots exceed the allowed one unit per acre by three lots, the proposed zoning ordinance allows for increases in allowed density under the Rural Residential 2 zoning



SCALE: 1" = 500'

FIGURE 4.2
RESIDENTIAL SITE PLAN
for
TOM'S CREEK BASIN
BLACKSBURG, VIRGINIA

district. Density increases are allowed based on the provision of permanent open space the exceeds the fifty percent requirement; the proposed site plan provides seventy percent. The additional lots do not interfere with the intent of the design following the criteria outlined in Chapter Three, and allow a modest increase in return for the developer.

Site Plan Evaluation

Table 4.1 illustrates how the proposed site plan fulfills the Evaluation Criteria for Open Space Site Designs. Following the table is a line item explanation of each decision made in completing the table.

**Table 4.1
Proposed Site Plan Evaluation**

<i>Open Space Site Design Criteria:</i>	<i>Site Plan Meets</i>	<i>Site Plan Does Not Meet</i>	<i>Not Applicable</i>
<i>Open Space:</i>			
1. Minimum of 50% preserved	X		
2. 25% of 50% open space suitable for active recreation	X		
3. Permanently protected	X		
4. Reasonably contiguous	X		
5. Publicly accessible	X		
6. Length:width ratio not exceeding 4:1	X		
<i>Site Design:</i>			
7. Respects locational context/rural character	X		
8. Pedestrian circulation system provided	X		
9. "Full-equity" value provided	X		
10. Site plan respects site geography	X		
<i>Primary Conservation Areas Protected:</i>			
11. Floodplains			X
12. Wetlands			X
13. Waterbodies	X		
14. Slopes over 25%	X		
<i>Secondary Conservation Areas Protected:</i>			
15. Mature woodlands	X		
16. Buffers around wetlands and waterbodies (100' preferred)		X	
17. Prime farmland			X
18. Critical wildlife habitat			X
19. Historic, cultural, archaeological sites			X
20. Ridgetops/Scenic Views	X		
21. Slopes 15-25%		X	

Table 4.1 Explanations:

Open Space:

1. **Minimum of fifty percent preserved:** Excluding residential lots and roadways leaves just over seventy percent of the parcel, or 68 acres, preserved as open space.
2. **Twenty-five percent of the fifty percent of open space suitable for active recreation:** Active recreation requires fairly flat slopes, therefore portions of the site contained within the U-shaped housing cluster and along the south western portion of the site are suitable for active recreation and contain some of the least severe slopes on the site.
3. **Permanently protected:** The open space will be permanently protected.
4. **Reasonably contiguous:** Only two portions of open space are separated from the majority of the sites open space. Access routes have been provided to allow trail systems to connect these regions to the remainder of the site, therefore the open space can be considered reasonably contiguous.
5. **Publicly accessible:** The open space is publicly accessible.
6. **Length:Width ratio does not exceed 4:1:** On average, the open space ratio does not exceed 4:1.

Site Design:

7. **Respects locational context and rural character:** Through the “organic” layout, the minimum lot size being no less than 10,000 square feet, and the protection of ridgetops from development, the site plan is designed to respect the locational context and preserve rural character.

8. **Pedestrian circulation system provided:** Provisions have been made for a pedestrian circulation system. These provisions include a 20' setback for rear lot lines from the site boundary to allow for a pedestrian trail to extend around the perimeter of the site, as well as easements located between lots to allow pedestrian access and connection from the two areas of open space within the loop roads.
9. **“Full-equity” value provided:** By definition, full-equity value is provided by this site plan in that at least one lot per acre is allowed, as the proposed Rural Residential zoning allows.
10. **Site plan respects site geography:** This site, as is the majority of the Tom's Creek Basin, is very diverse in terrain. This diversity has been taken into consideration, and respected as much as practical in the production of the site plan. Primary conservation areas are restricted from development, and secondary conservation areas are primarily included only in yard space, where necessary. The lots and road system follows existing contours as much as possible.

Primary Conservation Areas Protected

11. **Floodplains:** There are no designated 100 year floodplains on the site.
12. **Wetlands:** There are no designated wetlands on the site.
13. **Waterbodies:** The existing creek and its tributary are preserved.
14. **Slopes over twenty-five percent:** Except where bisected by roadways, slopes over 25 percent are preserved.

Secondary Conservation Areas Protected:

15. **Mature woodlands:** For the most part, mature woodlands are preserved.
16. **100' buffers around wetlands and waterbodies:** The buffer proposed around the tributary to the creek along the northern portion of the site falls below the recommended 100 feet for approximately 500 linear feet. However, these buffers do not fall below sixty feet at any point.
17. **Prime farmland:** The site does not have a recent history of farm use.
18. **Critical wildlife habitat:** No critical wildlife habitat has been identified on the site.
19. **Historic, cultural, and archaeological sites:** No significant historic, cultural, sites exist on the site.
20. **Ridgetops and scenic views:** For the most part, ridgelines have been protected. In one area in the southern portion of the site the loop road crosses over the ridge, with lots provided on one side. However, to minimize this violation an easement for pedestrian access to the public open space is located along the spine of the ridge to help push dwellings on lots eighty-nine and ninety away from the crest. By protecting the most visible portions of the development site, scenic views are also protected.
21. **Slopes fifteen to twenty-five percent:** Approximately nine lots in the southern portion of the site violate the secondary conservation area containing fifteen percent slopes; and approximately five lots in the northern portion of the site are in violation.

Summary

As illustrated by Table 4.1, and explained in detail above, the site plan shown in Figure 4.2 fulfills the criteria for open space site design. The only two categories which are not completely satisfied by the proposed plan, 100' buffers around waterbodies and slopes 15-25% protected, are classified as secondary conservation areas targeted for limited development, and are missed only by a slight margin. In addition, by conserving forest lands, natural resources, and unified open space within a permanent conservation easement, and by creating a residential development that considers the traditional rural scale of the Basin, the site plan accomplishes the goals of the proposed Rural Residential zoning district.

By fulfilling the evaluation criteria produced from the three alternative development approaches presented in Chapter Three, the proposed site plan begins to fulfill the intent of these individual approaches. For instance, cluster development, by definition, can be interpreted as the grouping of structures on the most suitable portion of a development site, preserving the remainder of the tract as useable open space. This is exhibited by the proposed site plan. Under rural landscape planning the preservation of prime farmland is a priority, however, the protection of character and scenic views are also emphasized. This particular parcel does not have a history of farming, but the site plan does focus on preserving both scenic views and rural character. Open space design development emphasizes a resistance to traditional suburban development as well as allowing the site planning process to be guided by the natural resources specific to the

site. Through the early identification of conservation areas and the grouping of development around these areas, the proposed site plan meets both of these goals.

As demonstrated, this site planning example shows how the evaluation criteria can lead to the preparation of a true open space site design. In part, this is because the evaluation criteria include not only open space requirements per se, but also design requirements to ensure the site plan respects the surrounding character and the site geography.

Chapter Five:

Conclusion

The loss of rural, open land to sprawling residential development is an unwelcome outcome of traditional zoning ordinances. Associated negative externalities include the loss of productive farmland; the conversion of natural open space and the ecological benefits provided by it; the interruption of scenic views; and the destruction of rural character. In response to concerns about these externalities, this thesis has attempted to defend the preservation of open space as a necessary component of rural residential development and to establish criteria that clarify the components of open space design.

Identifying and addressing the obstacles (see discussion beginning on page 15) that face the preservation of open space in residential development plays an important part in beginning to justify its inclusion within rural developments. At the heart of each of these obstacles is a lack of a comprehensive understanding of what open space preservation in residential development both means and involves.

In order to confront this, alternatives to conventional development all propose the grouping of development on the most appropriate portions of a site. The grouping, made possible through the reduction in minimum lot size required for individual lots, allows the provision of at least the same number of lots allowed under conventional development.

By grouping residential lots in appropriate areas, contiguous portions of the site are allowed to remain in their natural state, as preserved open space.

This thesis has illustrated why the preservation of open space is a necessary component of rural residential development. It has also illustrated that it takes more than merely preserving open land to create an open space design that respects the rural character of the landscape and wards off unwelcome sprawl.

However, future researchers are left with much to explore. The economic impact of open space development provides lingering questions worthy of detailed study: What are the actual cost effects of open space development for the potential home buyer? Are the reductions in infrastructure costs sufficient enough to maintain affordability? Or, will open space development simply become a new way of life for the wealthy? If environmentally conscious planners expect to work towards a more general acceptance of these concepts, more empirical, economically oriented studies are needed. In addition, detailed case studies of open space developments as they are built and occupied would provide useful information. Because the concept of open space development is still fairly new, the literature available on these issues is very limited.

In addition, planners need to place the public in a more active role when they are affected by issues of open space planning and design. Some general ways to accomplish this include postings on local Internet home pages and the publication of brochures, using lay person terminology, to discuss the issues in question. Often more proactive techniques are necessary, such as implementing programs in local schools which involve

children in “planning games” allowing them to make decisions about their surroundings and discussing the effects of different choices. A similar program can be designed for adults using a local piece of property as a case study. Computer imaging can be used to illustrate the results of different planning alternatives and discussions initiated that explain the positives and negatives of each.

The future livability of metropolitan and rural America is dependent on land use patterns that will provide the necessary development while preserving the natural environment. Rural land will continue to be converted into residential land, and the planning of these residential areas will effect the quality of life for individuals far beyond their physical boundaries.

Literature Cited

- “15 Ways to Fix the Suburbs”. 1995, May 15. *Newsweek*. 46-53.
- Alder, Jerry. 1995, May 15. “Bye, Bye Suburban Dream”. *Newsweek*. P. 40-45.
- Arendt, Randall. 1994a. *Designing Open Space Subdivisions*. Media, PA: Natural Lands Trust.
- Arendt, Randall. 1994b. *Rural by Design*. Chicago, IL: American Planning Association.
- Blacksburg Planning Department. 1974. *Blacksburg Open Space 1974-1985*.
- Blacksburg Planning Department. 1991. *1991 Blacksburg Comprehensive Plan*.
- Blacksburg Planning Department. 1995, July 13. *Tom’s Creek Basing Special Policy Area*.
- Blacksburg Planning Department. 1995, October 6. *Draft Zoning Ordinance for the Tom’s Creek Basin*.
- Brabec, Elizabeth. 1994. “The Economics of Preserving Open Space”. In Randall Arendt, *Rural By Design*. Chicago, IL: American Planning Association.
- Bressi, Todd. 1994. “Planning the American Dream”. In Peter Katz, *The New Urbanism*. Hong Kong: Mc-Graw-Hill Inc.
- Broward County Area Planning Board (Florida). 1970. *An Open Space Plan*. Broward County, FL: Author.
- Calthorpe, Peter. 1994. “The Region”. In Peter Katz, *The New Urbanism*. Hong Kong: Mc-Graw-Hill Inc.
- Canty, Donald. 1995, January. “Defining ‘The New Urbanism’ ”. *Builder* 18(1), 219-224.
- Corbett, Michael. 1981. *A Better Place to Live*. Emmaus, PA: Rodale Press.
- Duany, Andres and Plater-Zyberk, Elizabeth. 1994. “The Neighborhood, the District and the Corridor”. In Peter Katz, *The New Urbanism*. Hong Kong: Mc-Graw-Hill Inc.

- Ewing, Reid. 1994, Winter. "Characteristics Causes, and Effects of Sprawl: A Literature Reveiw". *Environmental and Urban Issues*, 21. 1-15.
- Foster, Stephen. 1995a, June 15. "Blacksburg Council Approves Spring Valley Rezoning". *Roanoke Times & World News*, NRV-1.
- Foster, Stephen. 1995b, June 2. "It's visionary, but is it good?" *Roanoke Times & World News*, New River Current: 1.
- Foster, Stephen. 1995c, June 8. "Planners OK Rezoning for Spring Valley". *Roanoke Times & World News*, New River Current: 1.
- Foster, Stephen. 1995d, June 27. "The Worth of a Silver Tongue". *Roanoke Times & World News*, NRV-2.
- Foster, Stephen. 1995e, February 25. "Residential Area Proposed Near Toms Creek Road". *Roanoke Times & World News*, New River Current.
- Foster, Stephen. 1995f, May 18. "Toms Creek Given a Difficult Choice". *Roanoke Times & World News*, NRV-1.
- Gerloff, Robert. 1994, May/June. "The New Urbanism Takes Hold". *Utne Reader*, (63), 28-30.
- Girling, Cynthia, and Helphand, Kenneth. 1994. *Yard, Street, Park*. New York, NY: John Wiley & Sons Inc.
- Gordon, Marty. 1995, June 9. "Commission recommends the approval of rezoning for project". *The News 124*(69), 1a, 7a.
- Higher Density Housing*. 1986. Washington, DC: National Association of Homebuilders.
- Jackson, Kenneth. 1985. *Crabgrass Frontier*. New York, NY. Oxford University Press.
- Jarvis, Frederick. 1993. *Site Planning and Community Design for Great Neighborhoods*. Washington, D.C.: Home Builder Press.
- Kaiser, Edward; Godshalk, Robert; and Chapin, E. Stuart. 1995. *Urban Land Use Planning*. Chicago, IL: University of Illinois Press.
- Kato, Akinori (Ed.). 1980. *Process Architecture Number 16, Plazas of Southern Europe*. Tokyo, Japan: Process Architecture Publishing Company, Ltd.

- Katz, Peter. 1994. *The New Urbanism*. Hong Kong: McGraw-Hill, Inc.
- Knack, Ruth. 1990. "Selling Cluster". *Planning*, 56, 4-11..
- Kone, Linda. 1994. *Land Development*. Washington, D.C.: Home Builders Press.
- Lancaster County Planning Commission. 1994. *The Liveable Communities Handbook*. Lancaster County, PA: Author.
- Kury, Mark and Geniesse, Susan. 1994. *Residential Cluster Development*. (CPL Bibliography No. 315). Chicago, IL: Council of Planning Librarians.
- Langdon, Philip. 1994. *A Better Place to Live*. Amherst, MA: University of Massachusetts Press.
- Levy, John. 1991. *Contemporary Urban Planning* (2nd ed.). Englewood Cliffs, NJ: Prentice-Hall, Inc.
- Lewis, Roger. 1993, October 16. "'New Urbanism' Congress Crusades for a Change". *The Washington Post*, p. f04.
- Little, Charles. 1990. *Greenways for America*. Baltimore, MD: Johns Hopkins University Press.
- Lynch, Kevin. 1990. "The Openness of Open Space". In Banerjee, Tridib, and Southworth, Michael (Eds.) *City Sense and City Design*. Cambridge, MA: The MIT Press. (Originally Published 1972).
- Mantell, Michael; Harper, Stephen; and Propst, Luther. 1990. *Creating Successful Communities*. Washington D.C.: The Conservation Foundation.
- Moule, Elizabeth and Polyzoides, Stefanos. 1994. "The Street, the Block and the Building". In Peter Katz, *The New Urbanism*. Hong Kong: Mc-Graw-Hill Inc.
- Natural Lands Trust, Inc. 1995, February. *Conservation Subdivision Design*. Hildacy Farm, PA: Author.
- Open Space Planning: An Initiative for Our Future*. 1993. Obtained from Town of Blacksburg Planning Department.
- Platt, Rutherford. 1972. *The Open Space Decision Process*. Chicago, IL: The University of Chicago.

Portfield, Gerald and Hall, Kenneth. 1995. *A Concise Guide to Community Planning*. McGraw-Hill, Inc.

Post, Nadine. 1994, May 9. "Putting brakes on suburban sprawl". *ENR*, 232(19), 32-39.

Sanders, Welford. 1981. *The Cluster Subdivision: A Cost-Effective Approach* (Planning Advisory Service No. 356). American Planning Association.

Singletary, Kenneth. 1995, May5. "Pluses, Minuses Seen in Proposed Development". *Roanoke Times & World News*, NRV-2.

Spring Valley Blacksburg, Virginia: A Planned Residential Community. 1995, April 14. Submitted to Town of Blacksburg as a Request for a Change of Zoning Classification.

Stiener, Frederick. 1991. *The Living Landscape*. McGraw-Hill, Inc.

Stokes, Samuel. 1989. *Saving America's Countryside*. Baltimore, MD: Johns Hopkins University Press.

Town of Amherst Planning Department. 1988. *Town of Amherst Phased Growth Bylaw* (Section 4.3 Cluster Development). Town of Amherst, MA: Author.

Univeristy of Michigan Law School. 1986. "Farmland and Open Space Preservation in Michigan: An Empirical Analysis". *University of Michigan Journal of Law Reform*, 19, 1107-1197.

Untermann, Richard and Small, Robert. 1977. *Site Planning for Cluster Housing*. New York, NY: Van Nostrand Reinhold Company, Inc.

Urban Land Institute. 1968. *The Pros and Cons of Cluster Housing*. Washington, DC: Author.

Van der Ryn, Sim and Calthorpe, Peter. 1986. *Sustainable Communities*. San Francisco, CA: Sierra Club Books.

Virginia Tech Community Design Assistance Center. 1994. *Open Space Handbook* (Publication 305-771). Virginia Cooperative Extension.

Whyte, William. 1964. *Cluster Development*. New York, NY: American Conservation Association.

Yaro, Robert; Arendt, Randall; Dodson, Harry; and Brabec, Elizabeth. 1993 *Dealing*

With Change in the Connecticut River Valley: A Design Manual for Conservation and Development. Cambridge, MA: Lincoln Institute of Land Policy. (Originally Published 1988)

Zisman, S.B. and Ward, Delbert. 1968. *Where Not to Build: A Guide for Open Space Planning.* Washinton, D.C.: United States Department of the Interior Bureau of Land Management.

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PROFESSIONAL REGISTRATION

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WORK EXPERIENCE

Anderson and Associates (August 1993 - Present): Blacksburg, Virginia
Engineers, Surveyors, Planners

Derck and Edson, Associates (June 1990 - July 1993): Lititz, Pennsylvania
Landscape Architects, Land Planners, Engineers

LandDesign, Inc. (September 1988 - August 1989): Alexandria, Virginia
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Purdue University (Summer 1988; Fall 1988): West Lafayette, Indiana
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HONORS AND ACTIVITIES

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