INTRODUCTION

U.S. metropolitan areas are spreading outward at unprecedented rates, causing alarm from Florida to California, from New Jersey to Washington State.[1] Without changes in policy and practice, most new development will take the form of suburban sprawl, sprawl being this nation's now-dominant development pattern. The economic and social costs will be enormous.[2]

In *Best Development Practices: A Primer*, good community development, as distinct from sprawl, is defined in operational terms. Public purposes loom large, though not at the expense of market considerations. Recommendations go to the enlightened edge of current development practice, but not so far beyond as to lose our target audience, the development community. The public purposes pursued though these best practices—among them, affordable housing, energy efficiency, preservation of natural areas, and sense of community—make good business sense.

Recommendations are also aimed at government planners and public officials. Set forth are broad principles upon which to base comprehensive plans and land development regulations, benchmarks against which to judge development proposals, and ample justification for good development practices that may have been advocated all along by knowledgeable officials.

BREAKING NEW GROUND

For 50 years or more, leading developers, planners, designers, environmentalists, and others have pointed the way toward better development. The American Planning Association (APA), Urban Land Institute (ULI), National Association of Home Builders (NAHB), and many others have published volumes on the subject.[3]

We borrow liberally from the best of earlier work. We also break new ground by blending contemporary and traditional design principles. Andres Duany, Peter Calthorpe, and other *new urbanists* raise powerful objections to contemporary suburbs. They advocate a return to urban design principles of pre-automotive times. But the automobile is a fact of life, and the low-density lifestyles that are both cause and effect of auto-dependence clearly appeal to most Americans.

From opinion surveys, housing consumers seem to be split between the two models of development, contemporary suburban and traditional urban. Many favor features of both. The most traditional of the featured communities—Celebration and Southern Village—will use contemporary design features in later phases. The most contemporary—Bluewater Bay, Haile Plantation, and The Woodlands—are experimenting with traditional neighborhood design. The future belongs to hybrids, and these best practices are structured accordingly.

Contemporary vs. Traditional Designs

Contemporary	Traditional
land uses separated and buffered	land uses mixed seamlessly
housing types separated and buffered	housing types mixed seamlessly
branching curved streets	gridded straight streets
long blocks	short blocks
wide streets	narrow streets
buildings set back from the street	buildings at the street
parking in front	parking in the rear
natural open spaces	formal public spaces
one unit per lot	two units per lot with accessory apartments

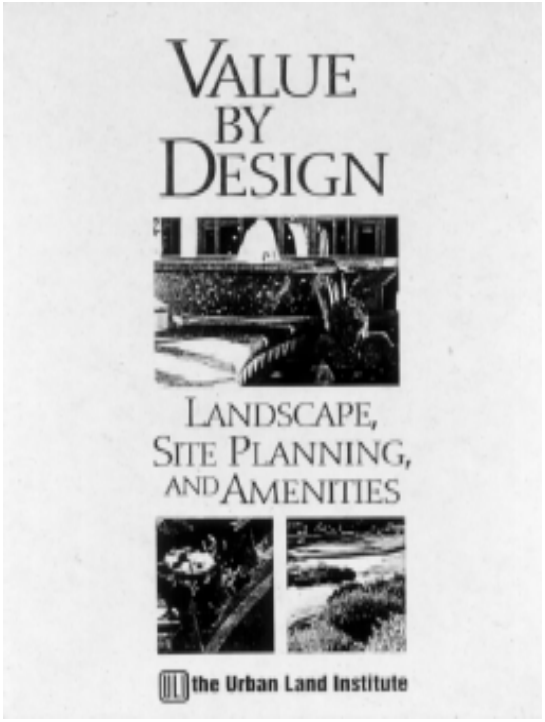
QUEST FOR THE BEST

When it comes to development guidelines, visionary is good, utopian is not. If guidelines are viewed as utopian, they will be dismissed by the naturally conservative and results-oriented development industry. Others have suffered this fate.

We look to established, successful developments for best development practices. Featured developments are exemplary, not in every respect but in many respects. Collectively, they embody all the best development practices. These places serve as a reality check. They show what can reasonably be expected of developers. They prove that developers can incorporate quality features and still make healthy profits.

In The Woodlands, home builders are able to charge 15 to 25 percent more than they can elsewhere in Houston—for identical houses. Despite its higher prices, The Woodlands still outsells the competition by more than two-to-one. In Miami Lakes, starter homes that sold for $20,000 when built in the early 60s now command prices of $120,000. Virtually identical houses in nearby subdivisions sell for about half as much. These are not isolated examples. The book upon which this primer is based is subtitled: *Doing the Right Thing and Making Money at the Same Time*. To reinforce the point, financial performance information is provided in the original.

Quality Pays for Itself



ABOUT THIS PRIMER

This primer is a condensation of principles and practices from *Best Development Practices*, a book prepared originally for Florida's Department of Community Affairs and updated for the American Planning Association and the Urban Land Institute (the latter representing the nation's most successful land developers).[4]

The original book offered eight to 12 "best" practices for each aspect of development. This primer captures the spirit of the individual practices through "cross-cutting principles," and then illustrates each principle by selecting two practices for discussion and illustration.

The original book featured seven Florida developments, selected on the basis of criteria outlined elsewhere.[5] For this primer we have added seven exemplary developments from out of state, and one new, high-profile Florida development, for a total of 15.

While conceived for "green field" sites, our best practices may be useful in assessing the quality of existing development or giving direction to redevelopment plans. The underlying principles of good development are that basic and universal.

Featured Developments

	Year Opened	Acreage	Population (1997)	Developer/Master Planner
Outside Florida				
Montgomery Village (Gaithersburg, MD)	1967	2,400	36,000	Kettler Brothers/RTKL
Prairie Crossing (Grayslake, IL)	1995	670	200	George and Vicky Ranney/William Johnson
Rancho Santa Margarita (Orange County, CA)	1986	5,000	40,000	Rancho Santa Margarita Joint Venture/PBR
Regency (Omaha, NE)	1968	400	2,500	Mutual of Omaha/SWA Group
Southern Village (Chapel Hill, NC)	1995	310	750	Bryan Properties/Stimmel & Associates
Village Homes (Davis, CA)	1976	60	650	Michael and Judy Corbett/In-House
The Woodlands (Houston, TX)	1974	26,500	50,000	Mitchell Energy & Development/William L. Pereira Associates
Within Florida				
Bluewater Bay (Niceville)	1978	2,000	7,000	Raimund Herden, Dave Weaver and Jerry Zivan/Hennington, Durham & Richardson
Celebration (Orlando)	1996	4,900	950	Disney Development/Cooper, Robertson & Partners
Haile Plantation (Gainesville)	1981	1,660	4,500	Bob Kramer and Bob Rowe/In-House
The Hammocks (Miami)	1978	1,100	15,900	Genstar/Sasaki Associates
Hunter's Creek (Orlando)	1986	4,000	12,000	American General Insurance/Canin Associates
Miami Lakes (Miami)	1962	2,500	23,000	Graham Family/Lester Collins
Oakbridge (Lakeland)	1987	1,400	1,800	Drummond Mining/Glatting Jackson
Palmer Ranch (Sarasota)	1987	5,250	9,000	Hugh Culverhouse/In-House

BEST LAND USE PRACTICES

CROSS-CUTTING PRINCIPLES: MIX LAND USES; CONCENTRATE DEVELOPMENT

Practice 1: Keep vehicle miles of travel (VMT) below the area average.

Practice 2: Contribute to the area's jobs-housing balance.

Practice 3: Mix land uses at the finest grain the market will bear and include civic uses in the mix.

Practice 4: Develop in clusters and keep the clusters small.

Practice 5: Place higher density housing near commercial centers, transit lines, and parks.

Practice 6: Phase convenience shopping and recreational opportunities to keep pace with housing.

Practice 7: Make subdivisions into neighborhoods with well-defined centers and edges.

Practice 8: Reserve school sites and donate them if necessary to attract new schools.

Practice 9: Concentrate commercial development in compact centers or districts.

Practice 10: Make shopping centers and business parks into all-purpose activity centers.

Practice 11: Tame auto-oriented land uses, or at least separate them from pedestrian-oriented uses.

In this first set of best practices, guidance is offered as to the mix of land uses and the layout of uses in relation to one another. Whatever form it takes–whether leapfrog, scattered, commercial strip, or spread development–sprawl is characterized by poor accessibility and lack of common open space. Here, we strive to promote good accessibility of workers to jobs, students to schools, and transit users to transit lines. Good accessibility translates into higher property values, less time wasted in travel, less auto-dependence and related air pollution and fuel consumption.

We also promote the set aside of ample open space. Natural areas support wildlife, enhance water quality, recharge groundwater supplies, hold stormwater, and provide views and recreational opportunities. Well-designed and well-located public spaces give otherwise monotonous subdivisions a sense of place and draw residents out of their private enclaves.

MIX LAND USES

Illustrative Practice: Contribute to the area's jobs-housing balance.

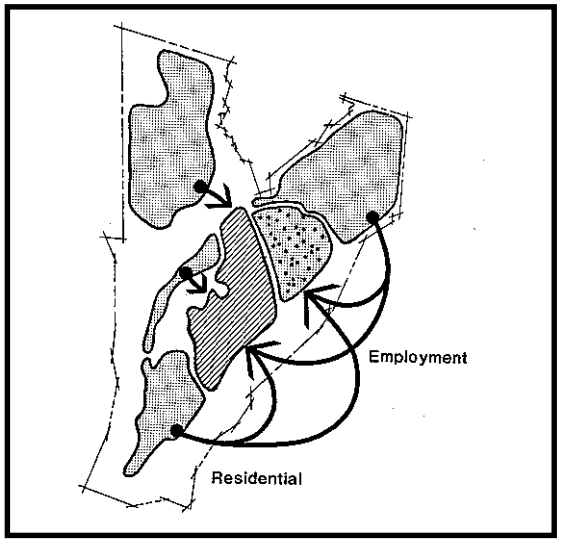
New communities often market themselves as places where people can both live and work. It is a good selling point and a worthy goal. At the scale of a new community (thousands of acres), a jobs-housing balance becomes achievable. That is, jobs and workers can be brought into numerical balance, usually at somewhere between 1.3 and 1.7 jobs per household; and housing prices can at least somewhat match worker incomes.

For smaller-scale projects, it becomes less practical to match jobs and housing, and even when a nominal match is achieved, a smaller proportion of work trips will remain on-site. But projects can still contribute to the jobs-housing balance in the larger subregion of which they are a part.

Celebration and Hunter's Creek are exemplary because they supply middle-income housing to residents on the "side of town" with a surplus of middle-income jobs. Miami Lakes, Rancho Santa Margarita, and The Woodlands are exemplary because they strive for jobs-housing balance on-site. As a result, about 10% of all work trips remain within these communities. In some new communities, more than one third are captured internally.

"Right Side of Town"
(Hunter's Creek)

Jobs-Housing Balance
(Rancho Santa Margarita)



Illustrative Practice: Mix land uses at the finest grain the market will bear and include civic uses in the mix.

Mixed-use development has many advantages. One is the ability to capture some trips that would otherwise end up on external roads. Another is the relative freedom afforded those who cannot drive when destinations are within walking distance. Additional benefits include: a positive fiscal impact on local governments when commercial development is part of the mix; a positive impact on residential property values when commercial and civic uses are close by (though not next door); and a greater sense of community when commercial and civic uses are mixed in with residential.

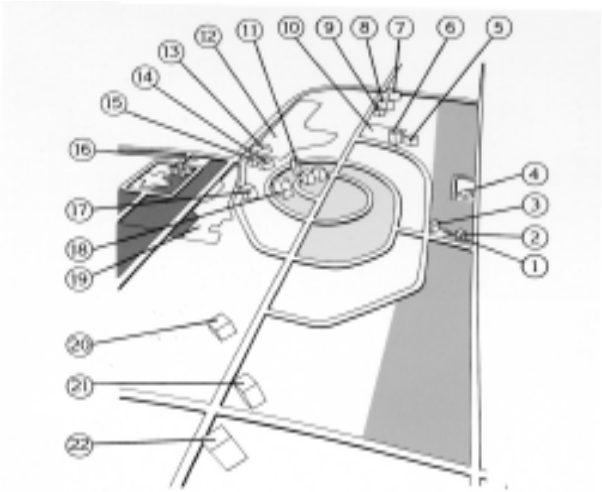
All contemporary developments featured in this primer have on-site commercial uses, complementing residential. This, perhaps more than anything else, is what makes them exemplary. Several incorporate multiple civic uses, which makes them feel like "real towns." In historic towns, civic uses typically occupy 10 percent of total land area. That is a good target for contemporary developers.

Most featured developments have relatively fine-grained development patterns, at least by the standards of suburbia. By "grain" of development, we mean the typical area devoted to a single land use. Individual apartment buildings interspersed among single-family homes create a fine grain. Large apartment complexes separated from single-family neighborhoods produce a coarse grain.

Haile Plantation has small clusters of townhouses, patio homes, and custom homes, all within a five-minute walk of the Haile Village Center. The Village Center includes shops and apartments back-to-back and under-over, and single-family houses down the street. At the relatively fine grain of this development, different land uses do not overwhelm each other and can easily be buffered or made architecturally compatible.

Celebration has an even finer grain, separated only by alleys or streets, suggesting that the market may be more receptive to mixing than previously assumed.

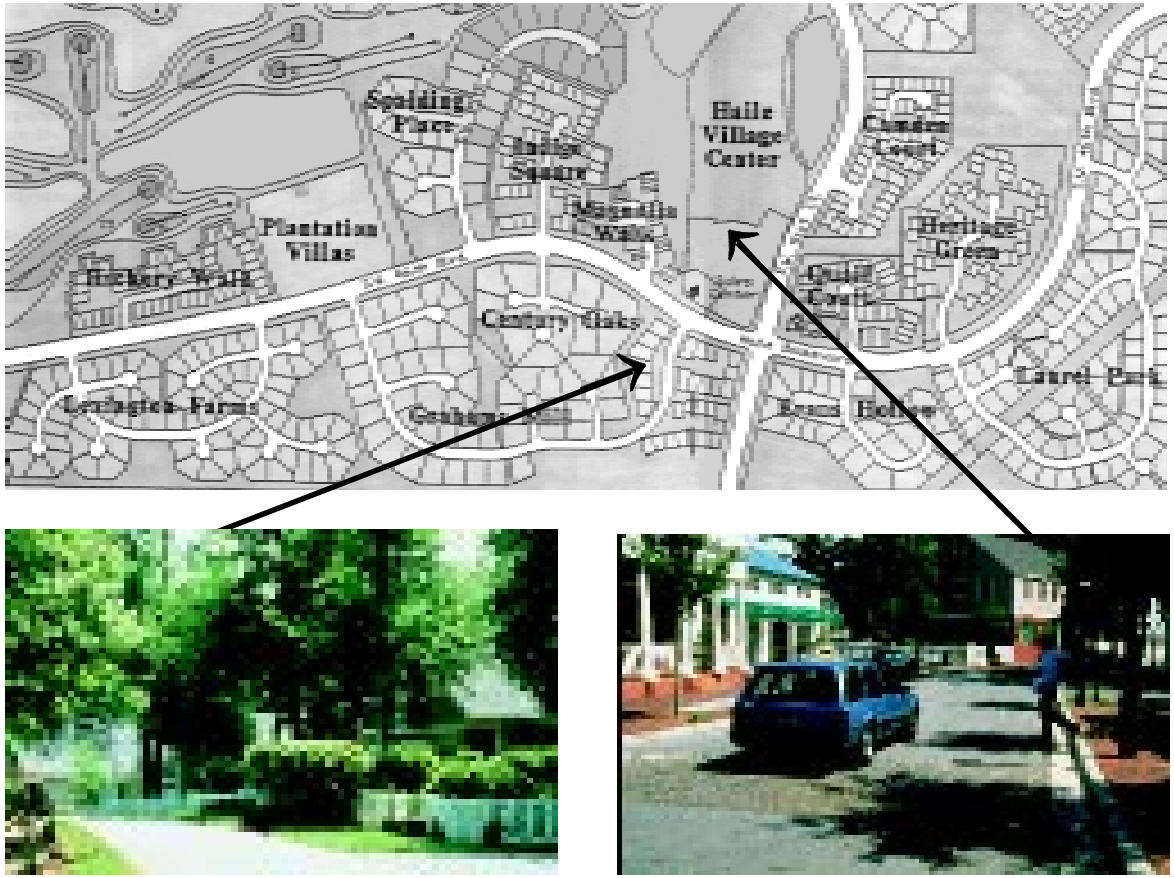
"Real Town" with Civic Uses (Miami Lakes)



1. Picnic Park
2. Police
3. Lake Katherine Shopping Center
4. Miami Lakes Technical Education Center
5. Miami Lakes Montessori School
6. Miami Lakes Junior High School
7. Fire Station
8. Library
9. Windmill Gate Shopping Center
10. School Park
11. Main Street Shopping
12. Championship 18-hole Golf Course
13. Miami Lakes Golf Resort
14. Cypress Village Shopping Center
15. Miami Lakes Community Center
16. 10-Acre Park
17. Miami Lakes Athletic Club
18. Miami Lakes Inn
19. Lighted Executive Golf Course
20. Miami Lakes Elementary School
21. Lake Patricia Shopping Center
22. Hialeah/Miami Lakes High School

Miami Lakes Business Park East
Miami Lakes Business Park West
Town Center

Relatively Fine Grain (Haile Plantation)



CONCENTRATE DEVELOPMENT

Illustrative Practice: Develop in clusters and keep the clusters small.

For as long as APA, ULI, and NAHB have promoted mixed-use development, they have also championed cluster development. The two go hand-in-hand. Cluster provides natural separations between land uses that would otherwise be incompatible.

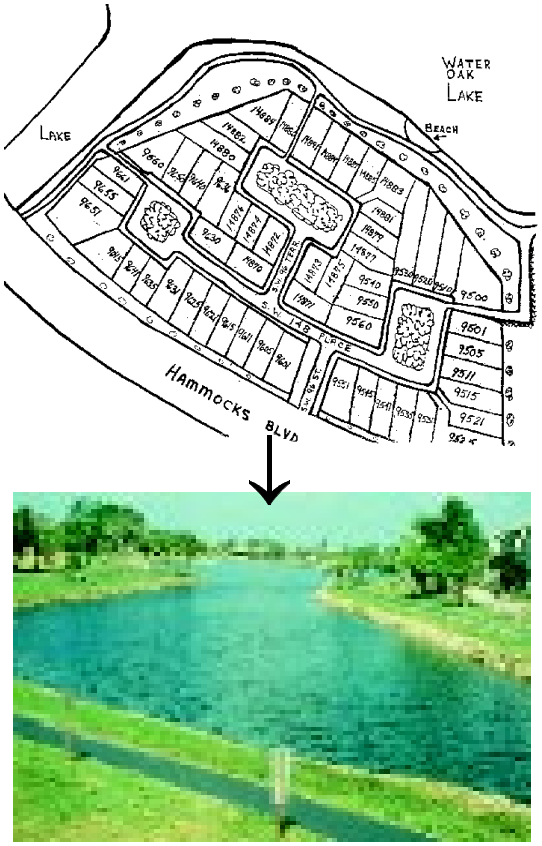
Cluster developments are built at *gross densities* comparable to conventional developments, but leave more open space by reducing lot sizes. This saves money by limiting site preparation and grading to certain areas, reducing the length of residential streets and utilities, and permitting the use of natural drainage in lieu of costly curbs and gutters, inlets, and underground storm sewers. All this can knock a third off site development costs.

Air conditioning loads are moderated by retained green spaces, stormwater runoff volumes moderated by permeable surfaces, and landscape irrigation requirements moderated by smaller lots and lawns. Valuable natural features can be preserved. Planned and casual interaction can occur in public spaces, contributing to the sense of neighborliness and community.

At The Hammocks, all single-family housing has been built under cluster zoning. This has meant that green spaces could be incorporated into neighborhoods and a splendid greenway system could be maintained between the neighborhoods and lakes. The Hammocks achieves an average net residential density of 11.5 units per acre, twice its gross density.

As with mixed use, cluster development patterns can be fine- or coarse-grained. A fine-grained pattern is preferred for several reasons.

Greenways and Lakes
Under Cluster Zoning
(The Hammocks)



Small housing clusters are safer than large ones because residents can identify "outsiders" and are more apt to exercise territorial control. Small increments of development minimize carrying costs and risks associated with economic downturn; developers and builders can learn from small rather than big mistakes. Small clusters feel more like places and less like projects. By "small" housing clusters, we mean 40 to 80 single-family units on average, no more.

At Montgomery Village, housing projects have gotten smaller and smaller with each successive phase of development. The developer wants frequent grand openings and small inventories as consumer tastes change, as when 20-foot-wide units replaced 18-foot-wide units in the townhouse market. He also wants to phase his infrastructure investments efficiently, and small projects have proven more efficient than large ones.

Housing Clusters
(Montgomery Village)

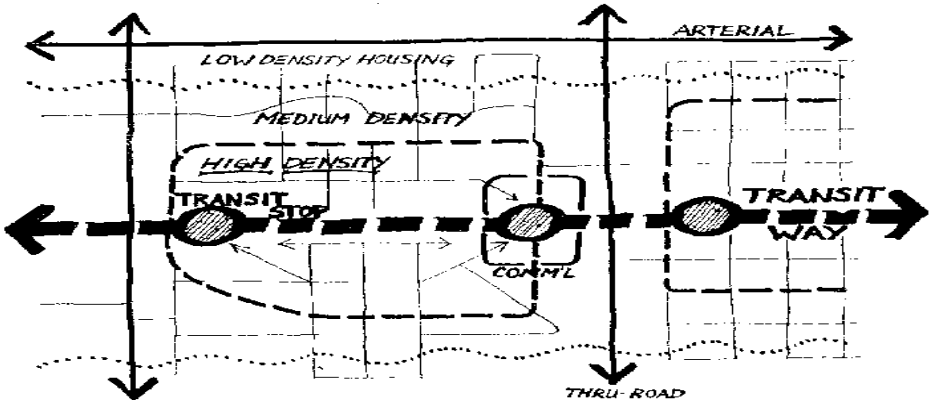
Illustrative Practice: Place higher density and senior housing near commercial centers, transit lines, and community facilities.

In a mixed-use development, we must decide how uses will be arranged in relation to each other. Conventional land use controls, which separate activities deemed incompatible, are no longer terribly useful. Except for heavy industry and big-box retail, compatibility is not an issue as long as clusters are small and aesthetics are controlled.

Instead, accessibility becomes the overriding consideration in land planning. By placing higher density and senior housing near commercial centers, transit lines, and community facilities, travel opportunities are provided for the residents most likely to need alternatives to the car. Also, housing is made more affordable for those on the tighest budgets. As the new urbanists are fond of saying, the best affordable housing program is one that eliminates the need for a second car.

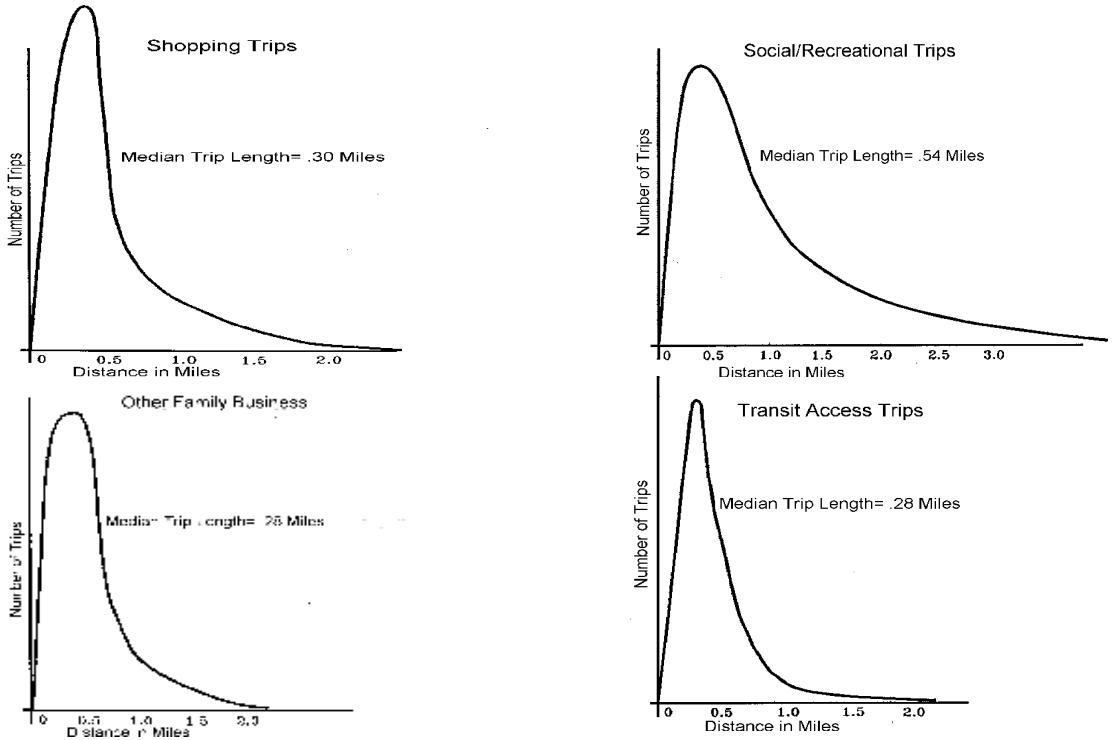
Following this practice, small commercial centers–which have trouble competing for consumers in cars–suddenly become viable because pedestrian traffic always favors nearby stores. Bus service–which is predominately accessed on foot–also becomes viable when higher density and senior housing are placed within walking distance. Commercial centers, transit lines, and community facilities should be no more than 1/4 mile from target housing if we expect anyone to walk to them.

Density Gradient Along the Transit Route



Source: H. Rabinowitz and E. Beimborn, *The New Suburb*, Technology Sharing Program, U.S. Department of Transportation, Washington, D.C., 1991, cover graphic.

Walking Distances for Different Purposes



Source: Tabulations from the 1990 Nationwide Personal Tranportation Survey (NPTS). Walking distances were estimated from reported travel times. Curves were smoothed to account for people's tendency to round off travel times.

Nearly all featured developments have placed their highest densities and senior housing around their town or village centers. With shopping, family services, professional offices, and entertainment nearby, the centers can meet many of the daily needs of residents.

"Step Down" Density Pattern
(Southern Village)

Apartments Along Main Street
(Miami Lakes)

Retirement Home Across the Street
from the Village Center
(Montgomery Village)

Small-lot Singles
in the Town Center
(Rancho Santa Margarita)

BEST TRANSPORTATION PRACTICES

CROSS-CUTTING PRINCIPLES: DISPERSE AND CALM TRAFFIC; SUPPORT ALTERNATIVE MODES

Practice 1: Design the street network with multiple connections and relatively direct routes.

Practice 2: Space through-streets no more than a half mile apart, or the equivalent route density in a curvilinear network.

Practice 3: Use traffic calming measures liberally.

Practice 4: Keep speeds on local streets down to 20 mph.

Practice 5: Keep speeds on arterials and collectors down to 35 mph (at least inside communities).

Practice 6: Keep all streets as narrow as possible, and never more than four travel lanes wide.

Practice 7: Align streets to give buildings energy-efficient orientations.

Practice 8: Avoid using traffic signals wherever possible and always space them for good traffic progression.

Practice 9: Provide networks for pedestrians and bicyclists as good as the network for motorists.

Practice 10: Provide pedestrians and bicyclists with shortcuts and alternatives to travel along high-volume streets.

Practice 11: Incorporate transit-oriented design features.

Practice 12: Establish travel demand management (TDM) programs at employment centers.

In the design of new communities, the transportation system is often an afterthought. First, the master planner prepares a land plan and development program based on market opportunities and site constraints. Next, the master planner designs a conceptual street network to serve a largely set land plan and development program. Finally, a traffic engineer is brought in to fine tune the network and "make the traffic work." This usually requires wide roads and even wider intersections.

The result, according to critics, is a transportation system that only an automobile could love. In these best practices, slow and steady is the goal, not fast, since high-speed traffic divides a community. Another goal is to preserve options to the automobile for those who might want or need to exercise them.

DISPERSE AND CALM TRAFFIC

Illustrative Practice: Design the street network with multiple connections and relatively direct routes.

The traditional urban grid has short blocks, straight streets, and a crosshatched pattern. The contemporary suburban street network has large blocks, curving streets, and a branching pattern.

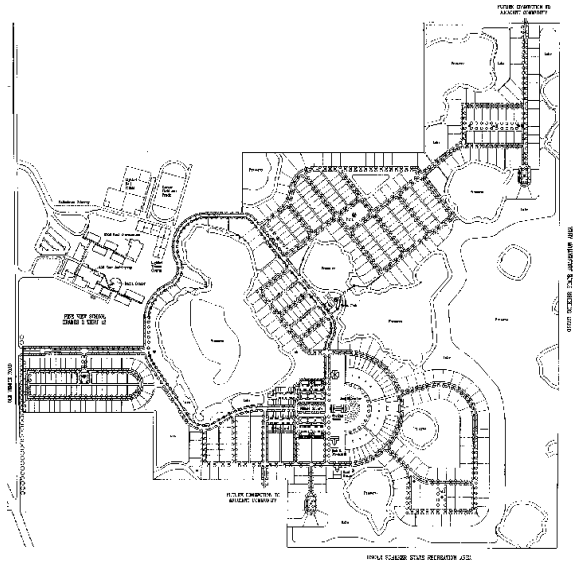
Traditional grids disperse traffic rather than concentrating it at a handful of intersections. They encourage walking and biking with their direct routing and their options to travel along high-volume streets. The most pedestrian-oriented cities in the world are those with the densest, web-like street networks.

On the other hand, contemporary networks have some obvious advantages over grids. By keeping through-traffic out of neighborhoods, contemporary networks keep accident rates down and property values up. In addition, contemporary networks, with their curves and dead ends, can go around or stop short of valuable natural areas. Streets can run along ridges or run perpendicular to slopes, thereby minimizing cut-and-fill.

We would like the best of both worlds: the mobility of the traditional urban grid and the safety, security, and topographic sensitivity of the contemporary suburban network. We can have it with *hybrid networks*. Short, curved stretches that follow the lay of the land or contribute to good urban design are okay. So are short loops and cul-de-sacs, as long as they leave the higher-order street network intact. By "higher-order street network" we mean arterials, collectors, and any subcollectors that carry through-traffic.

The street network at Rivendell, a quasi-traditional part of Palmer Ranch, is a hybrid. The ratio of street segments to segment ends is 1.4, a degree of network connectivity halfway between the extremes of the contemporary suburban network and the traditional urban grid. Southern Village comes in higher at 1.56, Miami Lakes a little lower at 1.38. Anything within this range is fine.

Hybrid Network at Rivendell (Palmer Ranch)

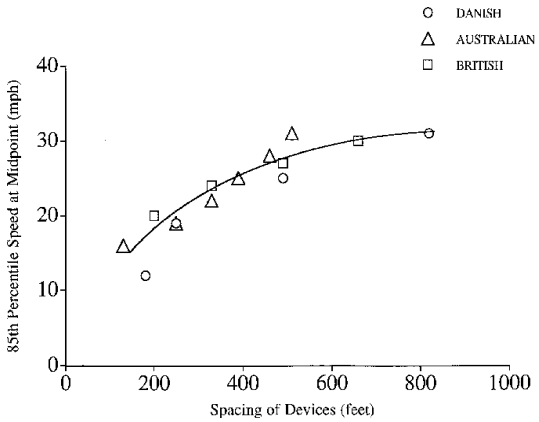


Illustrative Practice: Use traffic calming measures liberally.

The "livability" of streets declines as the volumes and speeds of traffic increase. Residents are more satisfied with the street environment when traffic volumes and speeds are low-to-moderate. They are more likely to walk, bike, and play along such streets. They feel safer. Controlling traffic volumes and speeds is also the key to pedestrian-oriented commercial streets.

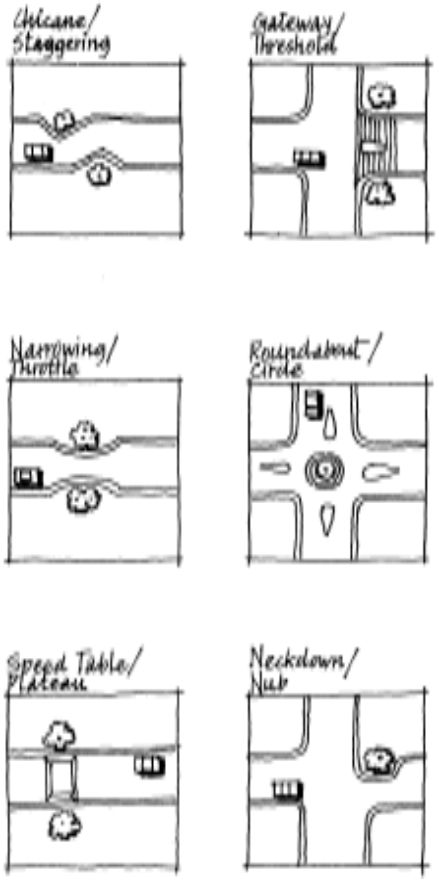
The shorter the uninterrupted length of roadway, the slower the traffic will be. Short stretches ending in T-intersections are particularly effective in reducing speeds and accidents. On longer stretches of roadway, it is still possible to calm traffic by dividing the length into shorter sections. Introduced at regular intervals, traffic calming measures or slow points operate on a simple principle: An abrupt change in either horizontal or vertical alignment causes drivers to naturally slow down. Just how much they slow down depends the type and spacing of measures.

Midpoint Speed vs. Distance Between Traffic Calming Measures



Sources: Main Roads Department, *Guidelines for Local Area Traffic Management*, East Perth, Western Australia, 1990, Table 7.2; J. Noble and A. Smith, *Residential Roads and Footpaths - Layout Considerations - Design Bulletin 32*, Her Majesty's Stationary Office, London, 1992, pp. 24-26; and L. Herrstedt et al., *An Improved Traffic Environment - A Catalogue of Ideas*, Danish Road Directorate, Copenhagen, 1993, p. 59.

Traffic Calming Measures



The Europeans and Australians are way ahead of us when it comes to traffic calming. They make every detail of the street and streetscape proclaim, "You are in a protected area—be careful!" The U.S. may not be ready for European woonerfs, angled single-lane slow points, and other more radical traffic calming measures. But we can certainly make greater use of short streets, zig-zag curves, traffic circles, textured pavements, and speed humps or, better still, raised crosswalks.

Miami Lakes uses angled on-street parking and flared sidewalks, narrow travel lanes, small building setbacks, brick crosswalks, and tree-lined streets to calm traffic in its town center. Its residential street network is designed around short segments and T-intersections, and curves have been inserted into its main thoroughfares for the sole purpose of slowing traffic.

Traffic Calmed Environment (Miami Lakes)

SUPPORT ALTERNATIVE MODES

Illustrative Practice: Provide networks for pedestrians and bicyclists as good as the network for motorists.

Residents of suburbia may walk or bike for fun within their individual subdivisions. They may walk for other purposes within activity centers reached by automobile. But most would not dream of using these modes for "utilitarian" trips, such as from home to work or home to shopping. And they are loathe to let younger children venture outside their immediate subdivisions on foot or bicycle. Destinations are just too far away, and facilities linking islands of activity are just too spotty.

If we expect people to walk or bike, we must provide networks for them as good as the network for motorists. This does not require exact parity between miles of roadway and miles of sidewalk. Rather it means that the same places must be reachable on foot or bike without risking life and limb.

Sidewalks are an absolute necessity along all through-streets serving developed areas. Pedestrian accidents are more likely on street sections without sidewalks than those with them. Sidewalk clearances, vertical curbs, street trees between street and sidewalk, and parked cars all add to the sense of security.

Buffered Sidewalk Along a Collector (Haile Plantation)

While not as essential on quiet residential streets, sidewalks are still usually warranted. In single-family developments, sidewalks, including the land occupied by the sidewalk itself and its planting strip, add about 2 percent to the hard costs of housing. For this modest expense, sidewalks extend the public realm beyond the street itself, encouraging neighborliness and street life.

Sidewalk guidelines published by the Federal Highway Administration (FHWA) have become widely accepted and endorsed here.

FHWA Sidewalk Guidelines

Arterials/Collectors	Both Sides
Local Streets	
Commercial Areas	Both Sides
Residential Areas	
More than 4 units per acre	Both Sides
1 to 4 units per acre	One Side
Less than 1 unit per acre	None

Source: R.L. Knoblauch et al., *Investigation of Exposure Based Pedestrian Accident Areas: Crosswalks, Sidewalks, Local Streets and Major Arterials*, Federal Highway Administration, Washington, D.C., 1988, p. 143.

Sidewalk Extending the Public Realm (Celebration)

(Southern Village)

Internal pathway systems, if properly designed, can knit a community together in a way that sidewalks cannot. Paved pathways along the central spine of The Hammocks are as heavily utilized as any in the U.S. This is due to the extensive network of pathways (more than eight miles without a single street crossing). It is also due to the lake views; good connections to neighborhoods, schools, recreation centers, and shopping areas; and natural surveillance afforded by bordering homes and apartments.

Internal Pathway (The Hammocks)

Other high-amenity pathway networks crisscross Montgomery Village, Prairie Crossing, Rancho Santa Margarita, Regency, Village Homes, and The Woodlands. They are the most beloved and heavily utilized amenities of these particular communities.

Other High-Amenity Pathways (Prairie Crossing/Rancho Santa Margarita/Regency)

Striped bike lanes or extra-wide curb lanes are warranted on all community streets carrying heavy traffic volumes. Bikeway guidelines published by the Federal Highway Administration (FHWA) are endorsed here. Rancho Santa Margarita has separate bike lanes on all arterials and some collectors, plus bike racks everywhere, making it the most bicycle-friendly large community featured.

Bike Lane (Rancho Santa Margarita)

FHWA Bikeway Guidelines

Up to 10,000 vehicles per day	
Less than 30 mph	14' curb lane
30 to 40 mph	5' bike lane
10,000 or more vehicles per day	5' bike lane

Source: Adapted from W.C. Wilkinson et al., Selecting Roadway Design Treatments to Accommodate Bicycles, Federal Highway Administration, Washington, DC, 1994, p. 19.

Illustrative Practice: Incorporate transit-oriented design features.

Transit operations have not proven wildly successful in new communities around the United States. Thus, rather than endorsing some particular transit service option, or calling for some form of developer subsidy, we suggest that communities be designed to support transit service when regional transit agencies are ready to provide it. If that day may never arrive, due to a site's remote location or low-density context, a large-scale development probably should not be approved in the first place.

About 50 transit-oriented development (TOD) manuals are now available across North America. Generalizing across the manuals, there is agreement that, at a minimum, medium densities are required to support transit service; a mixture of residential, commercial, and institutional uses is preferable to any single use alone. Grid-like street networks are superior to discontinuous, curvilinear networks; collectors should be closely spaced and should penetrate residential areas and activity centers.

All TOD manuals call for sidewalks along transit routes, on streets leading to transit routes, and radiating out from transit stops to nearby buildings. Some call for midblock crosswalks, cul-de-sac pass-throughs, diagonal walkways through parking lots, and other pedestrian shortcuts to make access to transit more direct.

Of the featured developments, the most transit-oriented, as of today, is Montgomery Village. Its transit market share—12 percent of work trips—may be the highest of any new community in the U.S. Transit service penetrates the village, ending in the village center. Net residential densities are high, and transit trip generators are concentrated in and around the village center. Several stops have bus shelters and benches, and are overlooked by housing for a measure of security. During peak hours, buses provide express service to a Washington Metrorail station.

Transit Stop
in the Village Center
(Montgomery Village)

While not yet served by public transit, The Woodlands has a park-and-ride lot and 19 express buses serving Houston employment centers. The buses have easy access to separate high-occupancy vehicle (HOV) lanes running into Houston. About 1,200 commuters use the service each weekday.

Express Buses to Houston
(The Woodlands)

At Prairie Crossing, a high-density TOD is slated for the southwest corner of the site, across the road from a commuter rail station bearing the community's name. At Southern Village, a park-and-ride lot is already operating next to the village center; bus service will eventually loop through the community on its way to the park-and-ride lot.

Commuter Rail Station
(Prairie Crossing)

BEST ENVIRONMENTAL PRACTICES

CROSS-CUTTING PRINCIPLES: PRESERVE ENTIRE ECOSYSTEMS; MIMIC NATURE

Practice 1: Use a systems approach to environmental planning.

Practice 2: Channel development into areas that are already disturbed.

Practice 3: Preserve patches of high-quality habitat, as large and circular as possible, feathered at the edges, and connected by wildlife corridors.

Practice 4: Design around significant wetlands.

Practice 5: Establish upland buffers around all retained wetlands and natural water bodies.

Practice 6: Preserve significant uplands, too.

Practice 7: Restore and enhance ecological functions damaged by prior site activities.

Practice 8: Minimize runoff by clustering development on the least porous soils and using infiltration devices and permeable pavements.

Practice 9: Detain runoff with open, natural drainage systems.

Practice 10: Design man-made lakes and stormwater ponds for maximum environmental value.

Practice 11: Use reclaimed water and integrated pest management on large landscaped areas.

Practice 12: Use and require the use of Xeriscape™ landscaping.

By designing with nature, developers can help themselves at the same time they further the goals of *habitat protection*, *stormwater management*, *water conservation*, and *aquifer protection*. Ways of furthering another environmental goal—*air quality*—were discussed previously under best land use and transportation practices.

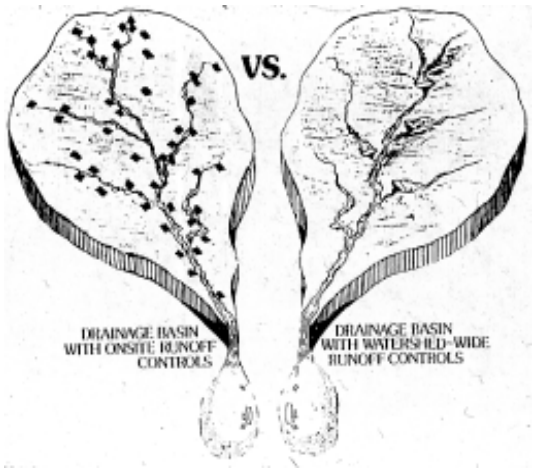
Natural amenities—woodlands, hedge-rows, slopes, rock outcroppings, and water bodies—cost nothing in their pure state and are beloved by residents. Wild places (natural areas with nothing done to them at all) are a particular favorite with children. Greenbelts and other open spaces, if designed for physical and visual access, can enhance property values of nearby developable lands.

PRESERVE ENTIRE ECOSYSTEMS

Illustrative Practice: Use a systems approach to environmental planning.

Planning and regulatory emphasis is shifting from the individual development site to the basin or ecosystem. The shift is prompted by the realization that functional systems are the appropriate units of environmental analysis and management. Wildlife must be managed as a "community" of interrelated species; actions that affect one species affect others. Stormwater is best managed on a watershed basis to coordinate the timing of stormwater releases and achieve economies of scale. And so it goes.

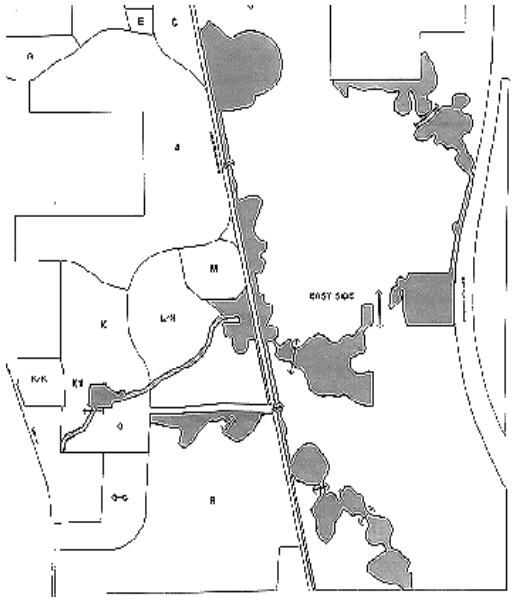
Two Approaches to Stormwater Management



Source: J.P. Hartigan, "Watershed-Wide Approach Significantly Reduces Local Stormwater Management Costs," *Public Works, Dec. 1983, pp.34-37.*

On the west side of Palmer Ranch, environmental issues were addressed on a project-by-project basis within the framework of a general master plan. When it came time to develop the east side, the developer and regulatory agencies agreed that environmental resources could be better protected if planning were system-wide. Palmer Ranch's surface water management plan for the east side considers the entire South Creek watershed. The open space plan emphasizes connections to off-site habitat and preservation of corridors rather than isolated patches. Comparing the extent of wetlands and uplands preserved on the two sides, the systems approach seems to have preserved connections better than the piecemeal approach.

Open Spaces Preserved with Piecemeal vs. Basin-wide Planning (Palmer Ranch)



Illustrative Practice: Preserve patches of high-quality habitat, as large and circular as possible, feathered at the edges, and connected by wildlife corridors.

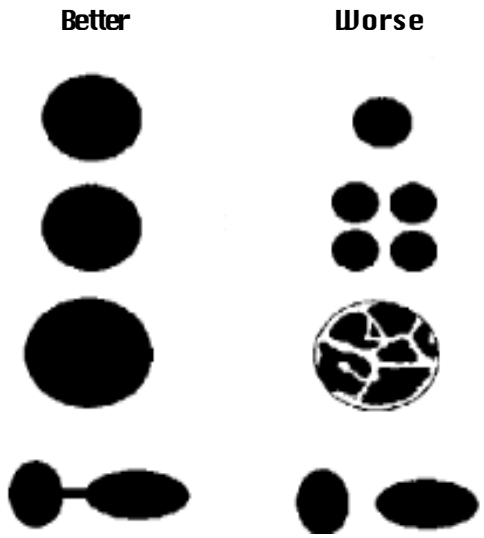
A debate once raged among biologists over the value of a single large preserve versus numerous small preserves of equal total area. The controversy was put to rest when leading biologists from opposing sides finally agreed that "bigness" and "multiplicity" are both essential for regional biodiversity.

A mosaic of smaller preserves or *patches* can be pieced together with the help of land developers. Patches preserved in an urbanizing landscape should be as large as possible. In general, the bigger the patch, the more species will colonize it. More important, most species at risk require good-sized patches or specialized habitat or both. Given the right kind of habitat, patches of 15 to 75 acres have been found to support many interior bird species, a host of smaller mammals, and most reptiles and amphibians.

Where land is limited, patches should be as nearly circular as possible to minimize edge effects. Edges invite competition from generalist species, predation, and human disturbance. The edges themselves should be "feathered" wherever possible; predation rates are lower where edges are gradual and undulating rather than hard and straight.

Wildlife corridors should be preserved to serve as "land bridges" between "habitat islands." The young need some way to disperse to avoid competition with their parents and inbreeding among themselves, and entire populations may have to temporarily evacuate patches in the face of flooding, fire, etc. Natural landscape connections between patches are preferred to man-made connections along hedgerows, drainage ditches, or railroads. Riparian strips along rivers and streams are the most valuable of all corridors, used by nearly 70 percent of all vertebrate species in some significant way during their life cycles.

Habitat Planning Guidelines



Source: Adapted from J. M. Diamond, "The Island Dilemma: Lessons of Modern Biogeographic Studies for the Design of Natural Reserves," *Biological Conservation*, Vol. 7, 1975, pp. 129-146; and M. E. Soule, "Land Use Planning and Wildlife Maintenance–Guidelines for Conserving Wildlife in an Urban Landscape," *Journal of the American Planning Association*, Vol. 57, 1991, pp. 313-323.

Hunter's Creek has the Shingle Creek corridor of wetlands and upland buffers traversing its western side. Rancho Santa Margarita has Arroyo Trabuco and Tijeras Creek, plus associated slopes, bluffs, and ridges, running its length. The Woodlands has three natural stream corridors, enhanced by created wetlands in their floodplains.

Conservation Area Along West Side (Hunter's Creek)

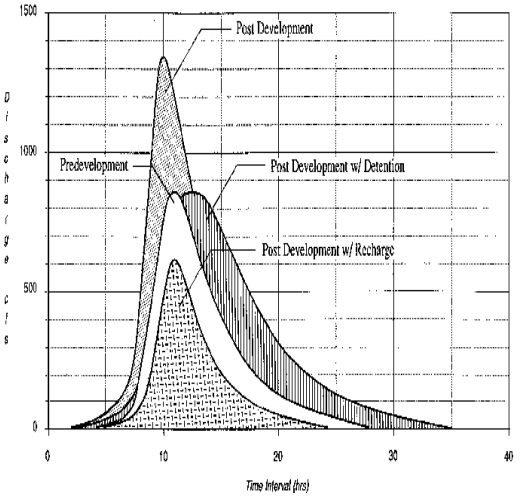
MIMIC NATURE

Illustrative Practice: Minimize runoff by clustering development on the least porous soils and using infiltration devices and permeable pavements.

When land is developed, a large volume of stormwater that once seeped into the ground or nourished vegetation is deflected by rooftops, roads, parking lots, and other impervious surfaces; it ends up as runoff, picking up urban pollutants as it goes. This change in hydrology creates four related problems. *Peak discharges*, *pollutant loads*, and *volumes* of runoff leaving a site all increase, as compared to pre-development levels. By reducing groundwater recharge, land development also reduces *base flows* in nearby rivers and streams.

To mitigate the adverse impacts of development, there are two options: stormwater *infiltration* and stormwater *detention*. With infiltration, stormwater is retained on-site in basins, trenches, or recharge beds under pavements, allowing it to infiltrate into the ground. With detention, stormwater runoff is slowed via swales, ponds, or wetlands, but ultimately discharged from the site. Experts are beginning to favor infiltration as the only complete approach to stormwater management. Where soils and water table elevations permit, infiltration can maintain the water balance in a basin and

Runoff Before and After Development (with different approaches to mitigation)



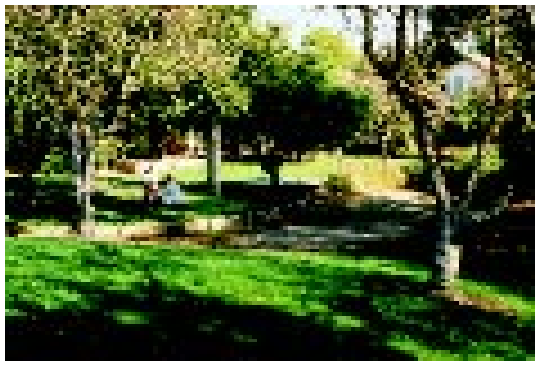
Source: Cahill Associates, *Stormwater Management Systems-Porous Pavement System with Underground Recharge Beds-Engineering Design Report*, West Chester, Pa., 1993, p. 20.

mitigate all four adverse stormwater-related impacts of development.

Infiltration can be maximized by clustering development on the least porous soils. In this way soils that allowed infiltration prior to development continue to allow it, while soils that were impervious to begin with remain so, though now covered with buildings and pavement.

Infiltration rates can be further boosted by means of infiltration basins, infiltration trenches, swales with check dams, and/or permeable pavements. Village Homes, was master planned in this manner and managed to avoid flooding when neighboring subdivisions were awash. Using natural drainage rather than storm drains also saved $800 per house (in 1975 dollars).

Natural Drainage System (Village Homes)

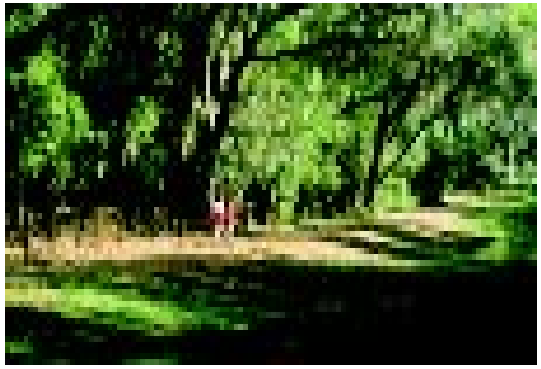


Prairie Crossing is using a stormwater "treatment train" of vegetated swales, created prairies, created wetlands, and a stormwater lake to reduce runoff volumes by a projected 65 percent and pollutant loads by even more (relative to conventional development). The swales and prairie lands clean and infiltrate runoff, while the wetlands and lake polish the outfall.

Prairie-Wetland-Lake Combination (Prairie Crossing)

Other featured communities using infiltration include: Haile Plantation (large infiltration basins), Bluewater Bay (small infiltration basins), Miami Lakes (infiltration trenches and turf pavers), and The Woodlands (porous asphalt).

Other Infiltration Measures (Haile Plantation/Bluewater Bay/ Miami Lakes)



Illustrative Practice: Use and require the use of Xeriscape™ landscaping.

While the term Xeriscape may conjure up images of cactus-and-rock gardens in desert regions, it actually refers to any landscape treatment that conserves water by following common-sense principles:

- Design to minimize maintenance.
- Analyze and improve soil conditions.
- Use locally-adapted plants.
- Irrigate efficiently.
- Use turf only where it is needed.
- Use mulches to retain soil moisture.
- Maintain landscapes properly.

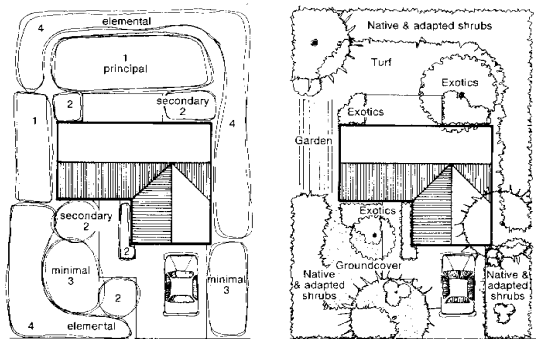
Xeriscape landscaping can cut water use in master planned developments by 50-60 percent; fertilizer use and landscape maintenance are reduced by like amounts. By one estimate, a homeowner can recoup the higher initial cost of a water-conserving landscape in three years through savings on irrigation and maintenance.

With Xeriscape landscaping, plants are chosen for their adaptability to local conditions. Native plants are well-adapted (being "native," after all). Many require little or no irrigation, fertilizers, pesticides, or herbicides.

Turf is used only where it serves a specific purpose, such as erosion control or recreation, rather than as fill-in material between other landscape elements. One visual preference survey found that lawns with up to 50 percent native groundcover are perceived as more attractive and less work (as well as much more "natural") than are conventional turf lawns.

Plants with similar irrigation requirements are grouped together into water use zones (so-called hydrozones). Irrigation systems can then be tailored to different zones rather than operating uniformly. It is recommended that high water use zones (consisting of turfgrasses and plants that require supplemental watering year-round) be limited to 50 percent of total landscaped area, and that drip or bubbler irrigation be used on trees, shrubs, and ornamentals.

Four Hydrozone Plan for a Single-Family Home



Source: R.L. Thayer and T. Richman, "Water-Conserving Landscape Design," in E.G. McPherson (ed.), *Energy-Conserving Landscape Design*," American Society of Landscape Architects, Washington, DC, 1984, pp. 185-213.

By deed restriction, forest removal is limited at The Woodlands and reforestation of disturbed areas is required. Wildflowers are planted in the parkway medians and along the pathways. At annual Arbor Day, 40,000 native seedling trees are distributed free to residents.

Xeriscape Landscaping (The Woodlands)

A Resident's Guide to Landscaping (The Woodlands)

Other developments featuring native landscaping include Haile Plantation, Prairie Crossing, and Village Homes. Even some of the most manicured developments are beginning to experiment with native plantings. Expect to see more of the same as other developers discover that a palette of native and adapted plants is more economical and visually pleasing than is endless turfgrass.

BEST HOUSING PRACTICES

CROSS-CUTTING PRINCIPLES: MIX HOUSING TYPES; CUT HOUSING COSTS

Practice 1: Offer "life cycle" housing.

Practice 2: Achieve an average net residential density of six to seven units per acre (without the appearance of crowding).

Practice 3: Use cost-effective site development and construction practices.

Practice 4: Design in energy-saving features.

Practice 5: Supply affordable single-family homes for moderate-income households.

Practice 6: Supply affordable multifamily and accessory housing for low-income households.

Practice 7: Tap government housing programs to broaden and deepen the housing/income mix.

Practice 8: Mix housing to the extent the market will bear.

These practices are designed to increase the affordability and diversity of the housing stock. Affordability is promoted for everyone, but particularly those with moderate, low, and very low incomes; for them, documented housing shortages exist.

Diversity of the housing stock is sought so people can "age in place" rather than moving at each stage in the life cycle...also, because diversity breeds vitality in all systems, natural and manmade. Earlier best practices promoted diversity in other areas, specifically, in ecosystems (biodiversity), transportation systems, and land use patterns.

MIX HOUSING TYPES

Illustrative Practice: Offer "life cycle" housing.

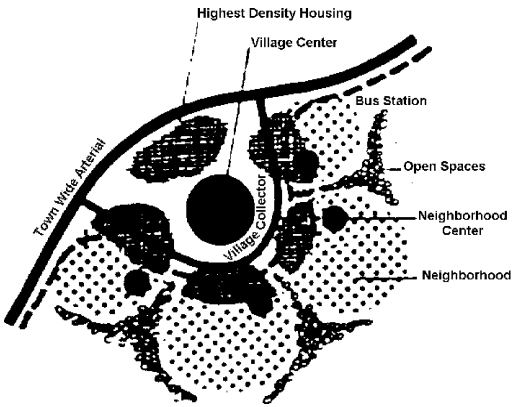
Suburbia segregates people at different stages in life by segregating housing by type, size, and price range. Large complexes of studio and one-bedroom apartments, large subdivisions of three- and four-bedroom homes, and large condominium projects guarantee that young singles, young families, and empty nesters will have minimal contact.

Suburbia offers little opportunity to put down roots; neither the homes nor the neighborhoods are equipped to see families through the life cycle. When families move up (or down), they move out.

This is in contrast to traditional towns, where a mix of housing led to a mix of people. The generations were mixed to the point of "granny flats" or "teenager cottages" behind family homes. It is also in contrast to new communities of the 1960s, an idealistic time when the idea of *three generational* or life cycle housing took hold at Columbia, MD and Reston, VA. Senior, multifamily, and single-family housing were all sited within the same villages and sometimes even within the same neighborhoods.

With life cycle housing available, social networks can remain intact after moves; children need not be uprooted from familiar schools; and elderly persons can remain near friends and families.

Mixed Housing within Villages and Neighborhoods of Columbia, MD

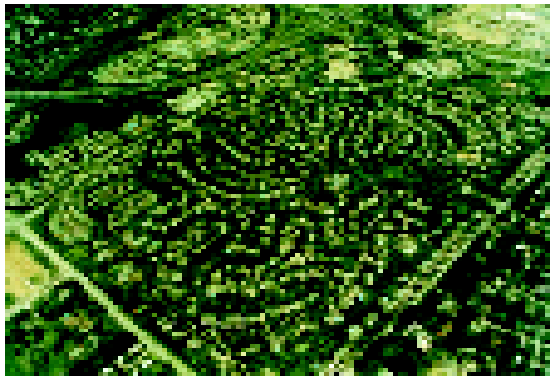


Source: M. Hoppenfeld, "The Columbia Process: The Potential for New Towns" *The Architects Yearbook*, Garden City Press Limited, Letchworth, England, 1972.

In addition, life cycle housing makes good business sense. For large developers, the key to profitability is rapid land absorption, and the key to rapid land absorption is to tap many market segments. "Life cycle" housing creates its own demand, as renters feed the starter home market, families in starter homes buy move-up homes, and so forth. One quarter of all new home buyers in The Woodlands are moving within the community. The move-up market can provide as many as half of all new home buyers.

Regency has everything from one-bedroom apartments to a 28,000-square foot mansion, all on a site of less than 400 acres. Only seven

Apartments to Mansions in a Small Community (Regency)



years after opening, Oakbridge could boast an enviable mix of product types, including congregate care. Where no independent builder was interested in supplying a given product, these developers built it themselves using in-house builders or general contractors.

Zero-Lot Line Homes to Congregate Care (Oakbridge)

Illustrative Practice: Mix housing to the extent the market will bear.

There are differing opinions about the extent to which housing for different socioeconomic groups can and should be mixed within neighborhoods. There are some who argue for maximum economic integration in the interest of social justice. Others advocate neighborhood homogeneity in the interest of social compatibility or crime prevention.

We come down in the middle, heeding the words of renowned urban sociologist Herbert Gans. Small clusters of housing, similar in type and price, can be placed next to other small clusters, themselves similar but different from other clusters in the same neighborhood. To promote social interaction, it is only necessary to have common areas and common facilities.

Mixed-income projects can be good for large developers because several market segments are tapped at once, yet infrastructure need be extended to only a small area at a time. The Hammocks mixes housing within the same subdivisions, with a high degree of market acceptance. Celebration follows this practice to an even greater degree, mixing three or four housing types around common areas.

Mixed Housing Around Common Recreational Facilities (The Hammocks)

Townhouses Next to Estate Homes (Celebration)

Nowhere is the need for mixing greater than with low-income housing. The failure to mix incomes may stigmatize certain areas, that is, make them into ghettos. Or worse, it may generate so much public opposition that low-income housing never gets built.

There is a growing sense that mixed-income housing is healthier for low-income households and no problem for their higher-income neighbors, this suggested by low vacancy rates among market-rate units in mixed-income projects. Since many federal, state, and local housing programs now promote the mixing of below-market and market-rate units, exemplary developers will find it financially beneficial to follow this best practice.

Below-Market and Market-Rate Townhouses Comfortably Co-existing (Montgomery Village)

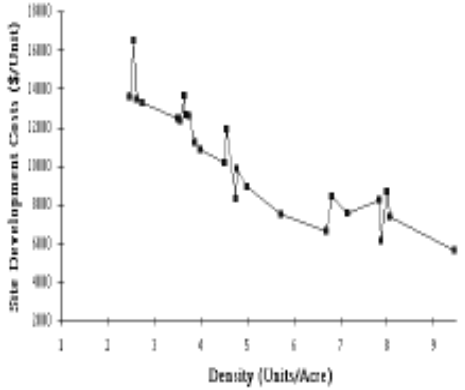
Federally Subsidized (Section 8) and Market-Rate Apartments 100% Occupied (The Woodlands)

CUT HOUSING COSTS

Illustrative Practice: Achieve an average net residential density of six to seven units per acre (without the appearance of crowding).

The harsh reality of housing is that density is necessary for affordability. Higher densities mean less land per unit, less site preparation, less infrastructure, and typically less floor and wall area, all of which hold down the hard costs of housing. It is a "harsh" reality because the mere mention of density sends shivers down the spines of suburban residents and their elected officials.

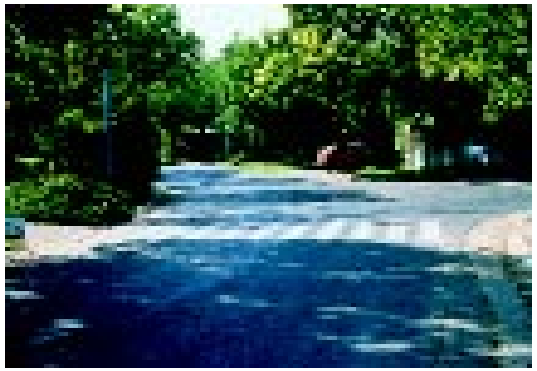
Falling Site Development Costs with Rising Density



Source: National Association of Home Builders, *Cost Effective Site Planning—Single Family Development*, Washington, DC, 1986, p. 56-97. Reprinted with permission from Home Builders Press, National Association of Home Builders, 1201 15th St., NW, Washington, DC 20005; 800-223-2665.

In this regard, density has gotten a bum rap. People confuse density with crowding, high density with high rise, and perceived density with measured density. We know, for example, that densities are perceived to be lower where there is open space nearby. Even a small commons provides a feeling of spaciousness. Other urban design elements that create the perception of spaciousness include small housing clusters, short blocks, low building heights, and natural landscaping.

Perceived Density < Actual Density of 7.7 Units/Net Acre (Village Homes)



Individual floor plans and lot layouts also affect perceived densities and acceptance in the marketplace. ULI and NAHB have published entire volumes filled with examples of dense housing that affords privacy, quiet, outdoor space, and interior light and airiness.

Monotony can be avoided at higher densities through what ULI has called "density by design." Zero lot line homes can be staggered or zigzagged, and setbacks and garage locations can be varied. Duplexes and triplexes can have entrances separated from one another and oriented, alternately, toward the street and side yards; this, plus landscaping to break up building masses, make attached homes fit nicely into detached home neighborhoods. Quadplexes and townhouses can have varying ceiling heights, roof lines, setbacks, and colors; units can be placed side-by-side, back-to-back, or over-under for, once again, variety. Examples of "density by design" can be found in all exemplary developments.

Duplex (Palmer Ranch)

Townhouses (Bluewater Bay)

How dense is dense enough? How dense is too dense? From surveys, residents are as satisfied with housing at six or seven units per acre as they are at three or four units per acre. Average net residential densities within this range make a nice target for suburban developers. Six of the featured developers exceed this target, and four more come close.

The highest net density, about 12 units per acre, is achieved at Rancho Santa Margarita. Density is a means to an end, affordability, and affordability is a means to an end, high land absoption rates. Two-thirds of all units sold have qualified as affordable in the pricey Southern California market. The community has averaged 720 home sales per year over 10 years of development (including a six-year California recession). Residential buildout will be reached six years earlier than expected.

Density without Crowding (Rancho Santa Margarita)

Illustrative Practice: Design in Energy-Saving Features.

This best housing practice goes hand-in-hand with a best transportation practice: aligning streets for optimum building orientation vis-a-vis the sun and prevailing winds. Ordinarily this means that the buildings' long windowed sides face within a few degrees of true south, so occupants benefit from solar heating in the winter when the sun is low in the sky, and natural shading in the summer when the sun is high. Village Homes manages to achieve a dominant north-south building orientation and corresponding energy savings within a curvilinear street network; it does so by means of staggered lots and houses. Space heating demands are reduced by about half with passive solar architecture.

Beyond building orientation, precision landscaping and energy-efficient construction practices can dramatically reduce heating and cooling costs, thereby making housing that much more affordable for owners and renters. Deciduous trees should be preserved and/or planted to block the summer sun. Trees are also helpful for humidity control and as a windbreak in extreme weather. And they are one of the best investments for home appreciation.

Where trees leave off, shrubs can block hot and cold breezes that would otherwise infiltrate windows. These same shrubs can be pruned in the spring and fall to maximize natural ventilation. The combination of optimal solar orientation, precision landscaping, and energy-efficient construction allows Village Homes to do without air conditioning units, saving on equipment as well energy costs.

North-South Orientation in a Curvilinear Network (Village Homes)

Passive Solar House (Village Homes)

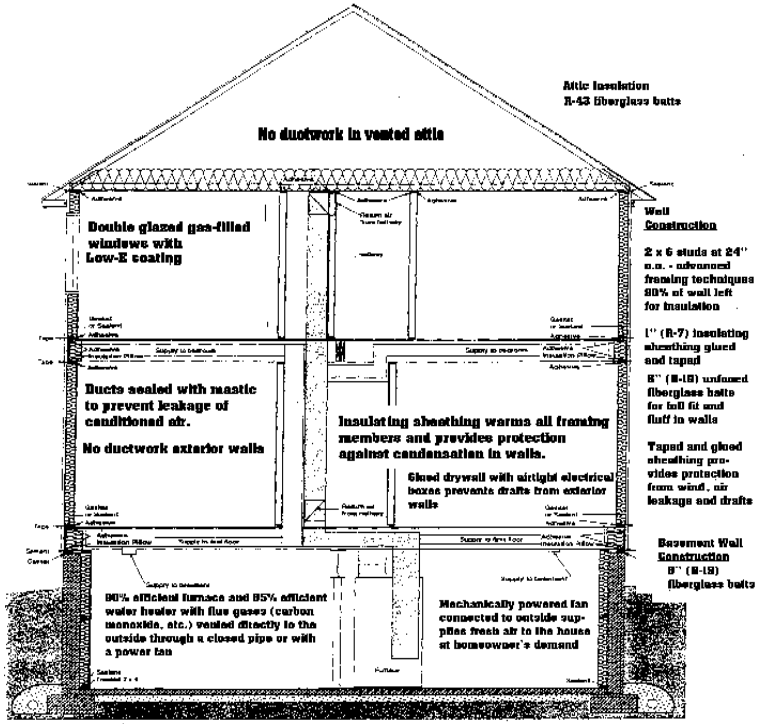
Along with Village Homes, one other development has been sensitive to solar orientation and landscaping issues. At Haile Plantation, tree clearing is usually limited to the front of lots; even in front, mature trees are preserved. Many houses have porches for shading and wide-shallow designs for cross-ventilation. Some are placed at an angle to the street for optimal solar orientation.

Tree Preservation and Southern Exposure (Haile Plantation)

With respect to construction practices, the list of energy-saving features is too long to be reviewed here. Many practices both save energy and cut the cost of home construction. Many others have extremely short payback periods. Guidance is available from the Florida Solar Energy Center's *Energy-Efficient Florida Home Building*, the National Association of Home Builders' *Energy-Smart Building for Increased Quality, Comfort, and Sales*, and the U.S. Department of Energy's Building America Initiative.

Prairie Crossing is the first large-scale demonstration project under the Building America Initiative. Standard specifications for every new house include: framing with 2x6 studs at 24" spacing (rather than 2x4s at 16" spacing) to increase space for thermal insulation without increasing lumber costs; extensive sealing, caulking, and gasketing to make the house virtually airtight; heat ducts within the building interior instead of the outside walls or attic to reduce heat loss; double-glazed, gas-filled windows; and a fan to bring fresh air into the house when needed. These features cut heating and cooling costs by almost half, while adding only $2,300 to the cost of a home (factoring in the smaller heating and cooling systems that will suffice). The added expense is recouped in just 4 years, after which the homeowner is ahead.

Energy-Efficient Home Building (Prairie Crossing)



Aerated Concrete Block House (Bluewater Bay)

Bluewater Bay is the first U.S. community to offer aerated concrete block houses. Aerated concrete blocks have millions of tiny air pockets that make them light, easy to cut, well-insulating, and unaffected by sudden changes in temperature. They reduce by about half the time air conditioning is required in Bluewater Bay's warm and humid climate. This is just one more example of a pattern evident throughout this primer–what distinguishes featured developers from many others is not any particular practice or practices but a willingness to adapt and innovate.

Notes

[1] Governor's Task Force on Urban Growth Patterns, *Final Report*, Florida Department of Community Affairs, Tallahassee, 1989; Center for Urban Policy Research (CUPR), *Impact Assessment of the New Jersey Interim State Development Plan*, New Jersey Office of State Planning, Trenton NJ, 1992; New Jersey State Planning Commission, *Communities of Place–The New Jersey State Development and Redevelopment Plan*, Trenton NJ, 1992; W. Fulton, *Beyond Sprawl: New Patterns of Growth to Fit the New California*, Bank of America, San Francisco CA, 1995; and R. Roth, *Redevelopment for Livable Communities*, Washington State Energy Office, Olympia WA, 1996.

[2] R. Ewing, "Is Los Angeles-Style Sprawl Desirable?" *Journal of the American Planning Association*, Vol. 63, 1997, pp. 107-126.

[3] Urban Land Institute, *New Approaches to Residential Land Development*, Technical Bulletin No. 40, Washington DC, 1961; Urban Land Institute, *Innovations vs. Traditions in Community Development*, Technical Bulletin No. 47, Washington DC, 1963; R. Witherspoon, J.P. Abbett, and R.M. Gladstone, *Mixed-Use Developments: New Ways of Land Use*, Urban Land Institute, Washington DC, 1976; D. Priest *et al.*, *Large-Scale Development–Benefits, Constraints, and State and Local Policy Incentives*, Urban Land Institute, Washington DC, 1977; Council on Development Choices for the 80s, *The Affordable Community: Adapting Today's Communities to Tomorrow's Needs*, Urban Land Institute, Washington DC, 1981; W. Sanders, *The Cluster Subdivision: A Cost-Effective Approach*, Planning Advisory Service Report Number 356, American Planning Association, Chicago, 1981; David Jansen Associates, Inc., *Community Design Guidelines*, National Association of Home Builders, Washington DC, 1985; National Association of Home Builders, *Cost Effective Site Planning: Single-Family Development*, Washington DC, 1986; R.D. Yaro *et al.*, *A Design Manual for Conservation and Development*, Lincoln Institute of Land Policy, Cambridge MA, 1988; D. Listokin and C. Walker, *The Subdivision and Site Plan Handbook*, Center for Urban Policy Research , Rutgers University, New Brunswick NJ, 1989; R. Ewing, *Developing Successful New Communities*, Urban Land Institute, Washington DC, 1991; D. Schwanke *et al.*, *Mixed-Use Development Handbook*, Urban Land Institute, Washington DC, 1987; C.S. Doble and G.M. McCulloch, Community Design Guidelines Manual, The Tug Hill Commission, Watertown NY, 1991; R. Ewing, *Developing Successful New Communities*, Urban Land Institute, Washington DC, 1991; E.L. Fisher, *Affordable Housing Development Guidelines for State and Local Government*, U.S. Department of Housing and Urban Development, Washington DC, 1991; S. Weissman and J. Corbett, *Land Use Strategies for More Livable Places*, The Local Government Commission, Sacramento CA, 1992; P. Calthorpe, *The Next American Metropolis–Ecology, Community, and the American Dream*, Princeton Architectural Press, New York, 1993; F.D. Jarvis, *Site Planning and Community Design for Great Neighborhoods*, National Association of Home Builders, Washington DC, 1993; D.L. Kone, *Land Development*, National Association of Home Builders, Washington DC, 1994; and R. Ewing, *Best Development Practices–Doing the Right Thing and Making Money at the Same Time*, American Planning Association (in cooperation with the Urban Land Institute), Chicago, 1996.

[4] Ewing, *op cit.*, 1996.

[5] Ewing, *op cit.*, 1996, pp. 5-6.