(3) Develop parking standards that reflect average parking needs instead of single peak day (e.g., Christmas Eve) projections.

(4) Build multi-story parking structures or under the building parking.

- Reduce street coverage
  (1) Reduce residential (local access) street widths.
  (2) Retrofit existing cul-de-sacs with vegetated islands designed to hold stormwater.
- Narrow sidewalks
  (1) Narrow low-use sidewalks to at least four feet in width.
  (2) Build sidewalks on only one side of the street.
  (3) Slope sidewalks to drain to vegetated swales or gravel strips.
- Design and locate buildings more effectively
  (1) Encourage cluster development that minimizes impervious surfaces
  (2) Build and use taller buildings, and modify policies to allow taller buildings.

A final study report will be available in March 1995. Those interested in receiving a copy of the report or information on evaluation techniques, technical assistance, and educational tools should contact:

Cedar Wells, Study Coordinator
City of Olympia Public Works Department
P.O. Box 1967
Olympia, WA, 98507-1967.
Tel.: (206) 753-8454 or (206) 753-8598

Technical Note 39

Use of Cluster Development to Protect Watersheds

Clustering refers to a compact pattern of development at a site. Clustering is not a new idea. It has been utilized for several decades in many communities around the country. Most of these cluster programs, however, were developed to meet general environmental, architectural or community objectives and were not designed explicitly for watershed protection.

Cluster does have a strong potential to reduce the total imperviousness of a site, fully protect all environmentally sensitive areas, and provide additional open and green space within a community. It works in a simple manner. A greater density of homes or structures on one portion of the site is traded for open space elsewhere on the site. The higher density is achieved by giving the designer more flexibility in reducing the size and geometry of individual lots than is normally allowed under subdivision codes.

Conventional subdivision codes contain rigid requirements that govern the minimum area of a lot, setbacks from the front, side and rear property lines, as well as minimum frontage requirements (mandatory width of the front yard) (Table 39.1). Together these requirements increase the distance between lots. Because the length of roads, sidewalks and other impervious surfaces is directly related to the distance between lots, a greater distance translates into more impervious cover.

When designed properly, cluster development can reduce site imperviousness by 10 to 50%, depending on the original lot size and road network. Some of the other benefits of cluster development are outlined in Table 39.2.

When designed properly, cluster development can reduce site imperviousness by 10 to 50%, depending on the original lot size and road network.

Communities have gained considerable experience in the use of cluster development over the past two decades. Our most detailed knowledge about local cluster programs is drawn from a national survey of 39 programs conducted by Heraty (1992). The responses from a wide cross-section of planners suggest that many current cluster programs may require significant modification if they are to achieve effective nonpoint source control. Some of Heraty's key findings include:

1. Most local cluster programs were not designed for the purpose of protecting streams or providing nonpoint source control.

Most local cluster programs were adopted for purposes unrelated to stream protection or urban nonpoint source control. Indeed, the five most frequently cited objectives for cluster programs were to achieve a greater variation in the style and design of developments (80%), protection of environmentally sensitive areas (primarily wetlands and forests, 77%), to provide

Table 39.1: Comparison of single family home dimensions conventional vs. cluster development, one-acre lots

Site Factor	Detached single family residence	Detached cluster
Min. site size	5 acres	5 acres
Maximum site density	1 du./acre	1 du/acre average
Lot size	40,000 ft² min.	10,000 ft² min.
Frontage	150 ft min.	75 ft min.
Front yard	40 ft min.	25 ft min.
Side yards	25 ft min./60 ft total	10 ft min./25 ft total
Rear yard	40 ft min.	25 ft min.
Bldg. footprint	5% of lot	18% of lot
Open space required	none	33% of site min.

community recreation areas (62%), to preserve the rural character of the landscape (51%), and to produce more affordable housing (39%). Only 18% of cluster programs were adopted as a means of reducing stormwater pollution from the site or as a technique to reduce impervious area. Most of the programs, however, acknowledged that clustering did reduce impervious cover when compared to conventional subdivisions.

2. Required open space in clusters is often poorly designed and fragmented.

Nearly every cluster program required that a portion of the site be retained in open space. On average, the minimum open space requirement for residential developments was one-third of total site area. An early problem reported by many communities, however, was the fragmentation and poor quality of the open space. In some cases, open space was poorly landscaped and widely scattered across the entire development. Consequently, the open space contributed little functional value to either the community or the environment. A third of all cluster programs now require that a minimum percentage of open space should be consolidated. The average consolidation requirement is 70% of total open space (range: 30 to 100%).

3. Few cluster programs require that a portion of open space should be protected as green space.

The survey reported that very few cluster programs required that any portion of open space be reserved as "green space" or undisturbed areas in native vegetative cover. Less than 10% of all programs had such a requirement. The provision of green space would greatly amplify the environmental benefit of clustering.

4. Cluster programs rarely specify what are allowable and unallowable uses of open space.

A great deal of variation was seen in the kinds of uses and activities that were allowed or denied within designated open space (Table 39.3). A surprising number of allowable uses created impervious cover (such as hard courts, pools, roads, bike paths). Only 14% of all programs restricted or prohibited the construction of significant impervious cover within green or open

Table 39.2: Benefits of cluster development

1. Reduces site and watershed imperviousness by 10 to 50%, depending on lot size and layout.
2. Reduces stormwater runoff and pollutant loads.
3. Reduces pressure to encroach on resource and buffer areas.
4. Reduces potential for soil erosion since green space is not cleared on up to 15% of the site.
5. Reserves up to 15% of site in green space that would not otherwise exist
6. Reserves up to 15% of site in open space dedicated to passive or active recreation.
7. Provides partial or total compensation for lots that would are lost for resource protection areas and stream buffers.
8. Reduces capital cost of development by 10 to 33%
9. Reduces the cost of future public services needed in the community.
10. Can increase future residential property values.
11. Reduces the size of stormwater quantity and quality controls.
12. Concentrates runoff where it can be most effectively treated.
13. Provides a wider range of possible sites to locate stormwater BMPs.
14. Creates larger urban wildlife habitat islands.
15. Increases sense of community and makes development more pedestrian friendly.
16. Can support other community planning goals such as preservation of farmland or rural landscapes, affordable housing, and architectural diversity.

space. Most cluster programs also allowed golf courses, lawn, turf, ballfields and fill within open space. While these uses are acceptable for open space dedicated to recreation, they are certainly not the most protective use of green space. Very few cluster programs acknowledged this key distinction.

5. Cluster remains a largely voluntary development option that is not frequently exercised by the development community.

Cluster was a non-mandatory option in 95% of the local cluster programs surveyed. On average, about 37% of all new subdivisions are clustered in each program, with the remainder conventionally developed. Surprisingly, 20% of communities reported that they had yet to receive a cluster proposal since they first adopted their cluster ordinance. Other communities report from 5 to 100 cluster proposals per year.

A number of market factors and perceptions explain the wide variation in the number of developers that opt to cluster. The development community needs to balance the perceived economic benefits of cluster against the vagaries of the real estate market (i.e., will the clustered units sell?). After all, the conventional subdivision product has sold well over the years—will a clustered product be equally acceptable in the market? Many respondents remarked that consultants, bankers, landscape architects and developers all need to be reassured on this point before it becomes a common practice.

Overall, the actual market acceptance varies depending on the type of housing and the quality of clustering. The survey indicated that 67% of cluster program managers felt that cluster developments properties appreciated in value at an equal or greater rate than conventional subdivisions. Some 18% of respondents felt that cluster developments did not appreciate as fast as conventional subdivisions. In many cases, this was thought to be due to the fact that the cluster development involved converting detached single family homes into attached townhouses.

From a cost standpoint, much of the development community now recognizes that clustering can save capital costs in construction, provide partial compensation for lost lots due to local, state or federal regulation, and provide greater architectural variety.

Still, local governments will need to provide more incentives to the development community, if the proportion of clustered subdivisions is to be increased from present levels. Over half of the planners acknowledged that a greater effort must be made to encourage developers to consider implementing cluster in their community. Some of the more frequently cited incentives include an expedited review process, more flexibility in design and density, and a greater investment in education and training of consultants and landscape architects.

Table 39.3: Allowable and prohibited uses of open space ***(adapted from Heraty, 1992)***

Land use or activity	Allowed (%)	Prohibited (%)	Restricted (%)
Parks, including foot or bike paths	94	3	3 (RO)
Athletic Field	49	15	36 (RO)
Golf Course	67	11	22 (RO)
Hard Courts	53	12	35 (RO)
Playground	58	8	34 (RO)
Swimming Pool	50	9	41 (RO)
Impervious Surfaces	86	14	
Individual OSDS	16	78	6 (P)
Common OSDS	41	53	6 (P)
Road/Bridge	55	39	6 (P)
Utility Lines	70	18	12 (P)
Lawn or Turf	71	14	6 (P), 9 (RO)
Stormwater BMPs	65	16	14 (GS), 5 (RO)
Agriculture	29		
Community Center Bldg	14		
Trails	39		

RO, in recreational areas only; GS, only in green space; P, use is restricted, may require permit or homeowner association approval; OSDS, On-site sewage disposal

6. A significant fraction of new development is occurring on larger lots and is located outside existing or planned water and sewer service areas.

Local communities are discovering the need to develop new cluster models to handle the emerging patterns of development in rural areas. These trends are best exemplified in Maryland. A statewide land use survey, indicated that large lot development (1 dwelling unit/acre or greater) was the fastest growing land use, and comprised about 20% of all residential development in the last decades (MOP, 1991). On an area basis, large lot development constituted over 76% of all land converted to residential use over the same period. Lastly, an astonishing 84% of residential development (mostly large lot development) occurred outside of existing or planned water and sewer service areas.

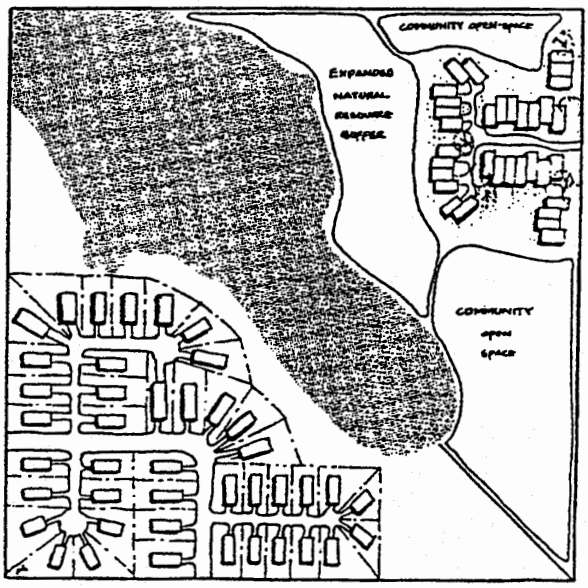
Table 39.4 Performance criteria for cluster design to protect watersheds, adaptable to 0.5 - 5 acre residential zoning categories

Performance standard	Criteria
Minimum site size	5 acres
Minimum lot size	10,000 square feet
Other relaxed lot dimensions	Reduced frontage, reduced setbacks on rear, front, and side yards, expanded building footprint.
Net density	Gross density less unbuildable lands
Unbuildable lands	Includes right of ways, open water plus wetlands, steep slopes, floodplains, stream buffer, and prime woodlands.
Required open space	33% of total net site area
Consolidation	75% of open space
Green space	No less than 50% of open space
Recreation space	No more than 50% of open space
Green space uses	The vegetative target is predevelopment forest. Siting of stormwater BMP and common OSDS systems may be allowed.
Recreation space use restrictions	Limit creation of impervious surfaces. Ballfields, playgrounds, pools, hardcourts, bike trails and stormwater ponds permitted. Vegetative goal is to minimize extensive turf areas.

While these trends in land use certainly suggest an enormous potential for clustering, the cluster models will need to be adapted to address special problems with respect to waste disposal, water supply, drainage and roads and other concerns. A generalized model for performance criteria for cluster development is provided in Table 39.4. The model is intended to be conceptual, each locality will need to refine and adapt it to meet the specific dimensions for each of its residential zoning categories.

— TRS

Editors Note: The Center is finalizing a detailed guidance manual on effective techniques to utilize clustering to reduce impervious cover. The manual, entitled Site Planning for Stream Protection, is expected to be published in the Spring of 1995.



References

Heraty, M. 1992. Results of Cluster Survey. Metropolitan Washington Council of Governments. Washington, D.C. 25 pp.

Maryland Office of State Planning. 1989. Environmental and Economic Impacts of Lot Size and other Development Standards. Baltimore, Maryland. 18 pp.

Maryland Office of Planning. 1991. Maryland's Land 1973-1990-a changing resource. Baltimore, MD. 68 pp.