ZONING ADVISORY PANEL PUBLIC COMMENT

Received Between July 23, 2021 (noon) and August 6, 2021 (noon)

As part of the County's strong commitment to an open and transparent public process, comments received from any Citizen which reference the Zoning Advisory Panel (ZAP) are usually made available to the general public through uploading the comments to the County's website prior to the next ZAP meeting. Similarly, if the commenter requests, the information may also be forwarded to the ZAP Members directly.

** Please Note: Inclusion of Public Comments herein, does not imply any support nor opposition of the comments by the County.*

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From: Thomas, Andrew
To: County_Planning_Mail
Subject: Public Comment 7.28.2021 ZAP meeting
Date: Tuesday, August 3, 2021 12:49:24 PM
Attachments: July 28, 2021, ZAP meeting, A. Thomas Public Comment..docx
CLUSTER development article.pdf
Dryscaping.pdf

Hello,

Please see attached public comment for the July 28th 2021 ZAP meeting and two articles on dry scaping and cluster development.

Thank you,

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1. Open Space.
    a. As discussions by various ZAP panel members note, open space is considered a valuable feature in almost any development pattern.   Currently the Montana Code Annotated allows for cluster development (CITE), as well as the current Helena Valley plan allows for cluster development.   In the plan cluster development is presented as allowed for reduced lot sizes provided the total acreage of a development averages to the minimum lot size. For example a 100 acres with a ten acre lot minimum could be nine one acre lots and one 91 acre lot.
    b. The problem with cluster development from the issue of the 10acre lot size requirement in the plan is that it does not allow for smaller than average lot sizes. Given that in rural areas there is likely not an issue with open space, cluster development does not seem like a relevant issue. However, in the more densely developed or developing areas especially in the lower Helena Valley an modified version of cluster development might be a useful tool to allow for cost effective development, preserve open space, and allow for a lower density of development and can be appropriate for what infrastructure can provide.
    c. To illustrate this consider the following scenario. A developer has a 100 acre parcel. Under existing regulations they could only put 10 lots on the parcel. Under traditional sub-division development practices they could built 150 to 300 half or quarter acre lots. From the perspective of the developer the 10 parcel option is not viable. From the perspective of the county the 150-300 parcel subdivision is not tenable either. However, applying a modified cluster development approach, a reasonable planner might conclude that a subdivision with 100 half acre or 130 quarter acre lots is tenable provided 30 acres is set aside for open space. Under this approach everyone's interest is considered and an optimal outcome is achieved.
    d. Additionally, the open space can either be kept as unimproved on if desired turned into improve park space for the community. Below are some images that reflect what these patterns likely would resemble. #1 large lot, #2 Traditional #3 modified cluster.
    e. #1 Large lot

f. 

g. Traditional suburban density subdivision

h. #3 Modified Cluster Development

2. Tax base.
3. A comment was made at the July 28th ZAP meeting regarding building the tax base. Although superficially a higher density of building may seem like the only consideration, on further examination there are a variety of other factors to consider. As I had discussed in earlier public comments, density alone is not a solution for increasing the tax base and local economy. Granted there is obviously some desirability to having certain areas that have a relatively high density of buildings, we must also consider a number of other factors.
4. First we must consider what is a reasonable ratio of urban, suburban, and rural densities. Second, it is necessary to consider the type of building that will occur in a certain area, residential, commercial etc.
5. Third one must then consider the costs and benefits of each development pattern. As mentioned at prior ZAP meetings a higher density of development per acre might yield more taxes, but we must consider the costs in terms of infrastructure and other economic activity. For example an urban level density it likely going to require substantially higher infrastructure costs related to traffic management and utilitites. Whereas suburban densities might be lower with regards to traffic management but more with regards to basic road maintenance and fire protection. Also, we need to consider non-tax related economic activity both in the direct and indirect sense. For example, a sprawling big box store such as Walmart, Winco or Costco might not be as “dense” in terms of what it yields in property taxes however such stores do provide relatively low cost consumer goods and jobs that are essential to the community. The same holds for agricultural land and small homebased businesses in rural areas. Indirectly, we need to consider what development pattern will maximize tax revenue and attractive people and businesses to the community. For example consider housing. If the county were to abitrarially say everyone should live in condos and 4-5 story mid rises many people would either leave the community or not move here. Also, land that could be developed and yield both tax revenue and other economic activity would lay idle. Thus, it is necessarily to “optimize” these

considerations so that all options are adequately developed. To do such I would consider using the following framework:

6. Density
    a. Level of density
    b. Cost of density (infrastructure/congestion)
    c. Benefit of density (taxes)
    d. Use pattern in density
    e. Amount of density relative to other densities
7. Economic impact
    a. Direct benefits
    b. Indirect benefits
8. Community
    a. Use patterns/Preferences
    b. Opportunity costs

9. Response to ZAP message board.
10. Dry scaping
    a. Please see attached article on dry landscaping.
11. 00

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The Value of Homes in Cluster Development Residential Districts: The Relative Significance of the Permanent Open Spaces Associated with Clusters

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Abstract This study uses the hedonic framework to look at an aspect of planning and its effects on property values. Specifically, the study examines the impacts of cluster residential development on home value using data on Lower Gwynedd Township (Pennsylvania, USA). Other factors remaining constant, the study finds that properties located within cluster developments (CLUS) attract premium prices of roughly 3.9 %, on average, relative to properties in conventional developments. However, part of the 3.9 % price premium is attributable to the permanent open spaces which are parts and parcels of clusters. When the variable for open space (OPEN) is introduced, the cluster (CLUS) premium reduces to 2.02 % suggesting the relative importance the permanent open spaces. The open space variable (OPEN) is associated with a premium of as much as 5.2 %, on average. The density of development variable (DENSITY) is significantly negative at conventional levels. The normative implication of the density finding is that raising permitted densities, per se, in a sub-urban setting where market densities are lower than permitted densities, will have adverse impacts on home value. The results of this study provide empirical support for sustainable, greener, residential cluster development.

Keywords Cluster residential development · Density bonuses · Permanent open space · Hedonic framework · Home value

Introduction

Residential cluster development is a form of land development in which principal buildings and structures are grouped together on a site, thus saving the remaining land area for common open space, conservation, agriculture, recreation, and public and semi-public uses (Whyte 1964; Unterman and Small 1977; Arendt 1996; Sanders 1980).

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In the United States, the development of Radburn, New Jersey, in 1928 represented the first formal introduction of the cluster development concept. In Radburn, single-family homes and garden apartments are sited in "superblocks" of 35 to 50 acres (Stein 1957). Clustering also became the basic site design concept in such contemporary new towns as Reston, Virginia, and Columbia, Maryland (APA 2006). It drew on English town planning principles, notably those of the so-called "garden city" movement.

The "garden city" movement is an approach to urban planning that was founded in 1898 by Sir Ebenezer Howard in the United Kingdom. Garden cities were intended to be planned, self-contained, communities surrounded by greenbelts, containing carefully balanced areas of residences, industry, and agriculture (see for example Godall 1987).[1] Notable "garden city" examples in the United States include: the Woodbourne neighborhood of Boston; Newport News, Virginia's Hilton Village; Pittsburgh's Chatham Village; Garden City, New York; Sunnyside, Queens; Jackson Heights, Queens; Forest Hills Gardens, also in the borough of Queens, New York; Radburn, New Jersey; Greenbelt, Maryland; the Lake Vista neighborhood in New Orleans; Norris, Tennessee; Baldwin Hills Village in Los Angeles; and the Cleveland suburb of Shaker Heights.

Today, there are many garden cities in the world. Most of them, however, have devolved to exist as just dormitory suburbs, which completely differ from what Howard set out to create. Contemporary town-planning charters like New Urbanism, Principles of Intelligent Urbanism, and Cluster Residential Districts (the subject of this study) find their origins in this movement.

The typical planning goals of cluster development are as follows:

a) preservation of open space to serve recreational and scenic purposes;
b) improved living environments which with a variety of housing that permits more economical housing to be constructed;
c) provide a pattern of development in harmony with the natural features of land; and,
d) provide an economical subdivision layout, efficient use of the land, with smaller networks of utilities and streets.

Many studies have apparently tied "open space" to value [see for example, Correll et al. (1978); Bolitzer and Netusil (2000); Luttik (2000); Smith et al. (2002); Geoghegan (2002); Irwin (2002); Lindsey et al. (2004); Evenson et al. (2005); Earnhart (2006); Krizek (2006); and Asabere and Huffman (2009)]. Open spaces,

[1] Inspired by the Utopian novel *Looking Backward*, Howard published his book *To-morrow: a Peaceful Path to Real Reform* in 1898 (which was reissued in 1902 as *Garden Cities of To-morrow*). His ideal garden city would house 32,000 people on a site of 6,000 ac. (2,400 ha), planned on a concentric pattern with open spaces, public parks and six radial boulevards, 120 ft (37 m) wide, extending from the centre. The garden city would be self-sufficient and when it reached full population, a further garden city would be developed nearby. Howard envisaged a cluster of several garden cities as satellites of a central city of 50,000 people, linked by road and rail. Howard organized the Garden City Association in 1899. Two garden cities were founded on Howard's ideas: Letchworth Garden City and Welwyn Garden City, both in Hertfordshire, England. Howard's successor as chairman of the Garden City Association was Sir Frederic Osborn, who extended the movement to regional planning. The concept was adopted again in England after World War II, when the New Towns Act triggered the development of many new communities based on Howard's egalitarian vision.

greenways, trails (green amenities already tied to value enhancement) are common in cluster developments. If clusters provide a package of these value added enhancements, one would expect to see some evidence in hedonic pricing modeling that supports the positive impact of cluster on price.

Conversely, as noted above, one of the goals of clustering is to produce high density and economical housing. The cramped living spaces associated with high density developments, usually the trade-off for clustering, could create negative externalities. However, the relationship between density and property values is not that simple. An increase in legally-permitted density will probably increase the value of a property if its market density is higher than the permitted density. Studies showing the effects of land use and environmental regulation on housing costs include: Courant (1976); Dowall (1979); and Katz and Rosen (1987).

Thus, we have an empirical question that needs to be resolved by this work. Albeit, will the effect of the competing equilibrium forces due to clustering be positive or negative? The objective of this study is to resolve this empirical question.

The next section presents a brief description of residential clusters in the study area and the study framework.

Cluster Residential Districts, the Study Area and the Data

There are two types of cluster development residential zoning districts in the township of Lower Gwynedd. These districts are classified by the Lower Gwynedd Township Zoning Ordinance,[2] as "AA-1" and "A-1" residential districts. These forms of development may permit a reduction in lot area requirements, frontage and setbacks to allow development on the most appropriate portions of a parcel of land in return for provision of a compensatory amount of permanently protected open space within the development. In effect, a developer of a tract in a cluster district may request as a conditional use, in accordance with Section 1298.07 and 1258.10 of the zoning ordinance that the tract be permitted to be developed at higher density if there is preservation of open space.

Among other things, cluster residential developments in the "A-1" district must have a minimum of 10 acres and shall be in a single and separate ownership or shall be the subject of an application filed jointly by all the owners of the entire tract, who shall stipulate that the entire tract will be developed in accordance with the approved plan. The corresponding minimum for the "AA-1" district is 5 acres.[3] The existence of these residential clusters in our study area presents a unique opportunity for a study

[2] See Lower Gwynedd Township Zoning Ordinance, Title Six Zoning, 06-15-2009.

[3] The general zoning requirements for the "AA-1" residential zoning district are as follows: residential district with a lot area of not less than 70,000 square feet for every building; number of dwelling units shall not exceed 0.45 dwelling units per developable acre over the developable area of the entire tract; and a minimum lot with of not less than 225 ft at the building line shall be provided for every dwelling. The corresponding requirements for the "A-1" residential zoning district are as follows: residential district with a lot area of not less than 80,000 square feet for every building where neither public sewer nor public water is available, not less than 60,000 square feet where either of public sewer or public water is available, and not less than 35,000 square feet when both public sewer and public water are available; the number of dwelling units shall not exceed 0.90 dwelling units per developable acre over the developable area of the entire tract; and a minimum lot with of not less than 175 ft at the building line shall be provided for every dwelling.

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of their potential impacts on home values. To the best of my knowledge, there exists no empirical evidence on the impacts of clusters.

The study area is the township of Lower Gwynedd located in Montgomery County, Pennsylvania. Lower Gwynedd is an affluent township with residents having a median household income of $74,351. In comparison, the State of Pennsylvania has a median household income of $50,713 (2000 census). The census also recorded a total of 10,442 residents (an estimate for 2005 was 10,920 residents). The total housing stock in 2008 was 4,784 with an average home value of $252,344 (MCPC 2008).[4] Inter neighborhood comparisons show that the residential neighborhoods of Lower Gwynedd are quite uniform in quality with median housing prices between $350,000–$545,000 (MCPC 2008). There is only one school district in Lower Gwynedd Township, and there are no discernible variations in the demographics and the quality of public goods across the subject cluster versus non-cluster neighborhoods.

The sample consists of a sample of 1,502 Single-family home sales that occurred from January 2005 to December 2009 in the Township of Lower Gwynedd. All single family detached sales in Lower Gwynedd during the five-year sample period were used, except for a number of distressed sales and sales with missing data. Information about the transactions was obtained from the Montgomery County Board of Assessment (BOA).[5] The database provides information on the sales price, and a set of variables describing property characteristics such as amenities, location, and date of sale, age, square footage, lot size, property address, rooms, baths, and so forth.

Information on cluster residential development in the Lower Gwynedd Township is provided by the Building and Zoning Department as summarized in Table 1. Among other things, the cluster development data contain a list of all cluster residential developments. As can be seen in Table 1, there are a total of 19 cluster developments in the township. Five out of the 19 are in "AA-1" cluster development districts while the remaining 14 are in "A-1" districts. About 11 % of the transactions in our database are cluster housing. The 19 clusters together cover a total area of 537.5 acres with an average density of 0.76 dwellings per acre with 31 % preserved as open space. The detailed nature of the information on the clusters made it relatively easy to distinguish cluster developments from non-cluster developments. Table 2, presents the data and summary statistics of the five-year database used for this study. The next section presents "The Empirical Framework and the Estimation Results".

The Empirical Framework and the Estimation Results

In explaining house prices, the real estate literature has typically used the hedonic framework to identify the marginal effect on house prices of various housing characteristics. The empirical framework for this study is the hedonic model (Rosen 1974). Sirmans et al. (2005) examines hedonic pricing models for over 125 empirical studies

[4] See Montgomery County Housing Units Build Report, Montgomery County Planning Commission, 2008.

[5] The BOA database is compiled by division of Information and Technology Solutions, Montgomery County Courthouse, P.O. Box 311-Suite 808, Norristown, 19404-0311.

Table 1 Cluster Development in Lower Gwynedd Township

Project	Gross acres	Density: dwelling Units/Acre	Acres of open space	% of site preserved
"AA-1" Districts				
Guidi-School House	6.5	0.62	1.6	25
Gwyn Crest	22.7	0.66	9.3	41
Gwynedd Valley	20.5	0.59	6.7	33
Weber Tract	19.7	0.56	8.0	41
Gladestry/Wharton	36.7	0.44	13.2	36
"A-1" Districts				
MJE Builders	10.5	0.57	1.2	11
Parson's Glen	21.2	0.85	6.0	28
Trewellyn Estates	105.2	0.68	38.3	36
Walnut Farm	12.2	0.74	2.0	16
Estates@Cedar Hill	51.8	0.79	17.6	34
Red Stone	10.6	0.94	2.1	20
Wooded Pond	35.2	0.91	9.2	26
Wyndham Woods	50.5	0.91	15.3	30
Foxfield	23.2	0.86	4.9	21
Spring House Farms	57.3	0.89	19.8	35
Meadow Creek	33.3	0.84	9.5	29
Willits Pond	10.0	0.80	1.5	15
Gwynedd Reserve	10.4	0.87	1.2	12
GRAND TOTAL	**537.5**	**0.76**	**167.4**	**31**

Building and Zoning Department, Lower Gwynedd Township, September 27, 2006, Ref. #8100-51. *Denotes numbers with averages that are slightly off perhaps due to rounding.

and finds that these studies have examined a vast number of variables. However, the impacts of cluster on house price were not identified as one of the variables previously studied.

The well-known hedonic framework is employed as shown by Eq. 1, below:

$$\mathrm{Ln(SP)} = \mathrm{Ln}(\beta_0) + \beta_1(\mathrm{CLUS}) + \beta_2(\mathrm{OPEN}) + \beta_3(\mathrm{DENSITY}) + \sum_{j=4}^{n} \beta j X ij + ej \quad (1)$$

Where:

Ln (SP)	The natural log of sales price
DENSITY	Dwelling units per developable acre permitted
CLUS	Dummy variable for cluster residential development
OPEN	Acres of open space in the subdivision
Xij	Conventional hedonic
e_j	Error term.

In addition the traditional OLS hedonic, this study also utilizes the spatial autoregression (SAR) estimator on the hedonic model. The WLS (plus SAR) procedure is employed owing to the fact that hedonic housing price studies of this type are prone

Table 2 Descriptive statistics

Variable	Definition	Mean	Stan Dev
SP	Selling price (‘000)	275.67	198.82
CLUS	Dummy variable for a residential cluster development	0.11	0.20
CLUS(AA-1)	Dummy variable for AA-1 cluster	0.04	0.11
CLUS(A-1)	Dummy variable for A-1 cluster	0.07	0.19
(CLUS X SQFT)	Mean house size for clusters in square feet (‘00)	28.90	9.66
((NCLUS) X SQFT)	Mean house size for non-clusters in square feet (00)	32.21	13.01
DENSITY	Dwelling units per developable acre permitted in subdivision	0.65	0.47
OPEN	Acres of open space in subdivision	4.3	2.59
NSTORS	# Stories	1.40	0.51
NROOMS	# Rooms	5.37	1.03
NBATHS	# Bathrooms	1.79	0.76
SQFT	Living area in square feet(‘00)	32.65	11.81
LOT	Lot size in square feet(‘00)	195.50	42.90
AGE	House age in years	38.42	17.25
EXCL	Dummy variable for excellent condition	0.32	0. 22
GOOD	Dummy variable for good condition	0.41	0.29
AVRGE	Dummy variable for average condition	0.20	0.36
POOR	Dummy variable for poor condition	0.17	0.07
POOL	Dummy variable for pool	0.19	0.32
GARAG	# Garages	1.83	0.77
BSMT	Dummy variable for finished basement	0.81	0.29
FIREPL	Dummy variable for fireplace	0.24	0.48
DECK	Dummy variable for deck	0.18	0.45
AC	Dummy variable for central air conditioning	0.23	0.37
TBD	Distance to township center	1.53	2.56
GWYDD	Dummy variable for location in the village of Gwynedd	0.12	0.34
GWYVL	Dummy variable for location in the village of Gwynedd Valley	0.17	0.29
PENLYN	Dummy variable for location in the area of the original village of Pennlyn	0.32	0.45
SPRNHS	Dummy variable for location in the village of Spring House	0.09	0.23
OTHER	Dummy variable for location in areas other-than the four original villages	0.30	0.48
STREET	Dummy variable for location on any of the major streets	0.13	0.38
R5TRAIN	Dummy variable for location within ¼ if a mile of either Pennlyn or Gwynedd Valley R-5 train stations	0.04	0.27
AMBLER	Dummy variable for location on the border of the Borough of Ambler	0.03	0.16

Table 2 (continued)

Variable	Definition	Mean	Stan Dev
QRT01	Dummy variables for first quarter of 2005	0.06	0.21
QRT02	Dummy variable for second quarter of 2005	0.04	0.11
QRT03	Dummy variable for third quarter of 2005	0.04	0.12
QRT04	Dummy variable for fourth quarter of 2005	0.02	0.09
QRT05	Dummy variable for first quarter of 2006	0.03	0.13
QRT06	Dummy variable for second quarter of 2006	0.07	0.24
QRT07	Dummy variable for third quarter of 2006	0.04	0.15
QRT08	Dummy variable for fourth quarter of 2006	0.06	0.20
QRT09	Dummy variables for first quarter of 2007	0.05	0.16
QRT10	Dummy variable for second quarter of 2007	0.07	0.33
QRT11	Dummy variable for third quarter of 2007	0.09	0.37
QRT12	Dummy variable for fourth quarter of 2007	0.03	0.16
QRT13	Dummy variable for first quarter of 2008	0.06	0.23
QRT14	Dummy variable for second quarter of 2008	0.03	0.15
QRT15	Dummy variable for third quarter of 2008	0.08	0.28
QRT16	Dummy variable for fourth quarter of 2008	0.07	0.30
QRT17	Dummy variable for first quarter of 2009	0.04	0.22
QRT18	Dummy variable for second quarter of 2009	0.03	0.24
QRT19	Dummy variable for third quarter of 2009	0.04	0.25
QRT20	Dummy variable for fourth quarter of 2009	0.05	0.30

to the typical problem of spatial autocorrelation. Basu and Thibodeau (1998), for instance, argue that spatial dependence exists because nearby properties will often have similar structural features and also share locational amenities. This is likely to be true in this case given that clusters were often developed at the same time and share the same location-specific amenities.

The WLS (plus SAR) procedure uses the same variables as the OLS to estimate the regression. However, this technique uses the correlated errors of the geographic information present in the data to improve prediction (see Pace and Gilley 1977; and Carter and Haloupek 2000 for detailed treatment of procedure).

As shown in Table 2, control variables for the hedonic analyses include physical property characteristics and time of sale. The study also includes several control variables for location including: distance from the township center (TBD); dummy variables for MLS specified areas of Gwynedd Village (GWYDD), Gwynedd Valley (GWYVL), Penllyn(PENLYN), Spring House(SPRNHS), and OTHER for all other locations). Also included are a dummy variable (STREET) for location on a major township road (this is a catch-all dummy variable assigning 1 for location on any of the major roads: Welsh Road, Norristown Road, Sumneytown Pike, 309 Expressway, Bethlehem Pike, Township road, Tennis Road, Pennlyn Pike, Dekalb Pike, Swedesford Road, and Gypsy Hill Road); proximity to Ambler Borough (AMBLER); and another dummy variable (R5TRAIN) for proximity to R-5 suburban train stations at Pennlyn and Gwynedd Valley.

Of the location variables, it is expected that TBD will carry a negative sign indicating preference for location in proximity to the center of economic activities. Relative to PENLYN, which is relatively not so affluent, it is expected that the location variables GWYDD, GWYVL, SPRNHS, and OTHER will carry positive signs consistent with local wisdom. The dummy variables STREET and R5TRAIN are expected to carry positive signs indicating universal preference for access. The dummy variable AMBLER for proximity to Ambler is expected to carry a negative sign granted that the Ambler Borough is not as wealthy as Lower Gwynedd township, relatively speaking.

Based on the Lower Gwynedd described above, several estimates are made using the OLS and WLS procedures. As to be expected, the results based on WLS are slightly qualitatively superior to the results based on the OLS. For the sake of brevity the WLS results are reported in Table 3 (the OLS results are not reported). A detailed discussion of the WLS results based on Table 3 is provided below.

The regression coefficients of the WLS regression results with correction for spatial autocorrelation are reported in Table 3 with their t-statistics (next to them). As can be seen in Table 3, the adjusted coefficient of determination (R^2) for Models 1 and 2 are 0.79 and 0.81, respectively. These are reasonable compared with much of the hedonic literature. An examination of variance inflation factors, tolerance levels and the correlation matrix (not reported in Table 3) reveal no obvious signs of multi-colinearity.

First on the control variables for property characteristics, the following variables; Ln (LOT); SQFT; $(SQFT)^2$; AGE; $(AGE)^2$; EXCL; GOOD; NSTORS; POOL; GARG; BSMT; FIREPL; DECK; AC, and NBATHS; are all significantly different from zero at conventional levels with expected signs. The variables NROOMS; and POOR are statistically insignificant. It must, however, be noted that the partial effects due to living area is already accounted for with the inclusion of NSTORS, SQFT, $(SQFT)^2$ and BATHS.

Of the control variables for location, only the dummy variable GWYVL for Gwynedd Village is significantly positive at conventional levels. The other location dummy variables: GWYDD; SPRNHS; OTHER, and R5TRAIN; are all statistically insignificant. The variable for distance to the township center (TBD) is also not statistically significant. The STREET dummy variable, however, is significantly positive as to be expected at conventional levels. Relative to the first quarter of 2005 (QRT01), all the quarterly variables from QRT02 through QRT13 (at the start of 2008) are statistically insignificant at conventional levels. However, the estimated coefficients of QRT14, 16,

Table 3 The WLS Regression Results with correction for spatial autocorrelation

	Model 1	Model 2
Variable	Coeff t-Stat	Coeff t-Stat
CLUS	0.038 6.75***	0.020 3.79***
OPEN	———— ————	0.051 3.33***
DENSITY	−0.022–3.01**	−0.022–3.11***
Ln(LOT)	0.210 13.56***	0.222 14.83***
NSTORS	0.085 13.22***	0.084 13.08***
NROOMS	0.080 0.99^{NS}	0.086 0.96^{NS}
NBATHS	0.104 13.28***	0.108 16.66***
SQFT	0.064 19.99***	0.063 20.20***
$(SQFT)^2$	0.002 13.01***	−0.024–13.44***
AGE	−0.012–6.66***	−0.012–6.00***
$(AGE)^2$	0.047 4.92***	0.052 4.80***
EXCL	0.076 3.46***	0.078 3.42***
GOOD	0.051 1.88**	0.050 1.91**
POOR	−0.009–1.11^{NS}	−0.009–1.00^{NS}
GARG	0.085 8.15***	0.090 8.11***
BSMT	0.063 3.66***	0.067 3.68***
FIREPL	0.071 10.50***	0.677 11.32***
DECK	0.047 3.09***	0.046 2.87**
AC	0.522 4.44***	0.551 4.44***
POOL	0.083 4.36***	0.083 4.39***
DOM	0.004 0.77^{NS}	0.003 0.79^{NS}
CONV	0.020 1.00^{NS}	0.021 1.02^{NS}
TBD	−0.004–0.83^{NS}	−0.005–0.81^{NS}
GWYDD	0.072 0.85^{NS}	0.087 0.97^{NS}
GWYVL	0.077 2.99***	0.071 2.36**
PENLYN	——— ——	——— ——
SPRNHS	0.034 1.55^{NS}	0.029 0.89^{NS}
OTHER	0.001 0.19^{NS}	0.001 1.18^{NS}
STREET	0.068 1.88*	0.068 1.83*
R5TRAIN	0.002 0.99^{NS}	0.002 1.01^{NS}
AMBLER	−0.066–3.41***	−0.069–3.31***
QRT01	——— ——	——— ——
QRT02	0.011 0.07^{NS}	0.014 0.08^{NS}
QRT03	0.003 1.42^{NS}	0.004 1.24^{NS}
QRT04	−0.023–0.88^{NS}	−0.023–0.89^{NS}
QRT05	0.006 1.11^{NS}	0.006 1.33^{NS}
QRT06	0.001 1.23^{NS}	0.008 1.22^{NS}
QRT07	0.001 0.94^{NS}	0.001 0.94^{NS}
QRT08	−0.002–1.02^{NS}	−1.03–0.77^{NS}
QRT09	0.001 0.08^{NS}	0.00 0.07^{NS}
QRT10	−0.011–0.07^{NS}	−0.014–0.083^{NS}
QRT11	−0.003–1.45^{NS}	−0.004–1.246^{NS}
QRT12	−0.022–0.88^{NS}	−0.021–0.89^{NS}

	Model 1	Model 2
QRT13	0.007 1.11^{NS}	0.007 1.33^{NS}
QRT14	−0.050–3.23***	−0.058–3.98***
QRT15	−0.001–0.94^{NS}	−0.001–0.94^{NS}
QRT16	−0.038–2.02**	−0.039–2.77**
QRT17	0.001 0.94^{NS}	0.001 0.94^{NS}
QRT18	−0.022–2.00**	−0.021–2.00**
QRT19	−0.001–0.94^{NS}	0.000 0.54^{NS}
QRT20	−0.033–2.02**	−0.033–2.77**
Constant	11.120 70.60***	12.101 69.90***
Adjusted R^2	0.790	0.810
F-Stat	122.44***	140.02***
Root MSE	0.59	0.65

Dependent Variable is Ln(SP);
* indicates significant at 90 % level; **indicates significant at 95 % level; ***indicates significant at 99 % level; NS indicates not significant

18, 19 are significantly negative. These generally negative coefficients towards the end of the study period are consistent with the overall negative outlook of US real estate markets towards the end of the study period (after 2008).

Now turning on the variables of interest, the estimated coefficient of cluster (CLUS) is significantly positive as expected at the 99 % level of confidence. The magnitude of the estimated coefficient on CLUS in Models 1(without the open space variable (OPEN)) is 0.038. However, part of this price premium is attributable to the permanent open spaces which are parts and parcels of clusters. When the variable for open space (OPEN) is introduced as shown in Model 2, the cluster (CLUS) premium drops from 3.9 % to 2.02 % suggesting the relative importance the permanent open spaces. The open space variable (OPEN) is associated with a premium of as much as 5.2 %, on average.

The dummy variables for the two types of clusters {CLUS (AA-1) and CLUS (A-1)} were employed at earlier runs of the model (not reported). However, they both proved to be statistically insignificant at conventional levels. The estimated coefficient on development density (DENSITY) is significantly negative at conventional levels. In other words, density of development, per se, has adverse impacts on value as to be expected. The next section presents the "Conclusions" of this study.

Conclusions

The major finding of this study is that cluster developments will produce higher home values, ceteris paribus. The estimated coefficient on CLUS is significantly positive at the 99 % level of confidence with magnitude of 0.038. However, when the open space variable (OPEN) is introduced (as shown in Models 2) the magnitude of the estimated coefficient of cluster (CLUS) drops from 0.038 to 0.020 suggesting the relative importance of the permanent open spaces in cluster developments. The estimated coefficient on open space (OPEN) is significantly positive at the 99 % level of confidence as shown in Model 2 with a magnitude of 0.051. The estimated coefficient on density of development (DENSITY) is also statistically significant in both models with negative signs suggesting the adverse nature of raising densities, per se, in a sub-urban setting where market densities are lower than permitted densities. All the control variables work as expected with predictable results. The findings of this study provide empirical support for organic, green-by-design, residential development.

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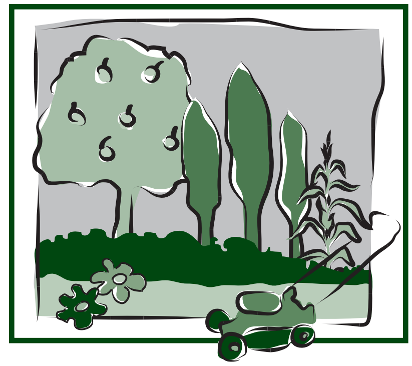
Colorado State University
Extension

Xeriscaping: Creative Landscaping

Fact Sheet No. **7.228** Gardening Series | **Basics**

by C. Wilson and J.R. Feucht*



Xeriscaping (zer-i-skaping) is a word originally coined by a special task force of the Denver Water Department, Associated Landscape Contractors of Colorado and Colorado State University to describe landscaping with water conservation as a major objective. The derivation of the word is from the Greek "xeros," meaning dry, and landscaping – thus, xeriscaping.

The need for landscaping to conserve water received new impetus following the drought of 1977 throughout the western states and the recognition that nearly 50 percent of the water used by the average household is for turfgrass and landscape plantings.

Unfortunately, many homeowners have cut back on turfgrass areas by substituting vast "seas of gravel and plastic" as their answer to water conservation. This practice is not only self-defeating as far as water conservation is concerned, it also produces damaging effects to trees and shrubs. It is not xeriscaping.

Planning – An Important First Step

Whether you want to redesign an old landscape or start fresh with a new one, a plan is a must. The plan does not have to be elaborate but should take into consideration the exposures on the site. As a rule, south and west exposures result in the greatest water losses, especially areas near buildings or paved surfaces. You can save water in these locations simply by changing to plants adapted to reduced water use. However, don't be too quick to rip out the sod and substitute plastic and gravel. Extensive use of rock on south and west exposures can raise temperatures near the house and result in wasteful water runoff.

Slope of Property

Slope or grade is another consideration. Steep slopes, especially those on south and west exposures, waste water through runoff and rapid water evaporation. A drought-resistant ground cover can slow water loss and shade the soil. See fact sheet 7.230, *Xeriscaping: Ground Cover Plants*, for suggested ground covers. Strategically placed trees also can shade a severe exposure, creating cooler soil with less evaporation. Terracing slopes helps save water by slowing runoff and permitting more water to soak in.

Reduce Irrigated Turf

Avoid narrow strips of turf, hard to maintain corners, and isolated islands of grass that need special attention. Not only is maintenance more costly, but watering becomes difficult, often wasteful. If your yard is already landscaped, see 7.234, *Xeriscaping: Retrofit Your Yard*, for information on ways to evaluate and eliminate unneeded turfgrass areas.

Bluegrass turf can be reduced to areas near the house or that get high use. In outlying areas, use more drought-resistant grasses or even meadow mixes containing wildflowers, particularly if your property is large. Refer to 7.232, *Xeriscaping: Turf and Ornamental Grasses*, for suggested alternatives to bluegrass.

Soil Preparation

Proper soil preparation is the key to successful water conservation. If the soil is very sandy, water and valuable nutrients will be lost due to leaching below the root zone. If your soil is heavy clay, common in this area, you will lose water through runoff.

J.R. Feucht, Colorado State University Extension landscape plants specialist and professor (retired). Prepared in cooperation with the Technical Advisory Committee for Xeriscape Front Range, an affiliate of the National Xeriscape Council, Inc. Reviewed by C. Wilson, Extension horticulture agent, Denver county. 10/07

Quick Facts

- Proper planning is the first step in landscaping to reduce water use.
- Steep slopes with south and west exposures require more frequent water to maintain the same plant cover as east or north slopes.
- Terracing slopes reduces runoff.
- Limit irrigated bluegrass turf to small or heavily used areas.
- Soil preparation is a key to water conservation.
- Proper irrigation practices and system design can lead to 30 to 80 percent water savings.

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A good soil, one that supports healthy plant life and conserves moisture, has a balance of rather coarse soil clusters (aggregates), sand and pore spaces. The "ideal" soil has as much as 50 percent by volume pore space, with the soil itself consisting of a good balance of sand, silt and clay.

A major problem with heavy soils is that clay tends to dominate the soil complex. Clay is composed of microscopic crystals arranged in flat plates. When a soil has a high number of these crystals, they act much like a glue, cementing the particles of sand and silt together and resulting in a compact, almost airless soil.

Such soils usually repel surface water, resulting in runoff. What water does get into these soils is held so tightly by the clay itself that plants cannot use it. Plants in a clay soil, even though it is moist, often wilt from lack of moisture. Plant roots also need air to thrive. In clay soils, air spaces are small and may be filled with water, so plant roots often suffer from oxygen starvation.

In very sandy soils, the opposite is true. Sandy soils have very large pore spaces. Because the particles are large, there is little surface area to hold the water, so sandy soils tend to lose water rapidly.

A good soil is not made in just one year. Add organic matter annually to garden areas. In areas to be sodded or seeded, add organic amendments as a one-time procedure. Take advantage of this one time before seeding or sodding by doing a thorough, complete job. This encourages deep roots that tap the water stored in the soil and reduces the need for wasteful, frequent water applications

Xerigation – Saving Water with Proper Irrigation

Proper irrigation practices can lead to a 30 to 80 percent water savings around the home grounds. If a sprinkler system is already installed, check it for overall coverage. If areas are not properly covered or water is falling on driveways and patios, adjust the system. This may mean replacing heads, adding more heads, or changing heads to do a more efficient job.

With the system on, observe places that are receiving water where it is not needed. Overlaps onto paved areas or into shrub borders may result in considerable water waste. Overwatering trees and shrubs may lead to other problems.

Irrigate turf areas differently than shrub borders and flower beds. North and east exposures need less frequent watering than south and west exposures. Apply water to slopes more slowly than to flat surfaces. Examine these closely and correct inefficiencies in irrigation system design.

If you do not have a sprinkler system and are just beginning to install a landscape, you can avoid the pitfalls of poorly designed and installed systems. Have a professional irrigation company do the job correctly. Make sure the system is designed to fit the landscape and the water needs of the plants and that it is zoned to reduce unnecessary applications of water. Coordinate the landscape design itself, selection of plants and the irrigation system to result in a sensible water-saving scheme.

Consider a drip system for outlying shrub borders and raised planters, around trees and shrubs, and in narrow strips where conventional above-ground systems would result in water waste.

If you use hoses instead of an underground system, you can observe water patterns. Instead of watering the entire lawn each time, spot water based on visible signs of need, such as turf that begins to turn a gray-green color.

Avoid frequent, shallow sprinklings that lead to shallow root development. Compact soils result in quick puddling and water runoff. They need aeration with machines that pull soil plugs.

Trees and shrubs separate from the lawn are best watered with deep root watering devices.

Xerimulch the Landscape

Properly selected and applied mulches in flower and shrub beds reduce water use by decreasing soil temperatures and the amount of soil exposed to wind. Mulches also discourage weeds and can improve soil conditions.

There are two basic types of mulches: organic and inorganic. Organic mulches include straw, partially decomposed compost, wood chips, bark, and even ground corncobs or newspapers. Inorganic mulches include plastic film, gravel and woven fabrics. Sometimes a combination of both organic and inorganic is used.

If soil improvement is a priority, use organic mulches. Wood chips and compost are most appropriate. As these materials break down, they become an organic amendment to the soil. Earthworms and other soil organisms help incorporate the organic component into the soil. Organic mulch is preferred because most soils in this area are low in organic content and need organic amendments to improve aeration and water-holding capacity.

Inorganic mulches, such as plastic film, effectively exclude weeds for a time, but they also tend to exclude the water and air essential to plant roots. Woven fabrics and fiber mats are preferred over polyethylene films. Fabrics and mats exclude weeds yet allow water and air exchange. Used in combination with decorative rock or bark chunks, they often outlast the less expensive but short-lived polyethylene films. For more information, refer to 7.214, *Mulches for Home Grounds*.

Steps to Xeriscaping

- Evaluate your property's exposure and slope and how your family uses the yard.
- Reduce irrigated turf where appropriate and replace it with low-water alternatives.
- Prepare the soil. This is your best opportunity.
- Irrigate properly.
- Use mulch to save water, inhibit weeds and improve the soil.
- Select appropriate plants.

Selecting Plants

Carefully select plants to be compatible with soil, exposure and irrigation systems. For recommended plants, see:

- 7.229, *Xeriscaping: Trees and Shrubs.*
- 7.230, *Xeriscaping: Ground Cover Plants.*
- 7.231, *Xeriscaping: Garden Flowers*.
- 7.234, *Xeriscaping: Retrofit Your Yard.*