

Impervious Surfaces

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Imperviousness represents the imprint of land development on the landscape. The Critical Area Act and Criteria incorporate land planning techniques designed to mitigate the adverse impacts of development on water quality and plant, fish and wildlife habitat. By establishing limits to the area of new impervious surface on project sites in Limited Development Areas (LDAs) and Resource Conservation Areas (RCAs), the Act and Criteria attempt to change the patterns of development around the Bay.

This publication provides local planners with guidance about the degree to which certain materials, structures and construction methods may be considered pervious. The paper is meant to establish the Commission's position on issues regarding the perviousness of commonly used surfaces and to fix parameters with which to evaluate the perviousness of surfaces not addressed herein. It is not the intent of this paper to displace methodologies that local planners have been using to calculate impervious surface but rather to provide a mechanism whereby development review is streamlined while consistent implementation of the Critical Area Act and Criteria remains ensured.

While the Act and Criteria prescribe clear limits to the area of new impervious surface, a definition of impervious surfaces is not provided. Perviousness is not an absolute characteristic of a material. The degree of perviousness is often determined by how a material is installed and how it is used. Field calculations of impervious surface area must also consider installation and use.

BACKGROUND

The framers of the Critical Area Act and Criteria considered limits to impervious surface within the Critical Area crucial to achievement of the Act's goals. In surveying the available scientific literature, it was noted that water quality and habitat degradation accelerate rapidly in watersheds when impervious surface areas are 12-13% of the total area. Current studies indicate an even lower threshold for stream degradation (**Figure 1**).

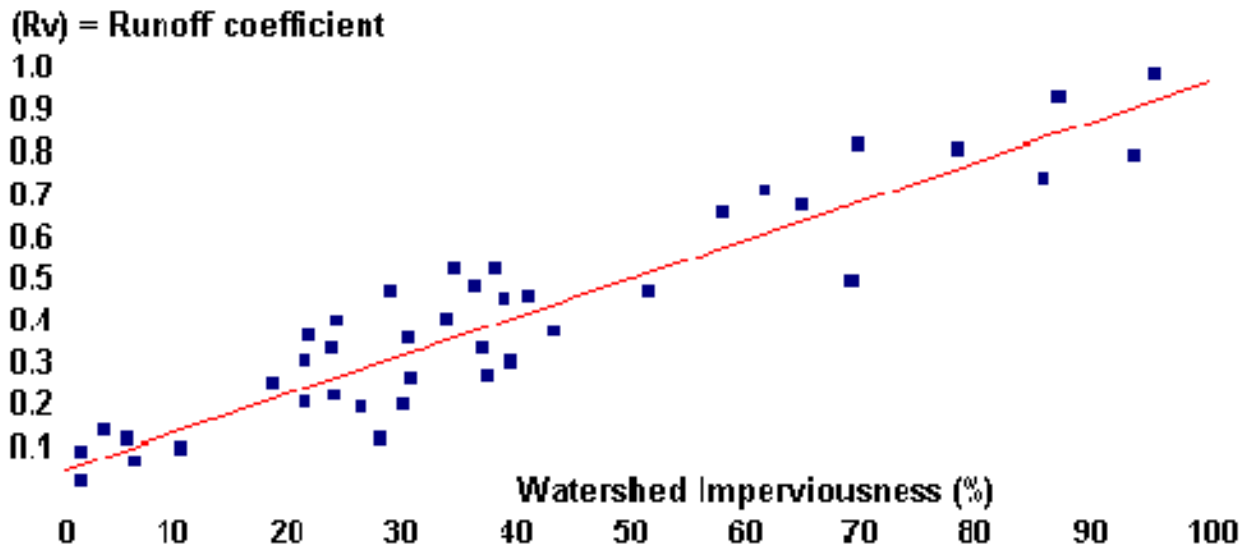


Figure 1: Stream degradation increases proportionately with imperviousness. Adapted from Schueler, *Watershed Protection Techniques* 1 (Fall 1994).

Sections 8-1808.3 of the Critical Area Act and 27.01.02.04C(7) of COMAR set limits on impervious surfaces in LDAs and RCAs. Performance standards for development are intended to promote achievement of the following policies:

1. Maintain, or, if possible improve the quality of runoff and ground water entering the Chesapeake Bay and its tributaries;
2. Maintain, to the extent practicable, existing areas of natural habitats

In addition, paragraph D(2) provides information regarding stormwater runoff, stating:

(a) **Limitation on Stormwater Runoff.** Development may not cause downstream property, watercourses, channels, or conduits to receive stormwater runoff at a higher volume or rate than would have resulted from a 10-year storm were the land in its predevelopment state. [Around the Chesapeake Bay, a 10-year storm is one that drops 5-6 inches of rain in a 24-hour period.]

(b) **Storage Capacity.** All stormwater storage facilities shall be designed with sufficient capacity to achieve the water quality goals of [the criteria] and to eliminate all runoff caused by the development in excess of that which would have come from the site if it were in its predevelopment state.

The Criteria state that "excess stormwater runoff" means all increases in stormwater resulting from the following activities:

- (a) An increase in the imperviousness of the site, including all additions to buildings, roads, and parking lots;

- (b) Changes in permeability caused by compaction during construction [or subsequent use] or modifications in contours, including the filling or drainage of small depression areas;
- (c) Alteration of drainageways, or regrading of slopes;
- (d) Destruction of forest [or areas of natural vegetation]; or
- (e) Installation of collection systems to intercept street flows or to replace swales or other drainageways

While the Act and Criteria frame the subject of impervious surfaces in the context of stormwater management, their reference to alteration of existing natural features indicates a broader concern about maintaining existing natural habitat and hydrologic patterns. By defining "excess stormwater runoff" in terms of its causes, the Criteria widen the conceptual definition of impervious surfaces to include not merely the material but its construction, installation, and use (Figure 2).

IMPACTS OF IMPERVIOUSNESS

It is important to realize that the environmental impacts of impervious surfaces are not limited simply to increases in stormwater quantity. By their nature, new impervious surfaces usually involve permanent impacts to the land.

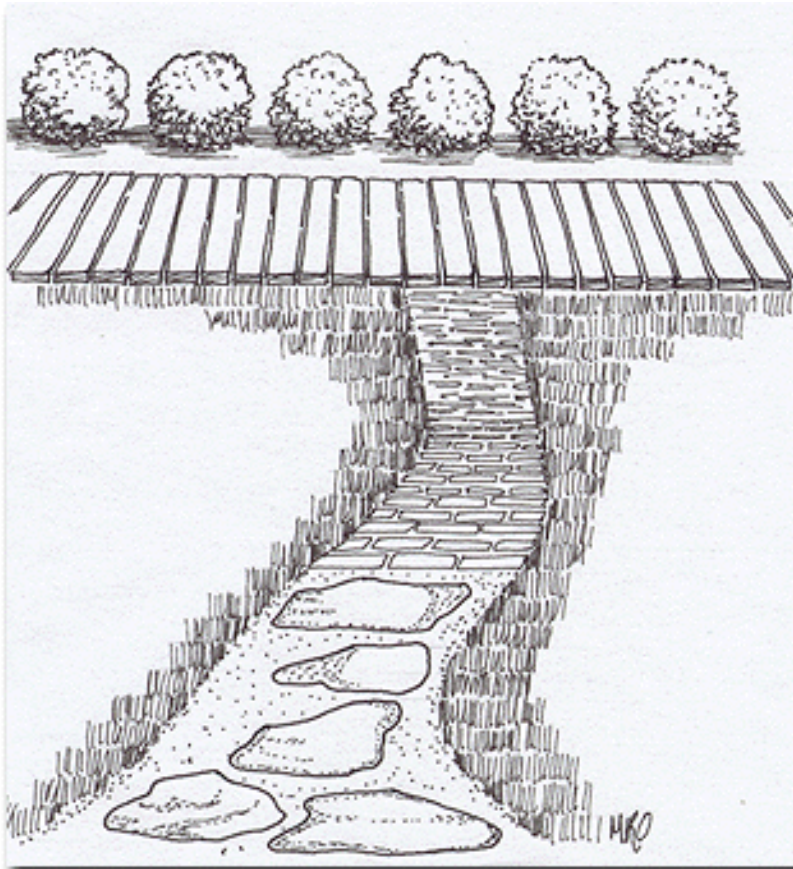


Figure 2: Different semi-pervious walkway surfaces can minimize runoff and add interest to the landscape.

Once an area is cleared of vegetation, graded and compacted, and an impervious surface or partially pervious surface is constructed or installed, the area generally will not return to a naturally vegetated state. New impervious surfaces change natural drainage patterns and impact the environment by affecting the way that stormwater and, in some cases, tidal water moves over the landscape and through the soil. New impervious surfaces can affect the quantity, velocity, and quality of stormwater resulting in impacts to nearby land and waterbodies.

Construction of new impervious surfaces can cause spiraling adverse impacts. New impervious surfaces reduce the area of land available for infiltration and alter natural hydrologic patterns. Construction of impervious surfaces reduces the area of land that can support forest or other types of vegetation and so reduce areas of natural habitat for a wide variety of species. The removal of vegetation impacts stormwater management because trees, shrubs, grasses, and downed woody debris help manage stormwater by trapping silt and sediment, stabilizing erodible areas, increasing infiltration, and reducing surface runoff. In addition, smooth, compacted surfaces increase the velocity of stormwater and its erosive potential. Impervious surfaces also affect stormwater quality by providing a surface that collects pollutants and sediments between rainfall events, concentrating these potentially detrimental substances in the first flush of a storm event.

LEGISLATIVE CHANGES

In May 1996, the Maryland General Assembly passed Senate Bill 657, which addresses impervious surface limits within the Critical Area. The Bill requires that local jurisdictions amend their Critical Area Programs on or before December 31, 1996 to address the provisions of the Bill. The Bill involves three significant changes to the current regulations.

Lots Under One-half Acre

If a parcel or lot one-half acre or less in size existed on or before December 1, 1985, then man-made impervious surfaces are limited to 25% of the parcel or lot. Formerly the regulations distinguished between residential and nonresidential use and the 25% limit for lots in nonresidential use only applied to lots of one-fourth acre or less in size. The new legislation effectively raises the size limit to one-half acre on all qualifying lots.



Figure 3: This design for a driveway minimizes impervious surfaces and runoff by using a mix of surfaces including pavers and by keeping a grass median.

Exceeding the 25% Limit on Lots Under One-half Acre

For a lot or parcel one-half acre or less in size, local jurisdictions may allow an applicant to exceed the impervious surface limits in the Act under certain circumstances. For these lots, total impervious surface limits may exceed the 25% limit by not more than 25% or 500 square feet, whichever is greater. Essentially, this section of the Bill raises the impervious surface limit on lots of one half acre or less to 31.25% ($25\% + [25\% \text{ of } 25\%] = 31.25\%$) or adds 500 square feet to the 25% limit, whichever is greater. In these situations, a variance is not required; however, a local jurisdiction must make sure that the following conditions exist: 1) impervious surfaces on the property have been minimized (Figure 3); 2) water quality impacts associated with runoff from the new impervious surfaces have been minimized or best management practices have been implemented; and 3) on-site mitigation or fees-in-lieu are used to offset potential adverse water quality.

Exceeding the 15% Limit On Lots Over One-half Acre But Under One Acre

For a lot or parcel that existed prior to December 1, 1985 and is greater than one-half acre but less than one acre, local jurisdictions may allow an applicant to exceed the impervious surface limits in the Act under certain circumstances. For these lots, total impervious surface coverage may be as much as 5,445 square feet. Essentially, this section of the Bill eliminates the problem with using the 25% limit for lots just under one-half acre and the 15% limit for lots just over one-half acre. The 5,445 square foot figure is based on 25% of one-half acre and use of this figure will eliminate any bias towards lots just slightly smaller than one-half acre. In these situations, a variance is not required; however, a local jurisdiction must make sure that the following conditions exist: 1) impervious surfaces on the property have been minimized; 2) water quality impacts

associated with runoff from the new impervious surfaces have been minimized or best management practices have been implemented (Figure 4); and 3) on-site mitigation or fees-in-lieu are used to offset potential adverse water quality impacts.

Other impervious surface limits of the Critical Area Act remain unchanged by the 1996 legislation. **Table 1** summarizes impervious surfaces limits based on the 1996 legislation.

Table 1: Allowances under 1996 legislation

Lot/Parcel Size in square feet	Impervious Surface Limit
0-8,000	25% of Parcel + 500 square feet
8,001 - 21,780	31.25% of Parcel
21,781 - 36,300	5,445 square feet
36,301 - 43,560	15% of Parcel

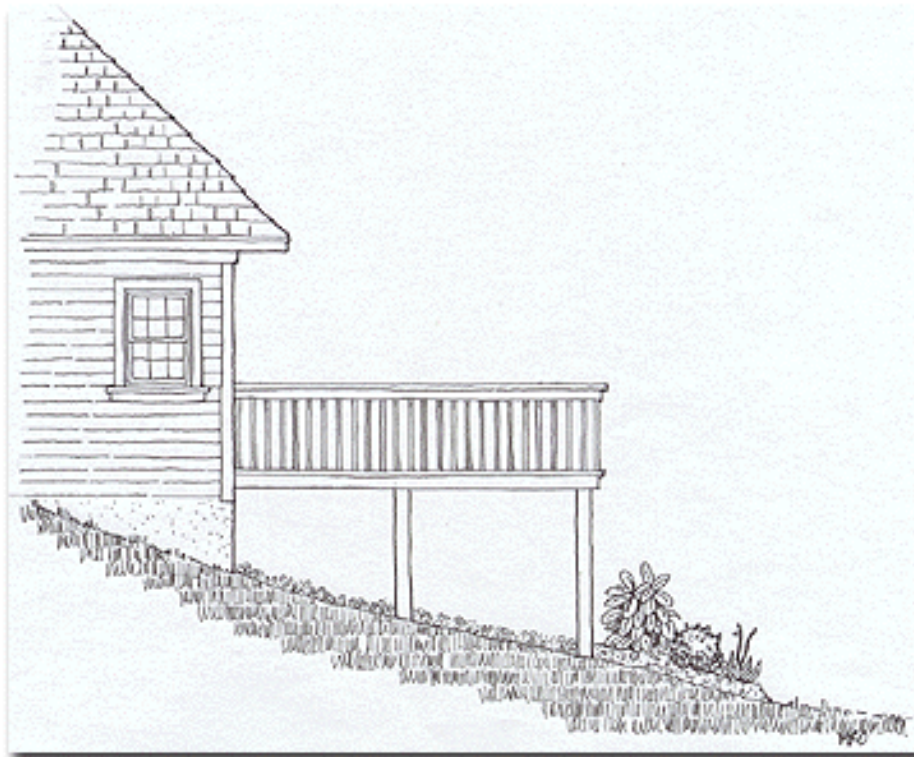


Figure 4: This deck is constructed with gaps between the boards to achieve perviousness and employs 6 inches of gravel and plantings beneath it to minimize subsequent runoff.

IS IT PERVIOUS?

Table 2 details the construction materials and surfaces that generate the most frequently asked questions regarding perviousness. The table was developed by considering the following factors: (1) alteration of natural drainage patterns; (2) impeded infiltration; (3) treatment to remove silt, sediment or nutrients; (4) vegetation, and; (5) groundwater discharge. In addition, the practices of local jurisdictions and information from engineers, planners and landscape architects familiar with materials and techniques were incorporated in the evaluations.

Table 2: Types of surfaces

Type of Structure	Impervious	Pervious	Notes
Deck, special construction	-	X	Spaces between boards, 6" gravel under deck, plantings.
Driveway, asphalt	X	-	-
Driveway, bank run gravel	X	-	Use causes gravel to become compacted over time.
Driveway, blue chip stone	X	-	Use causes stone to become compacted over time.
Driveway, concrete	X	-	-
Driveway, dirt	X	-	Use causes soil to become compacted over time.
Driveway, oyster shell	X	-	Use causes shells to become compacted over time.
Driveway, pavers (Balcon or other)	-	-	Site-specific evaluation determines perviousness.
Parking lots, gravel	X	-	Use causes gravel to become compacted over time.
Parking lots, gravel overflow	X	-	Use causes gravel to become compacted over time
Parking lots, "turf block"	X	-	Use causes turf areas to become compacted over time.
Patios, brick and mortar	-	-	-
Patios, brick on sand	X	-	Bricks are impervious and preclude growth of vegetation.

Patios, slate	x	-	-
Ponds	-	-	BMPs are not included in impervious surface calculations
Sidewalks, concrete	x	-	-
Sidewalks, brick and mortar	x	-	-
Sidewalks, brick on sand	x	-	-
Sidewalk, wood (boardwalk)	-	x	Spaces between boards, 6" gravel under deck, plantings
Swimming pools, in-ground	x	-	-
Swimming pools, above ground	x	-	-
Tennis courts, asphalt or polymer	x	-	-
Tennis courts, clay	x	-	-
Tennis courts, grass	x	-	-
Walkways, gravel	-	-	Site-specific evaluation determines perviousness.
Walkways, wood chip	-	x	-

REFERENCES

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