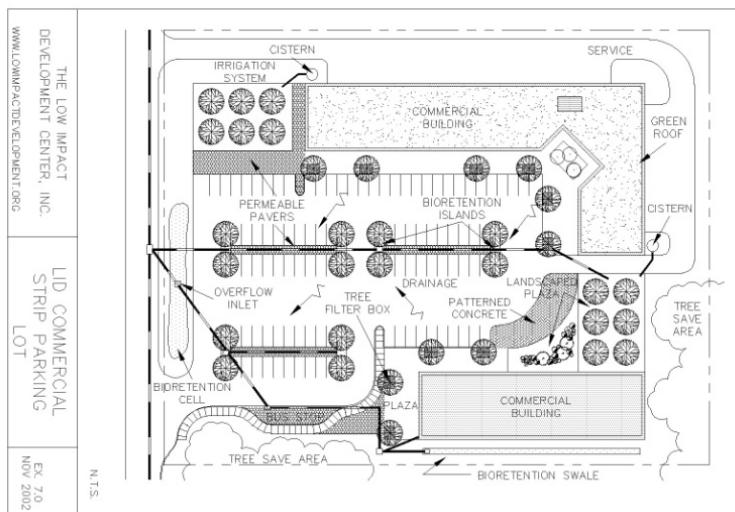


Green Parking



Practice Description

Green parking uses a combination of techniques to decrease the parking lot's impact on surrounding drainage patterns. Applied correctly, this can dramatically reduce impervious cover and, consequently, the amount of stormwater runoff. Some techniques include setting maximums for the number of parking spaces created, minimizing the dimensions of parking lot spaces, using permeable pavers in overflow parking areas, using bioretention areas to treat stormwater, encouraging shared parking, and providing economic incentives for structured parking. Green parking strategies can be used in both new developments and redevelopment ("Green Parking," USEPA 2006).

Planning Considerations

Applied together, green parking techniques can effectively reduce the amount of impervious cover, protect local streams, save expenses on stormwater management, and visually enhance a site. Proper bioretention area design can help meet stormwater management and landscaping requirements while keeping maintenance costs at a minimum. Some limitations to applying green parking techniques include applicability, cost, and maintenance. For example, shared parking is practical only in mixed-use areas, and structured parking may be limited by the cost of land versus construction.

The pressure to provide parking spaces can come from fear of complaints as well as bank loan requirements. This may pressure developers to construct more parking than necessary and to be a barrier to providing the greenest parking lot possible. Green parking lots, however, can dramatically reduce the amount of impervious cover created. The level of effectiveness depends on how much impervious cover is reduced as well as the combination of techniques used to provide the greenest parking lot. While the pollutant removal rates of bioretention areas have not been directly measured, their

capability is considered comparable to a dry swale, which removes 91% of total suspended solids, 67% of total phosphorous, 92% of total nitrogen, and 80-90% of metals (Schueler, 1996).

Implementation

Minimize Dimensions of Parking Spaces

Minimizing the dimensions of parking spaces is another green parking lot technique. Besides reducing the length and width of all spaces, parking stall dimensions can be reduced by providing compact vehicle spaces. While large sport utility vehicles (SUVs) are often cited as barriers to stall minimization techniques, most local parking codes require stall widths wider than the widest SUVs ("Green Parking," USEPA 2006).

Amend Parking Ratios

Many commercial areas require excessively high parking ratios based upon the highest hourly parking demand during peak seasons. Changing the calculation method to account for actual average parking demand instead can help jurisdictions set a maximum number of parking spaces. The table below provides examples of conventional parking requirements and compares them to average parking demand.

Conventional Minimum Parking Ratios (Source: ITE, 1987; Smith, 1984; and Wells, 1994)			
Land Use	Parking Requirement		Actual Average Parking Demand
	Parking Ratio	Typical Range	
Single family homes	2 spaces per dwelling unit	1.5 - 2.5	1.11 spaces per dwelling unit
Shopping center	5 spaces per 1000 ft ² GFA	4.0 - 6.5	3.97 per 1000 ft ² GFA
Convenience store	3.3 spaces per 1000 ft ² GFA	2.0 - 10.0	--
Industrial	1 space per 1000 ft ² GFA	0.5 - 2.0	1.48 per 1000 ft ² GFA
Medical/ dental office	5.7 spaces per 1000 ft ² GFA	4.5 - 10.0	4.11 per 1000 ft ² GFA
GFA = Gross floor area of a building without storage or utility spaces.			

Alternative Pavers

Utilizing alternative pavers is also an effective green parking technique. These can replace conventional asphalt or concrete in both new developments and redevelopment projects. Alternative pavers can range from medium to relatively high effectiveness in meeting stormwater quality goals.



The different types of alternative pavers include gravel, cobbles, wood mulch, brick, grass pavers, turf blocks, natural stone, pervious concrete, and porous asphalt.

Bioretention Areas

Bioretention areas can effectively treat stormwater in a parking lot. Stormwater is directed into a shallow, landscaped area and temporarily detained. The runoff then filters down through the bed of the storage area and is infiltrated into the subsurface or collected into an underdrain pipe for discharge into a stream or another stormwater facility. Bioretention areas can be attractively integrated into landscaped areas and can be maintained by commercial landscaping firms. For detailed design specifications of bioretention areas, refer to the *Bioretention (Rain Gardens) Practice*.

Shared & Structured Parking

Shared parking in mixed-use areas and structured parking are also green parking techniques that can further reduce the conversion of land to impervious cover. A shared parking arrangement could include usage of the same parking lot by an office space that experiences peak parking demand during the weekday with a church that experiences parking demands during the weekends and evenings. Costs may dictate the usage of structure parking, but building upwards or downwards can help minimize surface parking.

Common Problems

As referenced above, cost and maintenance are the major limitations on green parking techniques. Alternative pavers are currently recommended only for overflow parking because of the considerable cost of maintenance, and bioretention areas can be costly to construct. Strategies like setting maximums for parking spaces, minimizing stall dimensions, and encouraging shared parking can result in considerable construction cost savings, however, and all of the green parking techniques can also reduce stormwater management costs.

Alternate Pavers

Alternative pavers require proper installation and more maintenance than conventional asphalt or concrete. Accessibility, climate, soil type, traffic volume, and long-term performance should be considered along with costs and stormwater quality controls when choosing paving materials. Use of alternative pavers in cold climates will require special consideration since snow shovels are not practical for many of these surfaces. Sand is particularly troublesome if used with paving blocks since the sand that ends up in between the blocks cannot effectively wash away or be removed. In addition, salt used to de-ice can infiltrate directly into the soil and cause potential groundwater pollution.

Soil types will affect the infiltration rates and should also be considered when using alternative pavers. Clayey soils (D soils) will limit the infiltration on a site. If groundwater pollution is a concern, use of alternative pavers with porous soils should be carefully considered.

Maintenance

Alternate Pavers

The durability and maintenance cost of alternative pavers also limits use to low traffic-volume areas. For the reasons cited above, alternative pavers for parking are

recommended for light-use residential areas that do not require accessibility and for parking overflow areas. At the same time, alternative pavers can abate stormwater management costs. Used in combination with other better site design techniques, the cumulative effect on stormwater can be dramatic.

Bioretention

Bioretention requires regular landscaping maintenance, including measures to ensure that the area is functioning properly. In many cases, bioretention areas require intense maintenance initially, but less is needed over time. Many tasks can be completed by a landscaping contractor, who may already be hired at the site. Landscaping maintenance requirements can be less resource intensive than traditional landscaping practices such as elevated landscaped islands in parking areas.

Typical Maintenance Activities for Bioretention Areas (“Green Parking,” USEPA 2006)

Activity	Schedule
Remulch void areas Treat diseased trees and shrubs Mow turf areas	As needed
Water plants daily for 2 weeks	At project completion
Inspect soil and repair eroded areas Remove litter and debris	Monthly
Remove and replace dead and diseased vegetation	Twice per year
Add mulch Replace tree stakes and wires	Once per year