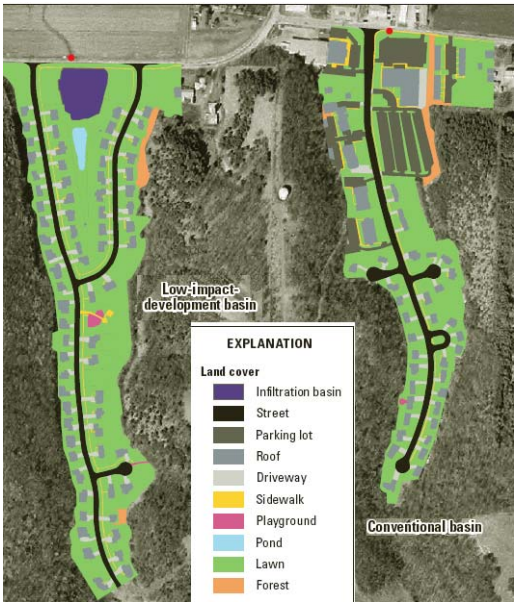
Village of Cross Plains

Cross Plains, Wisconsin (1999-2005)



Background:

The U.S. Geological Survey, in cooperation with the Wisconsin Department of Natural Resources, studied two residential basins in Cross Plains, Wis., during water years 1999–2005. A paired-basin study design was used to compare runoff quantity and quality from the two basins, one of which was developed in a conventional way and the other was developed with LID. The LID basin consisted of grassed swales, reduced impervious area (32-foot street widths), street inlets draining to grass swales, a detention pond, and an infiltration basin. Data collected in the LID basin represented predevelopment through near-complete build-out conditions.

Monitoring:

Six events with precipitation depths less than or equal to 0.4 inch produced measurable discharge from the LID basin. In the conventional basin, the number of discharge events, using the same threshold of precipitation depth, was 180.

Both the LID and conventional basins had nearly the same contributing area. Annual loads were greater in the conventional basin than in the LID basin for all but 3 study years, during which more than 50 percent of annual load in the LID basin was associated with one or two discharge events. Although low-impact design practices are able to retain and reduce stormwater runoff, and thus constituent loads, larger, less frequent precipitation events can greatly diminish the capability of LIDs to function as designed.

Conclusions:

Development of the LID basin did not appreciably alter the hydrologic response to precipitation characterized during predevelopment conditions. Ninety-five percent or more of precipitation in the LID basin was retained during each year of construction from predevelopment through near-complete build-out, surpassing the 90-percent benchmark established for new development by the Wisconsin Department of Natural Resources. The amount of precipitation retained in the conventional basin did not exceed 94 percent and fell below the 90-percent standard 2 of the 6 years monitored. While annual loads were markedly higher in the conventional area, there were still documented releases occurring from the LID area. The goal of no runoff was not met at either site.

It should also be noted that with large storms and saturated soils, the ability of low-impact design techniques to reduce runoff, and thus constituent loads, was significantly diminished. For both the LID and conventional basins, the temperature of runoff was largely affected by ambient air temperatures. However, the temperature of discharge from the LID basin increased upon runoff cessation. This increase was likely due to solar heating of water that was temporarily stored in the detention pond and infiltration basin.