

The goal of these workshops is to give designers, builders and managers the technical details necessary to properly design, construct and maintain LID facilities.



LID research, data, guidelines, specifications, and regulations are evolving rapidly.

LID practices for buildings engages new disciplines and interests for SW management.

New resources, including: SWMMWW, 2012 LID Manual, Rain Garden Handbook.

low impact development technical workshop series

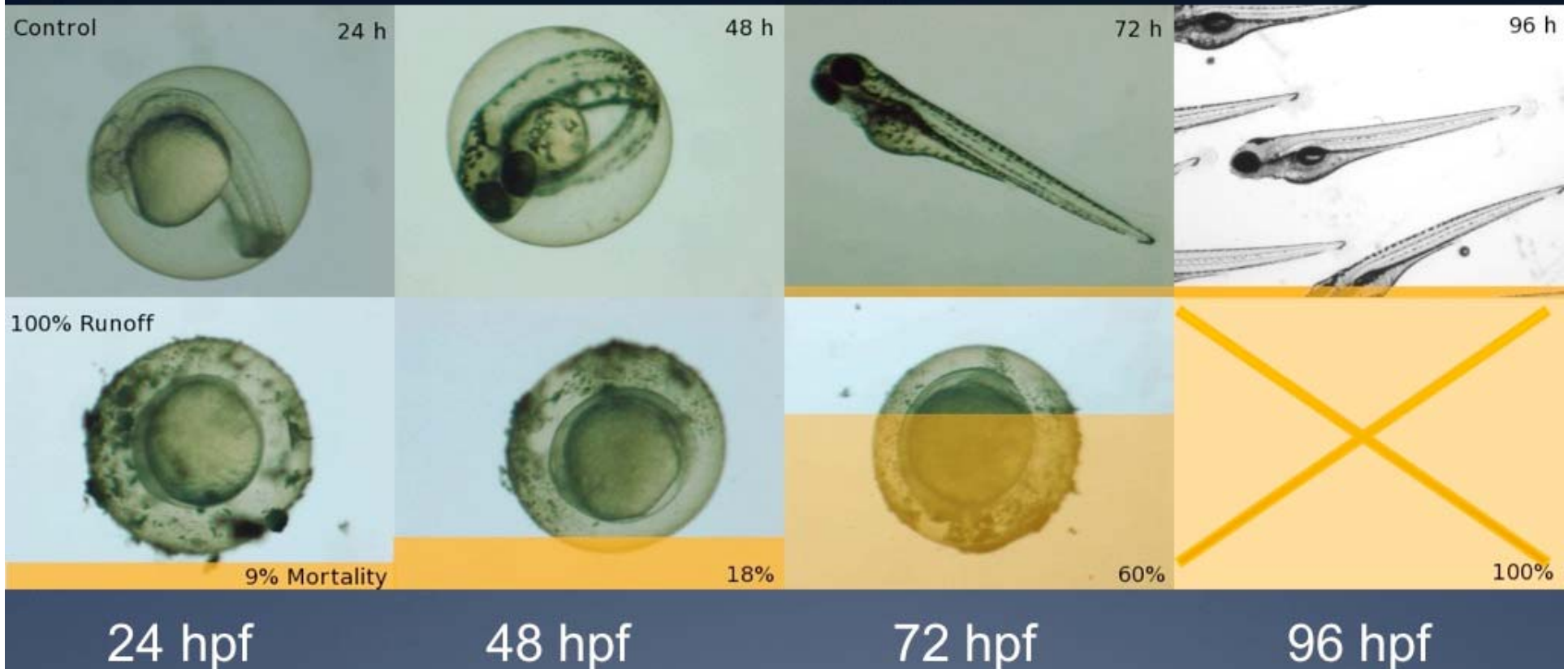
Puget Sound Conditions

Water Quantity



- Increased road networks (drainage density), road crossings and SW outfalls. → Increased peak flows, flow volume and frequency...increased channel erosion, fine sediment, pollutant loads and fish passage barriers.
- Increased fine sediment deposition. → Reduced intergravel DO and loss of salmon spawning and macroinvertebrate habitat.
- Loss or fragmentation of riparian areas. → Reduced LWD delivery, bank stability, bank structure and complexity, shading and temp control.
- Reduced quantity and quality of LWD. → Reduced channel stability, sediment storage, instream cover, and pool quality and quantity.

Developmental Delays in Stormwater Runoff



Embryos in 100% runoff developmentally arrested at 10 hpf

Comprehensive Stormwater Management Program

- Land use planning
- Standards equal to Ecology's
- Site plan review
- Construction site inspections
- Maintenance
- Source control
- Illicit discharges & problem response
- Existing problems
- Public education & involvement
- Watershed or basin planning
- Monitoring
- Stable funding
- Low impact development

From Puget Sound Water Quality Management Plan

Low Impact Development Principles and Practices



A land use development strategy that emphasizes protection and use of on-site natural features to manage stormwater.



Integrated engineered, small scale stormwater controls.

Low Impact Development Principles and Practices



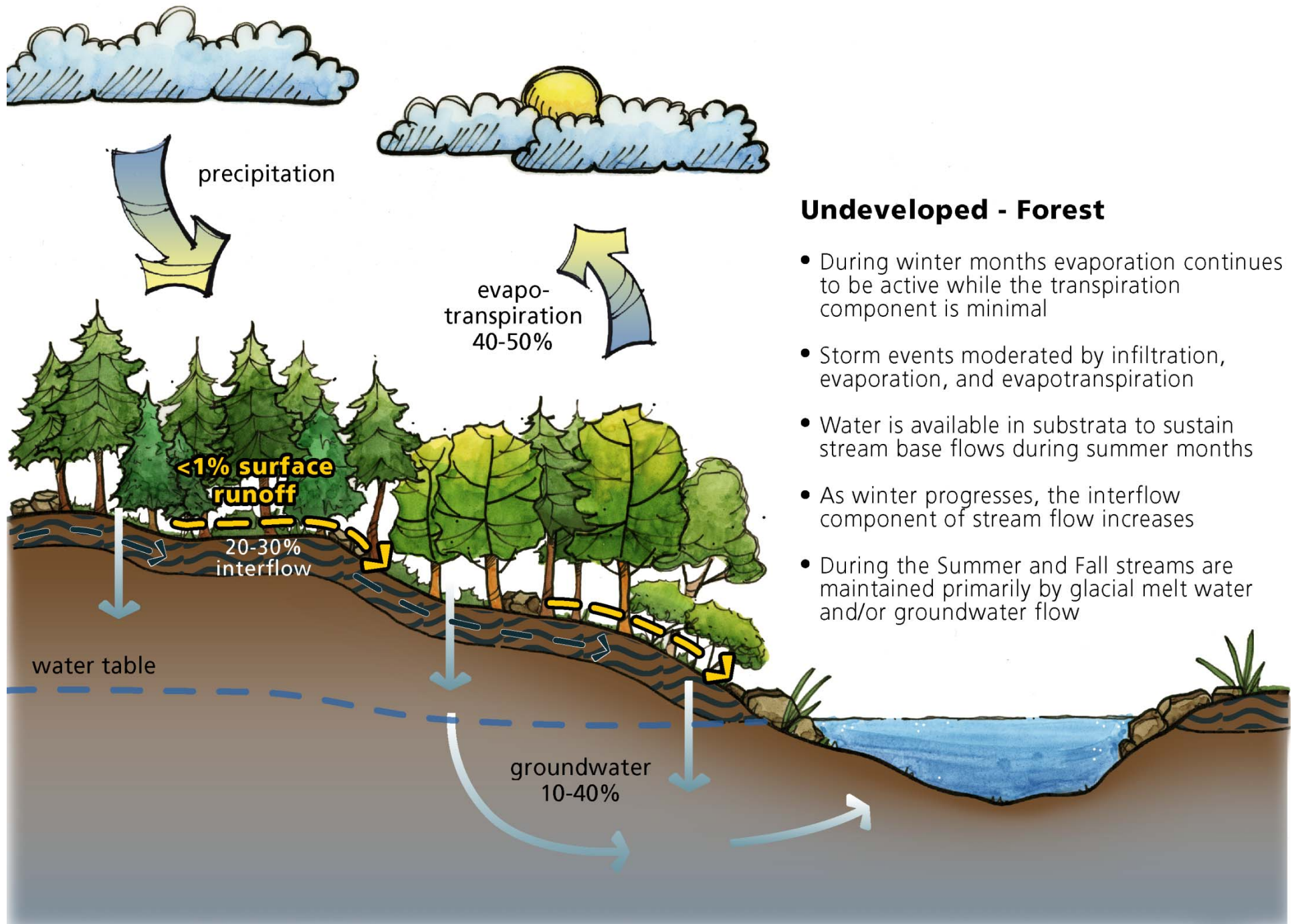
Used at the parcel and subdivision scale: site scale necessary but not sufficient...regional land use planning critical for effective stormwater management.



Primary goals: 1) no measurable impacts to receiving waters; and 2) maintain or more closely approximate pre-development surface flow volumes and durations.

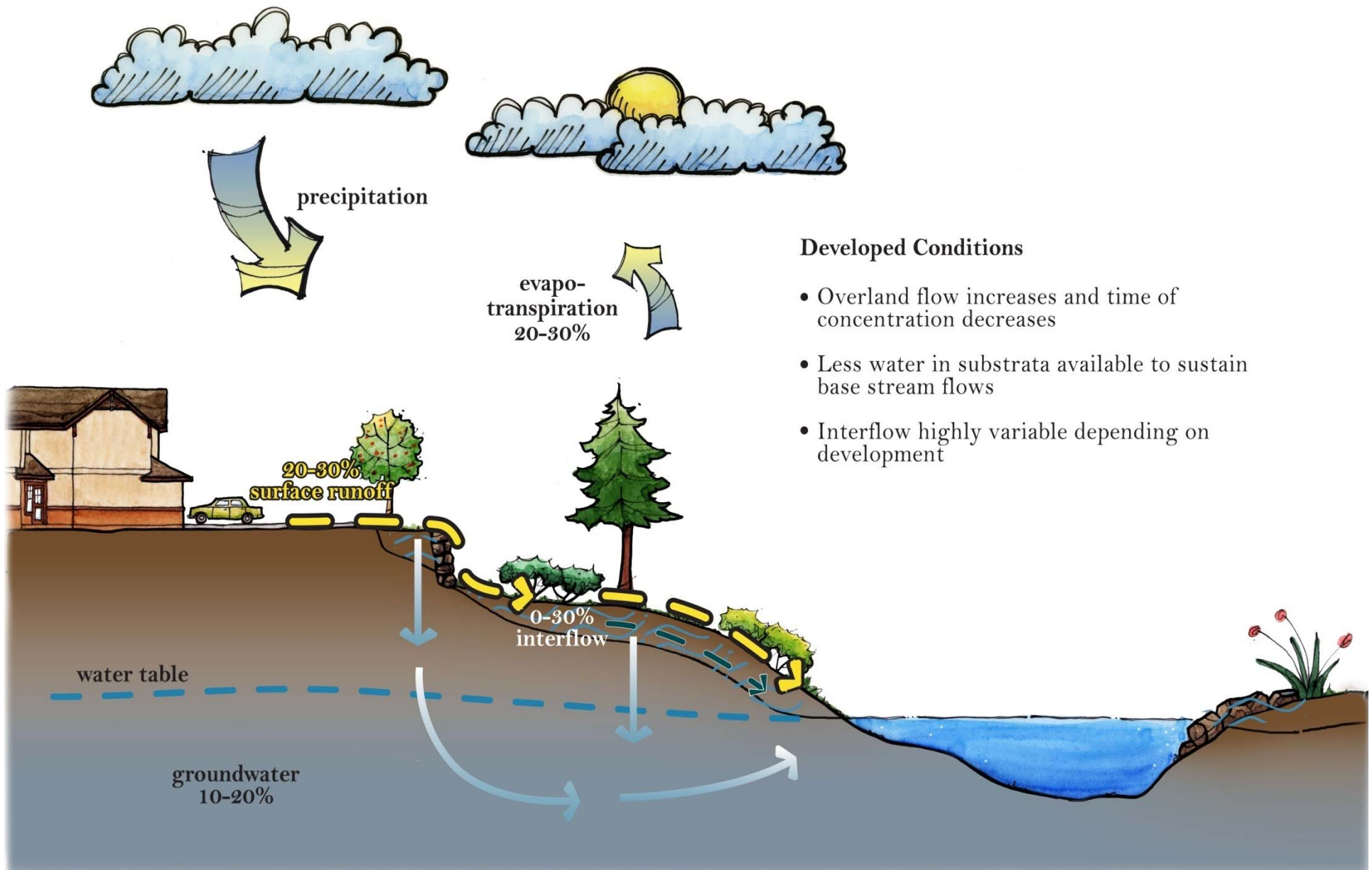
LID Objectives

- Protect and restore native soils/vegetation.
- Reduce the development envelope.
- Reduce impervious surfaces and eliminate effective impervious area.
- Manage stormwater as close to its origin as possible.
- Integrate stormwater controls into the design—create a multifunctional landscape.
- Reduce concentrated surface flow, minimize stormwater contact with impervious surfaces, and increase stormwater contact with soils and vegetation.



Undeveloped - Forest

- During winter months evaporation continues to be active while the transpiration component is minimal
- Storm events moderated by infiltration, evaporation, and evapotranspiration
- Water is available in substrata to sustain stream base flows during summer months
- As winter progresses, the interflow component of stream flow increases
- During the Summer and Fall streams are maintained primarily by glacial melt water and/or groundwater flow





Kensington Estates

Total acres:

23.92

Lots:

103 (4,143 sq ft ave.)

Open space:

15 acres (63%)

Effective impervious area
approaching 0%







Green Roofs



- Multiple benefits including improved energy efficiency, air quality, reduced temperatures, aesthetics extended roof life, and reduced stormwater flows.

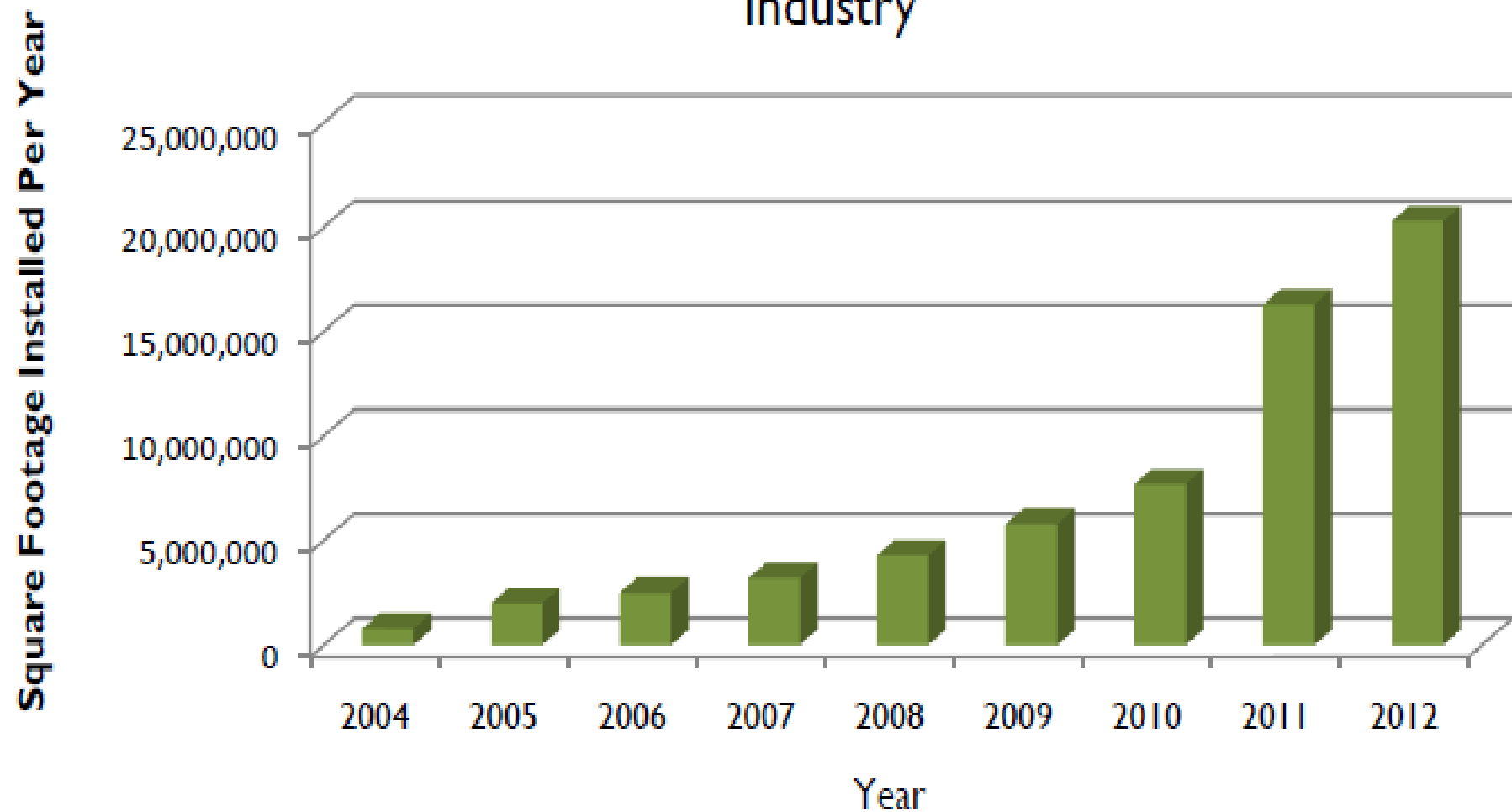


- 13.5 million square meters installed in Germany in 2003.

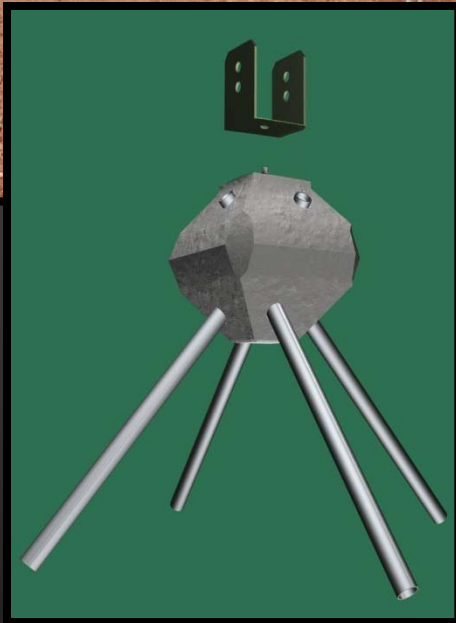
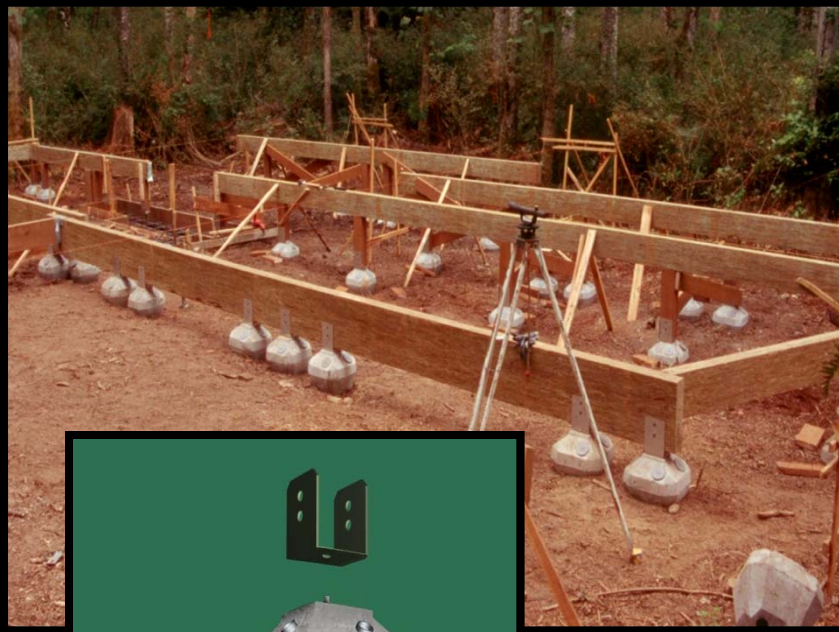
foundation, cistern, ecoroof basics

Green Roofs

Estimated Growth of the North American Green Roof Industry



PIN Foundations

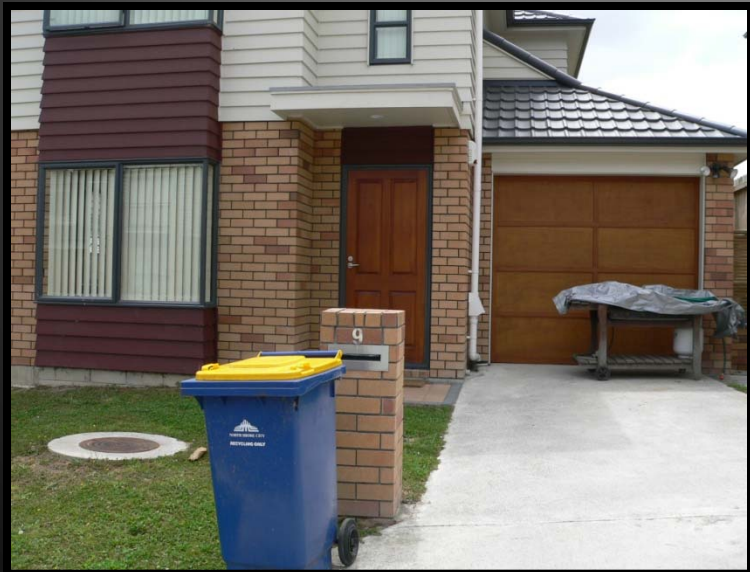


- Minimize soil disturbance.
- Retain better hydrologic function of soil.
- Good flow control credit under current guidelines.

Rain Water Harvesting



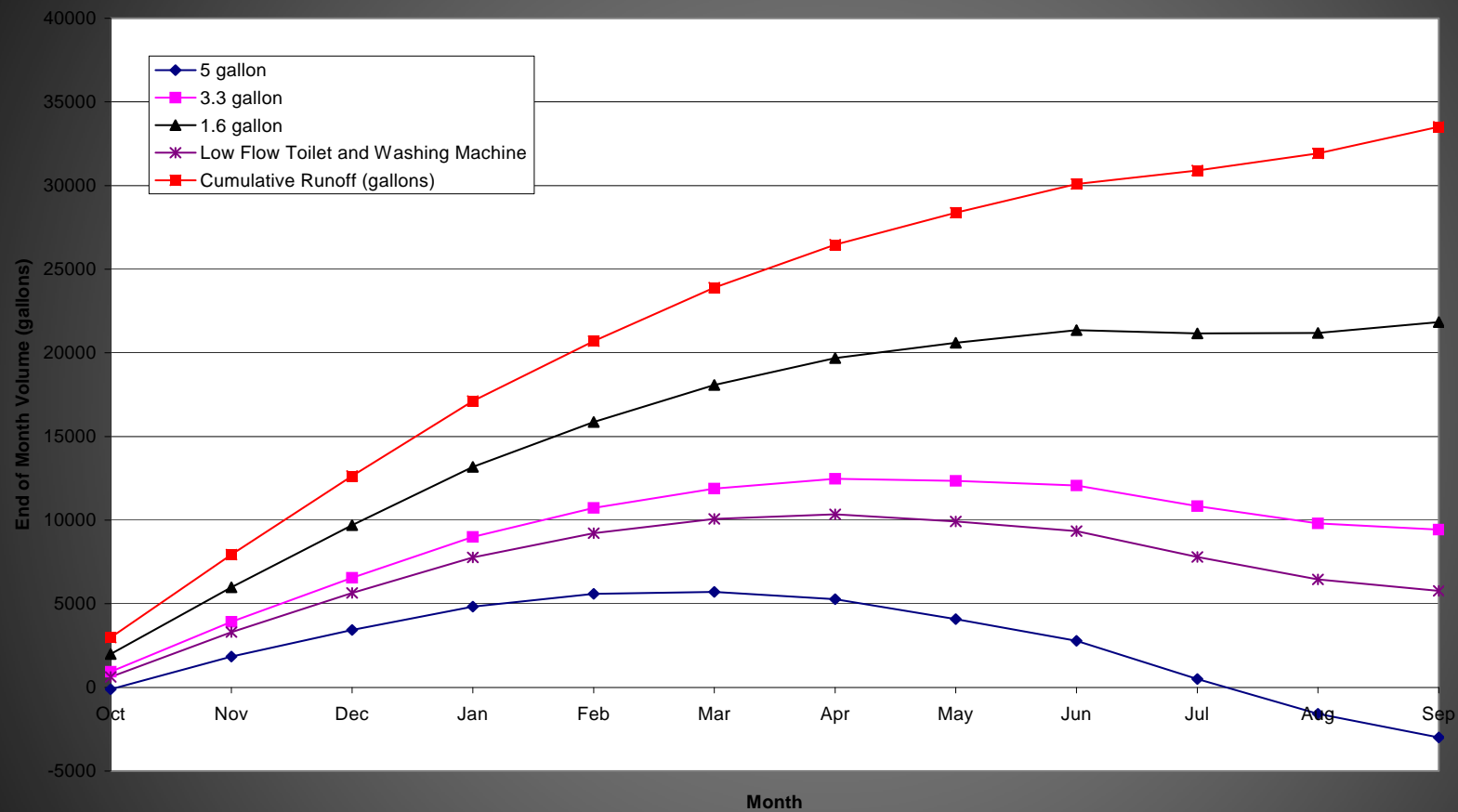
- Technology well established.



- Current regulations, perceptions and societal values are primary limiting factors.

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Controlling roof top stormwater important on projects in sensitive basins with poor soils and dense development



Initial modeling indicates the pre-development hydrologic function can be approximated on poor soils with a full suite of LID practices.

foundation, cistern, ecoroof basics