

Impacts of Water Conservation and Storm Water Management

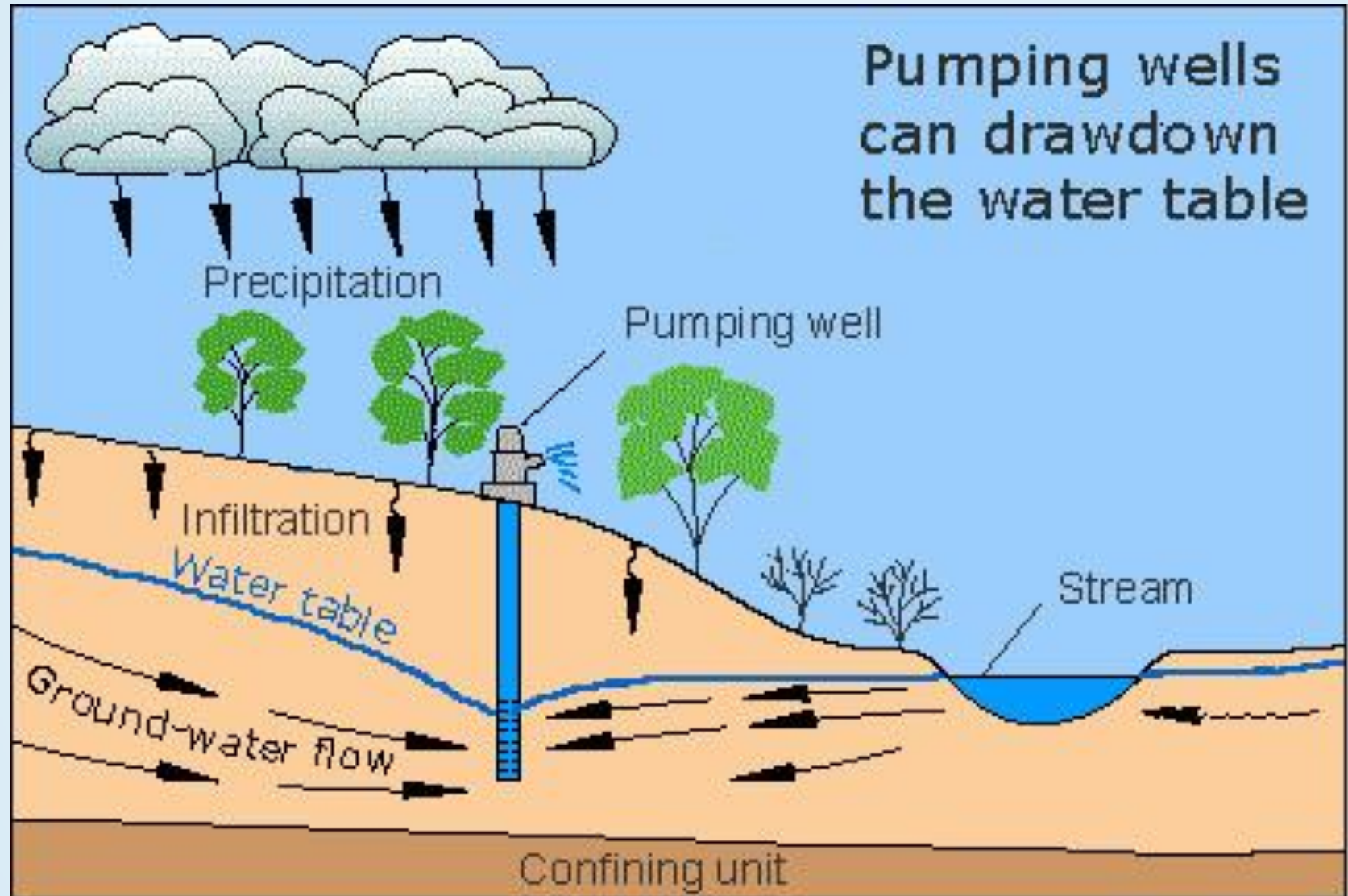
(on costs, environmental benefits, and quality of life)

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Pumping wells
can drawdown
the water table

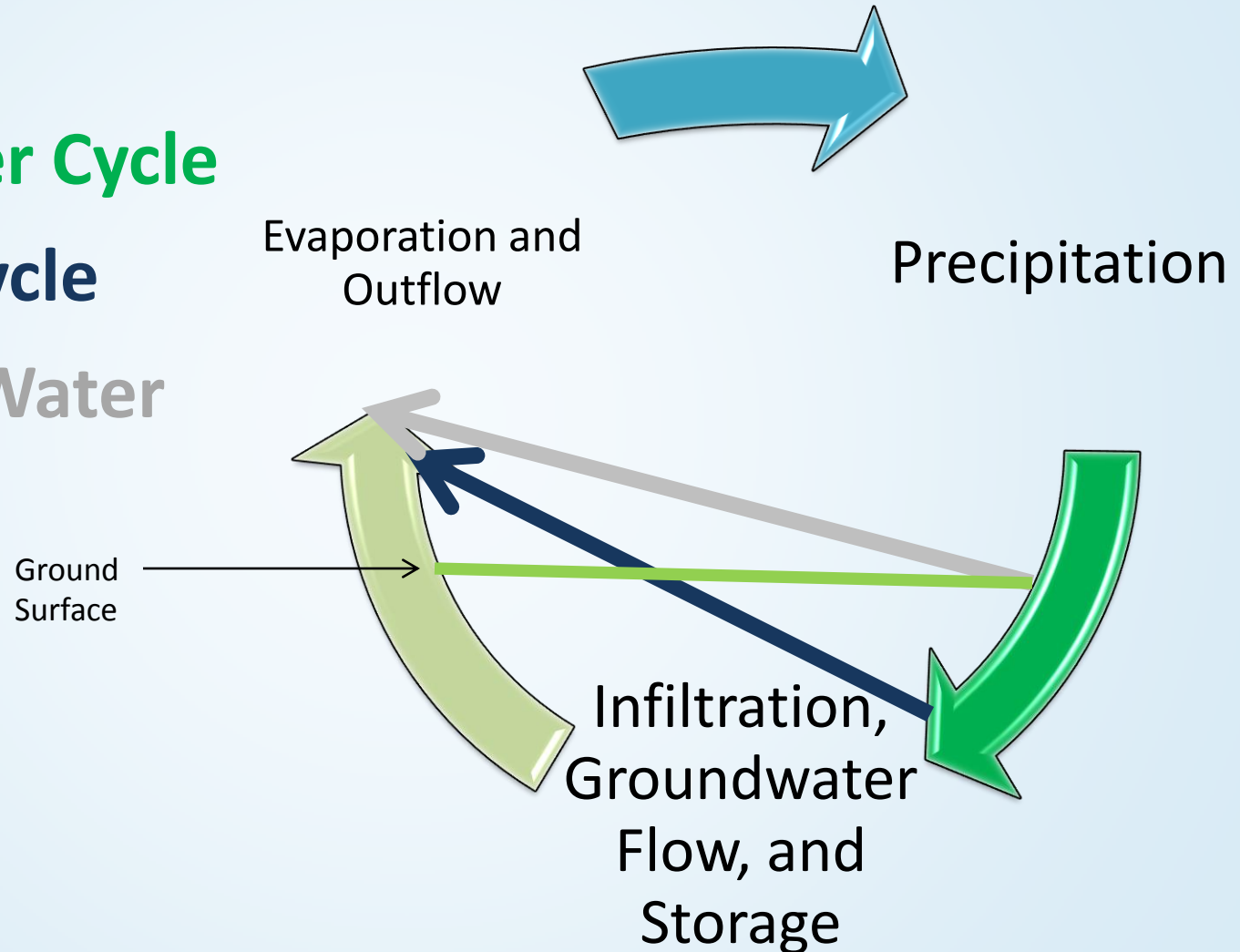


The Three Water Cycles

Natural Water Cycle

Water Use Cycle

Interrupted Water Cycle



Past Practices

Still needed – but with caveats

- Drainage/Flooding must be managed
- Prioritizing resources
- Timely technology introduction





Is there a better way?



Costly

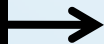


Less Costly

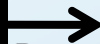


SAVINGS

REACTIVE



PREVENTATIVE



PREDICTIVE

Reconn



Belleville, MI – 4,600 SF Rain Garden installed in 2012 to intercept storm water from roof drain and parking lot.





Wayland, MI – 700 SF Rain Garden installed in 2012 to intercept storm water from roof drains





Okemos, MI – Rain Gardens and bioswales installed in 2010 to intercept storm water from parking lots and roads





Various Sites – Rain Gardens and bioswales



Factors that Dictate Water Use Impacts

- Type of water supply used
- Local hydrology
- Development patterns
- Upstream water use
- Storm water design
- Wastewater discharge location



Different Water Sources Cause Different Impacts

- What are the impacts if 1 MGD of water is withdrawn from...
 - A Great Lake?
 - A groundwater aquifer?
 - A river source?

Urbanization Impacts

- More impervious surfaces
- More debris in runoff
- Less natural infiltration
- Increasing storm sewer and POTW flows
- Blacktop temperatures
- More CSO's

Runoff Gallons per Road Mile

Cover Type	Soil Type	Area (sf)	Area (ac)	Runoff Volume, V (ft ³)	Runoff Volume (gallons)	Yearly Average Volume (gal)
Assuming D Type Soils						
Pavement and Rooftop	D	126,720	2.9091	8,352	62,473	1,360,946

- 1-inch Rain
- 24 Foot Wide Road
- 1 mile long
- Does not include parking lots or runoff from land adjacent to roads



Bloomfield Hills, MI – Rain Gardens installed in 2010 to intercept storm water from road



How much water runs off of a 1 mile road, 24 feet wide?

- Assuming a 1 inch rain event, approximately 400 Million Gallons of water runs off from impervious surfaces alone.
 - 5400 miles of roads in all of Oakland County = 7.3 million gallons per year
 - 450 miles of roads in Region of Waterloo = Over 600 million gallons per year
 - 330 miles of roads in Guelph = Almost 450 million gallons per year

Rooftop Capture

- What size ?
- Reused?
- Controlled Release



Recharge and Projecting Water Use Reductions

- Main recharge occurs primarily in winter snow melt and spring rains
- Summer rainfall more likely to evaporate off the surface
- Need to look at spring rainfall and impact on groundwater levels
 - Anticipate lower groundwater levels during main outdoor watering season
 - Provide public education on potential need for outdoor watering reductions

Wells Sensitive to Rainfall and Use

- Recharge comes primarily from snow melt and spring rains
- Summer rain is more likely to evaporate and not go to recharge
- Groundwater levels are generally very good (in Oakland County, Waterloo and Guelph.
- Static levels of water table fluctuate based on rainfall and well use.
- Need to monitor storm water movement to ensure groundwater does not have significant water diverted to streams directly.

The Cost and Value of Green Infrastructure

Management Practice	Proposed Area (ac)	Area (sf)	Volume Captured (cf)	Volume Captured (gal)	Contractor
Urban Reforestation	1.00	43,560	489	3,659	\$110,000
Forest Retention	1.00	43,560	6,850	51,932	\$110,000
Wet Meadow	1.00	43,560	43,560	325,872	\$80,000
Native Prairie	1.00	43,560	339	2,539	\$30,000
Agriculture	1.00	43,560	339	339	\$28,000
Rain garden	0.01	218	1,234	9,233	\$3800
Bioswales	20.00	linear feet	420	3142	\$900
	0.01	420			

Summary of Lessons Learned for Decision-Making

- Learn from past mistakes
- Use integrated water system planning
- Manage both water supply and water management in planning
- Combine water conservation/efficiency and green infrastructure programs

Broader Impacts Vision

- Support the ecological and societal impacts of water withdrawals and distribution
- Lower Long term costs
- Communities benefit environmentally, economically by conserving water and restoring hydrology