Low Impact Development, Rain Gardens and Clean Water

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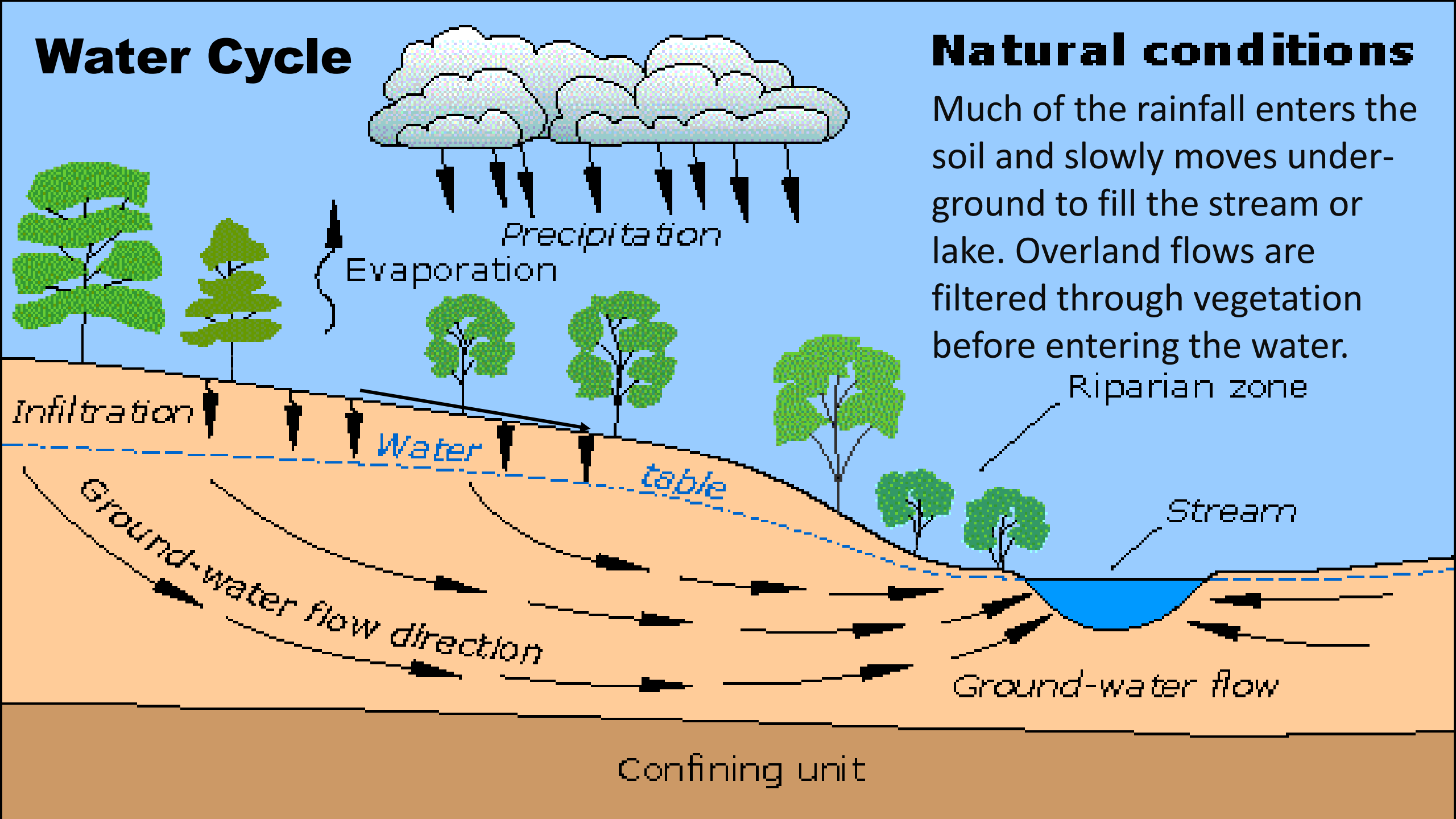
What we will learn:

- How does the water cycle work?
- What is a watershed and where do you live in?
- What happens to the water cycle in an urban area?
- What happens to our drinking water in San Antonio?
- The use of traditional stormwater management versus Low Impact Development (LID)?
- What are some LID strategies?
- What are the benefits to LID?
- How to make a simple Rain Garden.

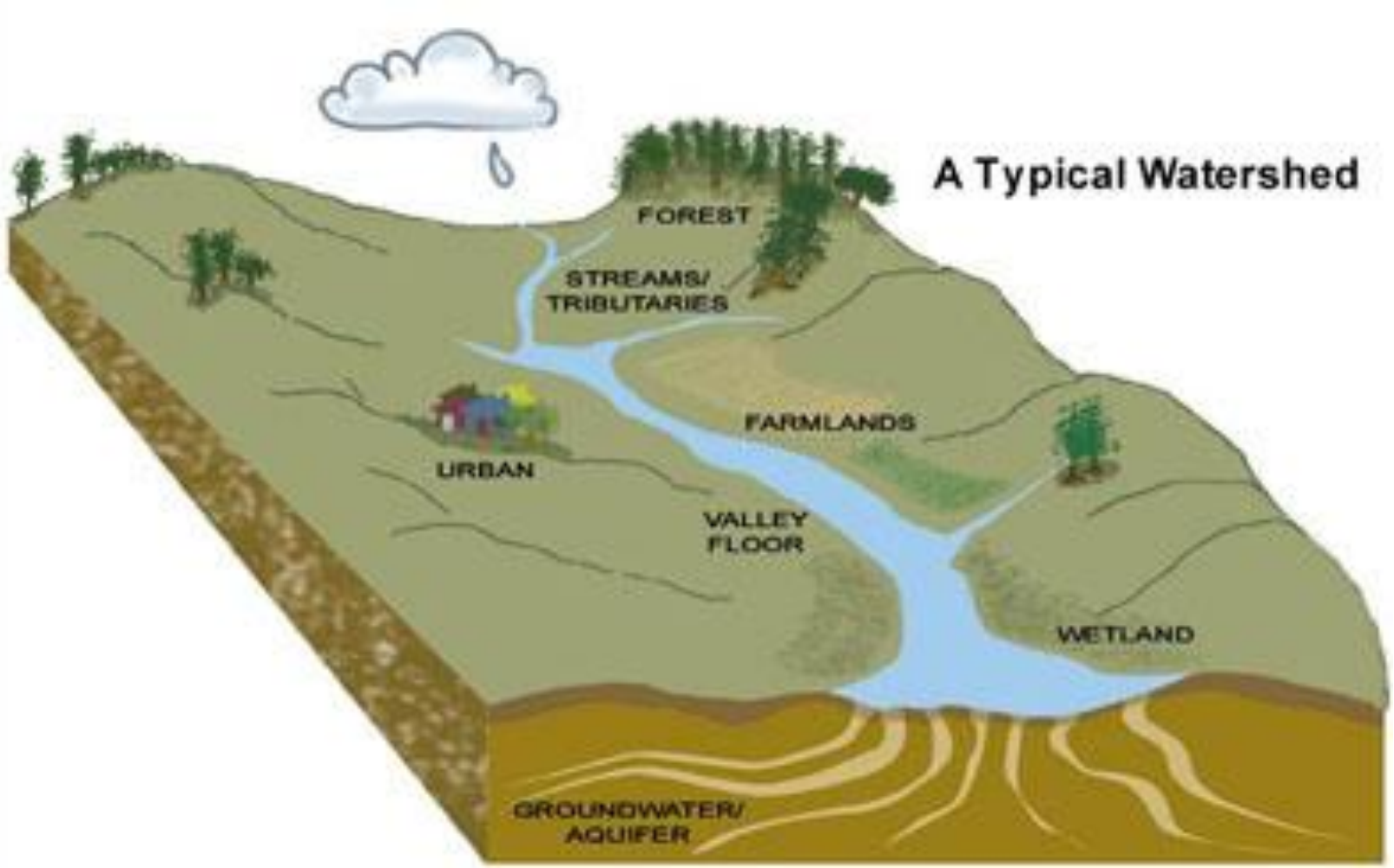
Water Cycle



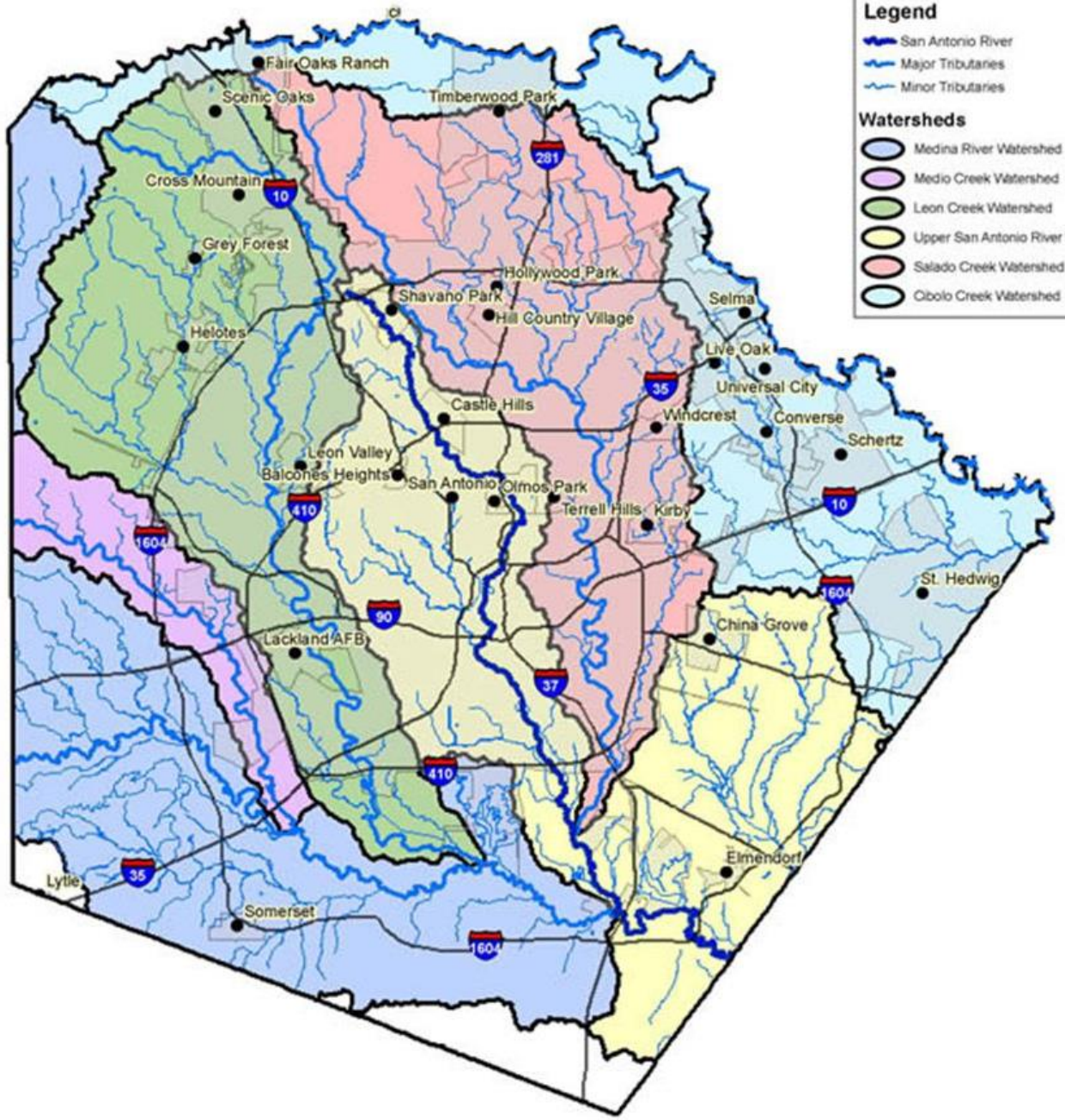
Natural conditions

Much of the rainfall enters the soil and slowly moves under-ground to fill the stream or lake. Overland flows are filtered through vegetation before entering the water.

We all live in a watershed



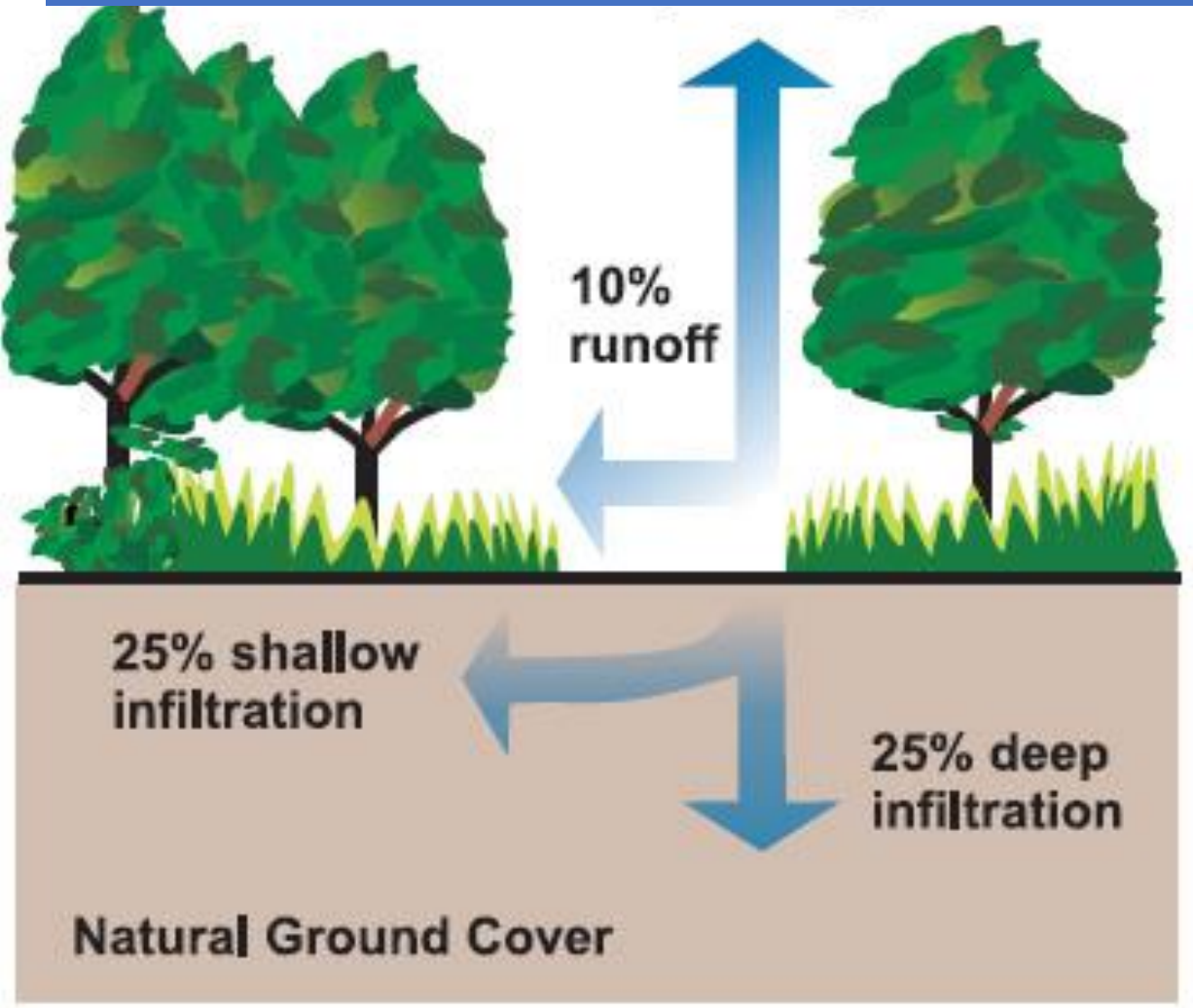
- A watershed is an area surrounded by a drainage divide (high area) where all of the land inside drains to one low point.
- So what water-shed do you live in?



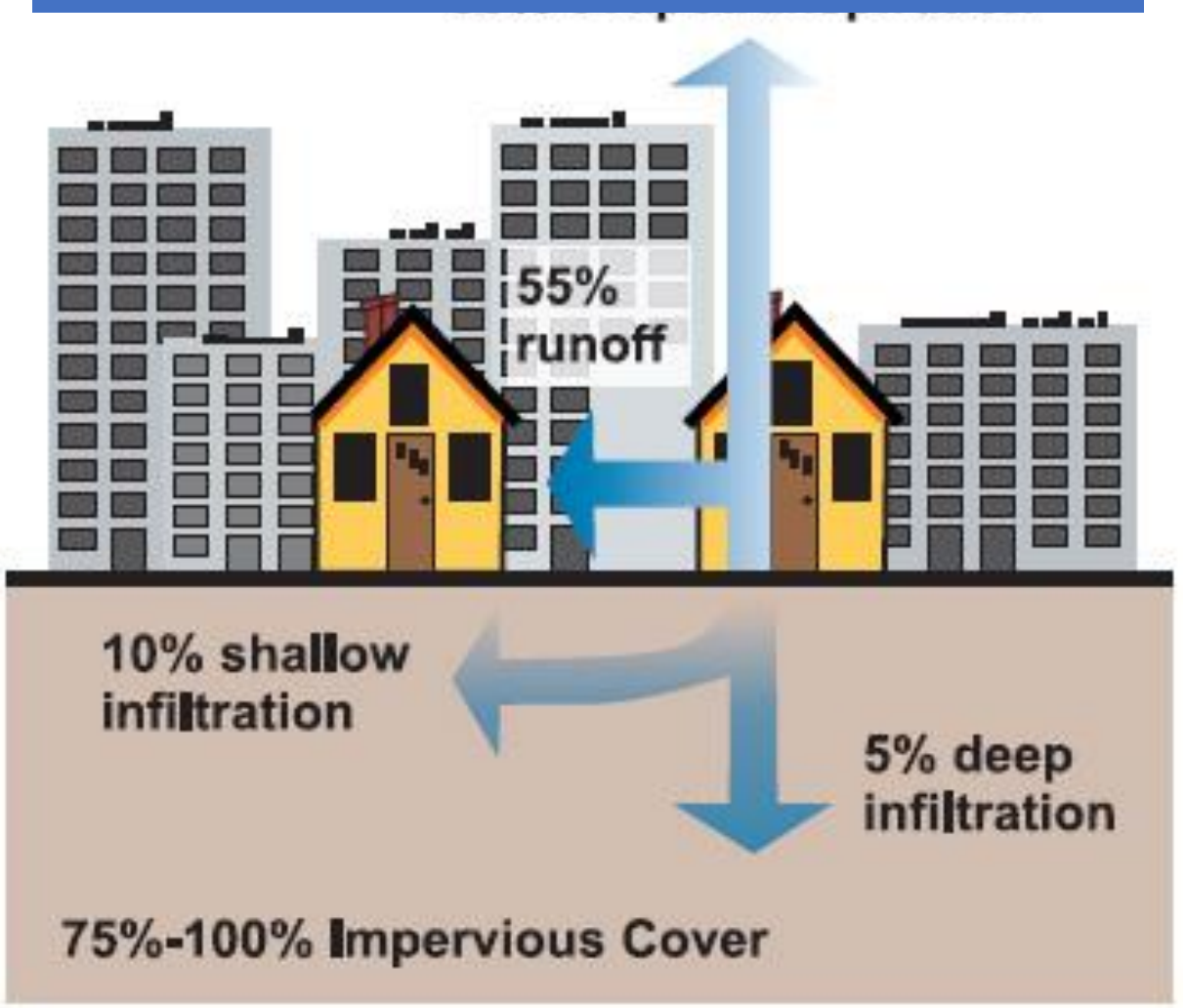
In San Antonio the watersheds are named after the creek or river that is the lowest point:

- **Medina River**
- **Medio Creek**
- **Upper San Antonio River**
- **Salado Creek**
- **Cibolo Creek**

Before development runoff is only 10%



After development, runoff is 55%!

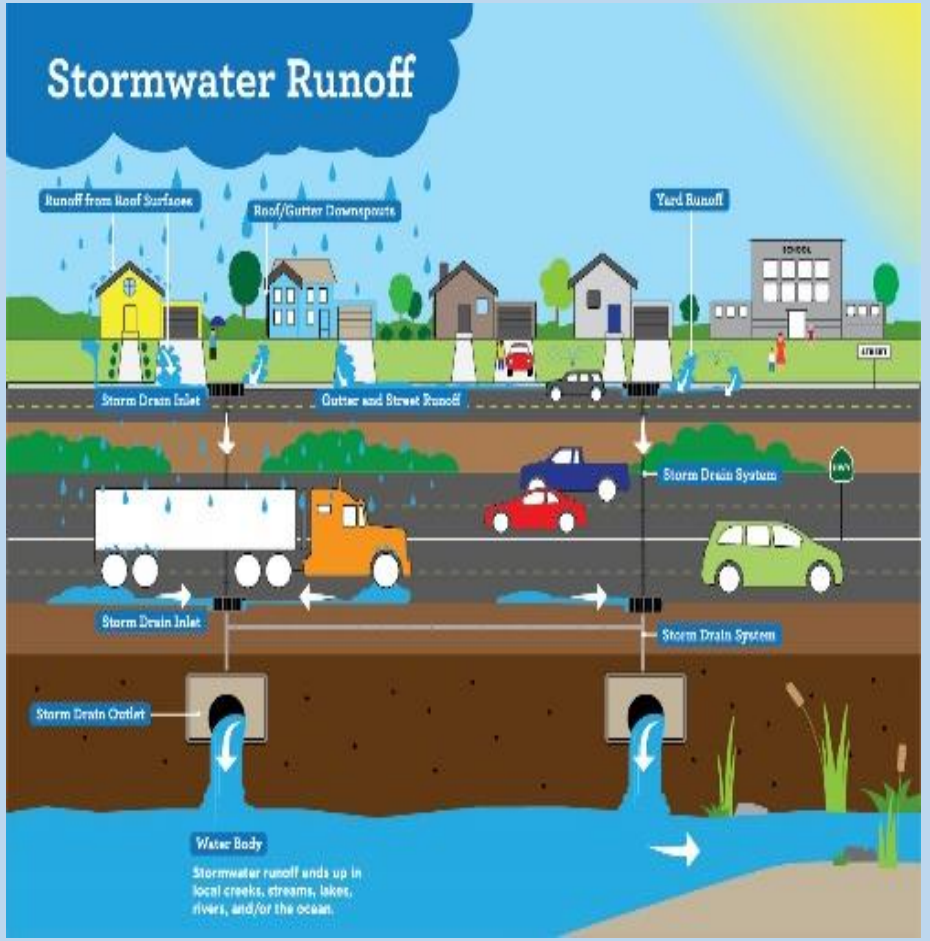


Which Creates…

As the watershed is “built out”

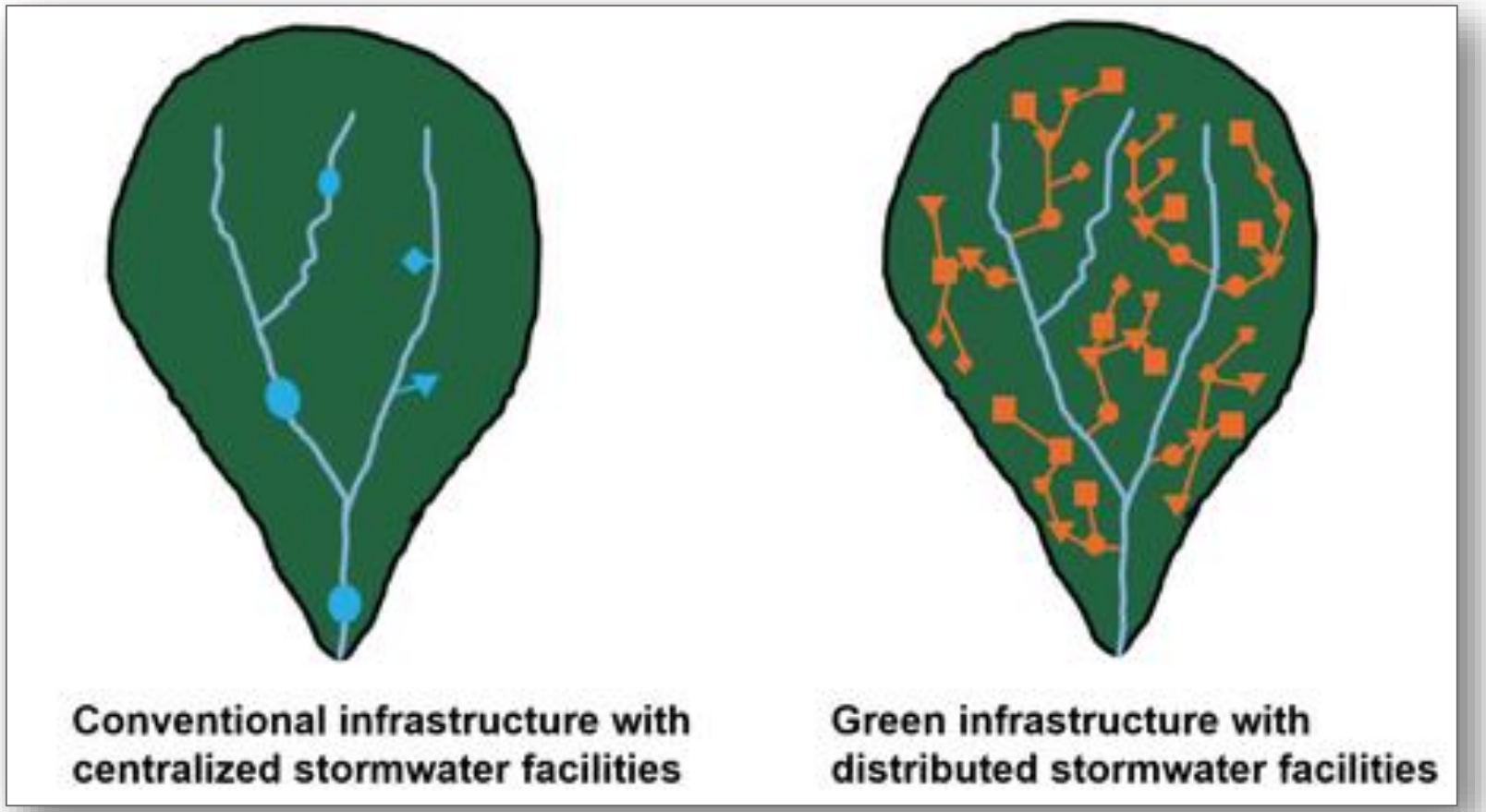
- When impervious land cover replaces natural vegetation with:
  - Buildings
  - Roads
  - Driveways
  - Sidewalks
  - Anything concrete

There is less infiltration into the soil.



- Water from rainfall is gathered and directed into a drainage system which usually flows directly into a stream or lake.
- This traditional type of drainage system is called “gray infrastructure”.

Currently flood control projects focus on specific areas of flooding vs utilizing a watershed approach

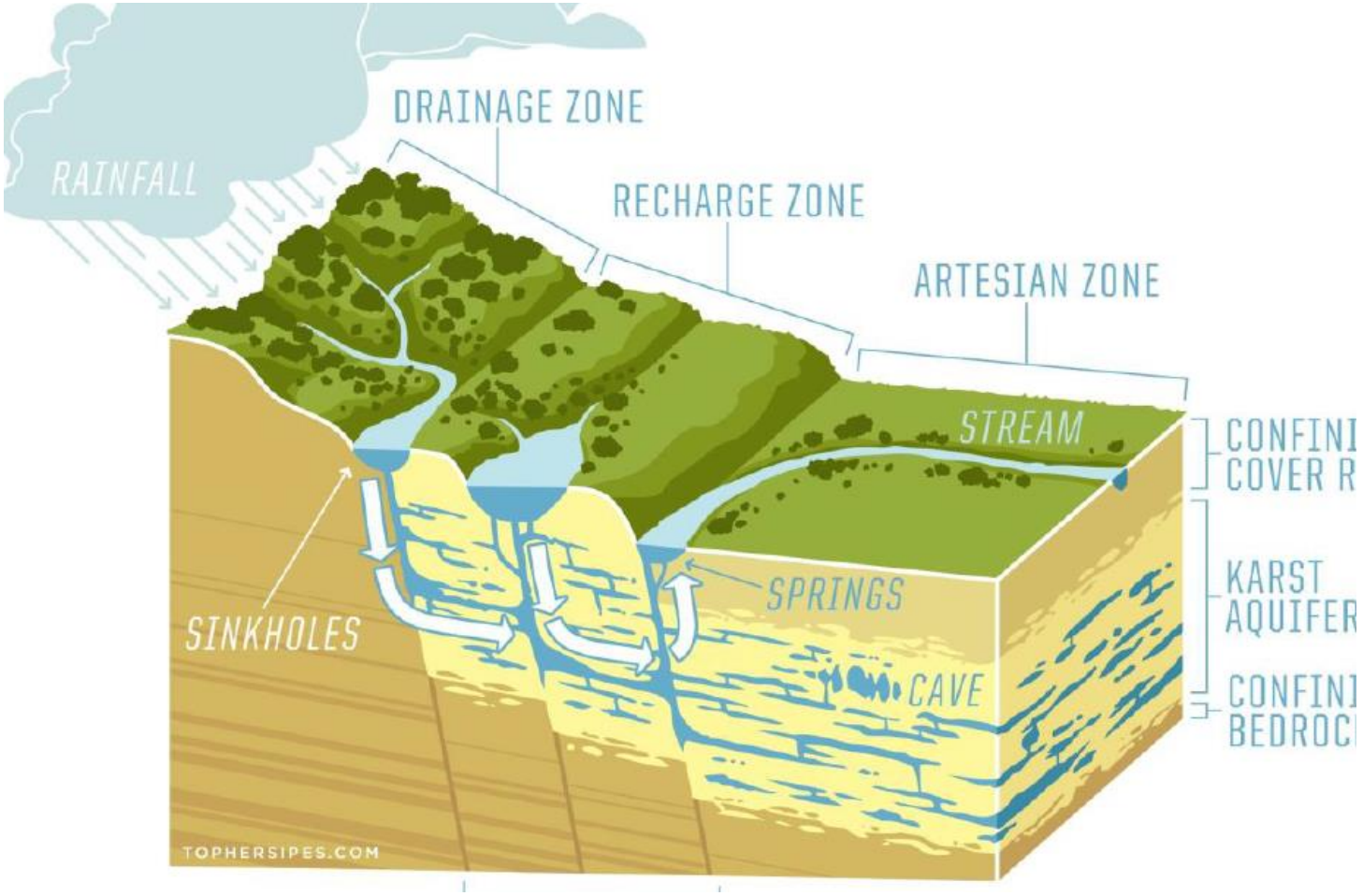


The watershed approach allows neighborhoods to be retrofitted with appropriately scaled green infrastructure, enhancing quality of life within communities; cooling temperatures and storing more soil water and carbon.

More runoff, flooding and water pollution…

- **When the stormwater goal is to move water off site as quickly as possible to protect properties:**
  - More gray infrastructure is added,
  - A greater commitment of public and private investments for flood control projects is required,
  - Water quality continues to worsen in streams and rivers,
  - Our drinking water is threatened.
- **So who is responsible?**

San Antonio depends on the Edwards Aquifer for its drinking water, but due to the lack of soil and the pervious rock, there is little filtration.



One may feel that commercial sites are the problem but, neighborhoods and our own yard, may be contributing by:

- Adding more impervious areas such as driveways and patios,
- Over using fertilizers and pesticides,
- Allowing pet wastes to accumulate,
- Ignoring oil leaks,
- Not disposing trash properly:
- Blowing leaves and grass clippings into streets,
- Allowing erosion from bare soil areas.

And because gray infrastructure directs urban runoff into our creeks and rivers including those in the Edwards Recharge Zone…

- The results have been:
  - Our major creeks and rivers have segments which do not meet Federal Water Quality Standards.
  - The Edwards Aquifer receives greater amounts of pollutants.
  - Larger and more flood control projects are required.
- So is there an alternative?

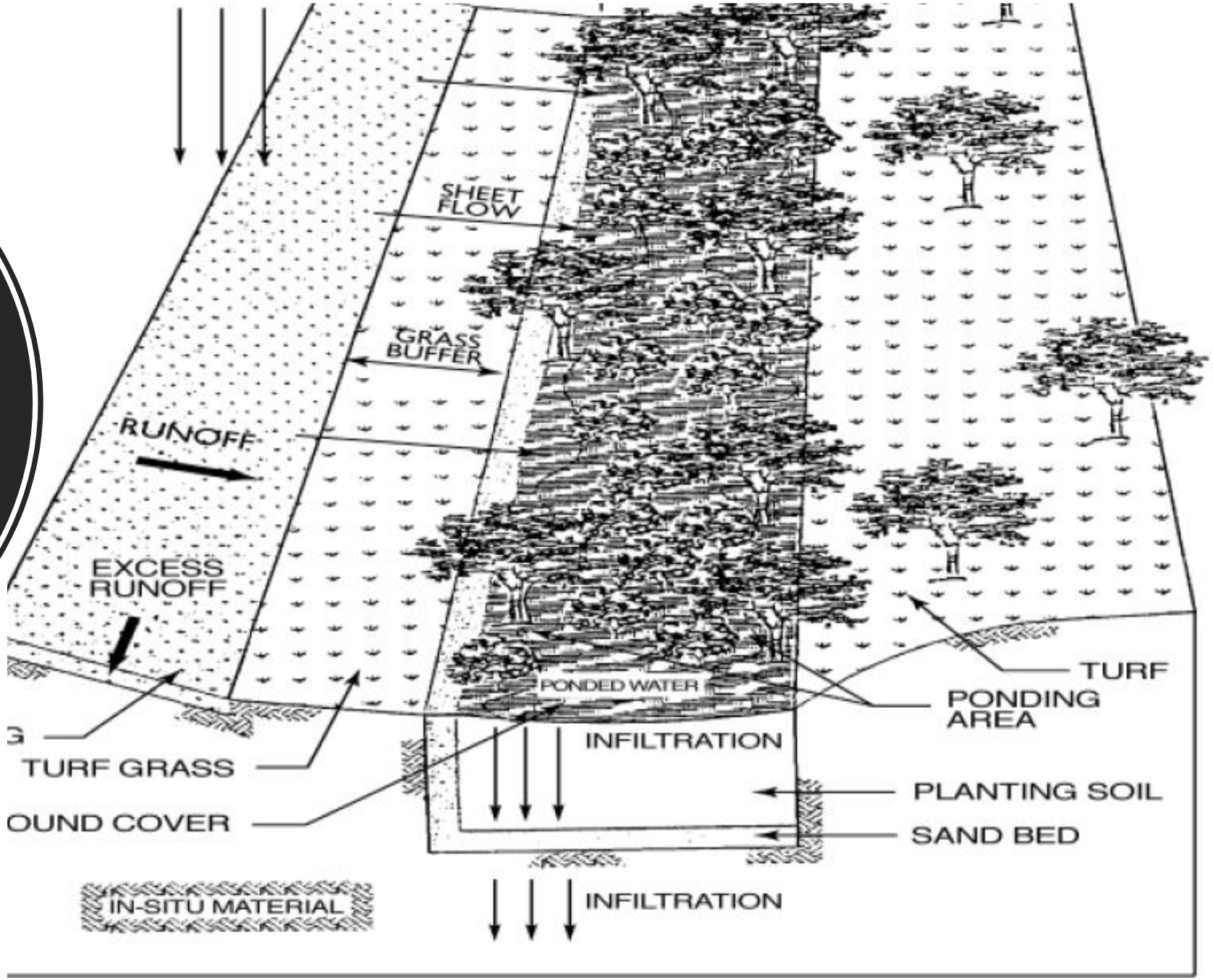
Low Impact Development (LID) or green infrastructure uses a different approach:

- This approach considers stormwater as a resource to be conserved, stored, filtered and used wisely.
- LID techniques or practices:
  - Minimize pollution at the source
  - Reduce impervious surfaces
  - Rely on small, distributed on-site practices
  - Infiltrate or reuse as much rainfall on a site as possible
  - Filter before discharging
- These practices result in better mimicking the original, pre-development infiltration pattern.

Common LID practices

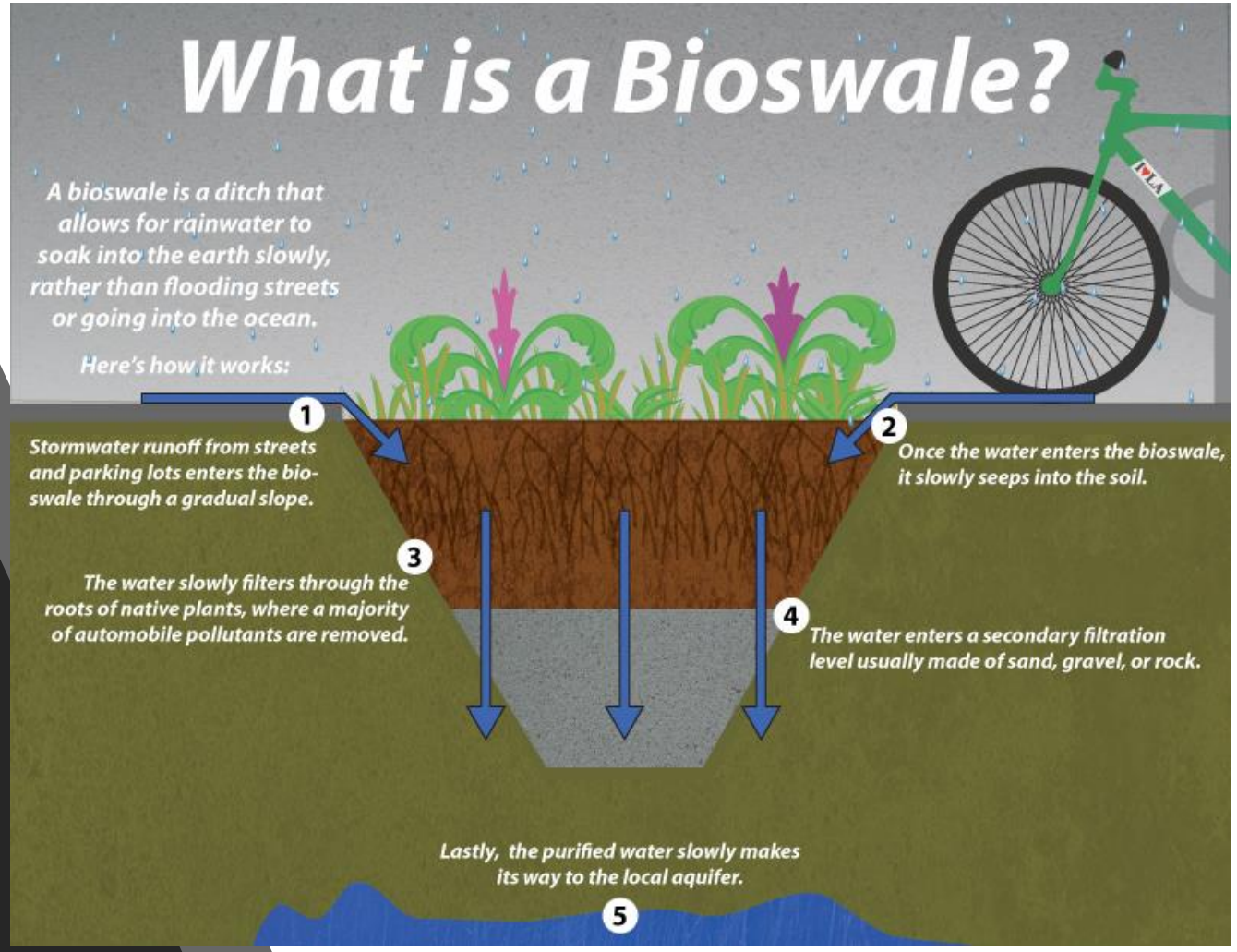
- Bioretention
- Permeable pavement
- Bioswales
- Rain gardens
- Landscaped roofs
- Constructed wetlands

LID practices are engineered to increase infiltration so that the stormwater is filtered before it enters into a drainage system.

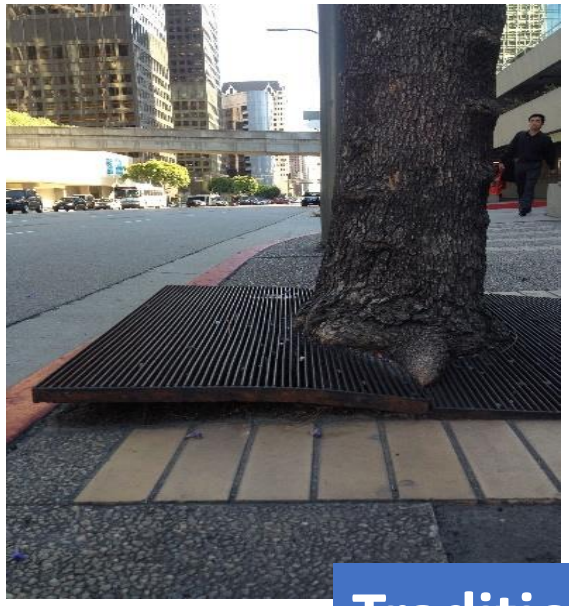


How does LID work?

- LID practices filter out pollutants such as oil, pet wastes, sediment and nutrients as the collected water seeps through vegetation and soil.
- The plant roots absorb the pollutants so that they can be broken down naturally.
- The water that eventually reaches groundwater and surface water is much cleaner.

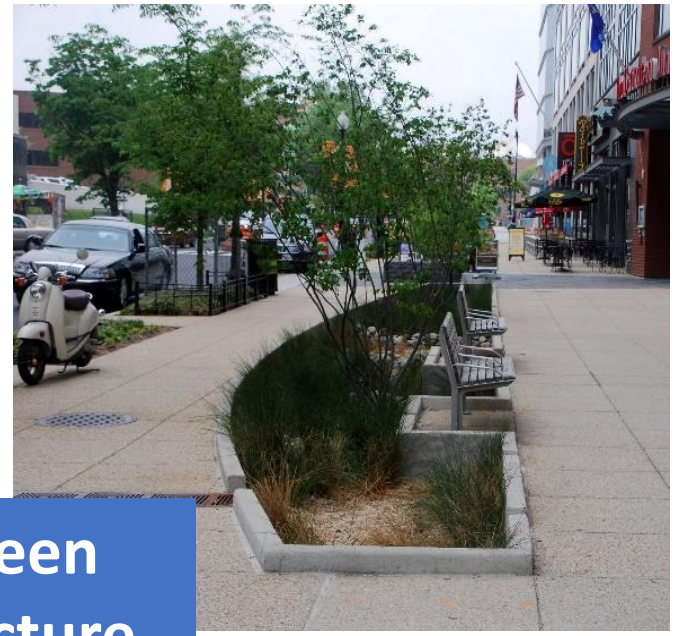


There are choices even in downtown areas. Which do you prefer?

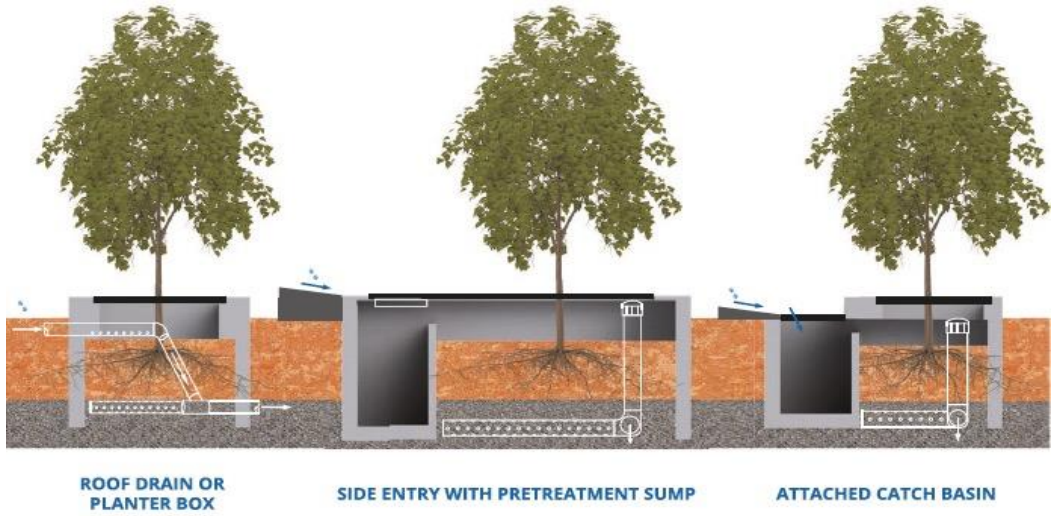


Traditional

These LID practices are engineered to be the correct size and use a soil that is well drained to ensure that water does not stand for more than 24-36 hours.

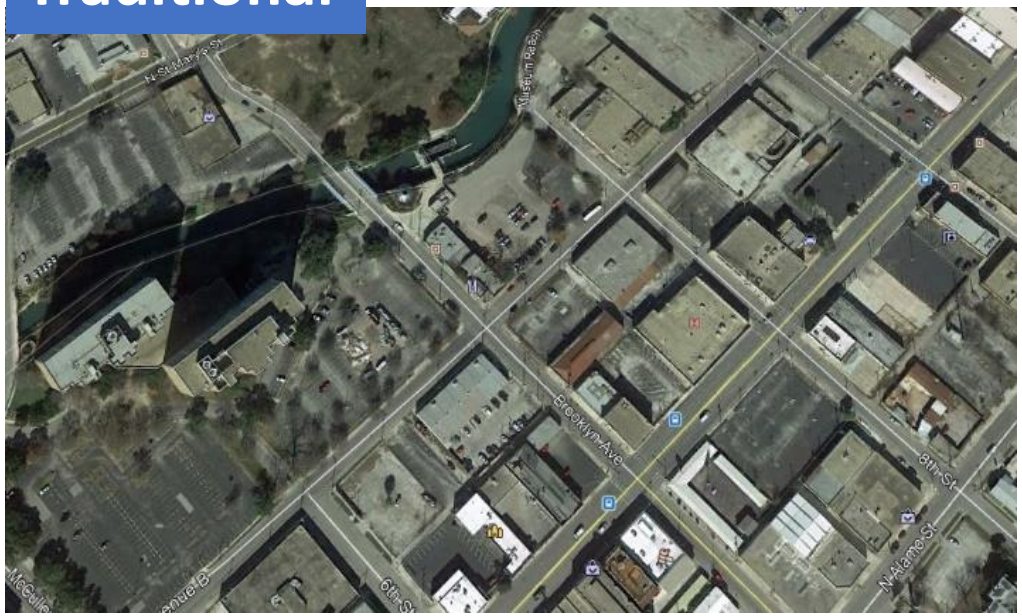


LID or Green Infrastructure



Landscaped roofs can collect some rain and use AC condensate for irrigation when there is no rain.

Traditional



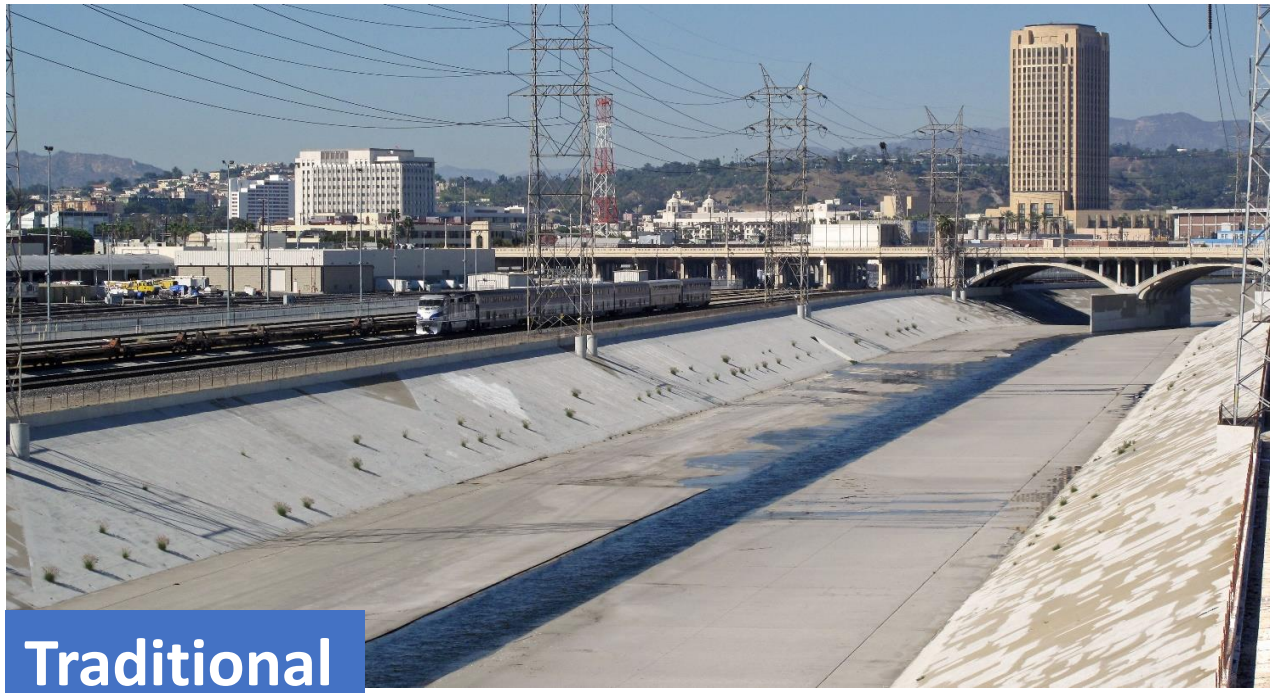
They also provide additional green space for downtown areas while reducing summer temperatures.

LID or Green Infrastructure

Traditional

LID or Green Infrastructure

Bioretention areas or bioswales filter out pollutants before they enter the drainage system.



Traditional

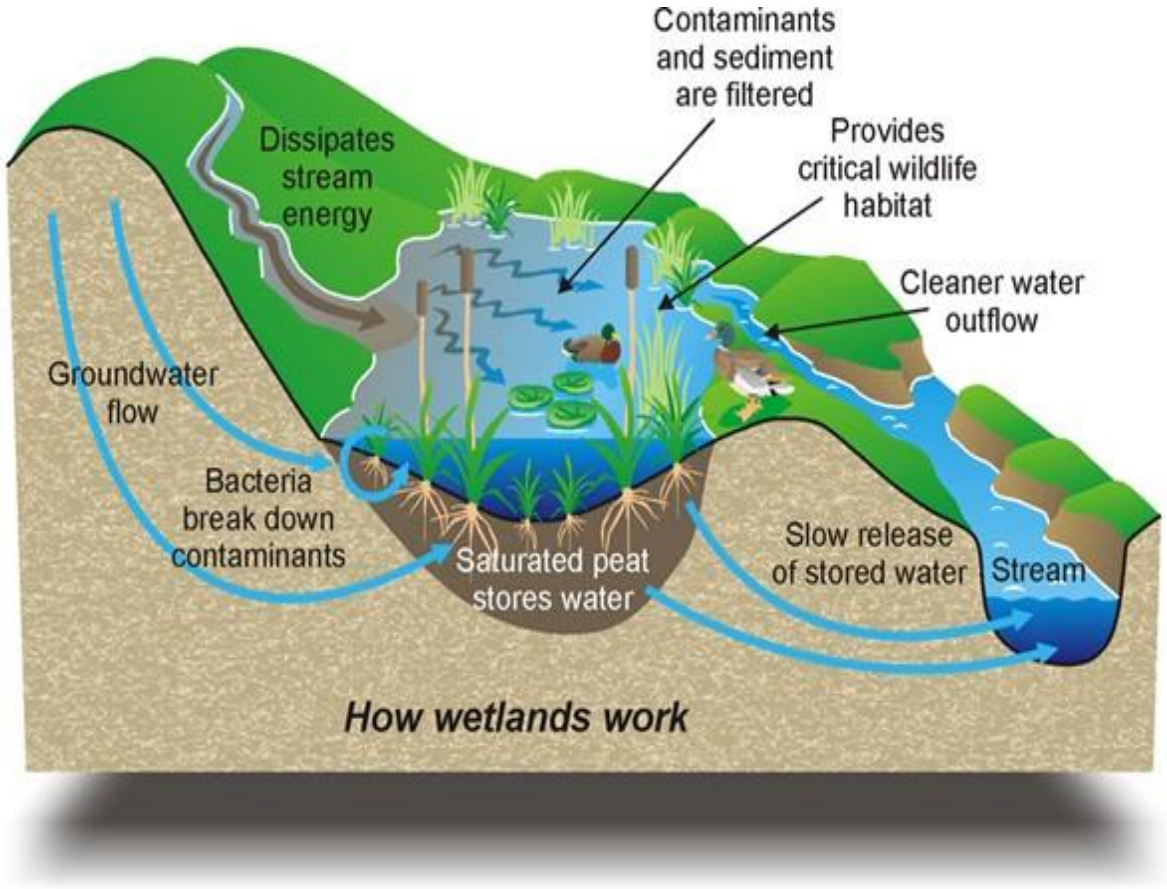
LID or Green Infrastructure

Gray infrastructure vs bioswales on a larger scale.

Detention areas or water quality ponds vs rain gardens

Traditional

LID or Green Infrastructure

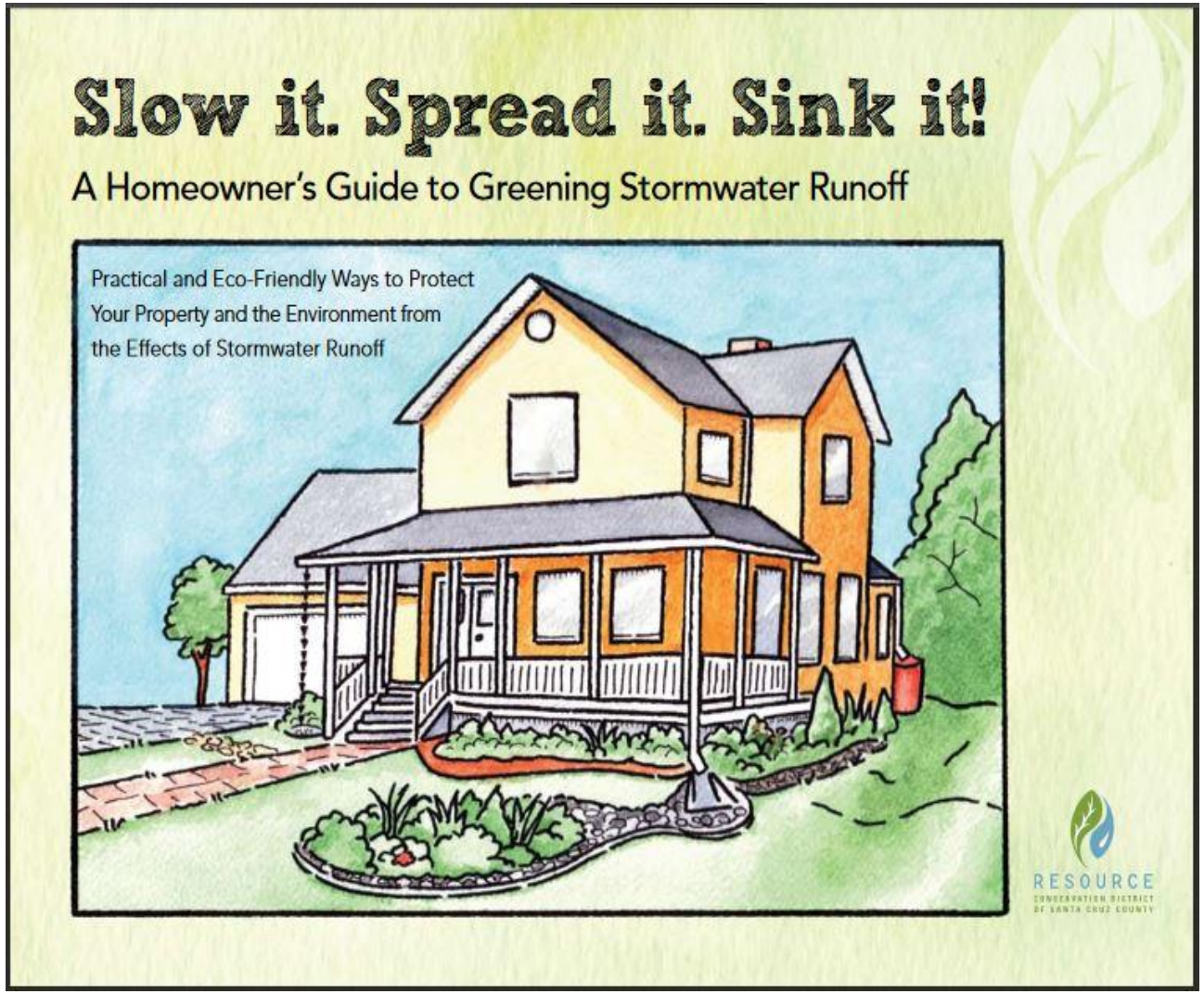


Constructed wetlands are another LID

So where do we start?

Start at home. Some of the easier ideas include:

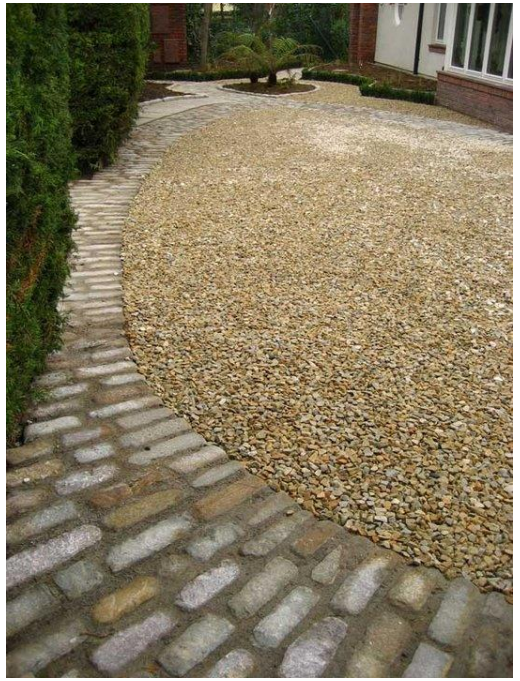
- Pick up litter and pet wastes,
- Compost grass clippings and leaves or use for mulch,
- Use only biodegradable cleaning and pesticide products,
- Add a layer of compost to your yard and mow on the highest level,
- Disconnect the downspout on the gutter or install a rain barrel and a rain garden.



Install Rain gardens to capture as much runoff as possible while allowing the captured water to infiltrate within 48hrs.

Let your creativity flow!

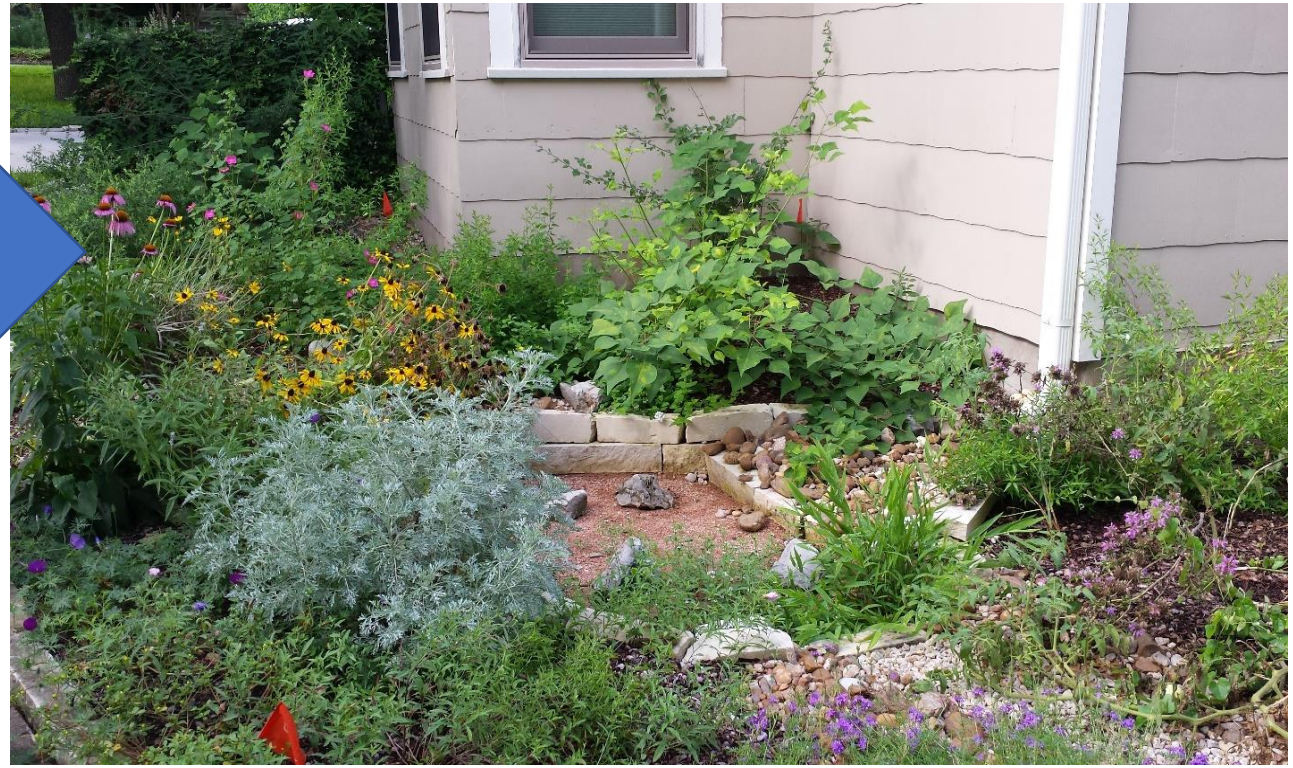
How many practices do you see?



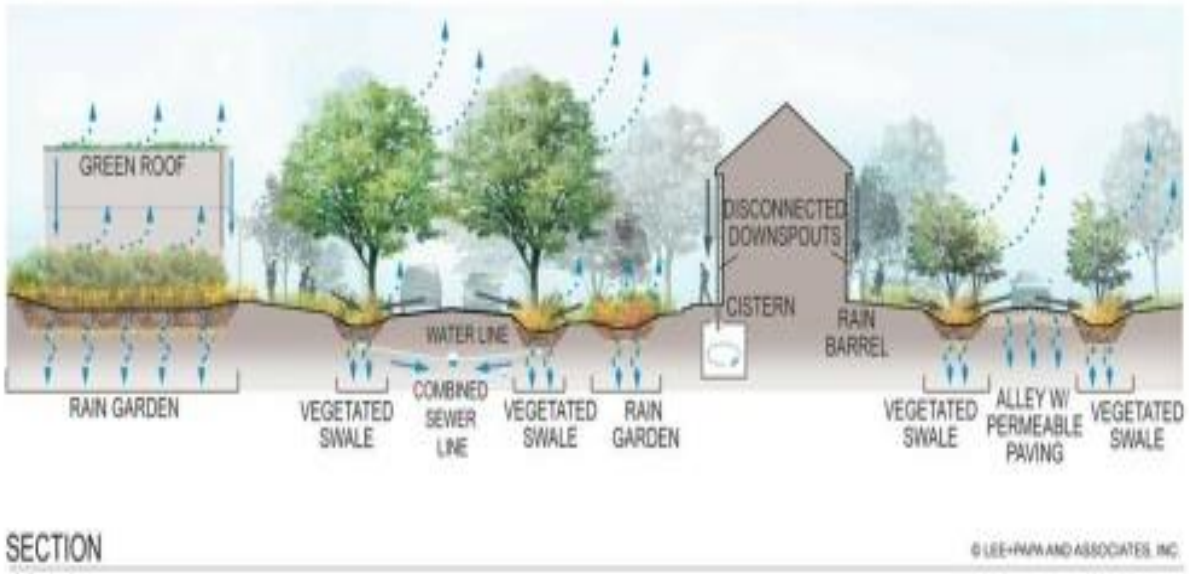
San Antonio home uses a Rain Garden:

Rain will soak into the soil providing moisture to the plants thus reducing the need for irrigation.

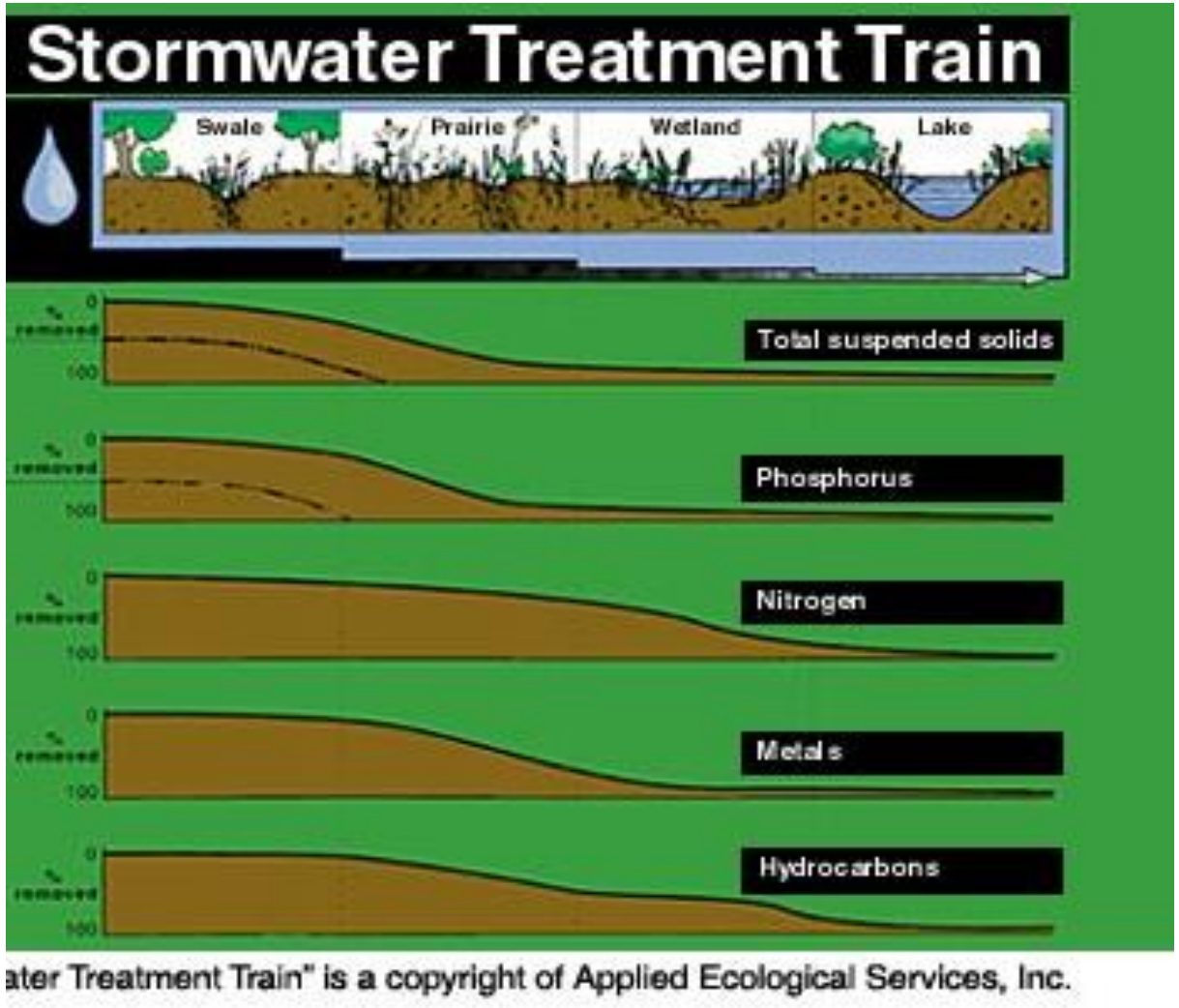
The gravel channel allows for excess rain to flow out into the grass.



A Treatment Train is more effective than just one large treatment and allows for multiple practices to be squeezed into a site.



Different types of practices are more effective in removing specific pollutants so a mixture of practices can result in better removal of pollutants on a site.



Use native plants to increase LID performance

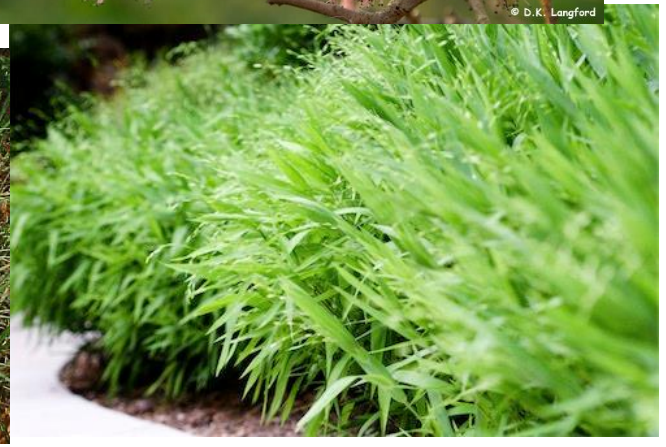


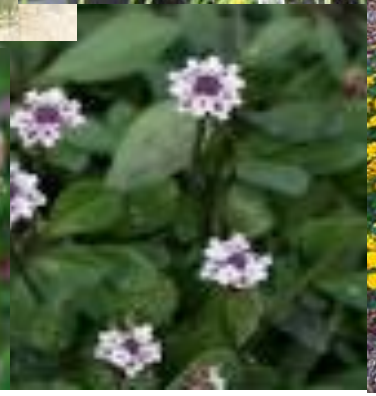






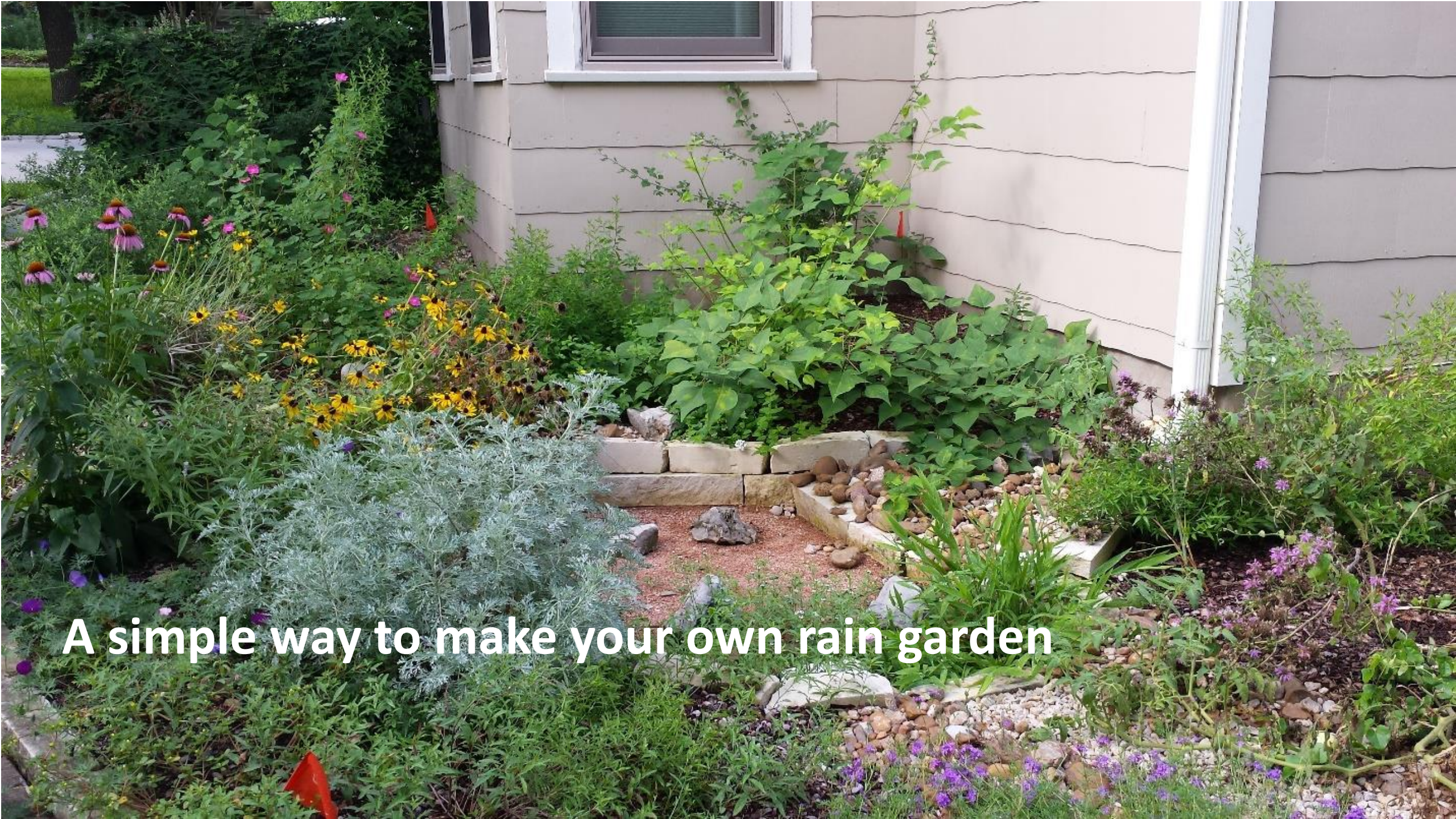






Benefits of Low Impact Development:

- Prevent water pollution
- Reduce flooding
- Protect our water resources
- Cool the air
- Save money
- Beautify neighborhoods
- Provide habitat for wildlife; butterflies, pollinators and hummingbirds
- Remove greenhouse gases to improve air quality

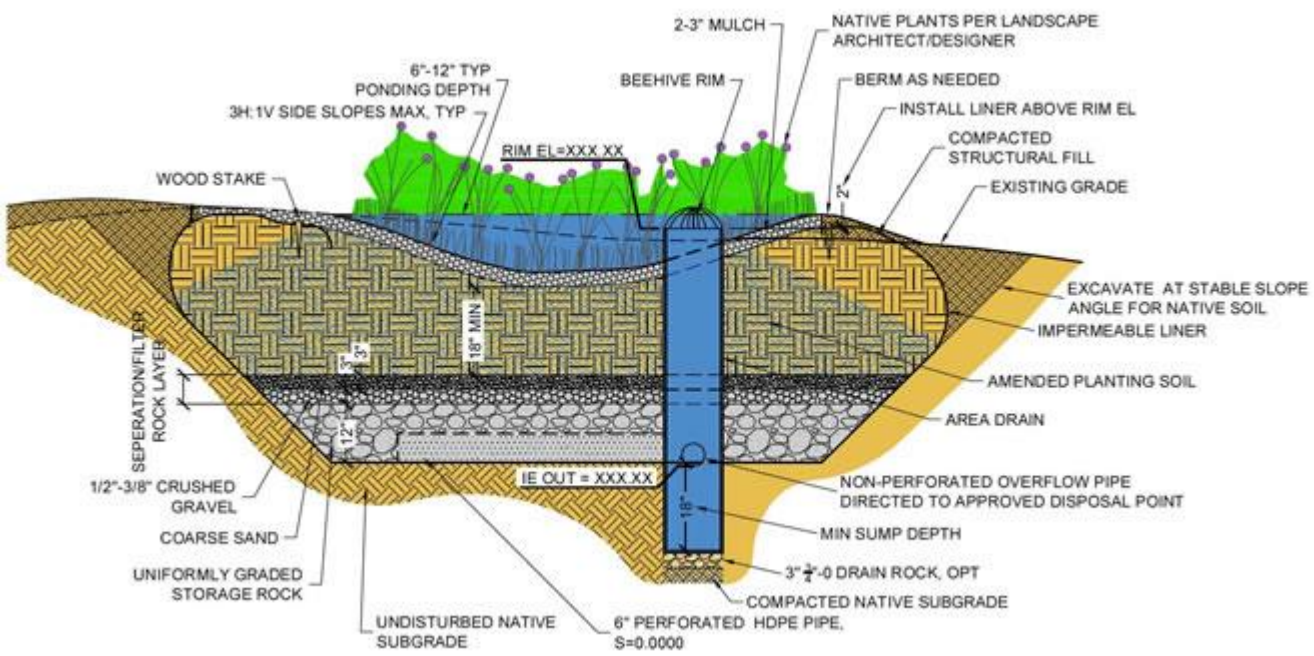

A simple way to make your own rain garden

How does a rain garden work?

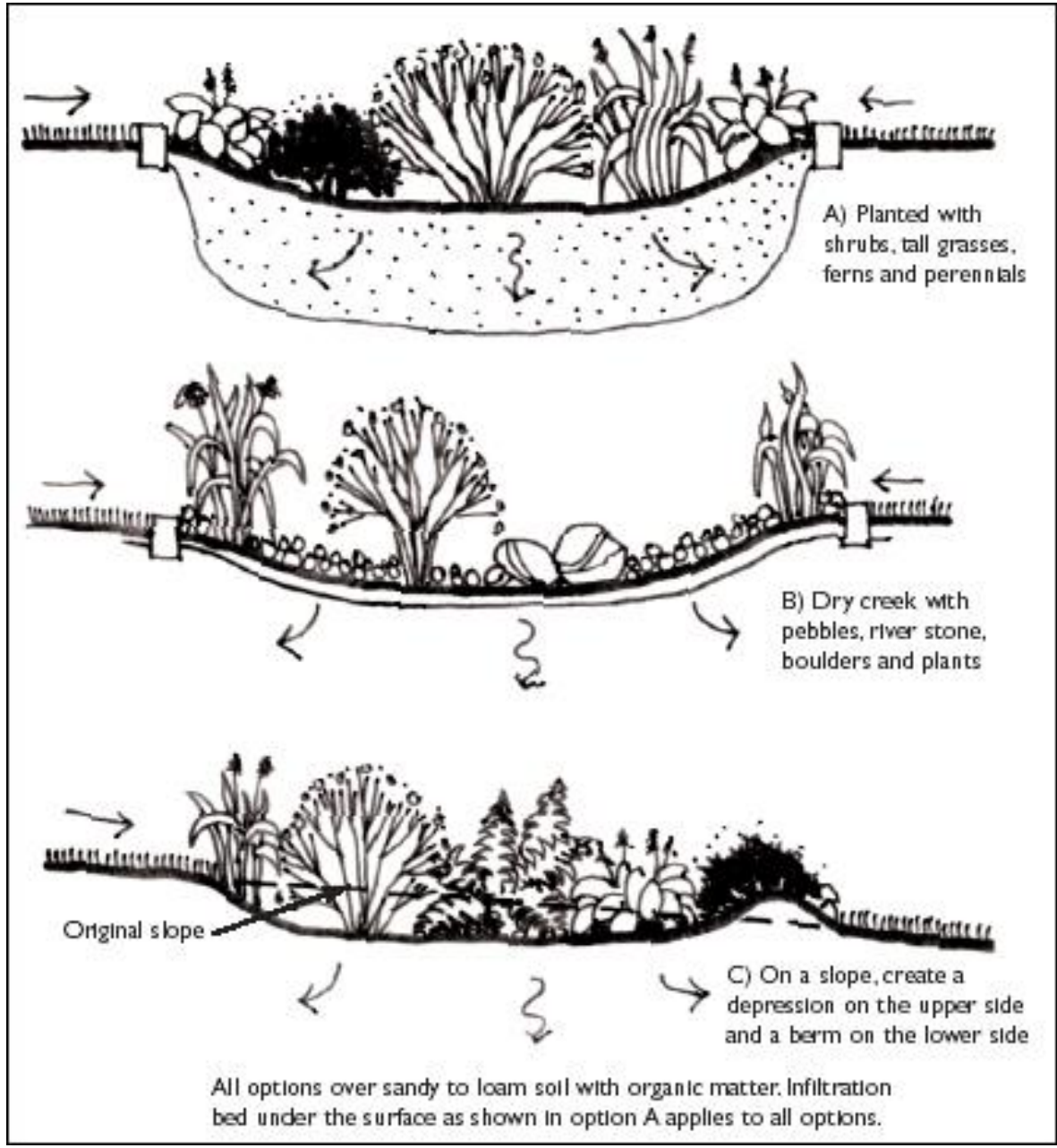
- Optimally a Rain Garden receives water from impervious (hard) surfaces such as rooftops, sidewalks, driveways and patios.
- The shallow depression of the garden holds the water so it can slowly infiltrate back into the soil as the plants, mulch and soil/granite naturally remove pollutants from the runoff.
- The water typically does not stay more than 24 hrs before infiltrating so does not create a problem for mosquitoes.
- Our rain gardens will have a mini “spillway” to allow excess water to flow around the garden and continue in its previous path.

* www.agawam.ma.us

There are many types:



Complex with under drains and over flow pipes or simple, using the slope of the land.



They can use a few plants; just grasses and/or sedges or complex with a variety of plants.

They can be located in Sun or Shade.


credit: Aaron Volkening

This home in Alamo Heights has the right side of the garden for herbs and vegetables. The rain from the gutter soaks into the soil, providing moisture to the plants for a longer period of time and thus reducing the need for irrigation.

The gravel channel allows for excess rain to flow out into the grass.

Materials used for ~550 sq ft gardens:

Weed barrier is used in the channel and in the bottom of the rain garden. ~ 3” of decomposed granite is applied over the fabric in the rain garden.

Mulch is used around the plants.

Limestone blocks or local limestone boulders will form the back of the rain garden to create a berm.

A variety of rocks and washed limestone will form the inlet channel and spillway.

Steps:

Use native and adapted, non-invasive plants to produce a xeric-wildscape.

- Small trees: Eve's necklace, TX mtn laurel, Anacacho, Redbud, TX persimmon, Possum haw
- Shrubs: Evergreen sumac, Agarito, Rosemary, Rockrose, Boneset, Mexican oregano, Salvia greggii
- Grasses/Sedges: Mulhly, Little Bluestem, Blue grama, Inland Sea Oats, Cedar sedge, Horsetails
- Flowering perennials: Daylilies, Milkweeds, Verbenas, Lantanas, Frogfruit, Turks cap, Purple coneflower, Mealy sage, Brown eye Susan, Blackfoot daisy, Blueshade, Pigeonberry, Blue Mist, Zexmania, Texas milkweed
- Yucca types: Red yucca, Manfreda
- Bulbs: Rain lilies, Iris

Native plants increase Rain Garden/LID performance

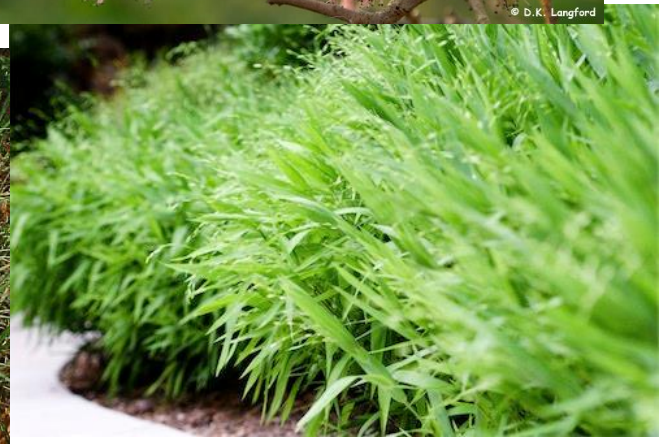


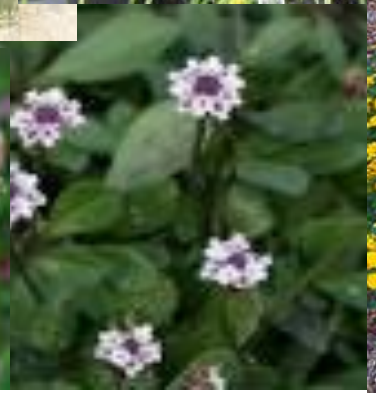












Maintenance: The secret to using native plants

- Maintain them like you want them to appear in your yard; if you want a “cleaner” look. Don’t be afraid to cut back or even “shape”.
- Weeding: take some time each week ~1 hr, so it will not turn into a disaster zone.
- Unwanted plants that are the biggest issue:
  - Bermuda grass
  - Johnson grass
  - Beggar’s lice
  - Tree seedlings; Hackberry, Ligustrum, Oak, etc.
  - Schedule at least 1 work day during the year for major pruning and mulching. Bitters Brush Site, CPS Energy and some tree pruners will provide course mulch for free.

Thank you and I hope you are inspired!