Taking it up a Notch!

LAKE GEORGE STANDARDS AND
THE DO'S AND DON'TS OF DESIGN

NORTH COUNTRY STORMWATER TRADESHOW & CONFERENCE

OCTOBER 2022

The Era of Teleconferences is Done, Virtually

Hollywood Squares: 1960's-1980's TV

Reality TV?

Virtual Conferences…

Photo Source: https://t4.ftcdn.net/jpg/03/86/56/37/360_F_386563704_UCMZsPxWtikY77GVWp4BNFvtCMUkNh7h.jpg

Finn :)
Five Year Review

Finn :)
Five Year Review

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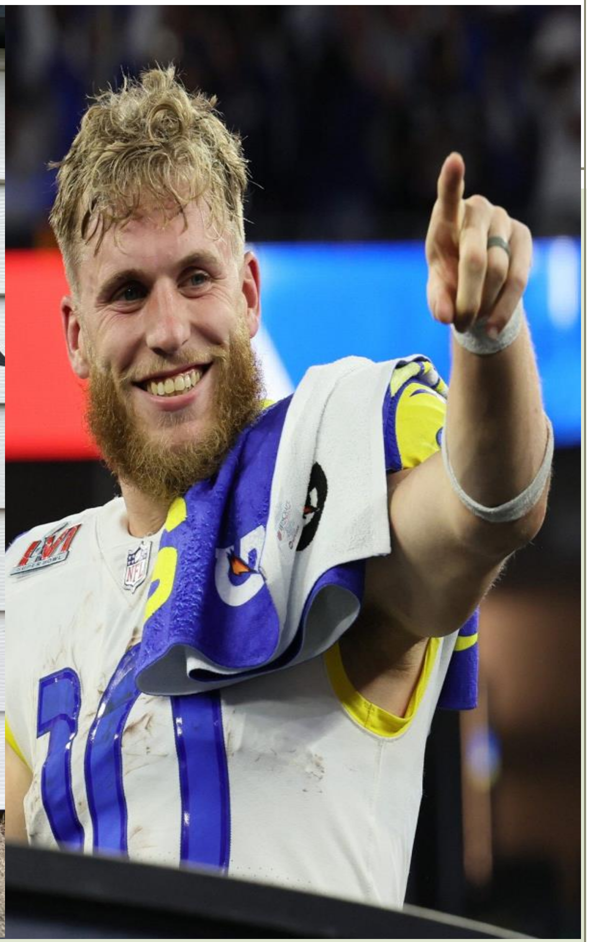
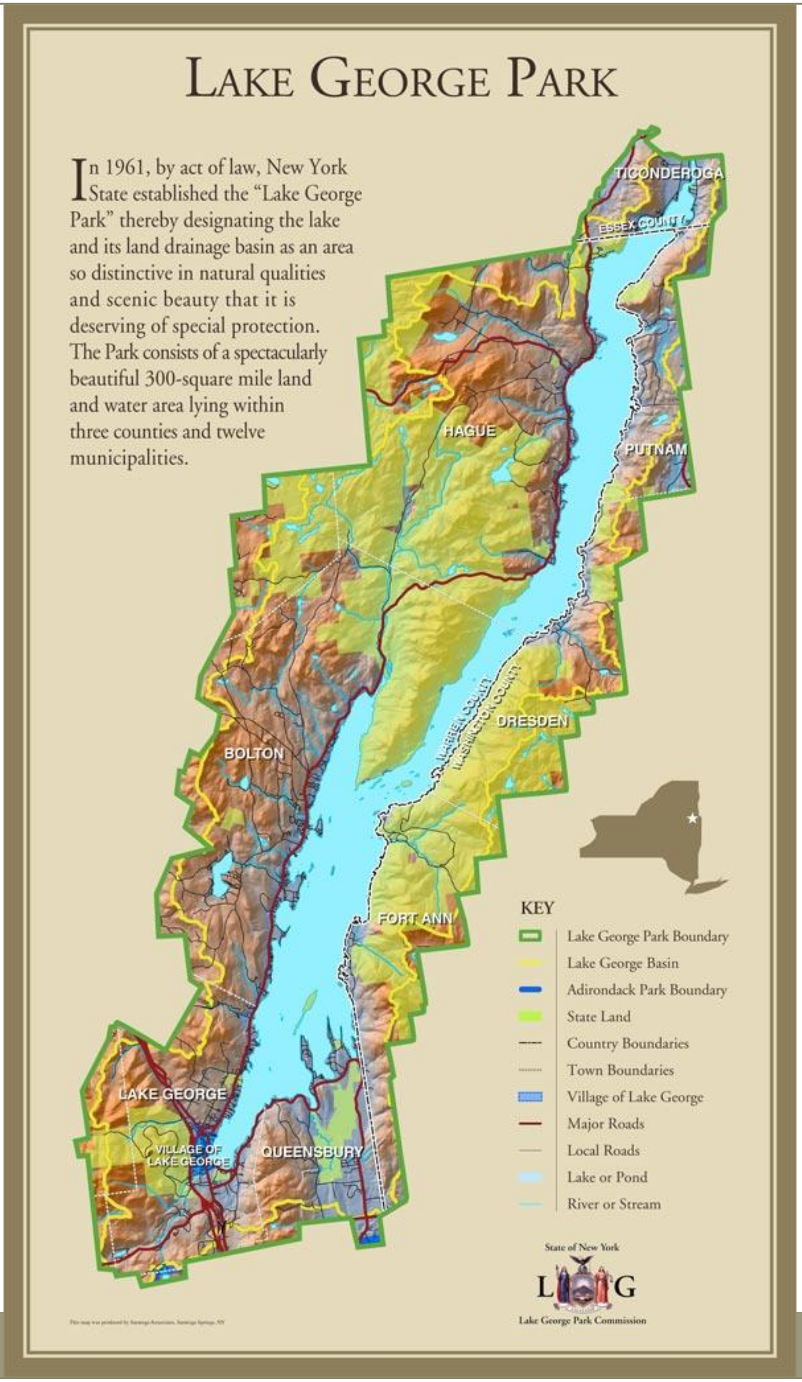
Five Year Review



What is the Lake George Park Commission?

The Lake George Park Commission is a NYS agency established to oversee and manage the unique resources of the "Lake George Park" especially the lake's superior water quality.

To do so, the Commission is conveyed special authority and responsibility by New York State. The Commission's programs fill critical gaps to ensure the lake's protection and encourage cooperation among the many public and private entities whose common goal is the lake's preservation.



The Problem: Stormwater Runoff and Water Quality

- "Nation's largest source of water quality problems", EPA
- Pollutants in stormwater runoff are the single largest impact to Lake George water quality and clarity
- Primary pollutants: phosphorus, nitrogen, sediment, chlorides

The Cause: Stormwater Runoff and Water Quality

- Removing vegetation
  - Decreases interception and evapotranspiration
- Impervious surfaces increase runoff:
  - Pollutants are increased
  - Water recharge is reduced
  - Floods more frequent and severe
  - Water temperature increases
- Increased flow causes:
  - Erosion
  - Wider, deeper channels
  - Lower base flow levels

Source: US EPA
Photo Source: https://i.etsystatic.com/17132315/r/il/a4ad8f/3410986446/il_794xN.3410986446_npai.jpg

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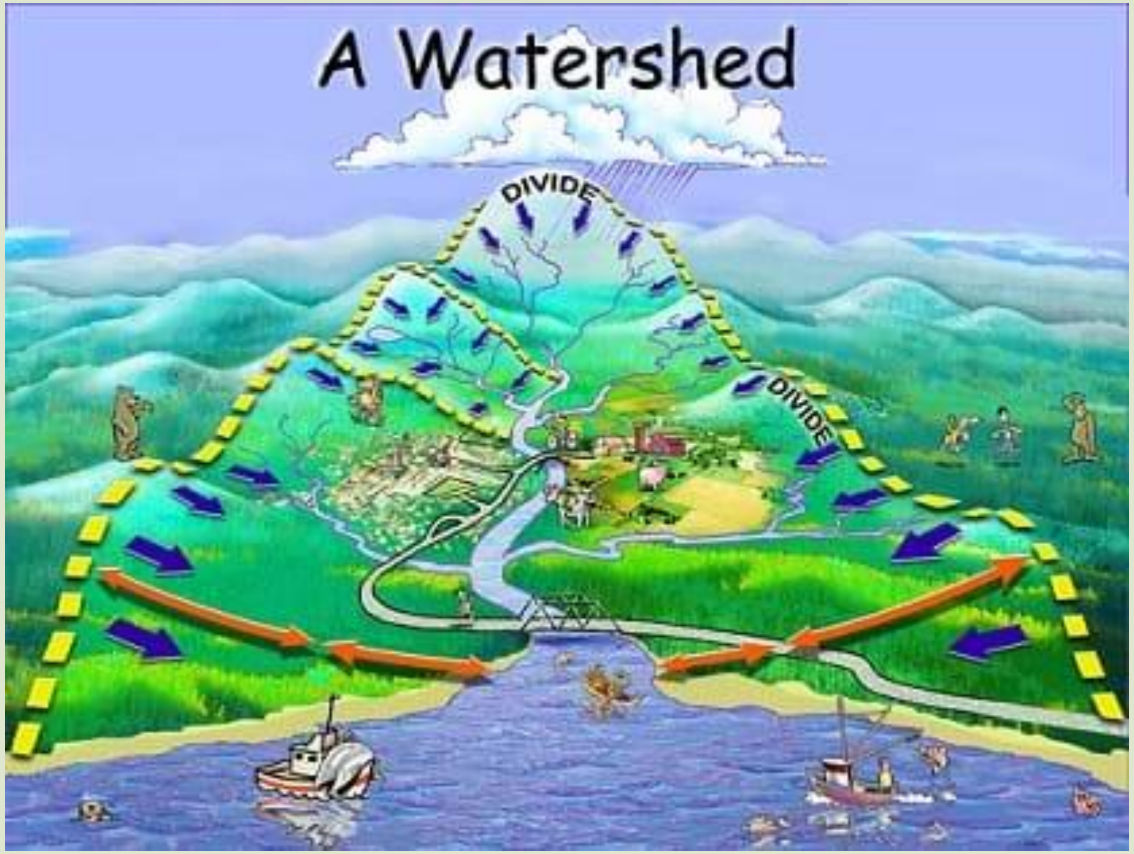

Source: US EPA
Photo Source: https://teachengineering.org/content/cub_/lessons/cub_watershed/cub_watershed_lesson01_figure1.jpg

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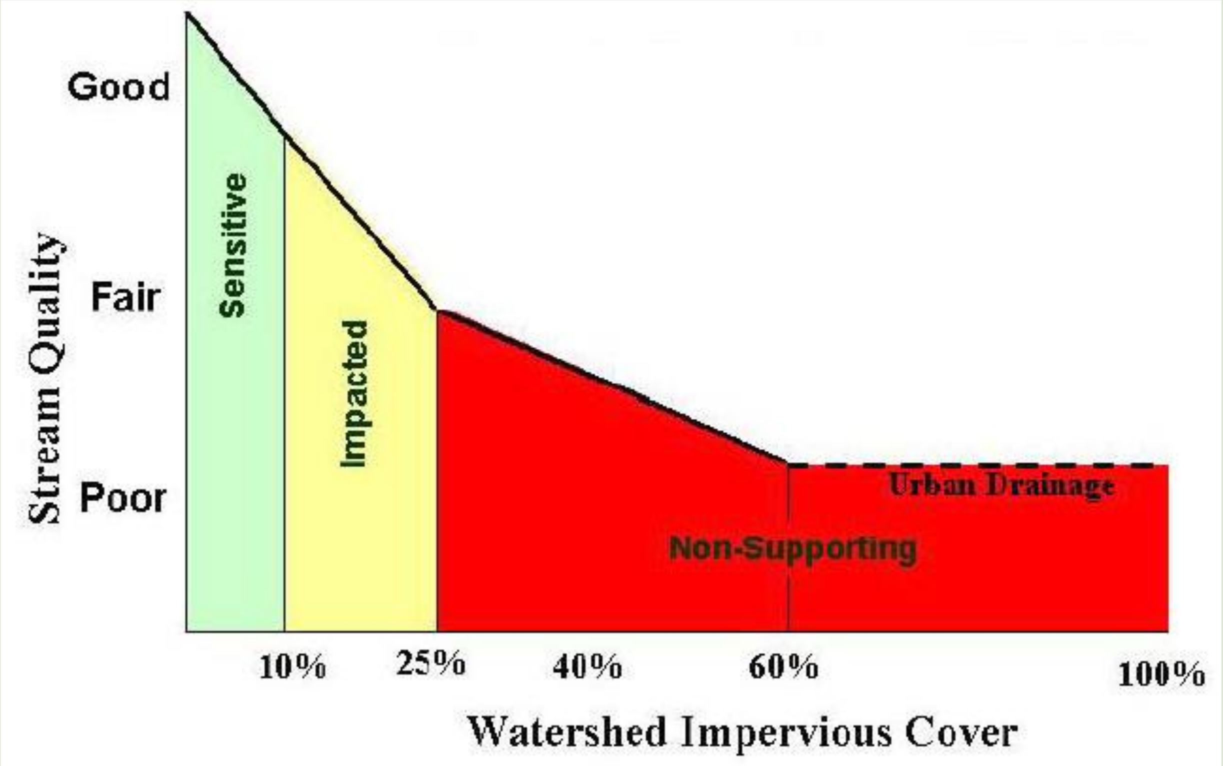
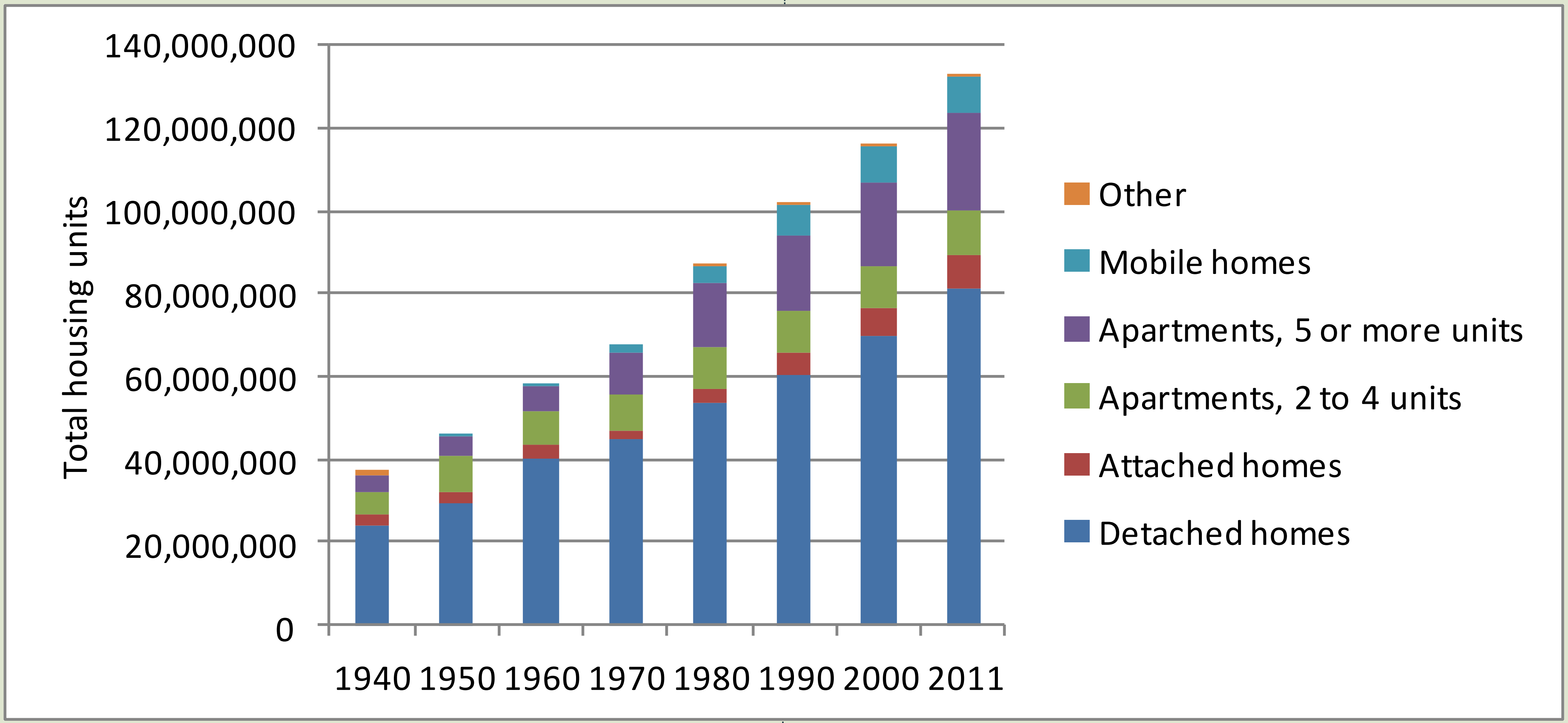


Source: US EPA
Photo Source: Center for Watershed Protection, "Impacts of Iimpervious Cover on Aquatic Systems," March 2003

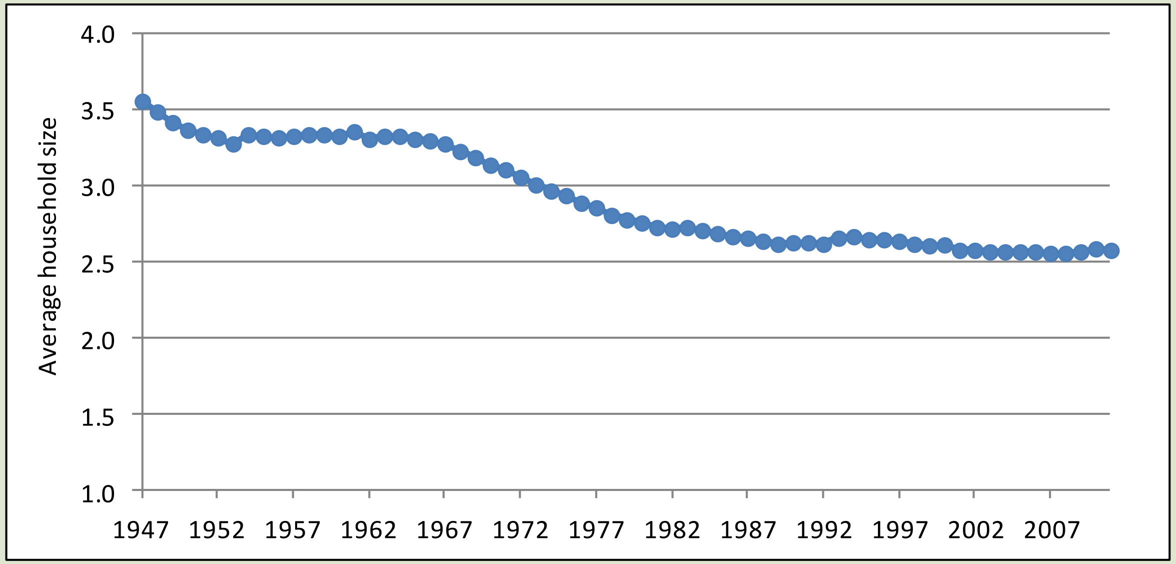
National Trends in Development: Housing Units



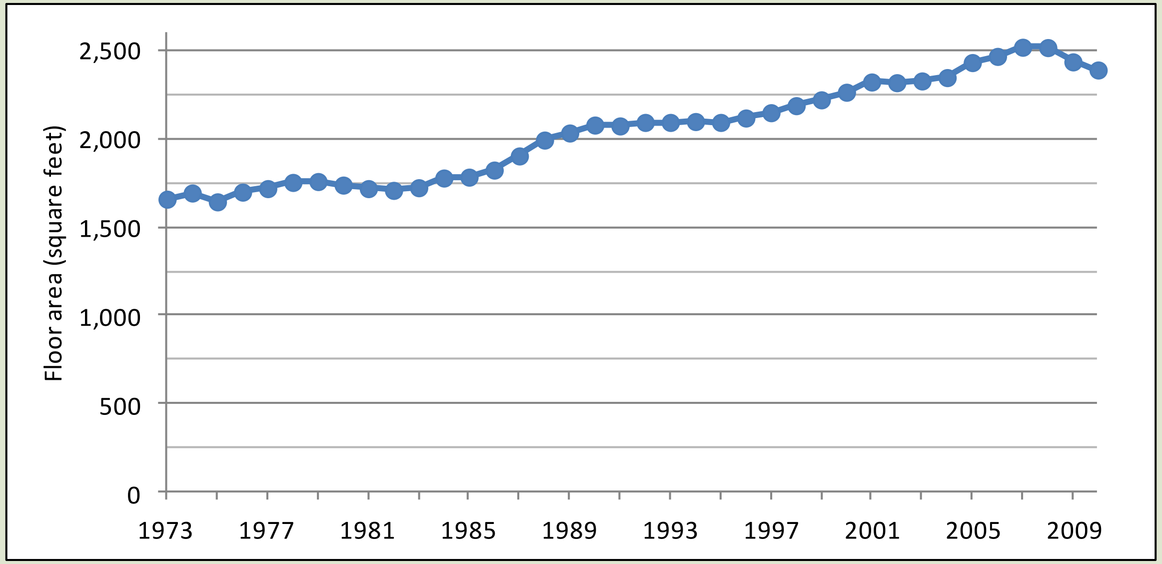
Source: US EPA and US Census Bureau

National Trends: Household Size Vs House Size

of People Per House



Floor Area Per House



Source: US EPA and US Census Bureau

The Impact: National Stormwater Numbers

- Per US EPA, Urban-related stormwater runoff is thought to be responsible for the impairment of:
  - 51,548 miles of rivers and streams
  - 858,186 acres of lakes, reservoirs, & ponds
  - 13,867 square miles of Great Lakes open water
  - Streamflow is altered at 86% of monitoring stations in developed areas.
    - Majority of waters have not been assessed

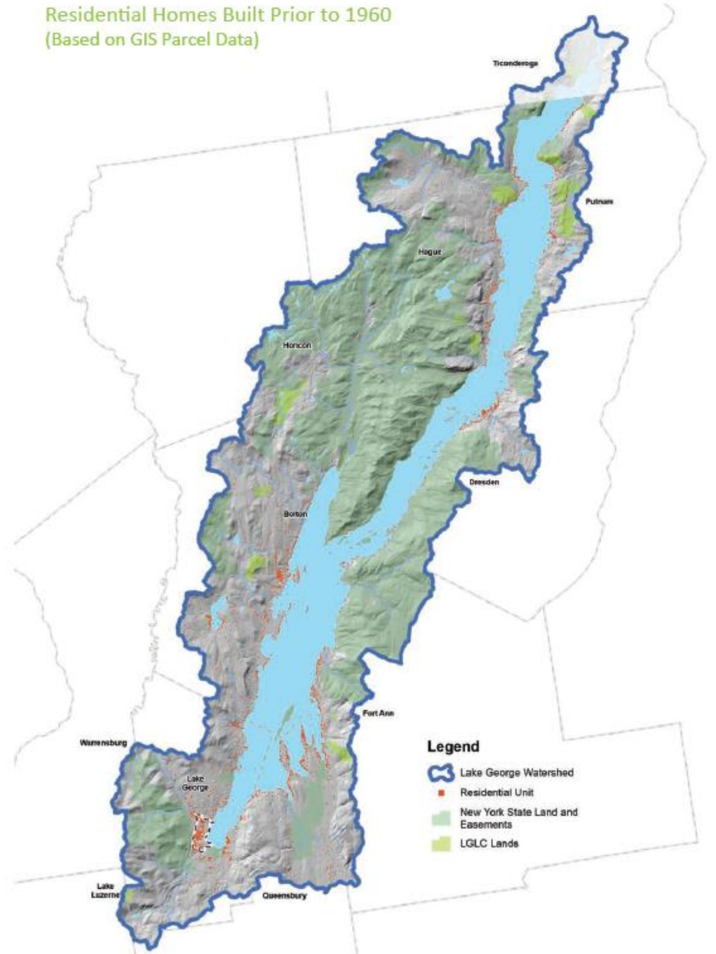
Source: US EPA

Development in the Lake George Watershed

Pre-1960	1980	2015

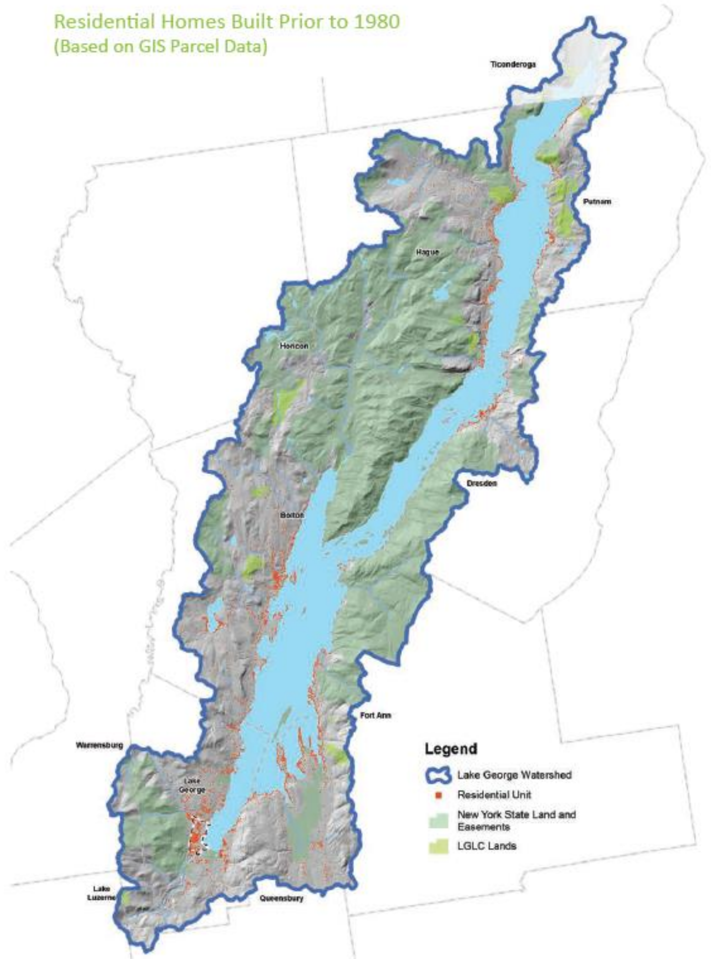
7 LAKE GEORGE WATERSHED DATA ATLAS

Residential Homes Built Prior to 1960
(Based on GIS Parcel Data)



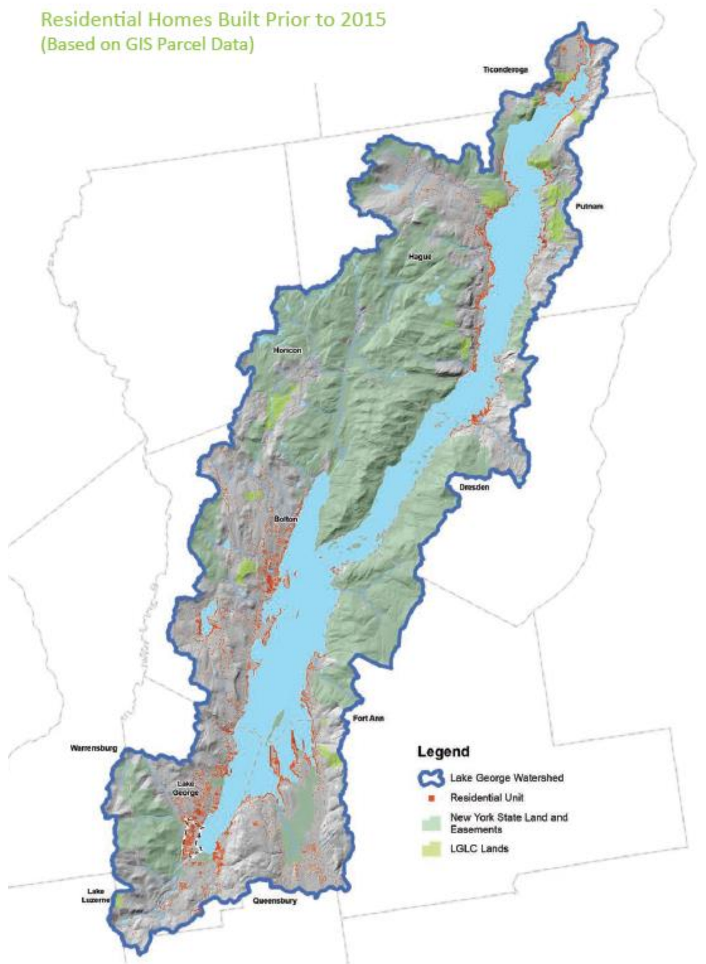
9 LAKE GEORGE WATERSHED DATA ATLAS

Residential Homes Built Prior to 1980
(Based on GIS Parcel Data)



HOUSING CHARACTERISTICS 12

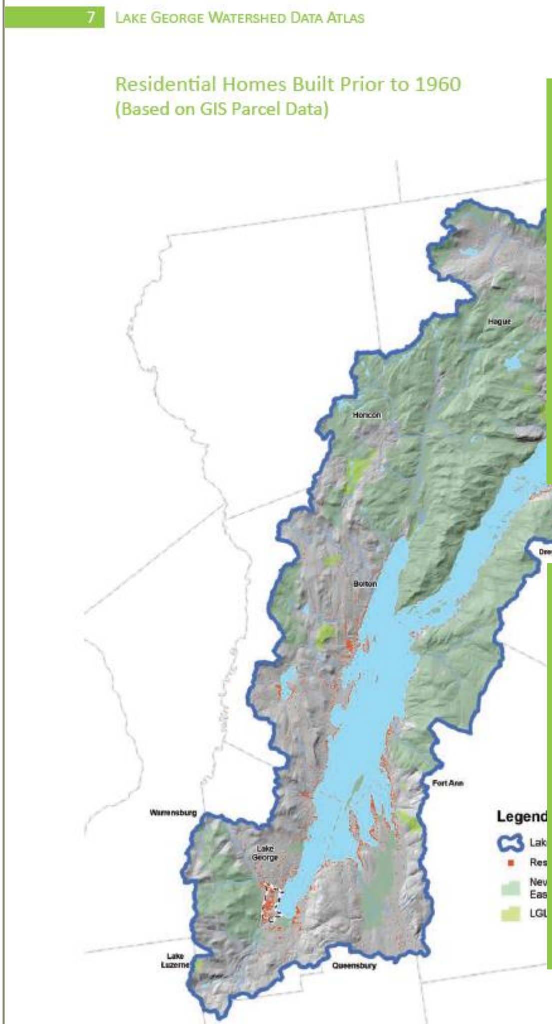
Residential Homes Built Prior to 2015
(Based on GIS Parcel Data)

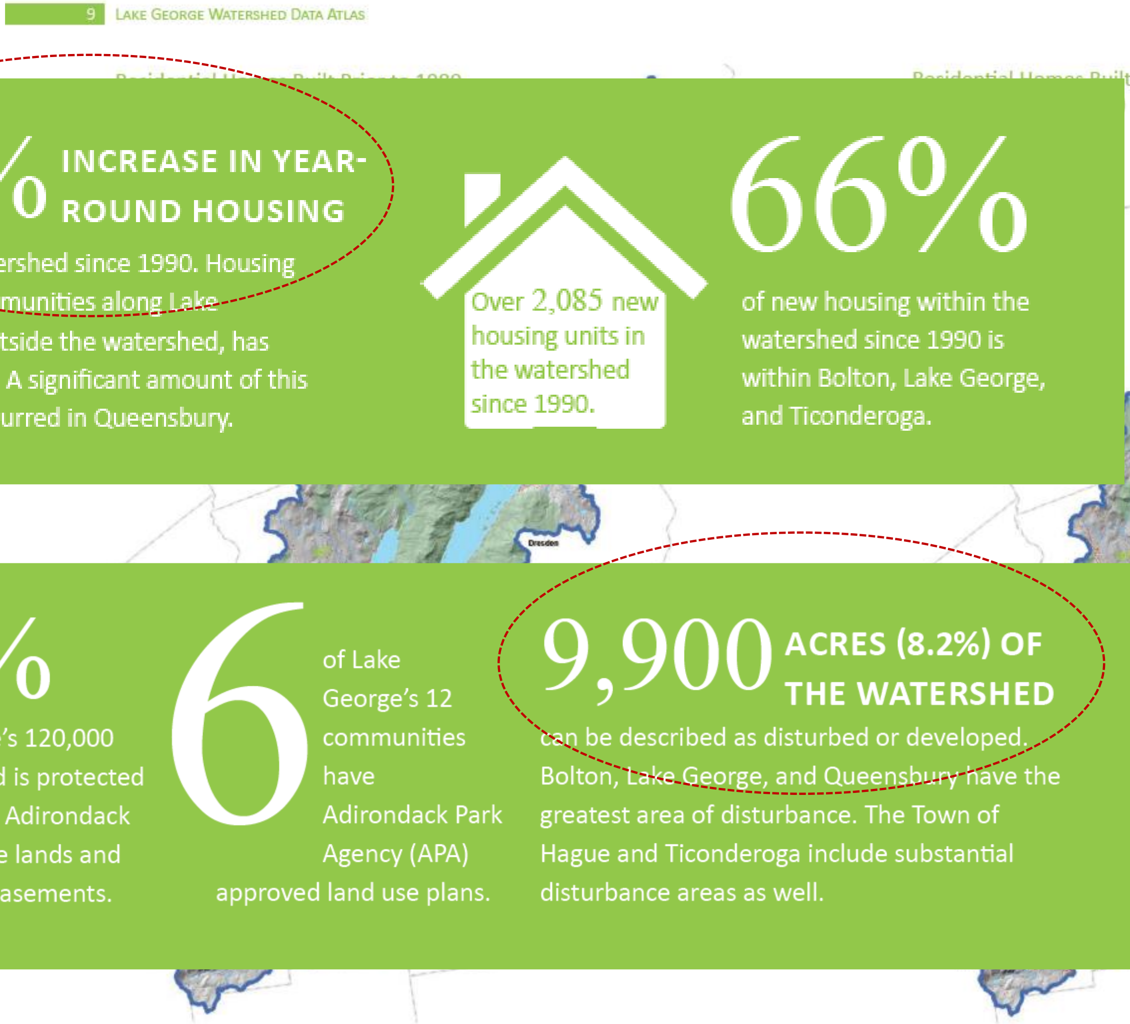


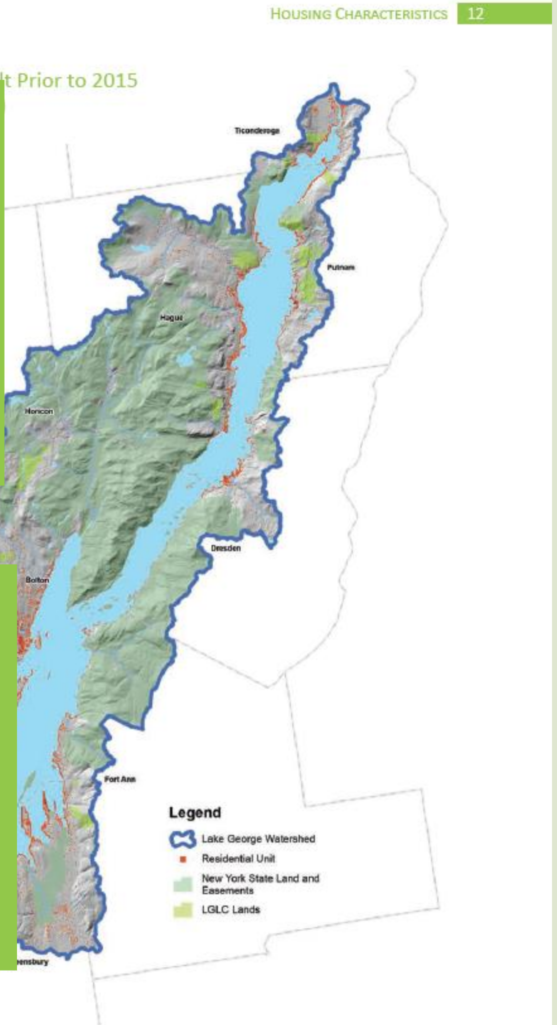
Source: Lake George Association, "Lake George Watershed Data Atlas" Lake George, NY, December 2016

Development in the Lake George Watershed

Pre-1960 | 1980 | 2015







27% INCREASE IN YEAR-ROUND HOUSING within the watershed since 1990. Housing within the communities along Lake George, but outside the watershed, has increased 27%. A significant amount of this growth has occurred in Queensbury.

Over 2,085 new housing units in the watershed since 1990.

66% of new housing within the watershed since 1990 is within Bolton, Lake George, and Ticonderoga.

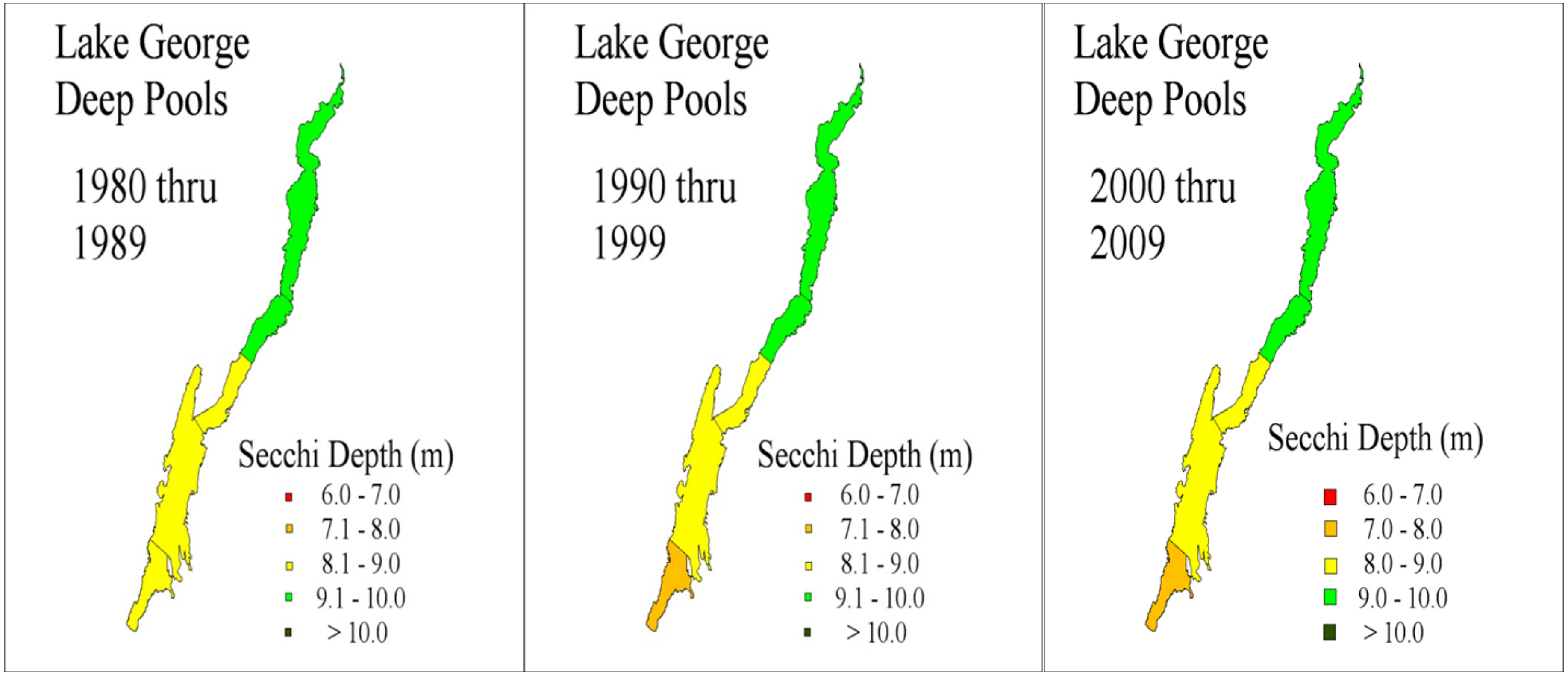
50% of Lake George's 120,000 acre watershed is protected land, including Adirondack Forest Preserve lands and conservation easements.

6 of Lake George's 12 communities have Adirondack Park Agency (APA) approved land use plans.

9,900 ACRES (8.2%) OF THE WATERSHED can be described as disturbed or developed. Bolton, Lake George, and Queensbury have the greatest area of disturbance. The Town of Hague and Ticonderoga include substantial disturbance areas as well.

Source: Lake George Association, "Lake George Watershed Data Atlas" Lake George, NY, December 2016

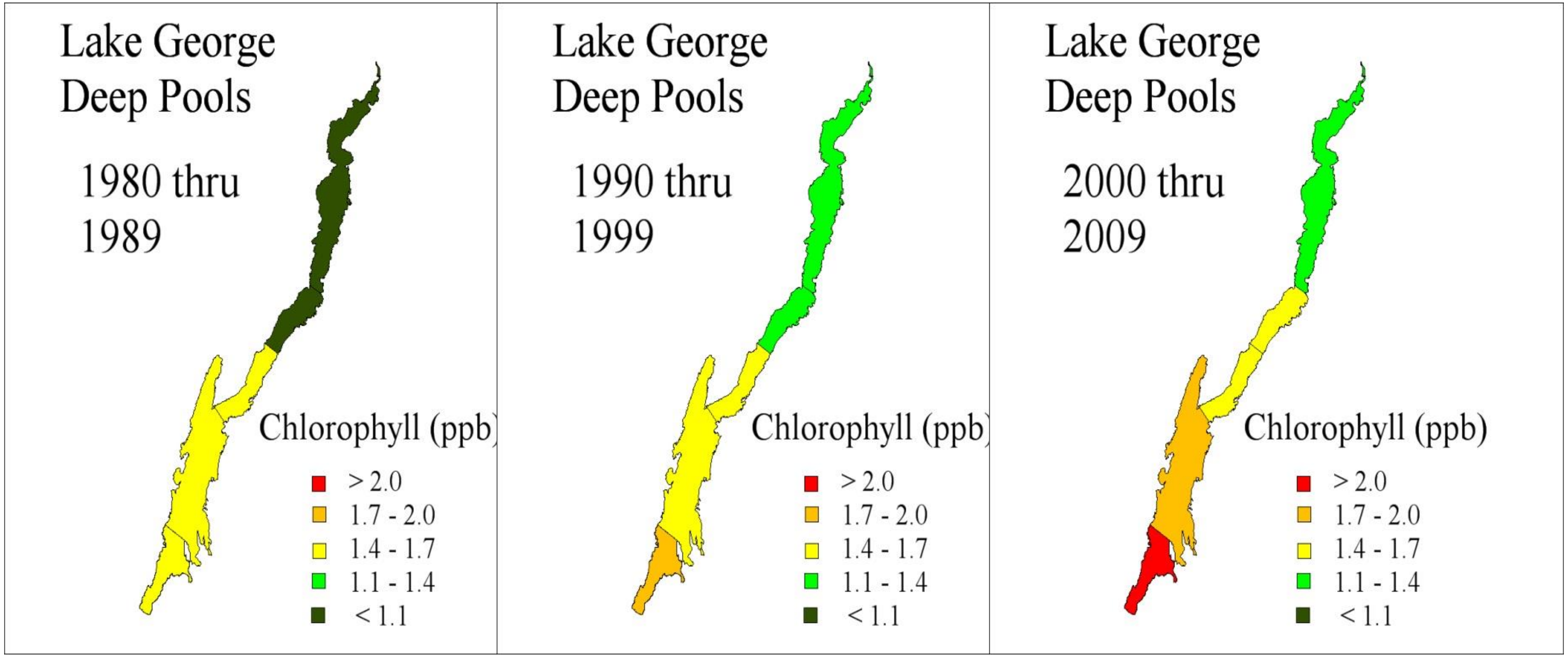
Reductions in water clarity



- Secchi disk data show a decline in transparency over time – 6% lakewide over 30 yrs
- Rate of decline is similar in all basins
- A clear south to north gradient in transparency is present
- Difference of 1.6 m from south to north
- Increased algal production may account for the difference

Source: "The State of the Lake Water Quality: Highlights of Over 30 Years of Research 1980-2013", presentation by Lawrence Eichler, Darrin Freshwater Institute

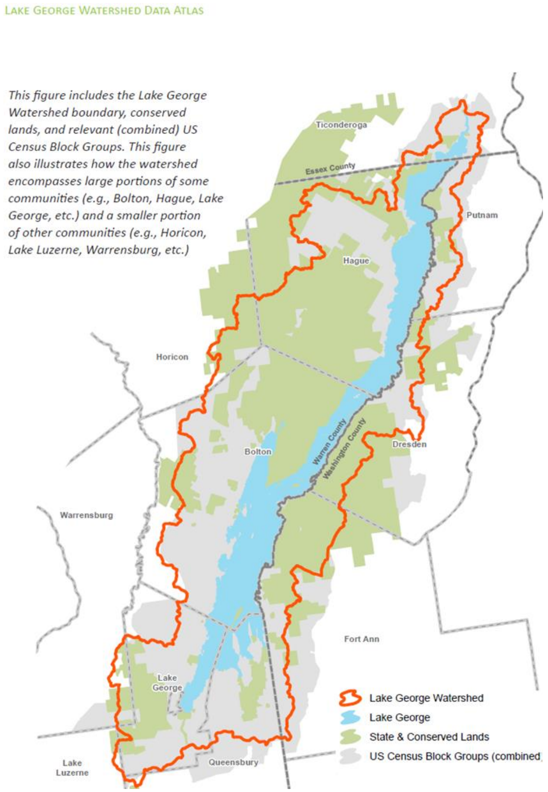
Increased Chlorophyll Levels Observed



- Chlorophyll increased lake-wide by 33% over 30 years
- Indicative of increased primary productivity
- Chlorophyll levels show a strong south to north gradient
- The differences between basins are increasing over time

Source: "The State of the Lake Water Quality: Highlights of Over 30 Years of Research 1980-2013", presentation by Lawrence Eichler, Darrin Freshwater Institute

Trends in Water Quality Correlate with Development



Municipality	Watershed Acres	Impervious Category	Watershed Acres	(%) Town Watershed	(%) Total
Bolton	32,835	Built or Hardscape	1,190.8	3.6%	7.5%
		Maintained Landscape	206.0	0.6%	
		Dev. Open Space & Cleared	1,076.5	3.3%	
Dresden	9,273	Built or Hardscape	132.0	1.4%	3.3%
		Maintained Landscape	19.8	0.2%	
		Dev. Open Space & Cleared	152.7	1.6%	
Fort Ann	11,521	Built or Hardscape	132.8	1.2%	3.0%
		Maintained Landscape	3.4	0.0%	
		Dev. Open Space & Cleared	210.0	1.8%	
Hague	29,728	Built or Hardscape	652.7	2.2%	4.5%
		Maintained Landscape	52.1	0.2%	
		Dev. Open Space & Cleared	623.7	2.1%	
Horicon	3,633	Built or Hardscape	12.6	0.3%	0.4%
		Dev. Open Space & Cleared	0.9	0.0%	
Lake George (T)	14,270	Built or Hardscape	1,139.2	8.0%	16.9%
		Maintained Landscape	259.9	1.8%	
		Dev. Open Space & Cleared	1,017.2	7.1%	
Lake George (V)	383	Built or Hardscape	222.4	58.1%	95.1%
		Maintained Landscape	61.2	16.0%	
		Dev. Open Space & Cleared	80.6	21.0%	
Lake Luzerne	223	Built or Hardscape	5.3	2.4%	4.5%
		Dev. Open Space & Cleared	4.8	2.2%	
Putnam	5,528	Built or Hardscape	131.5	2.4%	5.2%
		Maintained Landscape	19.7	0.4%	
		Dev. Open Space & Cleared	135.6	2.5%	
Queensbury	8,623	Built or Hardscape	528.7	6.1%	18.6%
		Maintained Landscape	219.1	2.5%	
		Dev. Open Space & Cleared	860.2	10.0%	
Ticonderoga	2,979	Built or Hardscape	197.9	6.6%	27.1%
		Maintained Landscape	87.5	2.9%	
		Dev. Open Space & Cleared	522.3	17.5%	
Warrensburg	1,864	Built or Hardscape	7.8	0.4%	0.4%
Total Watershed	120,860	Built or Hardscape	4,353.8	3.6%	8.2%
		Maintained Landscape	928.6	0.8%	
		Dev. Open Space & Cleared	4,684.6	3.9%	

- Similar to water quality, land development has a strong south to north gradient
- In the south basin, 19% of the watershed contains 43% of the hardscape
- Areas of decreased water quality are associated with greater development

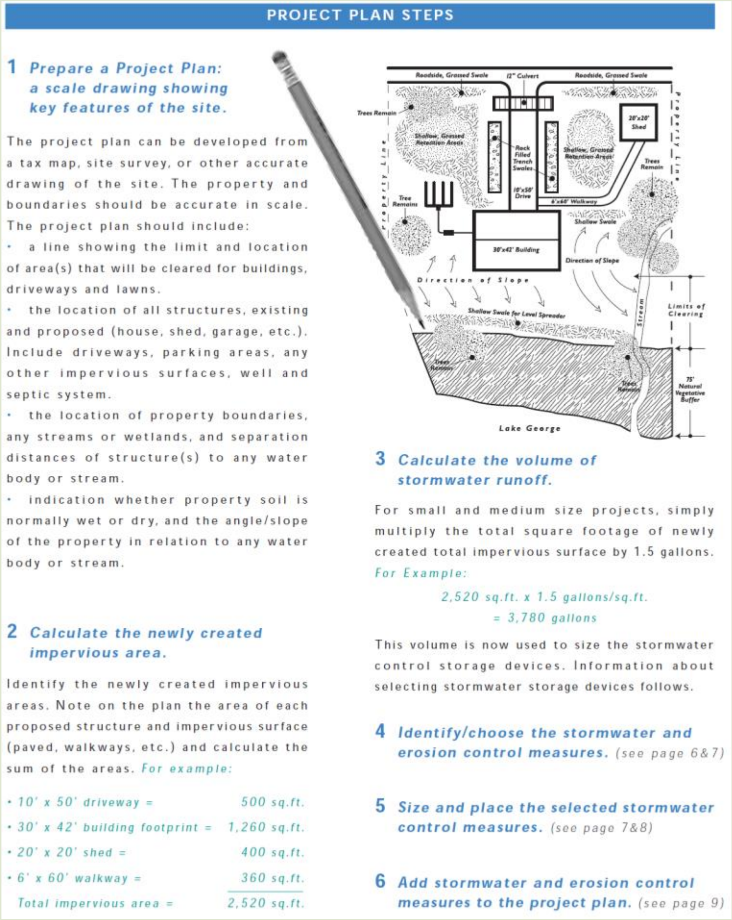
Source: Lake George Association, "Lake George Watershed Atlas", March 2016

What we do?... Take it up a notch!
Watershed-Based Stream and Stormwater Regulations

- SW Effective September 1990

- Key Elements
  - Low Threshold of Jurisdiction
    - 1,000 sqft of new impervious area, or
    - 5,000 sqft of land disturbance

  - Post Construction SWCM's Limiting Offsite Impacts through onsite Volume Control



PROJECT PLAN STEPS

1 Prepare a Project Plan: a scale drawing showing key features of the site.

The project plan can be developed from a tax map, site survey, or other accurate drawing of the site. The property and boundaries should be accurate in scale. The project plan should include:

- a line showing the limit and location of area(s) that will be cleared for buildings, driveways and lawns.
- the location of all structures, existing and proposed (house, shed, garage, etc.). Include driveways, parking areas, any other impervious surfaces, well and septic system.
- the location of property boundaries, any streams or wetlands, and separation distances of structure(s) to any water body or stream.
- indication whether property soil is normally wet or dry, and the angle/slope of the property in relation to any water body or stream.

2 Calculate the newly created impervious area.

Identify the newly created impervious areas. Note on the plan the area of each proposed structure and impervious surface (paved, walkways, etc.) and calculate the sum of the areas. *For example:*

- 10' x 50' driveway = 500 sq.ft.
- 30' x 42' building footprint = 1,260 sq.ft.
- 20' x 20' shed = 400 sq.ft.
- 6' x 60' walkway = 360 sq.ft.

Total impervious area = 2,520 sq.ft.

Lake George

3 Calculate the volume of stormwater runoff.

For small and medium size projects, simply multiply the total square footage of newly created total impervious surface by 1.5 gallons. *For Example:*

2,520 sq.ft. x 1.5 gallons/sq.ft.
= 3,780 gallons

This volume is now used to size the stormwater control storage devices. Information about selecting stormwater storage devices follows.

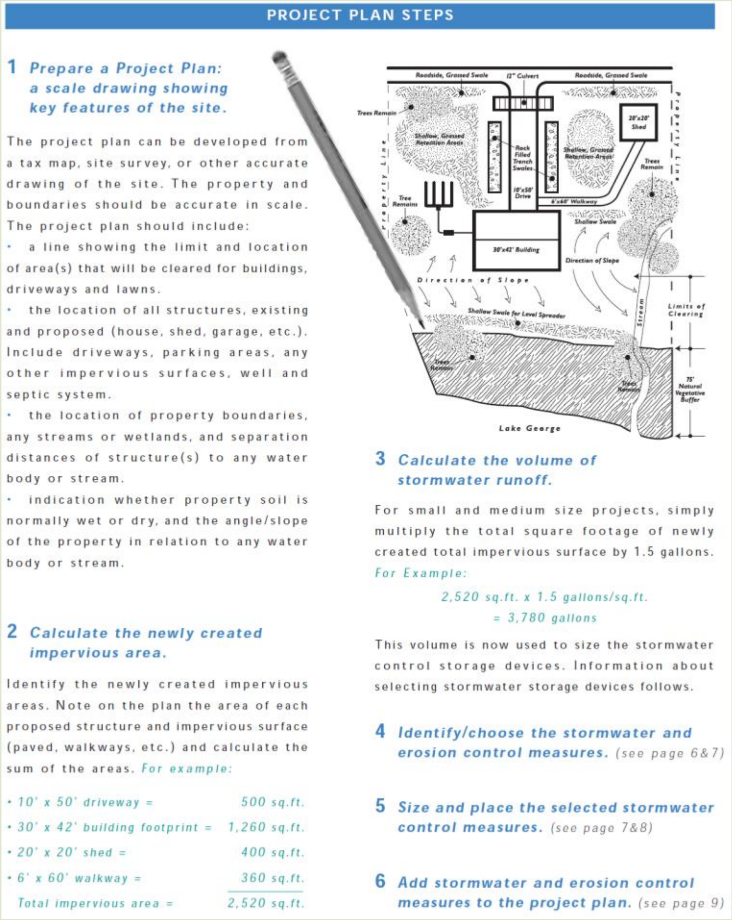
4 Identify/choose the stormwater and erosion control measures. (see page 6&7)

5 Size and place the selected stormwater control measures. (see page 7&8)

6 Add stormwater and erosion control measures to the project plan. (see page 9)

Commission Stormwater Regulations

- Minor Projects
  - <15,000 sqft land disturbance
  - Infiltration Device Performance:
    - 1.5 gallons / sqft Impervious Area
- Major Projects
  - >15,000 sqft land disturbance
  - Akin to Full SWPPP
  - Infiltration Device Performance
    - 10-yr/24-hr Storm Volume
    - 25-yr/24-hr Storm Rate
  - Retrofit existing development



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Bending The Curve

- For the first time in 20+ years, the Commission conducted a full evaluation of its regulations
- Current condition still leads to slow decline
- How do we change?

- NEW Stream Corridors
- SW Device Setbacks
- Fertilizer Restrictions
- SW Retrofits

AA-S Stream Corridor Regulations

- Multiple benefits of stream buffers
  - Reduce sediment, nutrients, stream bank erosion, flood impacts, stream temps, etc.

AA-S Stream Corridor Regulations

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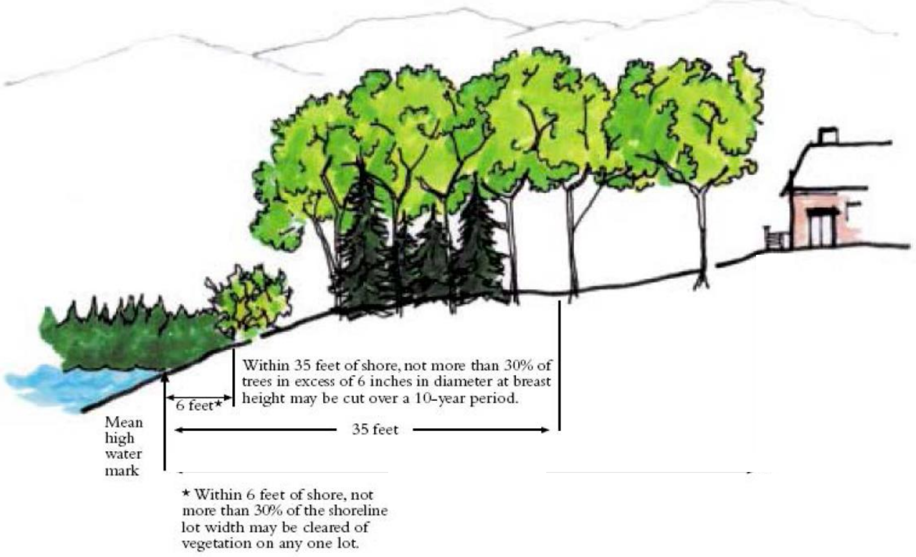
  - Reduce sediment, nutrients, stream bank erosion, flood impacts, stream temps, etc.
- New 35’ Stream Corridor Standards:
  - Permit required for activity in AA-S stream corridor
  - Cutting Restricted – 30% or 75’ max
  - Impervious Area <100 sqft
  - Pervious Hardscape < 400sqft

SHORELINE CUTTING RESTRICTIONS

Except to allow for the removal of diseased vegetation and rotten or damaged trees, all vegetative cutting on a parcel with shoreline on a lake, pond, or navigable river or stream must comply with the following restrictions:

(a) Within 35 feet of the mean high-water mark, no more than 30 percent of the trees in excess of six inches diameter at breast height (4½ feet above ground) may be cut over any 10-year period.

(b) Within 6 feet of the mean high-water mark, no more than 30 percent of any vegetation may be removed.



AA-S Stream Corridor Regulations

- Multiple benefits of stream buffers
  - Reduce sediment, nutrients, stream bank erosion, flood impacts, stream temps, etc.
- New 35' Stream Corridor Standards:
  - Permit required for activity in corridor
  - Cutting Restricted – 30% or 75' max
  - Impervious Area <100 sqft
  - Pervious Hardscape < 400sqft
- Removal Efficiency:
  - TSS: 70-98%,
  - Total P: 46-79%
  - Total N: 48-74%

Author	Width (m)	% Slope	% Removal of TSS
Dillaha et al (1988)	4.6	11	87
Dillaha et al (1988)	4.6	16	76
Dillaha et al (1988)	9.1	11	95
Dillaha et al (1988)	9.1	16	88
Dillaha et al (1989)	4.6	11	86
Dillaha et al (1989)	4.6	16	53
Dillaha et al (1989)	9.1	11	98
Dillaha et al (1989)	9.1	16	70
Magette et al (1989)	4.6	3.5	66
Magette et al (1989)	9.1	3.5	82

Study	Total P Removal	
	4.6 m buffer	9.1 m buffer
Dillaha et al 1988	71.5%	57.5%
Dillaha et al 1989	61%	79%
Magette et al 1987	41%	53%
Magette et al 1989	18%	46%

Table 2. Removal of Total Phosphorus by Grass Buffers.

With one exception, studies by Dillaha et al and Magette et al found a positive correlation between the width of grass riparian buffers and the ability to trap total phosphorus in surface runoff.

Study	Total N Removal	
	4.6 m buffer	9.1 m buffer
Dillaha et al 1988	67%	74%
Dillaha et al 1989	54%	73%
Magette et al 1987	17%	51%
Magette et al 1989	0%	48%

Table 3. Removal of Total Nitrogen by Grass Buffers.

Studies by Dillaha et al and Magette et al found a positive correlation between the width of grass riparian buffers and the ability to trap total nitrogen in surface runoff.

Source: "A Review of the Scientific Literature on Riparian Buffer Width, Extent, and Vegetation", 1999, Wenger

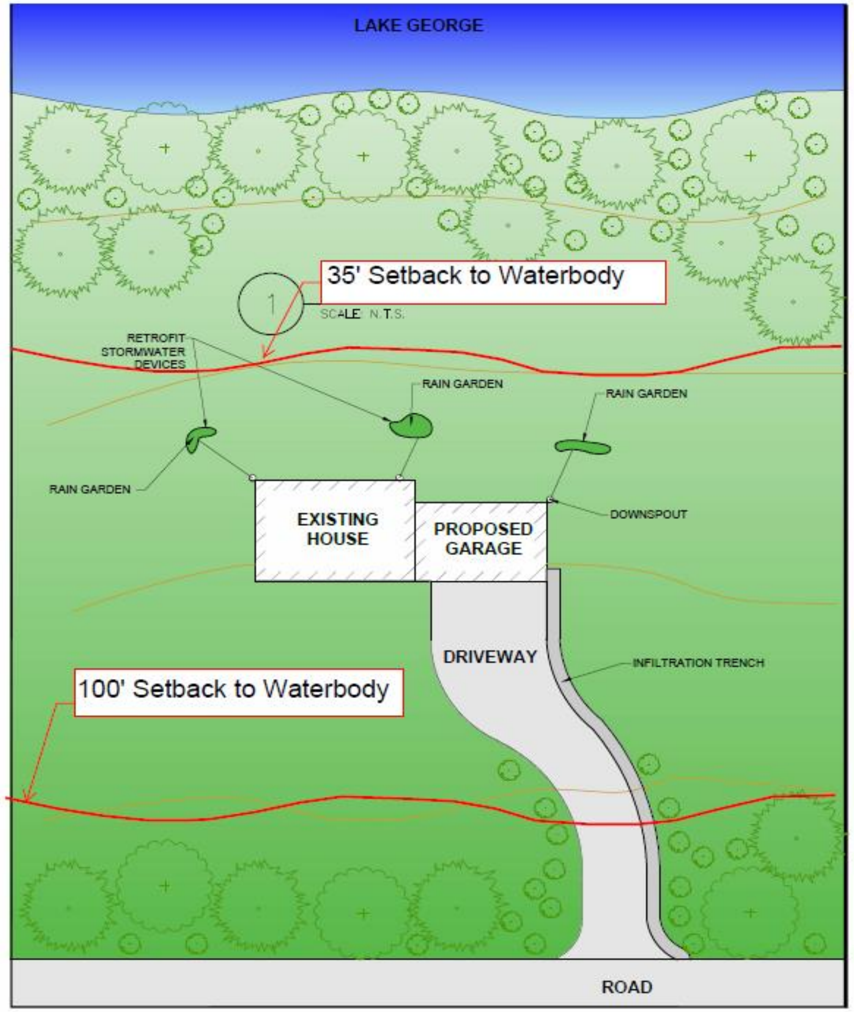
AA-S Stream Corridor Regulations

- Crossings and Culverts
  - No channelization or piping of streams except for approved utility/road crossings (no burying streams)
  - # of Crossings Limited to one per site, and for logging one per 1,000ft of stream
  - Crossing max width: Driveways 20’, Roads 30’

- Crossing Design Review by DEC
  - Culverts embedded 20% to mimic natural bottom
  - Structures shall span 1.25x the stream bed width
  - Structures shall not impound 10-yr storm
  - 50-year peak storm event passage required

Stormwater: New Infiltration Device Setbacks

- Old Regs Waterbody Setbacks
  - Previously no setback for infiltration devices on smaller projects (<15,000sqft)
    - Devices placed in riparian areas
    - Limited overflow protection between devices and waterbodies
    - Reduced the benefits of the riparian areas
      - Loss of mature vegetation
      - Less contact time for surface and subsurface filtration and volume reduction
- Updated Regs: 35' setback
  - All infiltration devices servicing new development have a minimum 35' setback to waterbodies
  - 100' setback to remain for areas subject to high traffic (roads, commercial parking lots)
  - Protects shoreline buffers/corridors (APA & LGPC)



Fertilizer Restrictions

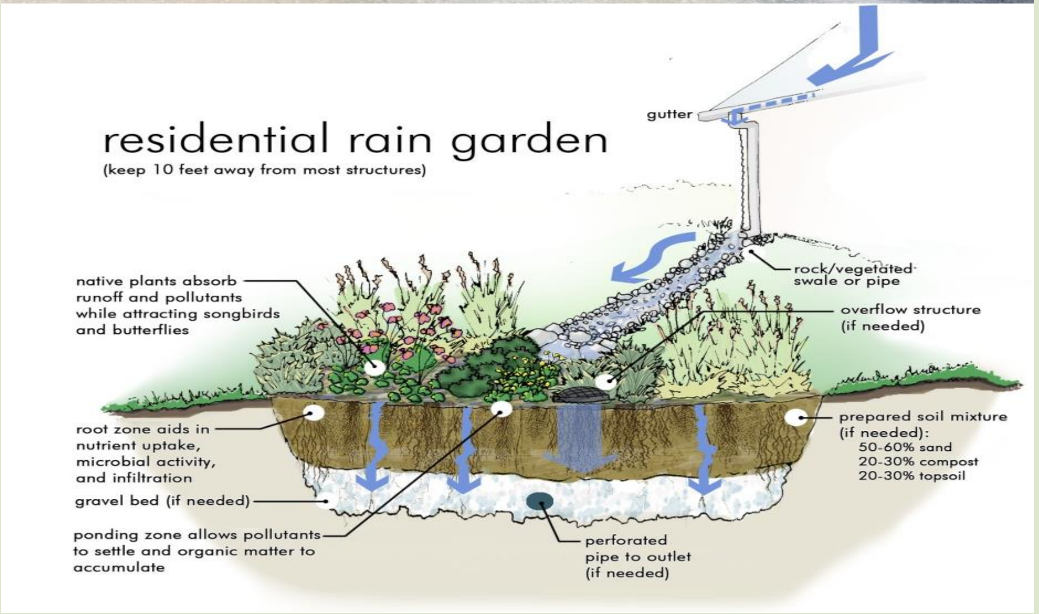
- No lawn fertilizer applications within 50 feet of a waterbody
- Will help reduce phosphorus and nitrogen inputs from lawns
- Apply Queensbury and Lake George fertilizer code to the entire watershed

Retrofits: Make it Better

- Apply existing retrofit standard to all jurisdictional projects
  - Previously only applied to Major Projects, extended to Minor Projects
  - Infiltrate existing stormwater from a site
  - Devices sized for minimum volume control of 0.5” from all impervious areas

- Simple fixes
  - Trenches
  - Swales
  - Rain gardens

- Low cost, great impact



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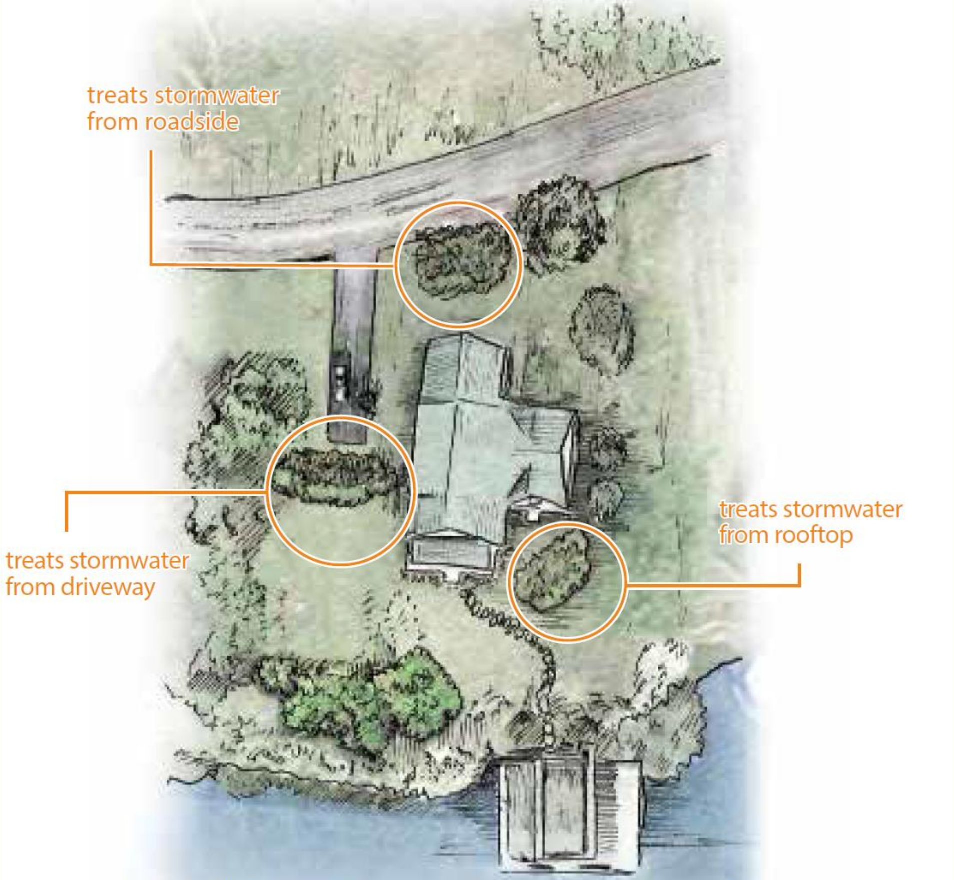
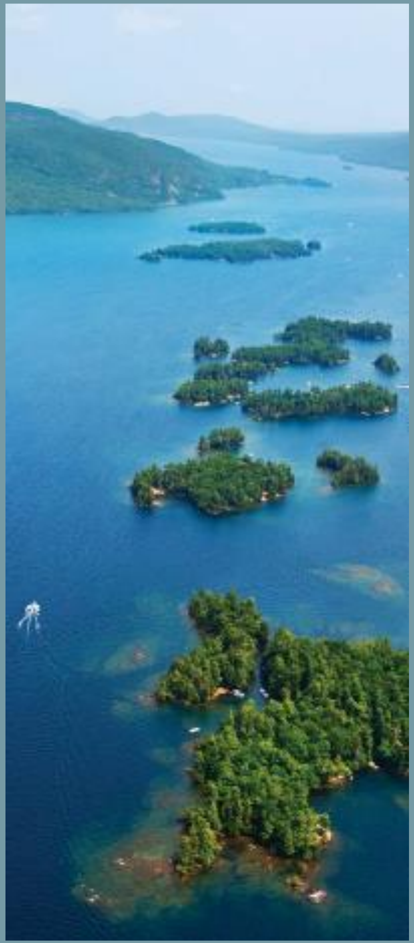


FIGURE 10:
Rain Garden placement

Rain gardens should be built near impervious surfaces.

"Do It Yourself Water Quality", 2010 Fund for Lake George, LG Waterkeeper

Bending The Curve



- Each proposed element is a simple, common sense, balanced approach
  - Stream Corridors
  - Infiltration Device Setbacks
  - Fertilizers
  - SW Retrofits
- Not overly burdensome to landowners
- In concert, these items will collectively strengthen improve long-term water quality

Quiz Time!!

Photo Source: https://www.liveabout.com/best-game-show-catch-phrases-1396892

- In the last 10+ years, only two applications received a permit without any request for modification or clarification…
- What two firms accomplished this?
  - A) Chazen & EDP
  - B) Jarrett Engineers & LA Group
  - C) SRA & Trudeau
  - D) DeFranco & Hutchins Engineering
  - E) Trick Question – It's never happened!

LGPC Stormwater Hall of Fame!!

Tony DeFranco

Lucas Dobie

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- What two firms accomplished this?
  - A) ----
  - B) ----
  - C) ----
  - D) **DeFranco & Hutchins!!!**
  - E) ----

Photo Source: https://hutchinsengineering.com/about/
Photo Source: https://www.anthonydefrancoconsulting.com/team

Small Site Hydrology Crib Notes

- GET THE H_2O IN THE GROUND
  - Impermeable Liners
  - Underdrains
- LIVING ON THE EDGE
  - Retaining walls
  - Exempt Disturbance
  - Trench on a hill
- HAVE A BACK-UP PLAN
  - Permeable Pavers
  - Weirs
- COMMUNICATION
  - Soils
  - Device Sizing
- STAY HOME
  - Treat close to the source
  - Shared Devices

Photo Sourcehttps://i.imgflip.com/1t5zxr.jpg:

The Do's and Don'ts

- **Get Water into the Ground**
  - **Do!**
  - For How Long?
    - For-eh-ver
  - **Don't** design or construct things that will preclude or short circuit infiltration

Photo Source: https://i.ebayimg.com/images/g/oPgAAOSwK6RZHfRD/s-l400.jpg
Photo Source: https://chucklebuzz.com/wp-content/uploads/2014/11/golf-ball-go-home.jpg
Photo Source: https://www.youtube.com/watch?v=Fdnz-T5cWyQ

The Do's and Don'ts: Get it in the Ground

Photo Source:https://www.phc-online.com/v/vspfiles/photos/KBC19-Men-2.jpg

- **Impermeable Liners**
  - **Don't Diaper Your Device!**
    - Unless you need the protection
  - When are they appropriate?
    - That Depends (HA!!!)
      - Hotspots – Gas Station
  - Do you need volume control via infiltration?
    - Lose the liner!

The Do's and Don'ts: Get it in the Ground

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Photo Source: https://i.pinimg.com/736x/7a/51/4f/7a514f8e760ef194059fbb4e1f98de80.jpg

The Do's and Don'ts: Get it in the Ground

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  - When are they appropriate?
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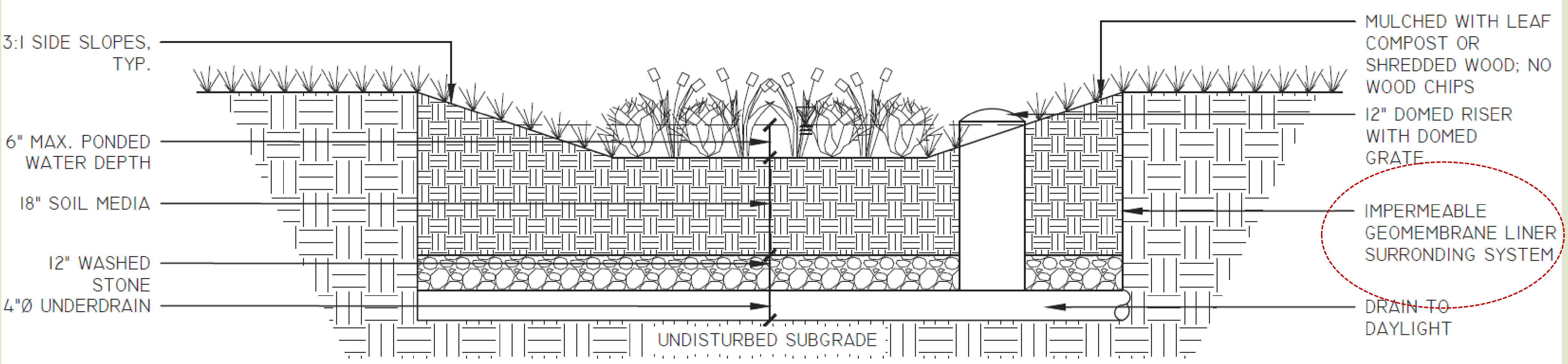

The Do's and Don'ts: Get it in the Ground

- **<u>Underdrains</u>**
  - **Don't Andy Dufresne the Device!**
    - Daylighted Underdains Short Circuit Infiltration
    - Footing drains can act similarly

Photo Source:https://www.independent.co.uk/arts-entertainment/films/news/this-is-how-long-andy-s-tunnel-was-in-the-shawshank-redemption-a6874701.html
Photo Source: https://miro.medium.com/max/1400/1*Xj8dAH1GmxiDtA5yM_jnIg.jpeg

The Do's and Don'ts: Get it in the Ground

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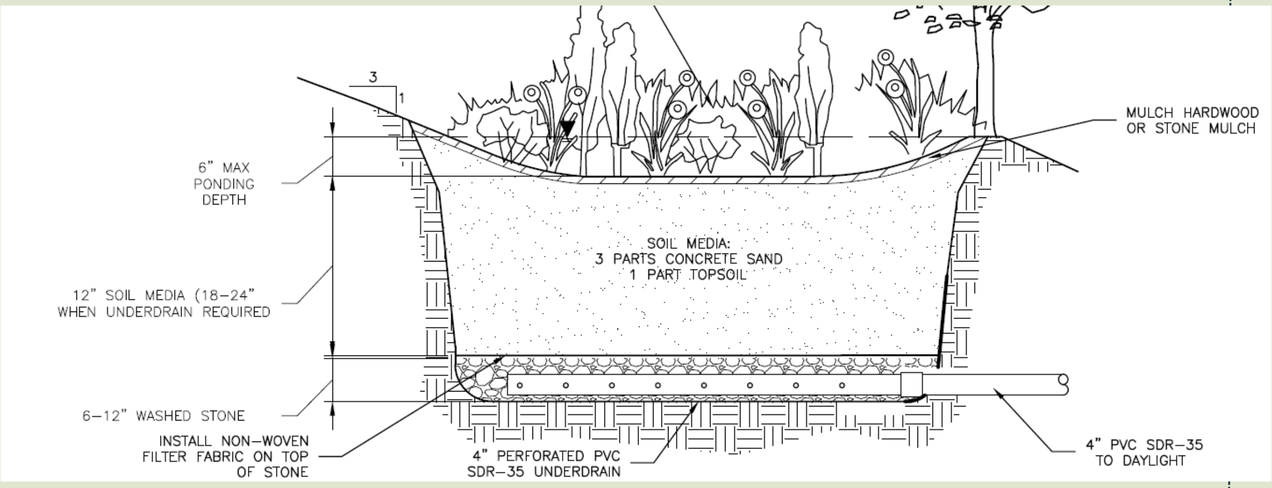

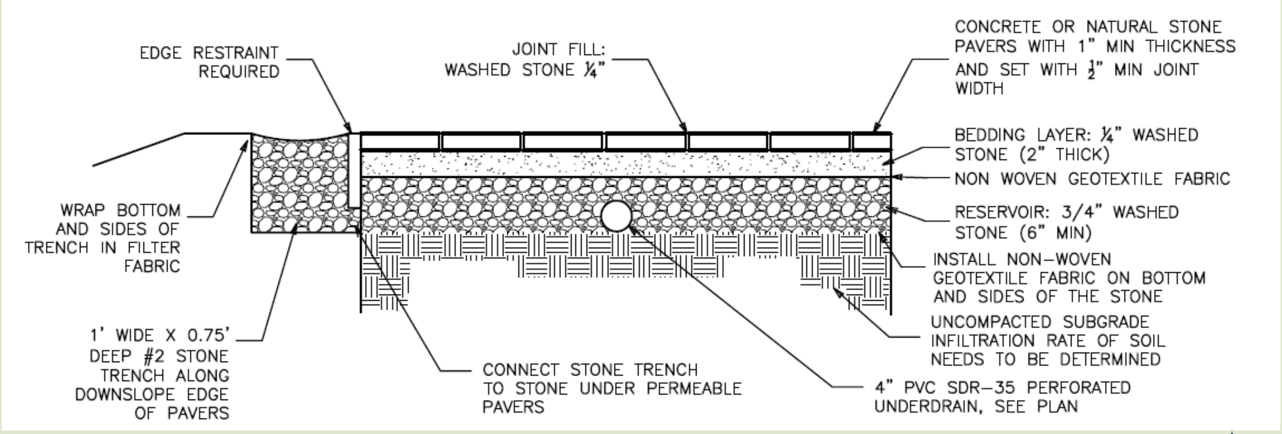

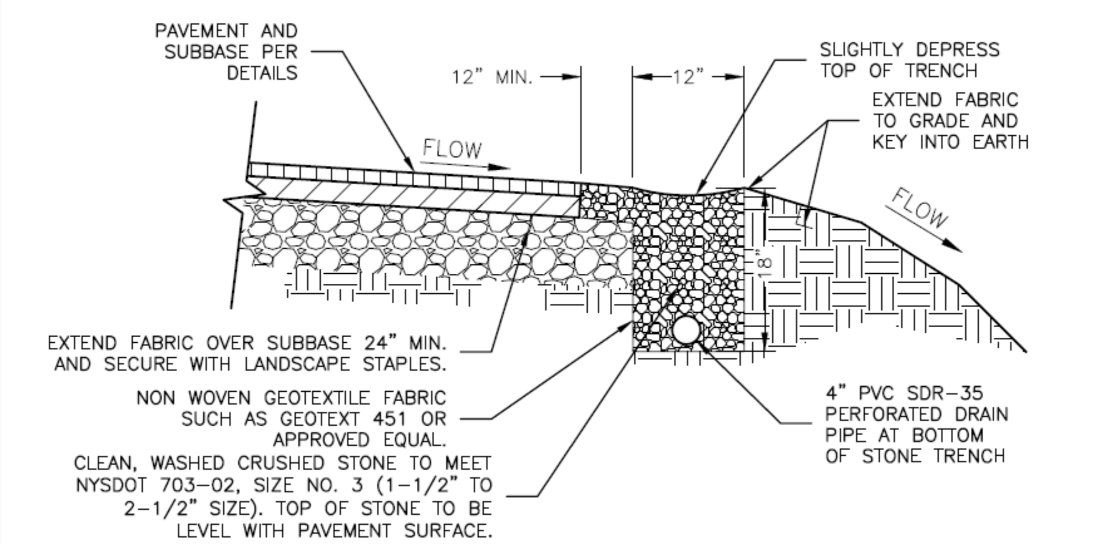

The Do's and Don'ts: Get it in the Ground

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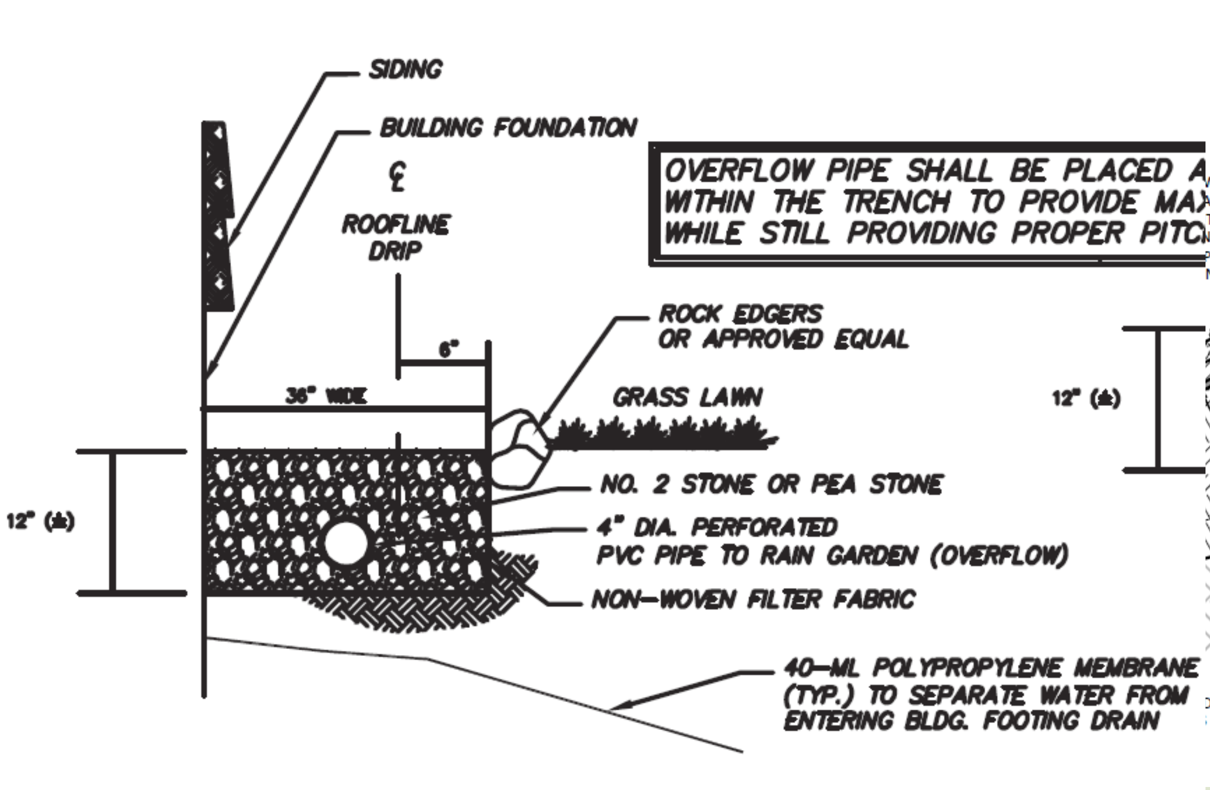

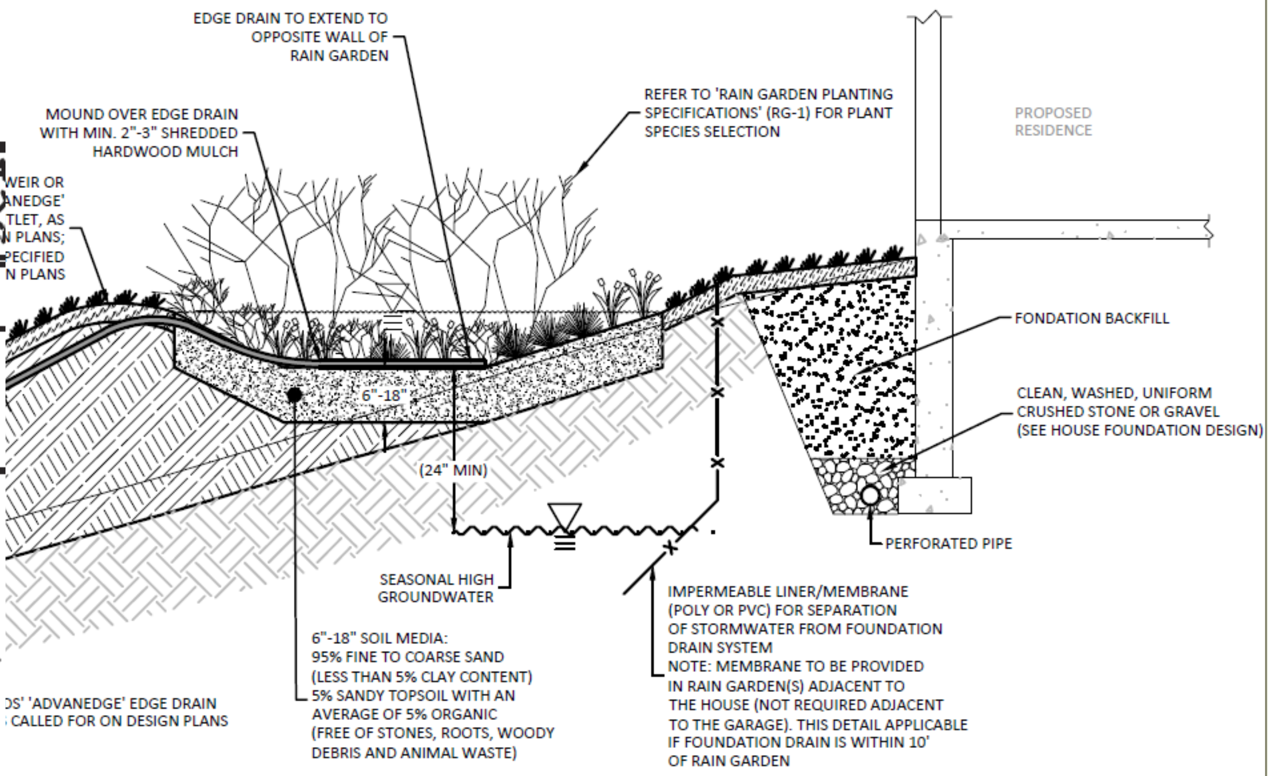

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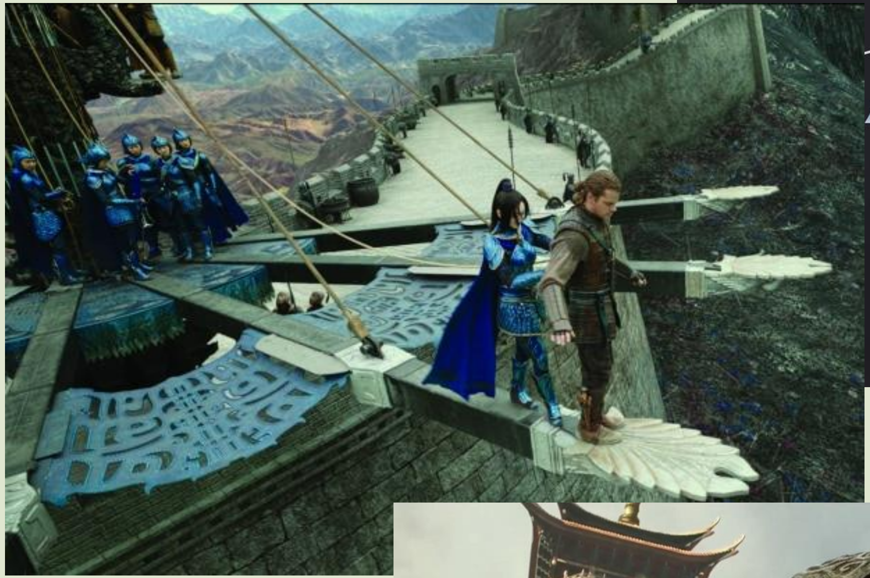
The Do’s and Don’ts: Living on the Edge



- **<u>Retaining Walls</u>**
  - **Some Walls are Good & Necessary**
  - **Don’t put a device behind them**
    - Structural instability
    - Drainage short-circuits infiltration
    - Indicates the design is not working with the land

Photo Source:https://cdn.shopify.com/s/files/1/0361/2200/1543/products/pink_ef1a44aa-3d38-4602-bbfe-c06f068192e7_700x.jpg?v=1654914767
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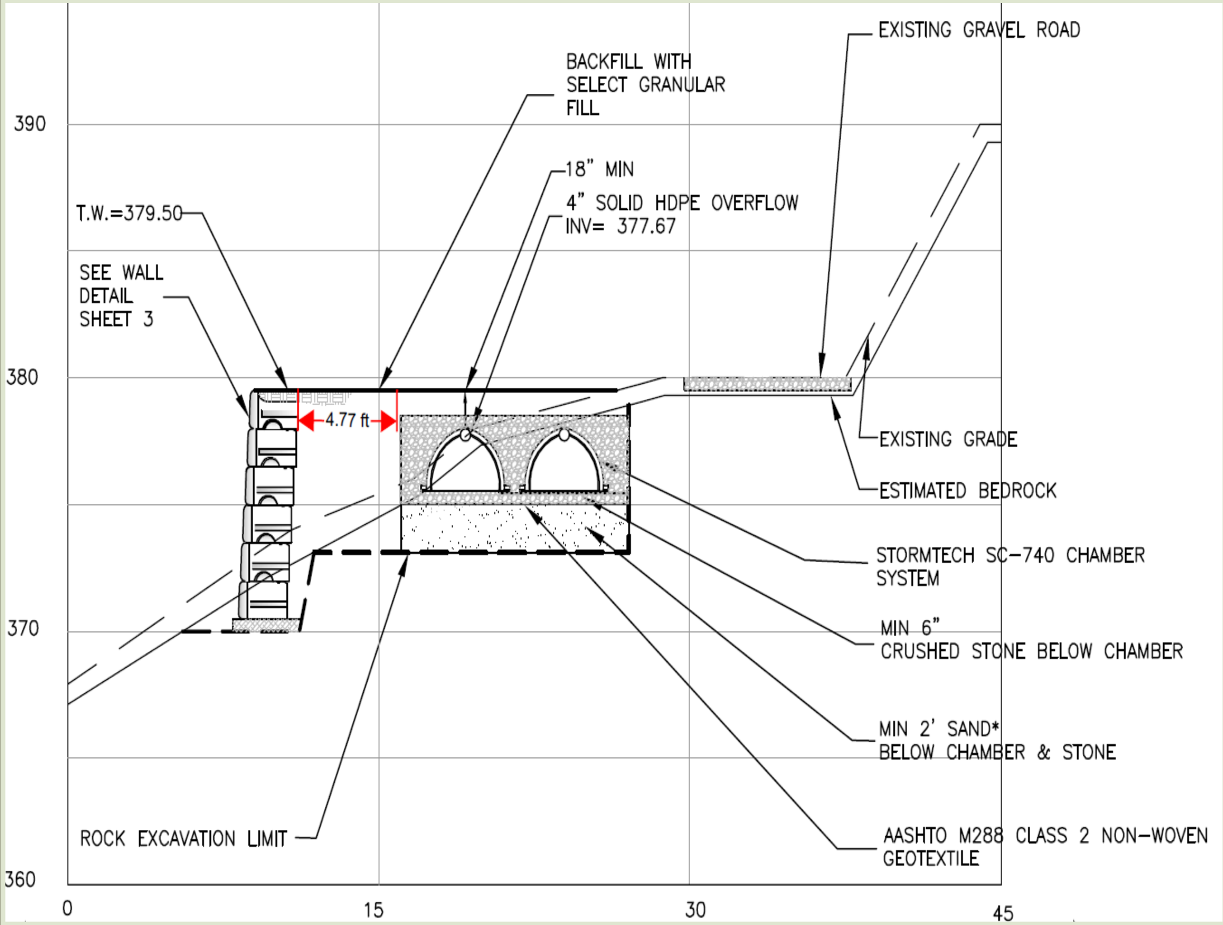
Photo Source: https://2.bp.blogspot.com/-RUW50tOc-_8/WhHRs-173EI/AAAAAAAAR0U/0BppUBw9KPIsmGyEwa0kxVBQKlWROh01gCLcBGAs/s1600/Thre%2BGreat%2BWall%2Bmonster%252C%2Bthe%2BQueen.jpg

The Do's and Don'ts: Living on the Edge



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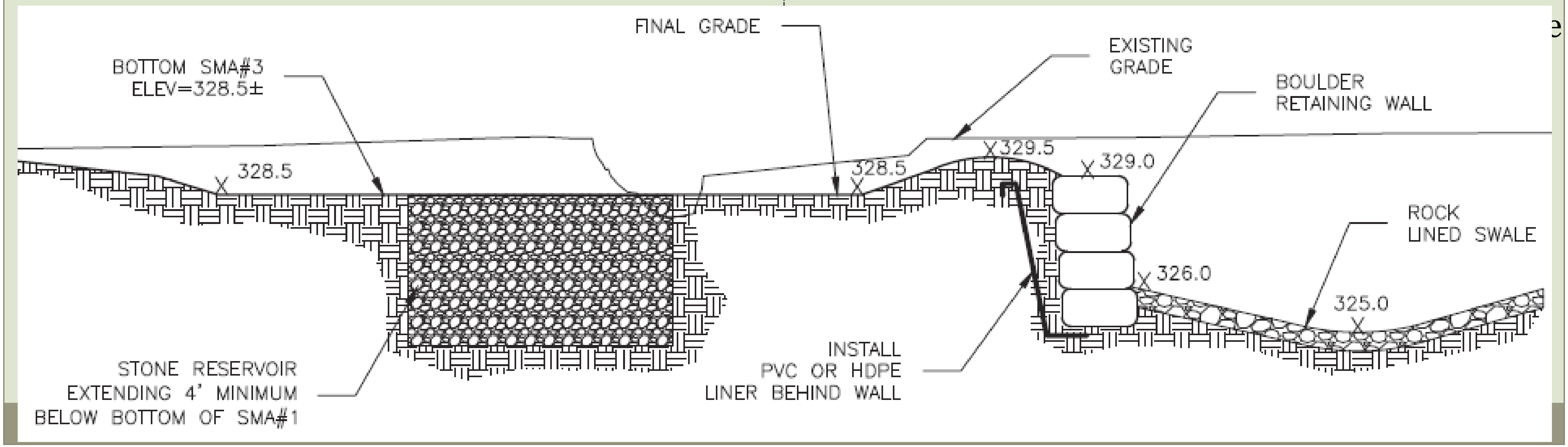
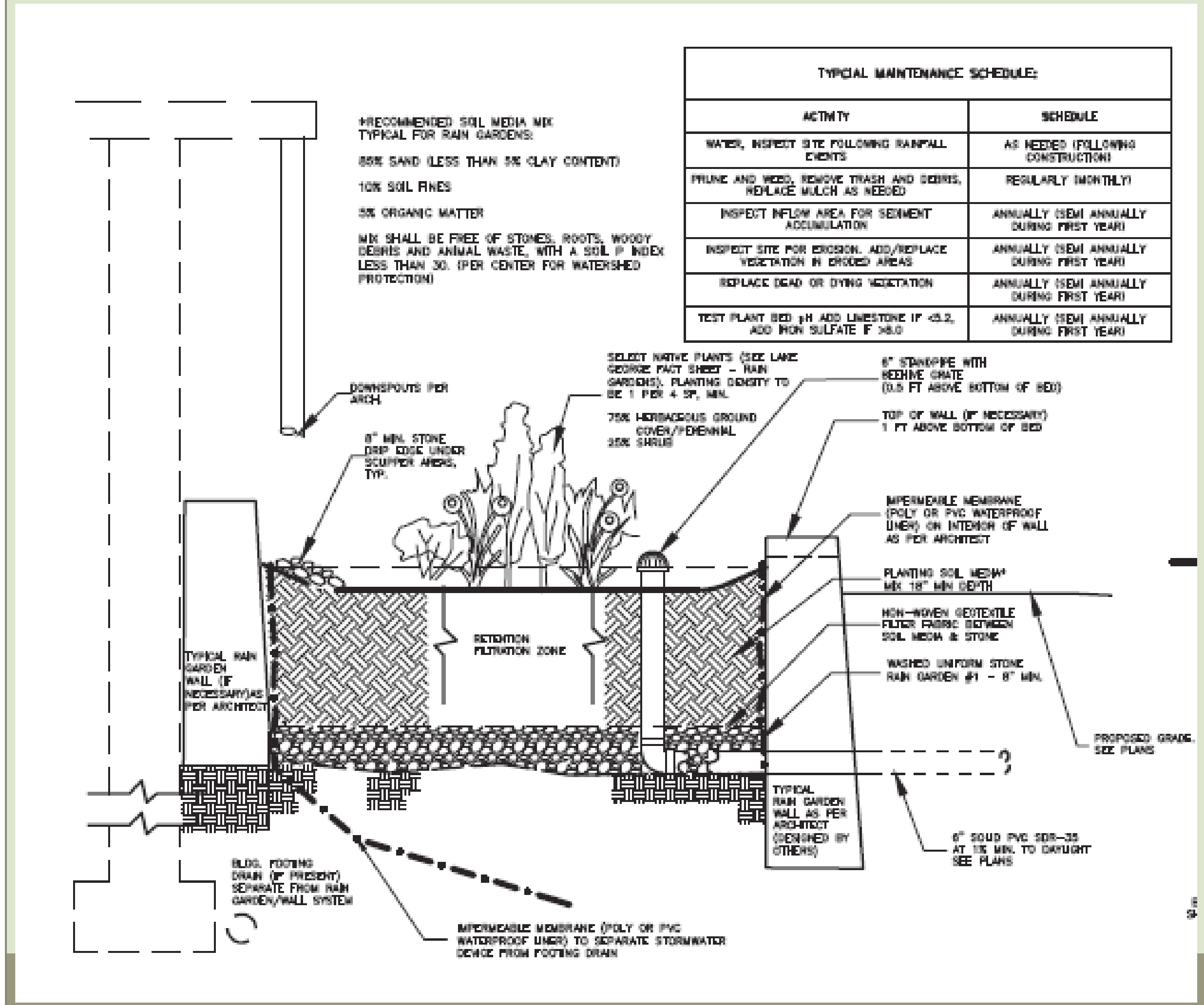


The Do’s and Don’ts: Living on the Edge



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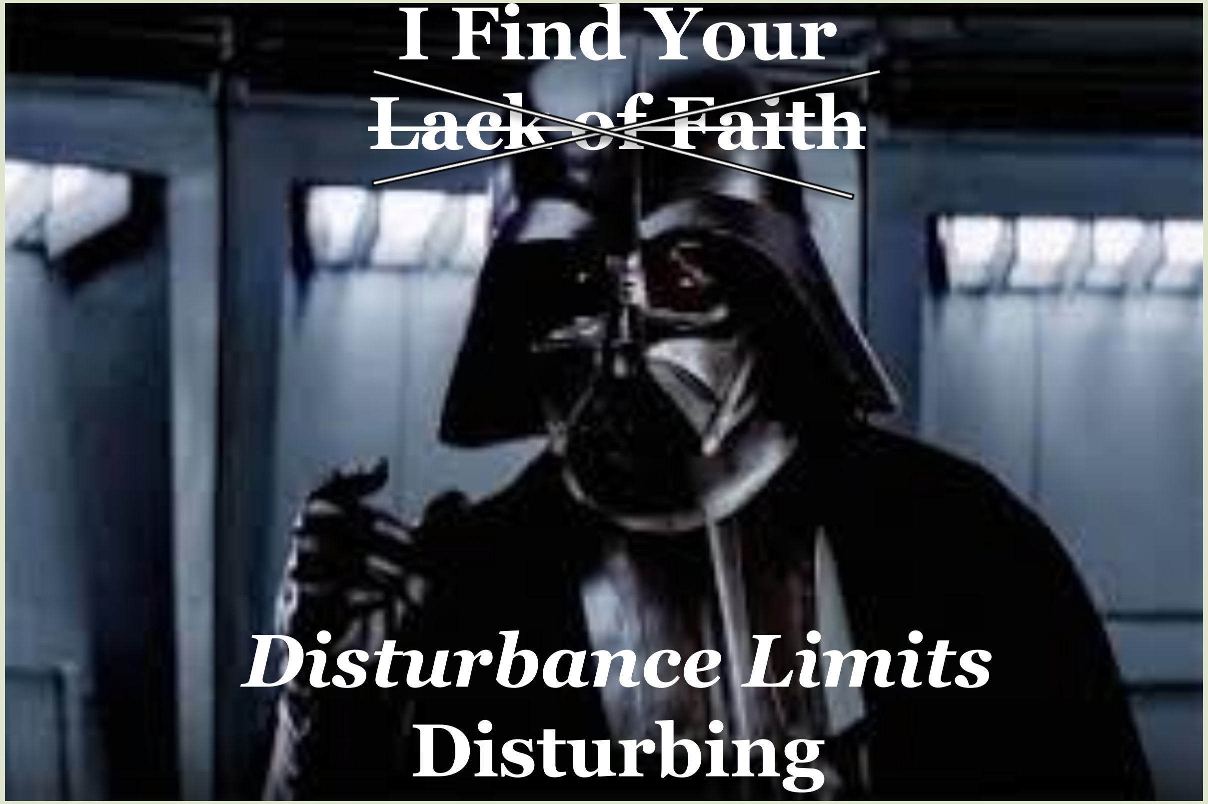
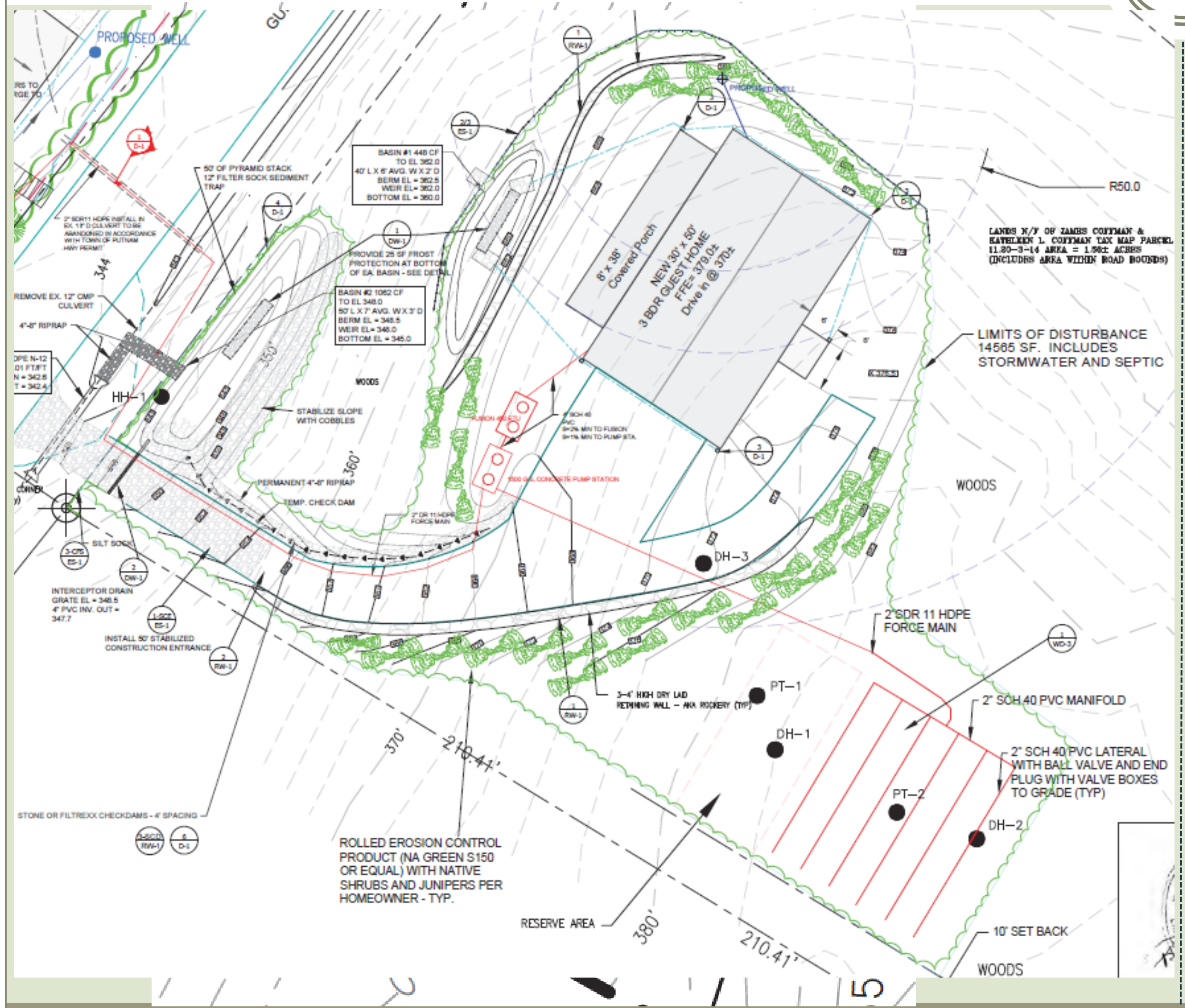
The Do's and Don'ts: Living on the Edge



- **Do**
  - Depict and note the limits of land disturbance

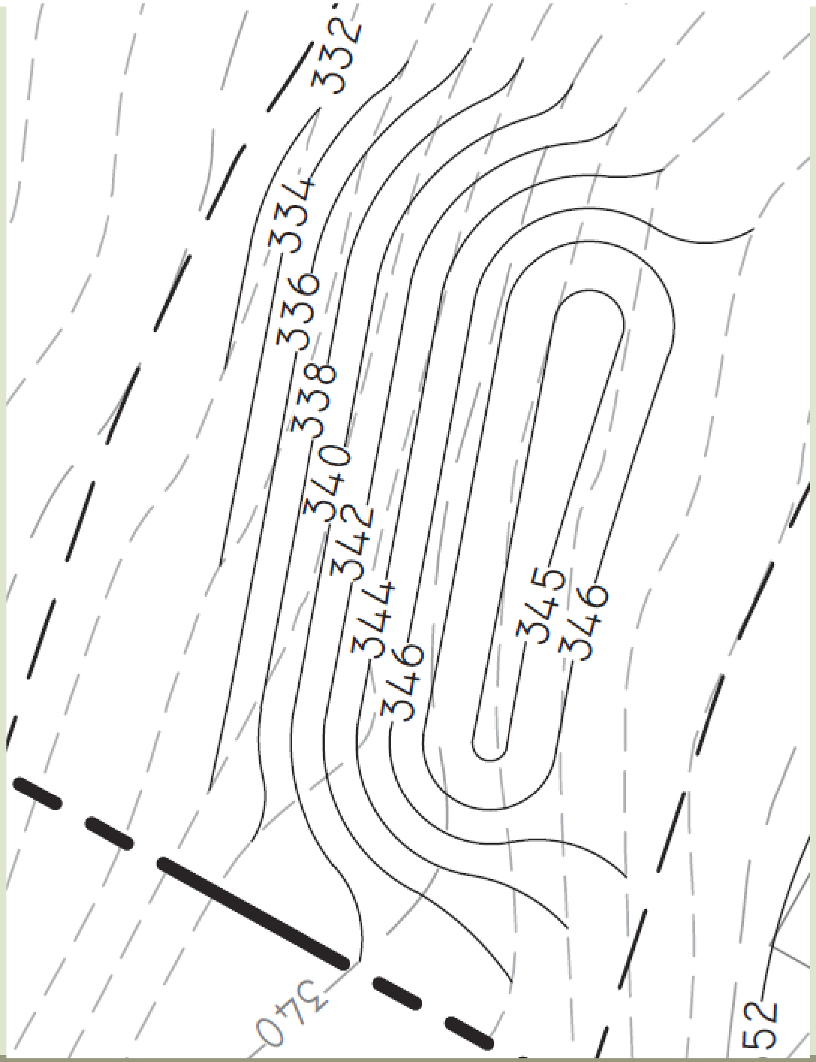
Photo Source:https://us-tuna-sounds-images.voicemod.net/e091e343-00ea-4385-aef0-4a19c2870750.jpg

The Do’s and Don’ts: Living on the Edge



- **Do**
  - Depict and note the limits of land disturbance
  - Do differentiate between land disturbance that counts toward project classification and that which is exempt

The Do's and Don'ts: Living on the Edge



- **Do**
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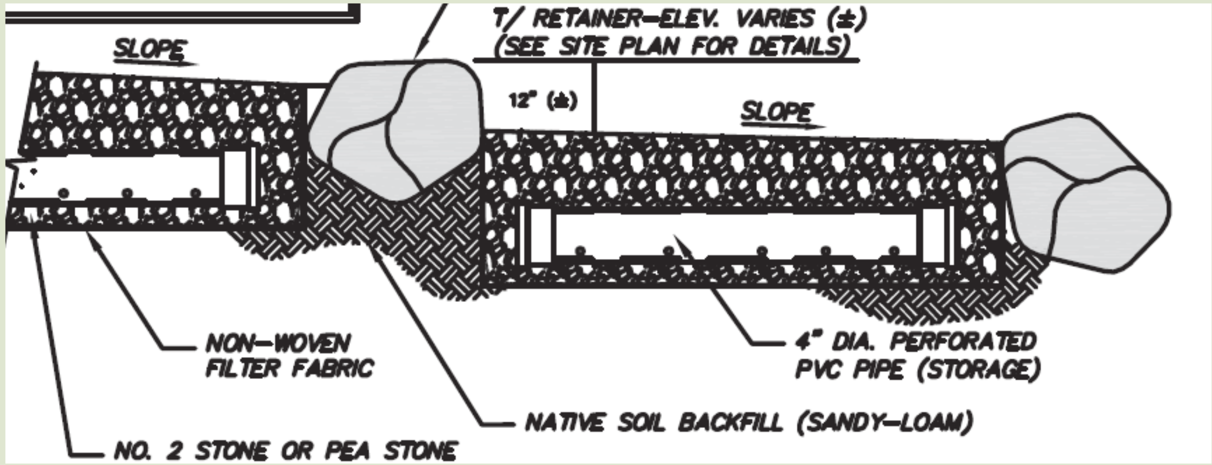
  - Do differentiate between land disturbance that counts toward project classification and that which is exempt
  - Do exempt the surface area of the infiltration device
- **Don't**
  - Exempt extraneous grading

The Do's and Don'ts: Living on the Edge



- **Do**
  - Depict and note the limits of land disturbance
  - Do differentiate between land disturbance that counts toward project classification and that which is exempt
  - Do exempt the surface area of the infiltration device
- **Don't**
  - Exempt extraneous grading
  - Design infiltration devices that behave as conveyances (e.g. trench on a slope)

The Do's and Don'ts: Have a Back-Up Plan

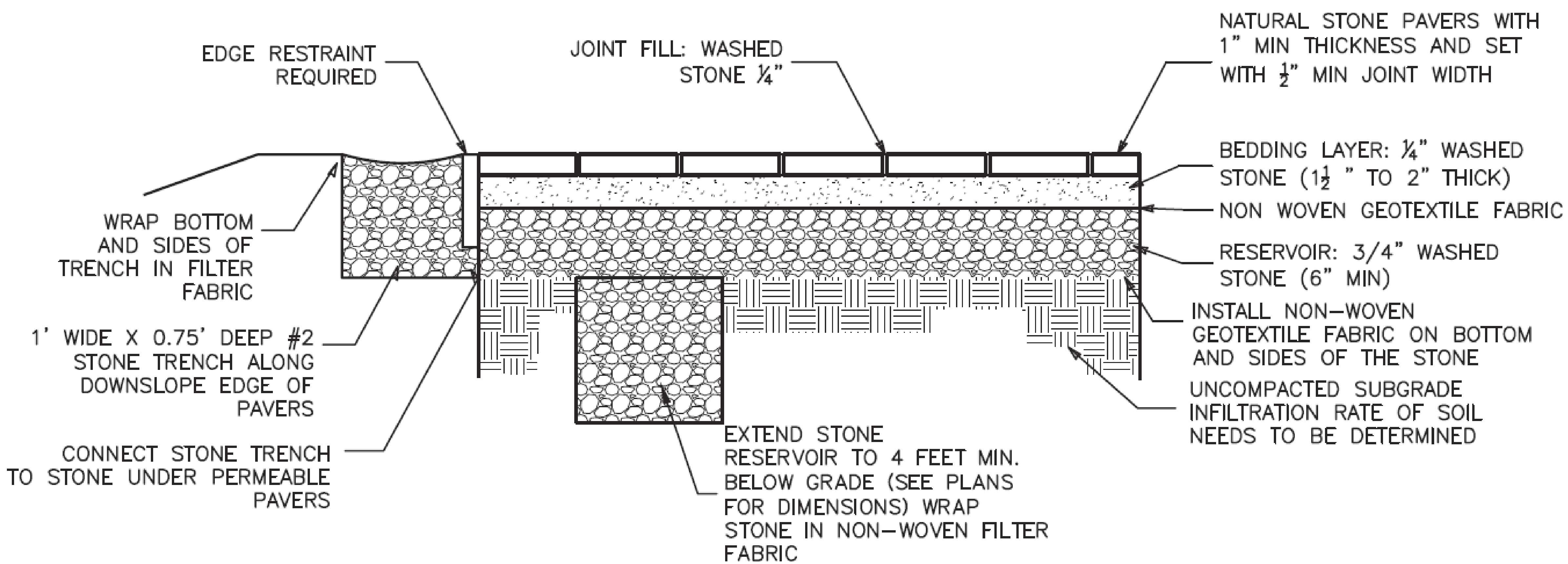
Permeable Pavers

- **Do**
  - Have a Plan for when they Back-Up
    - Overflow mechanism
    - Contingency plan for surface blinding
- **Don't**
  - Don't put them in a place where you can't infiltrate - separate from SWGW and Bedrock

Photo Source:https://pics.onsizzle.com/not-having-a-plan-disagree-i-have-a-plan-for-16055069.png
Photo Source: https://th.bing.com/th/id/OIP.uDvWzBgpCSoYixJrKhpD6wHaD-?w=318&h=180&c=7&r=0&o=5&pid=1.7

The Do's and Don'ts: Have a Back-Up Plan

Permeable Pavers



The Do's and Don'ts: Have a Back-up Plan

<u>**Weirs**</u>

- **Do**
  - Use Weirs
  - Weirs are great!
    - Johnny
    - Bob
    - Weir-d Al
  - **Don't**
    - Assume that water will safely and diffusely overflow on its own

Photo Source:https://66.media.tumblr.com/402fec34e09038d6b27bf9a9153025b4/tumblr_inline_mgaaoyEjob1ryxnh2.jpg
Photo Source: https://s.yimg.com/ny/api/res/1.2/[illegible]
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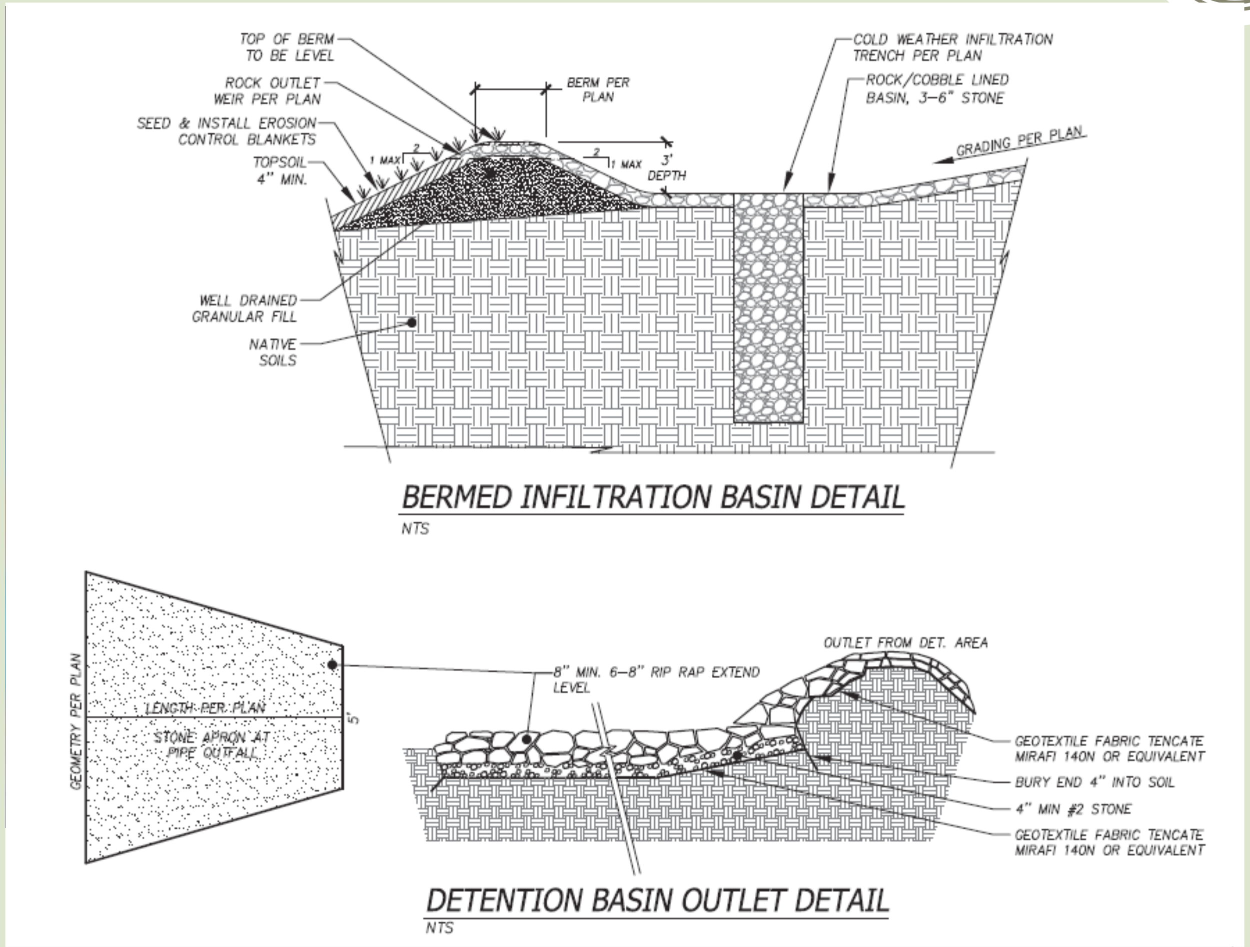
The Do's and Don'ts: Have a Back-up Plan



Weirs

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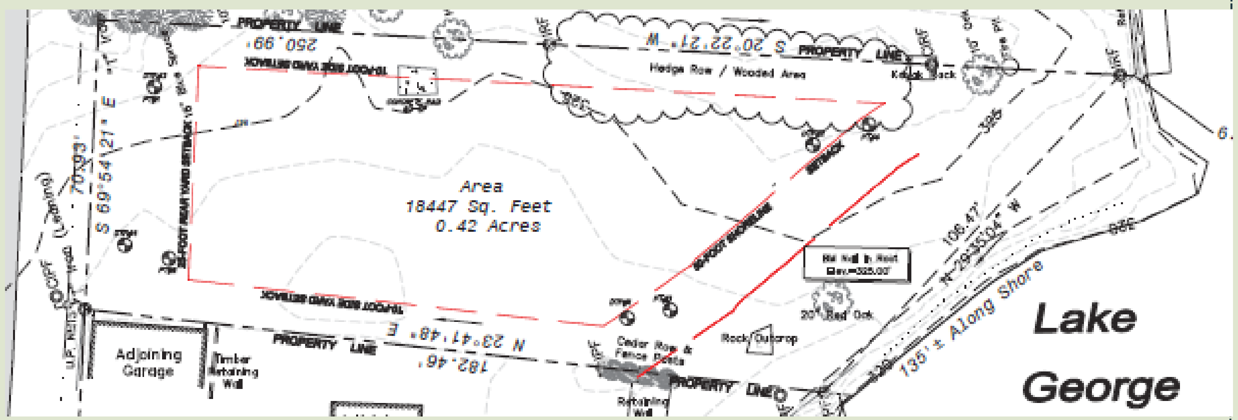
  - **Don't**
    - Assume that water will safely and diffusely overflow on its own

The Do’s and Don’ts: Communication

- **Gotta See the ~~Baby~~ Soils!**
  - **Do!**
    - Show test pit locations
    - Show results
    - Presence/Absence & Depth to SHGW & BR
  - **Don’t**
    - Rely on soil maps
    - Use test pits located far from the device
    - Ask to do test pits after the permit

Photo Source:https://media-exp1.licdn.com/dms/image/C4D12AQHtVz1nKn5ZUw/article-cover_image-shrink_180_320/0/1533130158083?e=2147483647&v=beta&t=iy7rEpvcflpDBiOIOEVY-zGm0uOCs3N3nlxB6n_w_2s

The Do's and Don'ts: Communication



TEST PIT #1 (DTP #1) DATA (6/28/2020)

DTP #1

0– 3" – TOPSOIL
3"–48" – YELLOW SAND
48"–60" – DARK BROWN SAND W/ FRAGMENTED CHUNKS OF STONE
ROOTS @ 48"
SHGWT @ 48"
NO EVIDENCE OF LEDGE / BEDROCK

- **Gotta See the ~~Baby~~ Soils!**
  - **Do!**
    - Show test pit locations
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The Do's and Don'ts: Communication

- **Device Sizing**
  - **Do**
    - Show your Calculations
    - Right-Size your device based on the tributary area
  - **Don't**
    - Assume that because all the devices cumulatively meet the volume requirement that they are individually sized correctly

Photo Source:https://i.imgflip.com/31im82.jpg

The Do's and Don'ts: Communication

STORMWATER MANAGEMENT PRACTICE SUMMARY ENTIRETY OF ROOF, DRIVE, PATIO - 1.5 GALS / SF					
SUBCATCHMENT	SITE FEATURE	AREA	VOLUME REQ'D (1.5 GAL PER SQ. FT.)	SMP	SMP VOLUME PROVIDED
1S	NORTHEASTERLY PORTION OF ROOF	1525 SF	2290 GAL = 305 CF	1P - VEG. DET. AREA	320 CF (715 SF TOP AREA - 6" DEPTH)
2S	LAKESIDE MIDDLE PORTION OF ROOF	740 SF	1110 GAL = 150 CF	2P - STONE SOUTH OF LAKESIDE PATIO	152 CF (380 SF - 12" DEPTH, 40% VOIDS)
3S	SOUTHERLY PORTION OF ROOF	1880 SF	2820 GAL = 375 CF	3P - VEG. DET. AREA	440 CF (1065 SF TOP AREA - 6" DEPTH)
4S	DRIVEWAY	1005 SF	1510 GAL = 200 CF	4P - PERMEABLE PAVERS	270 CF (1005 SF, 8" DEPTH OF DRAINAGE COURSE, 40% VOIDS)
5S	PATIOS	585 SF	880 GAL = 120 CF	5P - PERMEABLE PAVERS	155 CF (585 SF, 8" DEPTH OF DRAINAGE COURSE, 40% VOIDS)

- **<u>Device Sizing</u>**
  - **Do**
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    - Right-Size your device based on the tributary area
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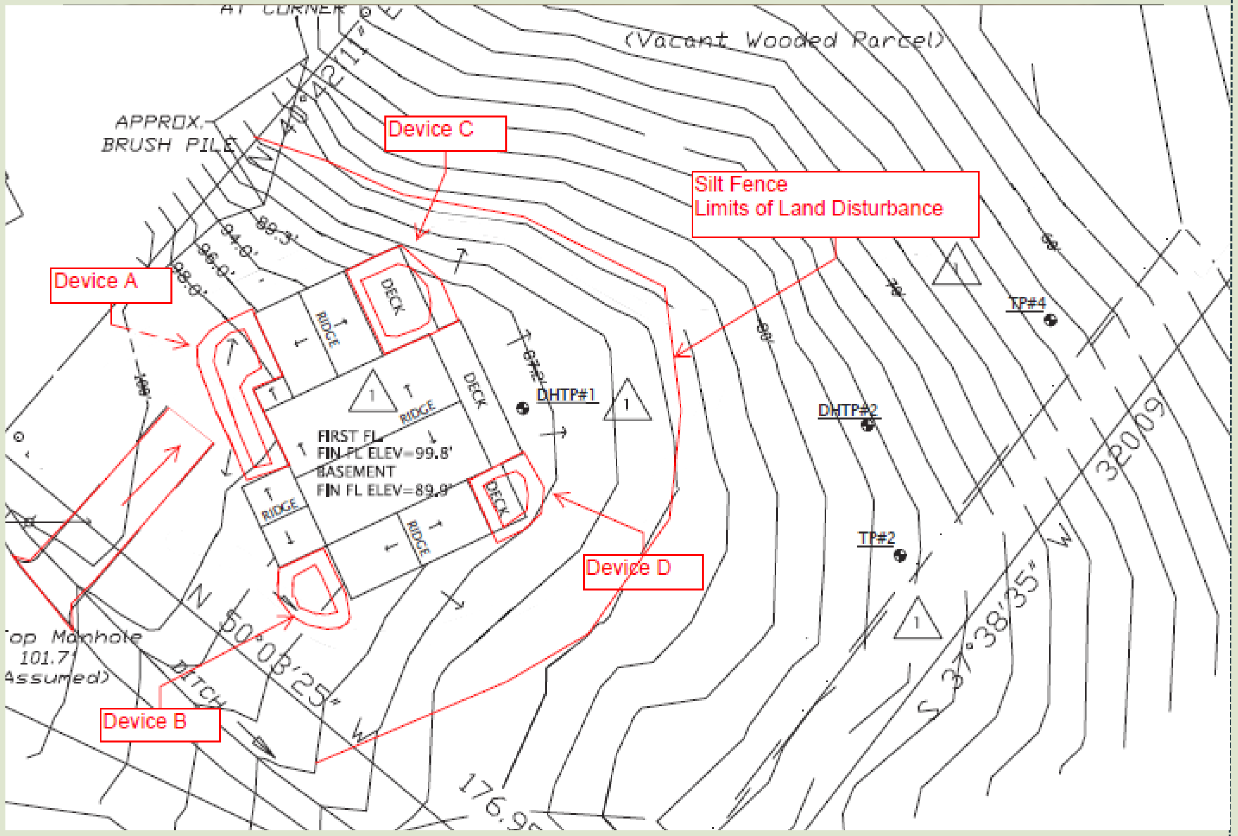
    - Assume that because all the devices cumulatively meet the volume requirement that they are individually sized correctly

The Do's and Don'ts: Stay Home

- **Stay Close to Home**
  - **Do**
    - Treat SW Close to the Source
  - **Don't**
    - Concentrate water and convey it to an end of pipe solution

Photo Source:https://i1.sndcdn.com/artworks-000029647007-wshc2q-t500x500.jpg

The Do's and Don'ts: Stay Home



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  - **<u>Don't</u>**
    - Concentrate water and convey it to an end of pipe solution

The Do's and Don'ts: Stay Home

Sharing Devices

- Don't
  - Share devices unless you have to
    - Too many hands in the pot
    - Associations are not well known for their professional and efficient functioning…

Photo Source: https://pics.me.me/thumb_suns-it-could-be-our-milk-201-no-milk-will-66804608.png
Photo Source: https://img-www.tf-cdn.com/movie/2/neighbors-2014.jpeg

Thank you!
Keep up the good work!

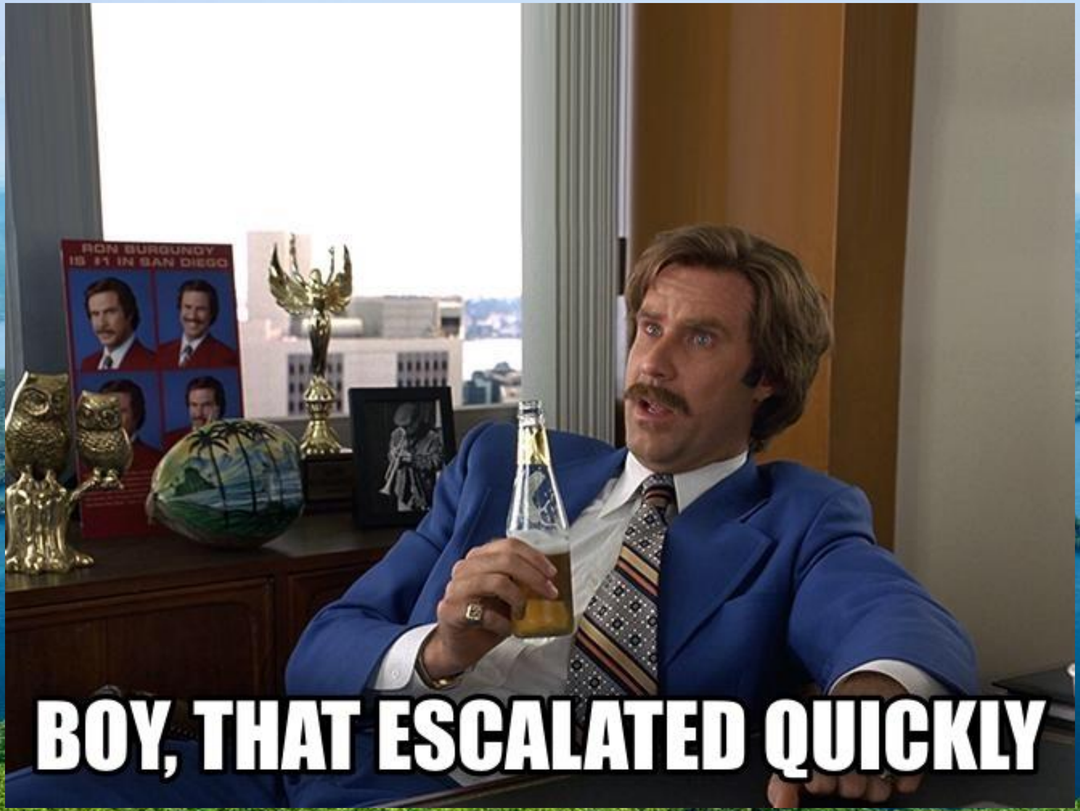

Photo Source:http://e.lvme.me/k9rb7r5.jpg

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Photo courtesy of Carl Heilman