Impervious Surface Dynamics and Trends in Low Residential Areas

Stormwater Management, Urban Forestry, and Zoning considerations

November 2024

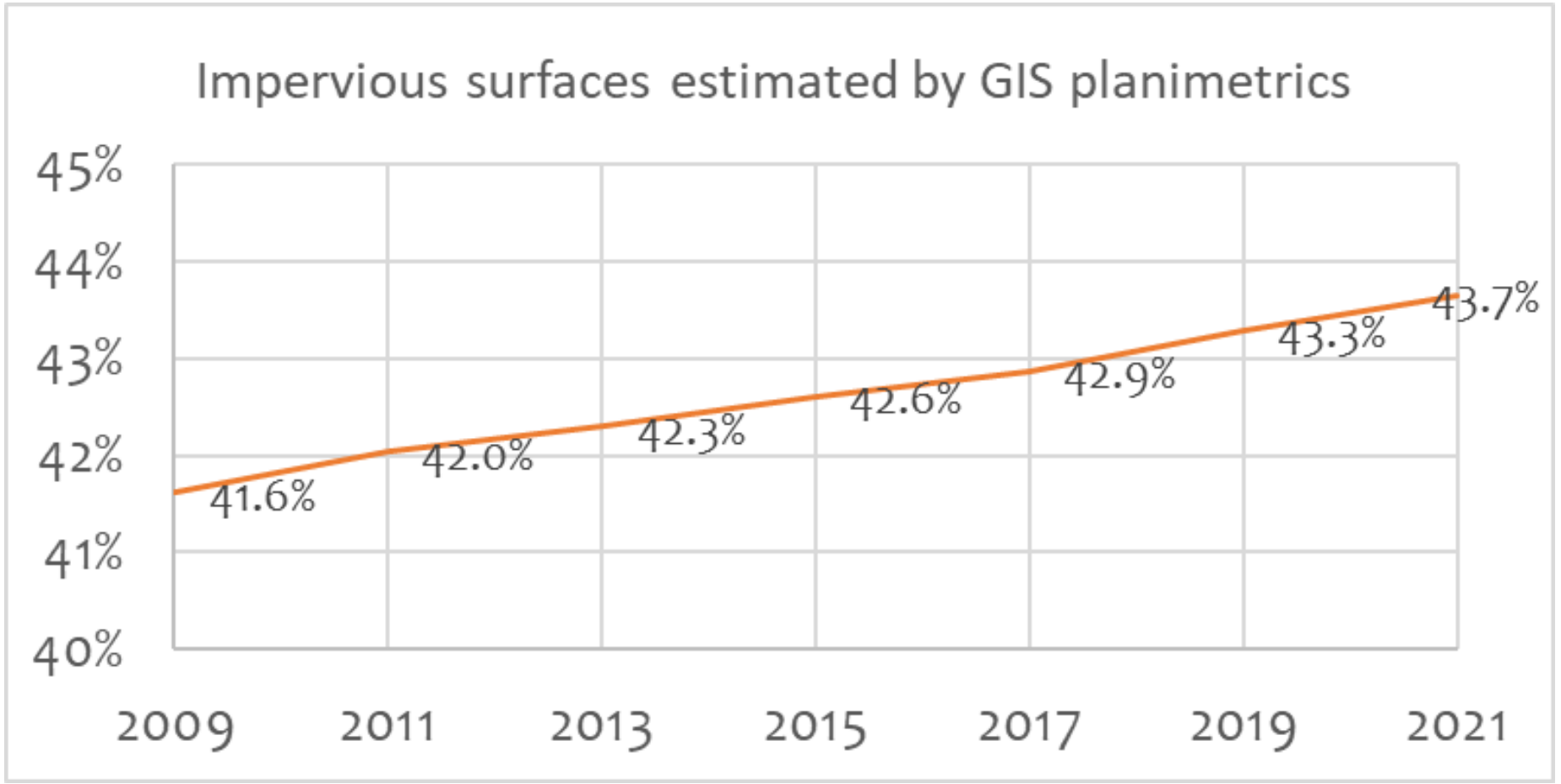
Purpose of the work session

Examine, understand, and discuss:

- Impervious surface trends in the County over time
- How impervious surfaces on newer home lots compare to older home lots
- The impervious surfaces regulated and not regulated by Zoning
- The importance of pervious areas to achieve stormwater management and urban forestry objectives
- The tools and programs the County uses to mitigate the stormwater/tree impacts of low residential development
- Potential actions and tradeoffs to consider

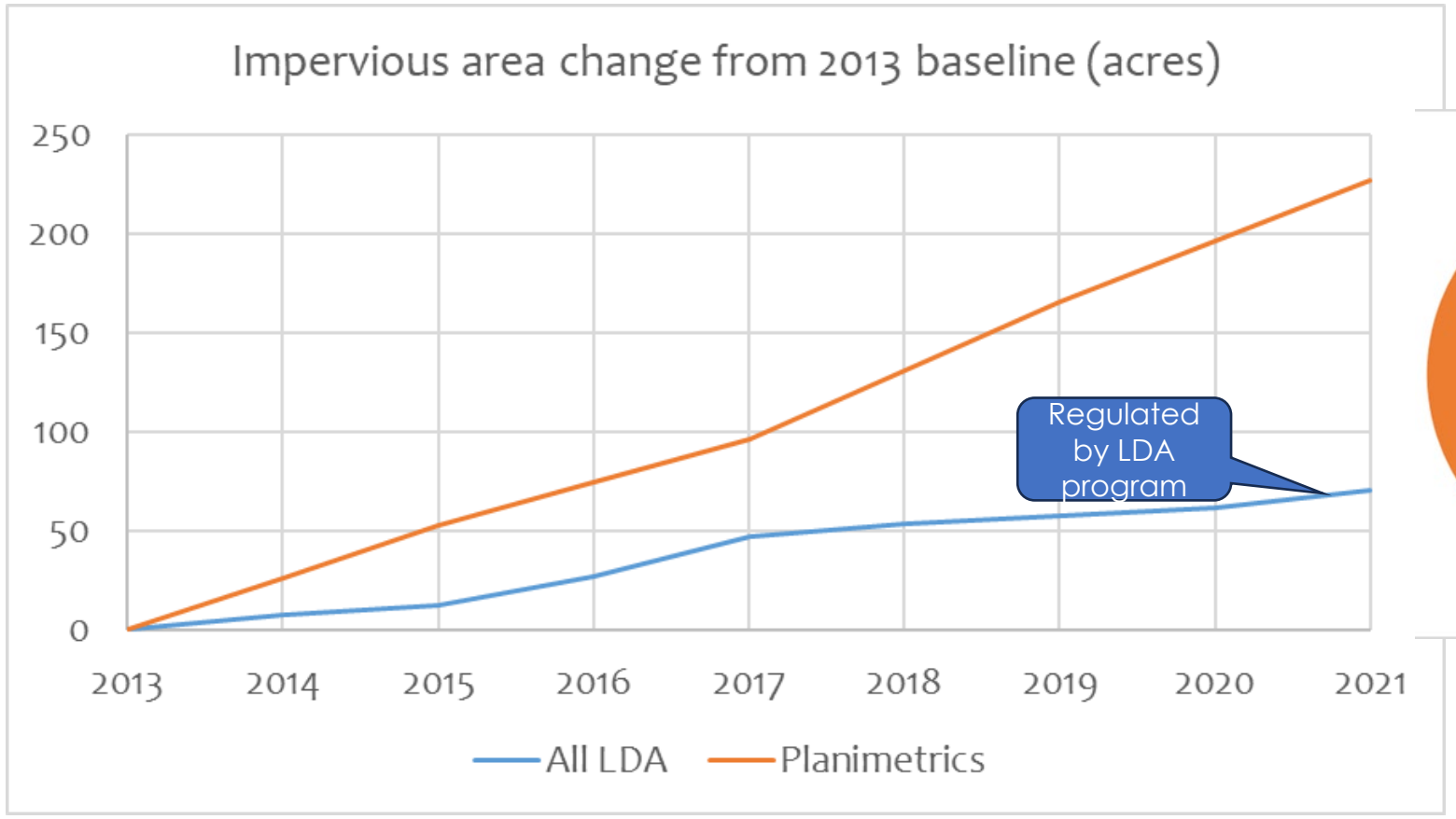
Overall context

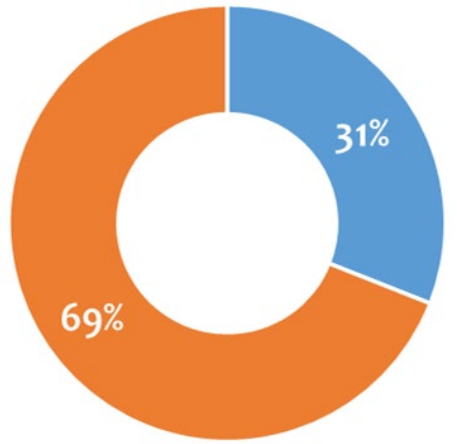
Impervious surfaces County-wide are steadily increasing…



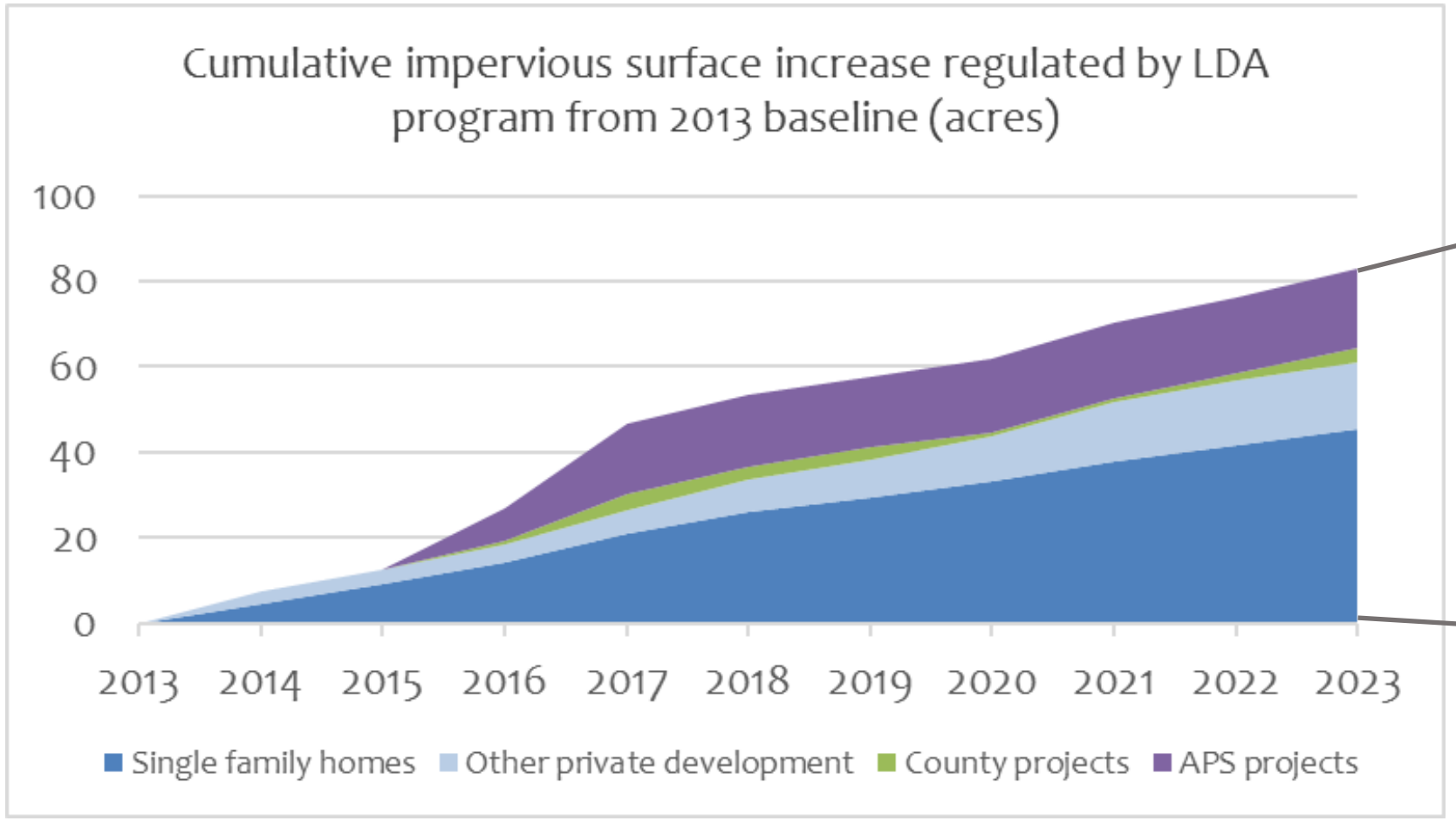
Context (cont.)

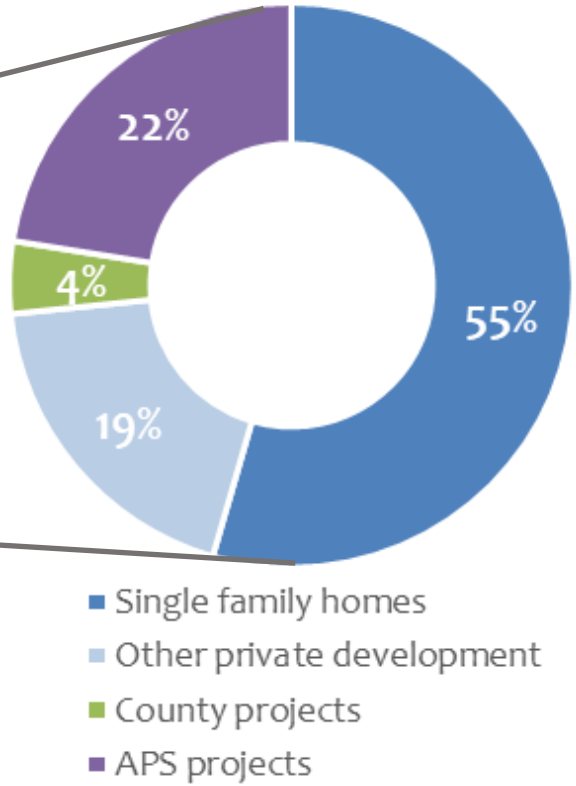
...and more of the increase is unregulated by the LDA program than is regulated.





Of LDA regulated impervious surfaces, single family homes are the largest and majority source of increases





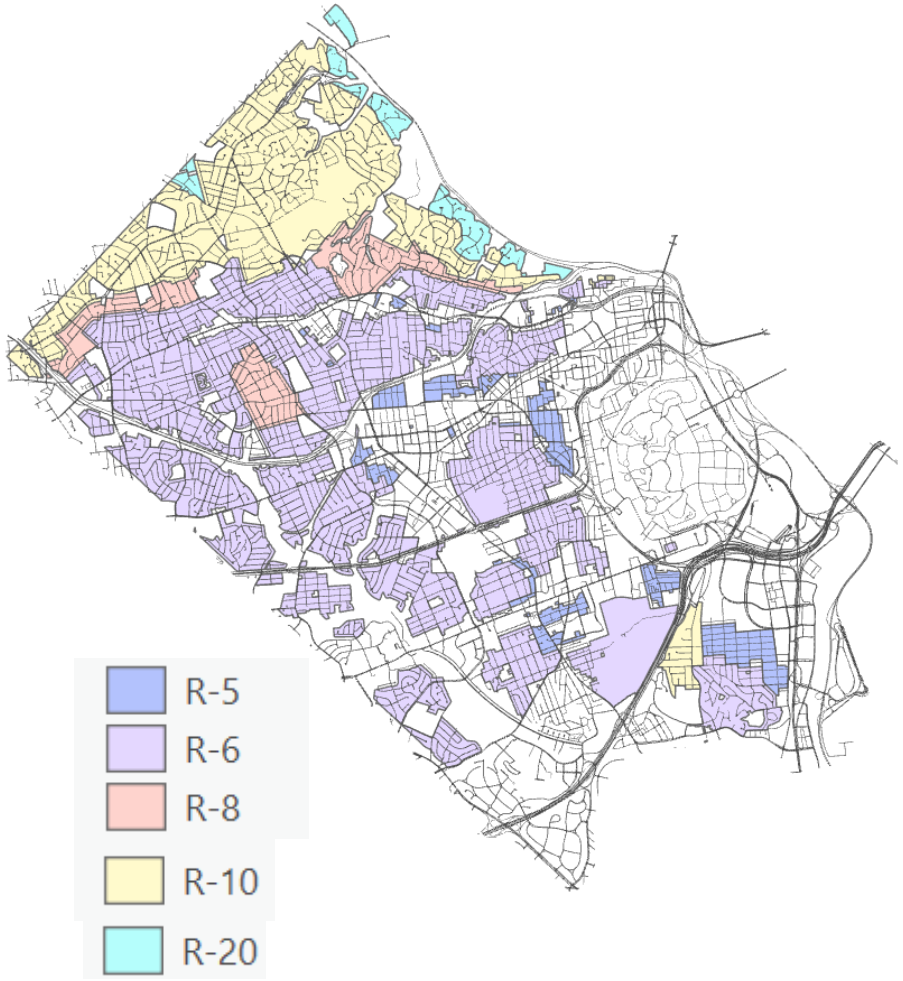
*Note that 'County projects' wedge decreases in 2020 from removal of S Clark ST

Why focus on low residential areas?

- Lots zoned R5-20 represent **~70%** of Arlington's private land
- These are the areas where impervious surfaces are increasing the most
- Impervious area on these lots is where stormwater and tree impacts happen
- Pervious area on these lots is where tree planting and stormwater mitigation both occur

The County's future stormwater and tree canopy dynamics will play out primarily through how low residential areas continue to develop over time

Areas zoned R5-20



How Stormwater and Zoning regulate impervious surfaces in low residential zones

What is and is not regulated

LDA program

- Regulates land disturbance >2500 square feet (lowest State threshold)
  - Mainly new homes
  - Most home additions and improvements are below this threshold and not regulated
- Does not set limits on impervious surfaces
- Requires mitigation of runoff impacts from new impervious surfaces

Zoning

- Regulates building and driveway footprints
- Does not regulate most walkways and patios

Examination of low residential lot data

1. How has impervious cover changed over time?
2. How has impervious coverage compared to lot coverage limits?
3. What proportion of impervious area is from surfaces that don't count as lot coverage?

How impervious cover has changed over time

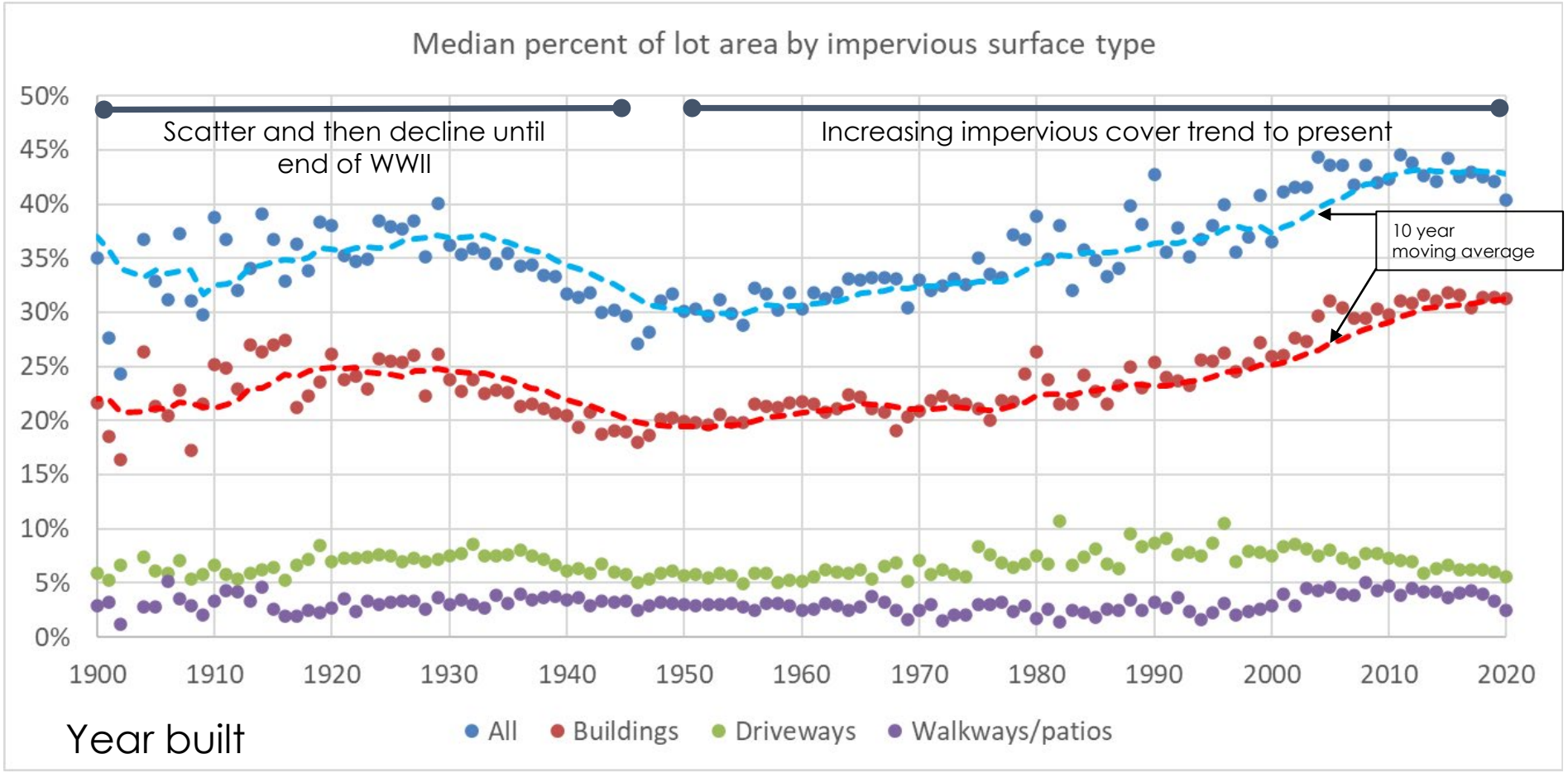
Impervious cover trends over time
1900-present day

3 main categories:
- Buildings
- Driveways
- Walkways and patios

Total lot impervious area and building footprints have increased over time

For newer homes, most of the lot impervious is from the building footprint

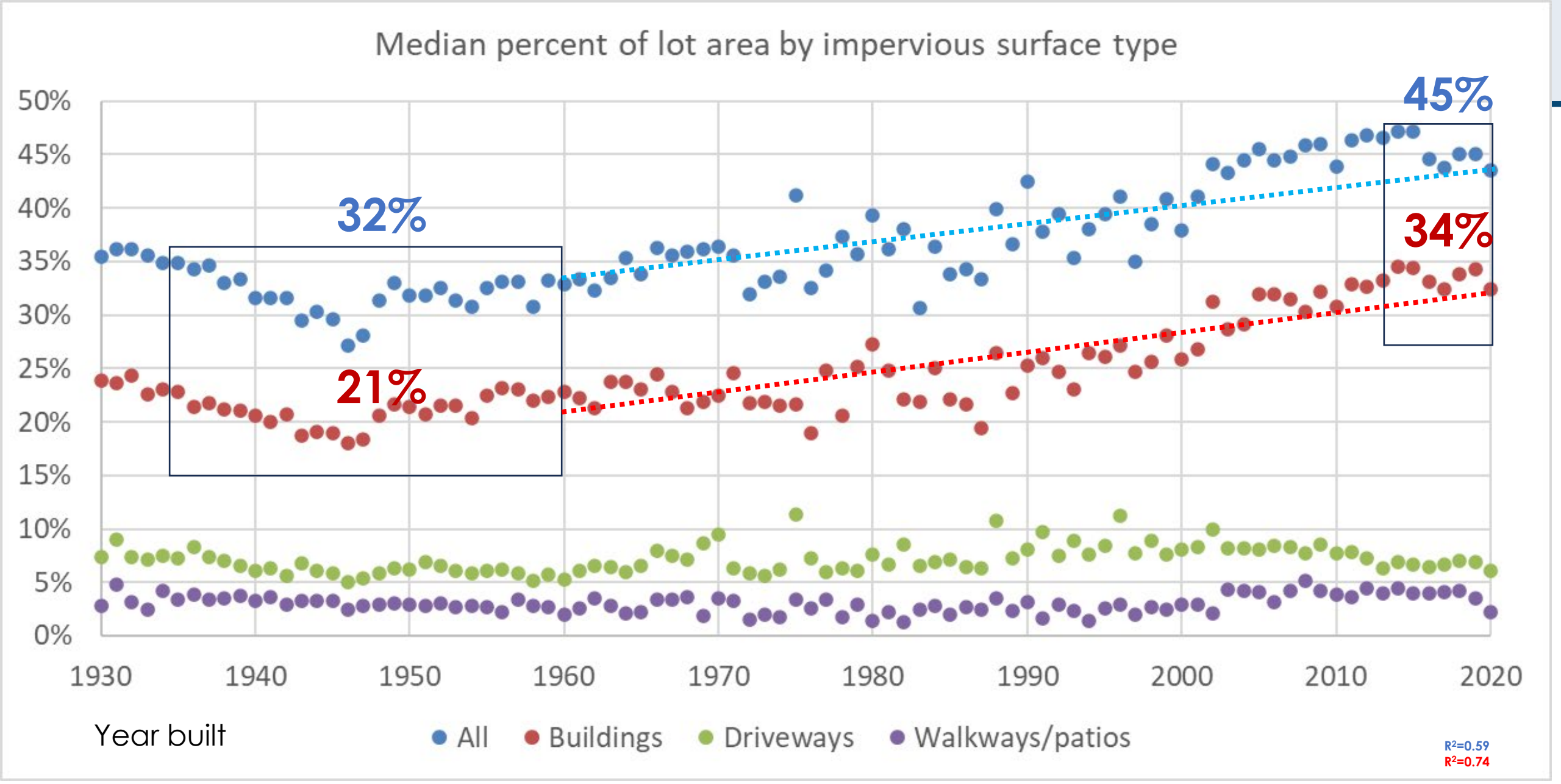
Proportionately less space for driveways and walkways/patios



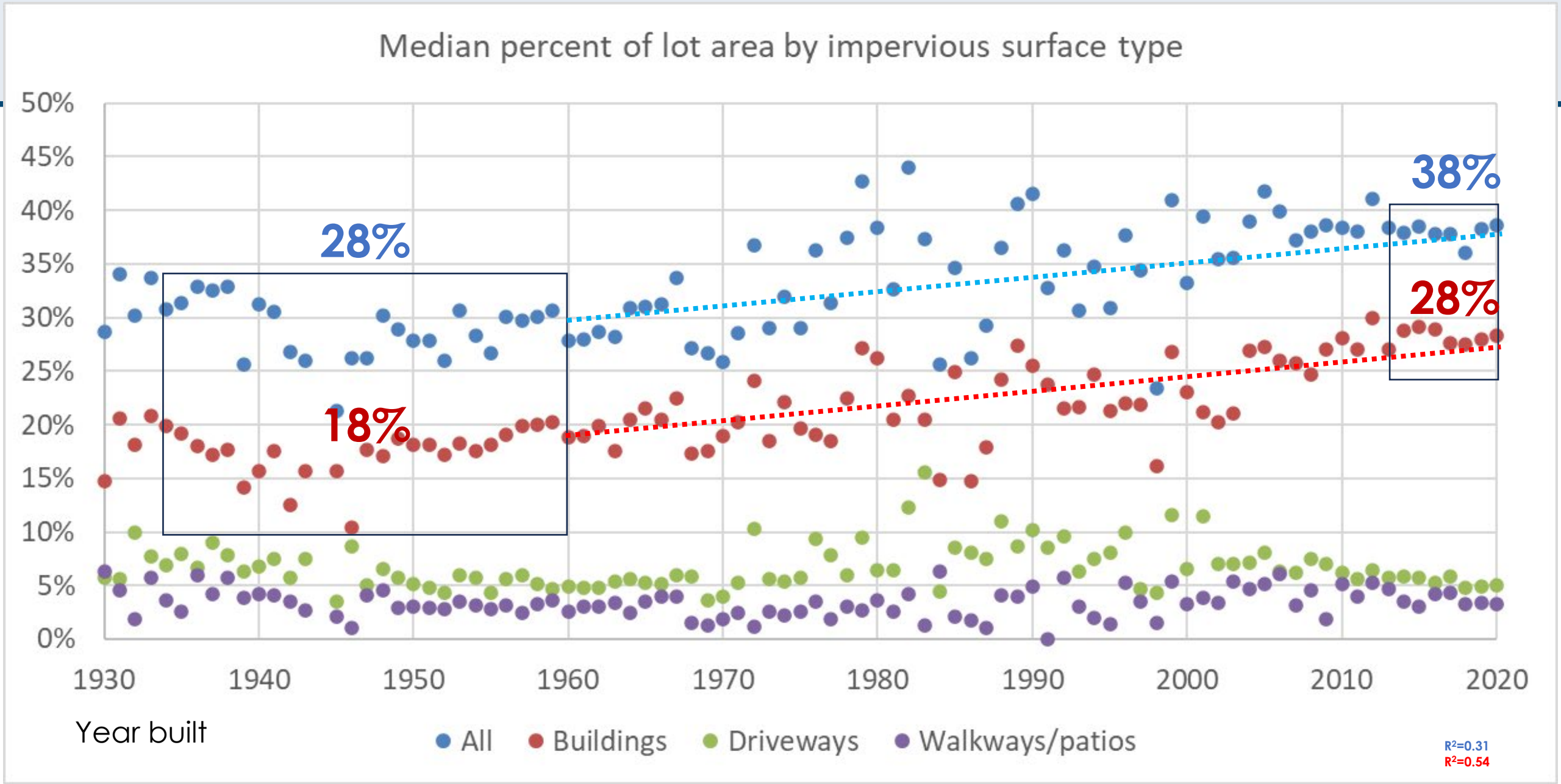
Focus on R6 and R10 lots

- Analyzing data within specific R zones is more useful because much less variation in lot size
- R6 and R10 lots comprise 85% of R zone parcels; 84% of R zone parcel area and impervious area
  - R6 lots = **58% of R zone parcel area**
  - R10 lots = 26% of R zone parcel area
- Baseline reference: Year built **1935-1960** (60% of all parcels)
- Present day: Year built **2014-2020** (5% of all parcels)

R6 lots: Total impervious cover and building footprints have both increased



R10 lots: Total impervious cover and building footprints have both increased



Impervious footprints 2014-2020 v 1935-1960
Square footage

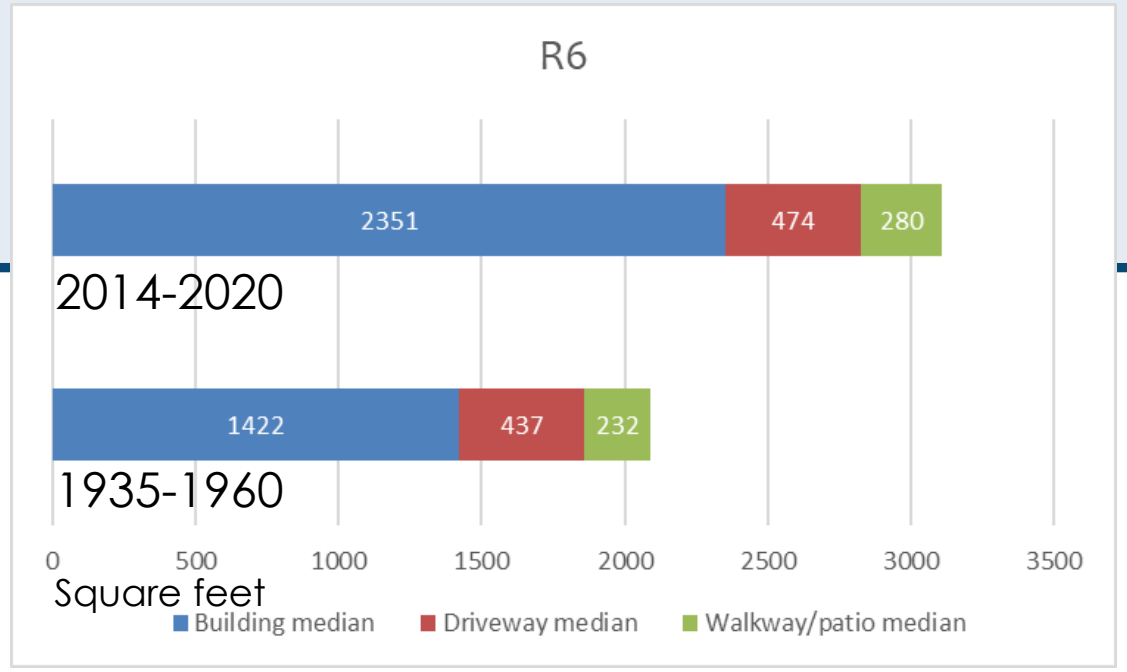
Building footprints have increased substantially
Walkways/patio footprints have also increased

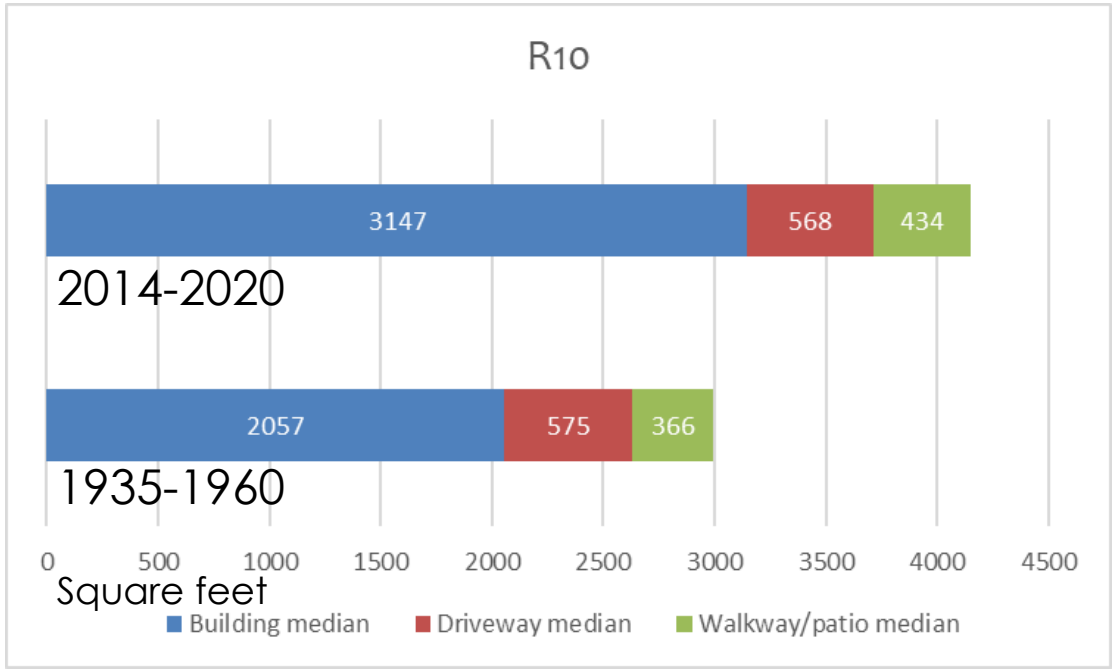
R6

- Buildings +65%
- Driveways +9%
- Walkways/patios +21%

R10

- Buildings +53%
- Driveways -1%
- Walkways/patios +19%



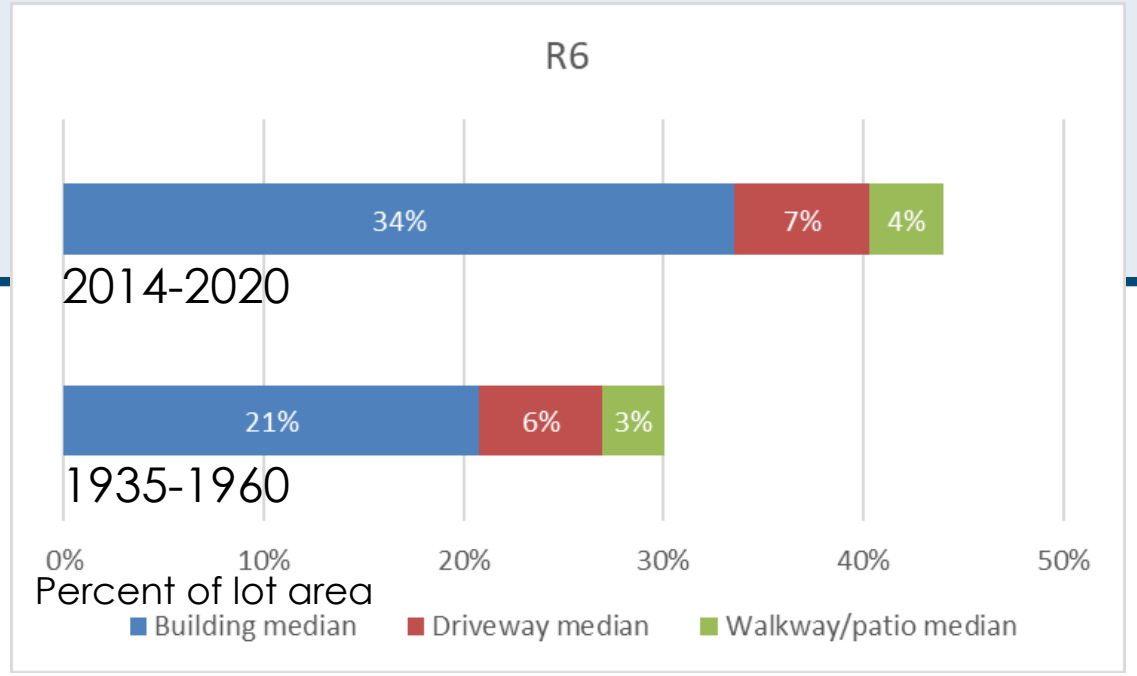


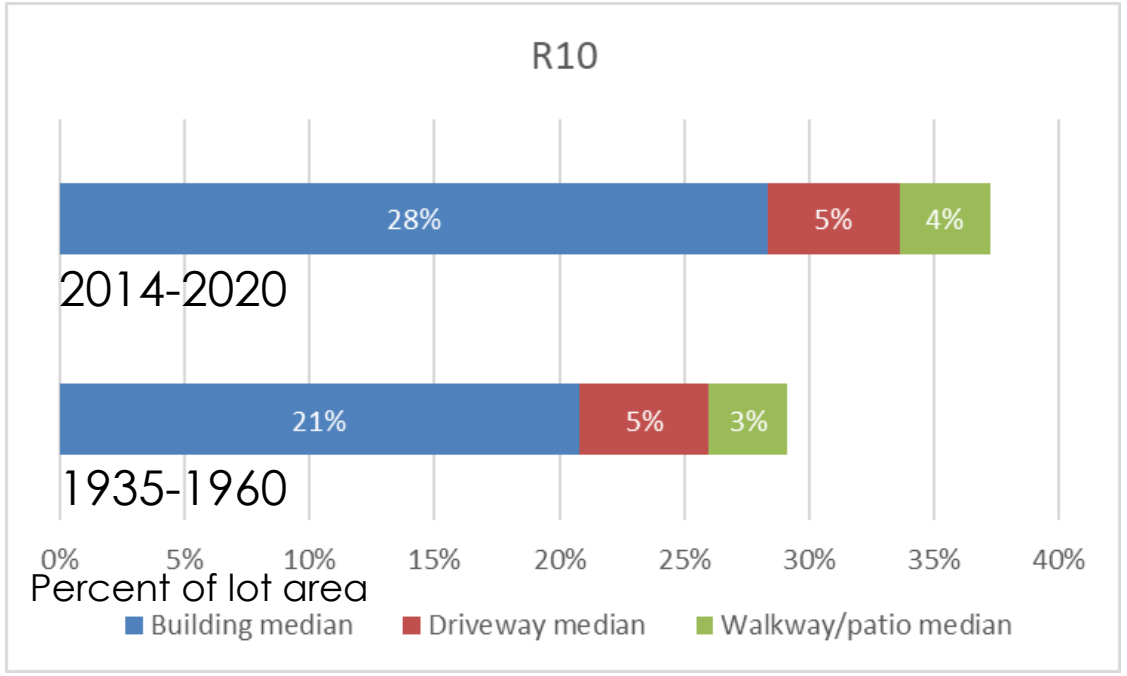
Impervious footprints 2014-2020 v 1935-1960
Percent of lot area

As a percentage of lot area:

- Building footprints also have increased substantially
- Walkway/patio footprints have increased slightly

The next sections examine why the walkway/patio portion is increasingly important





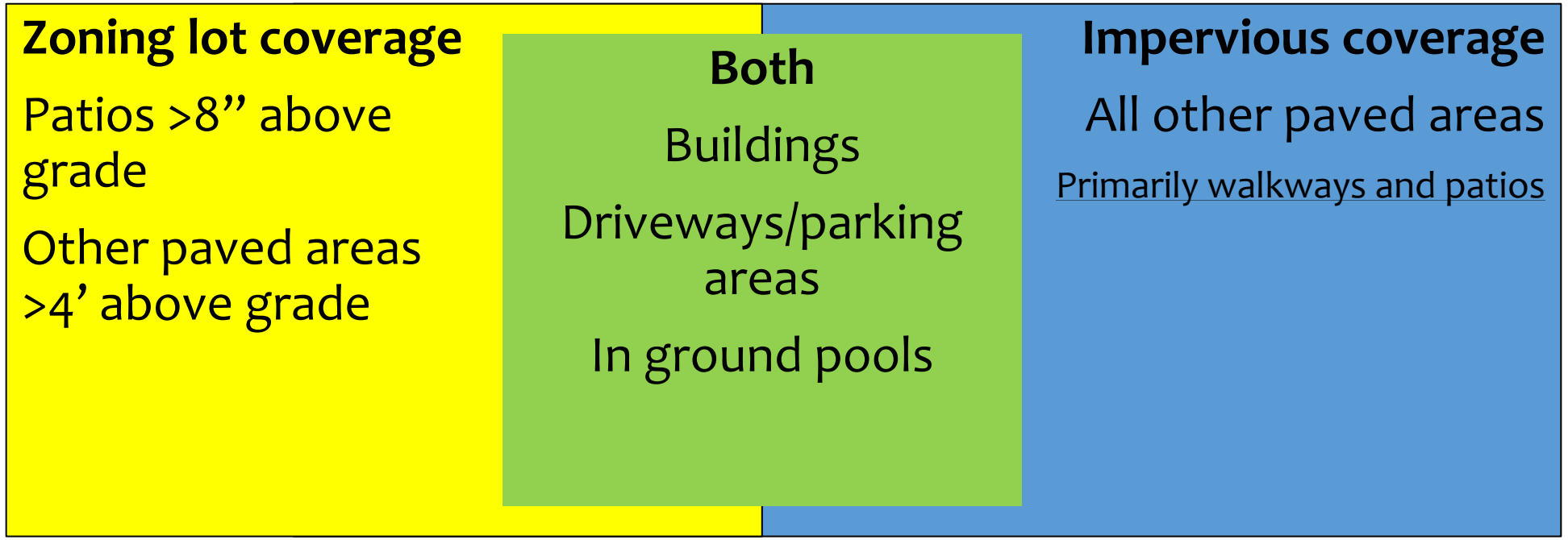
How impervious coverage has compared to lot coverage limits

Zoning lot coverage does not include all impervious area on the lot

"*Impervious cover*" or "*impervious surface*" means a surface composed of any material that significantly impedes or prevents natural infiltration of water into the soil. Depending on the design, impervious surfaces may include, but are not limited to: roofs, buildings, streets, parking areas, and any concrete, asphalt, or compacted gravel or dirt surface.

Chapter 60 – Stormwater Management Ordinance

Main differences



Zoning lot coverage limits

Base lot coverage

Max lot coverage with bonuses

Categories	R-5	R-6	R-8	R-10	R-20
Maximum lot coverage (%)	45	40	35	32	25
Maximum lot coverage of one-family dwelling with porch of at least 60 square feet (exclusive of any wrap-around or side portion) on the front elevation (%)	48	43	38	35	28
Maximum lot coverage with detached garage in the rear yard (%)	50	45	40	37	30
Maximum lot coverage with detached garage in the rear yard and porch of at least 60 square feet (exclusive of any wrap-around or side portion) on the front elevation (%)	53	48	43	40	33
Maximum main building footprint coverage (%)	34	30	25	25	16
Maximum main building footprint coverage with front porch (%)	37	33	28	28	19
Maximum main building footprint (sf.)	2,380	2,520	2,800	3,500	4,480
Maximum main building footprint with front porch (sf.)	2,590	2,772	3,136	3,920	5,320

R6 lots: Impervious area vs lot coverage

Most older homes: IA < lot coverage limits
Most newer homes: IA > lot coverage limits

2014-2020

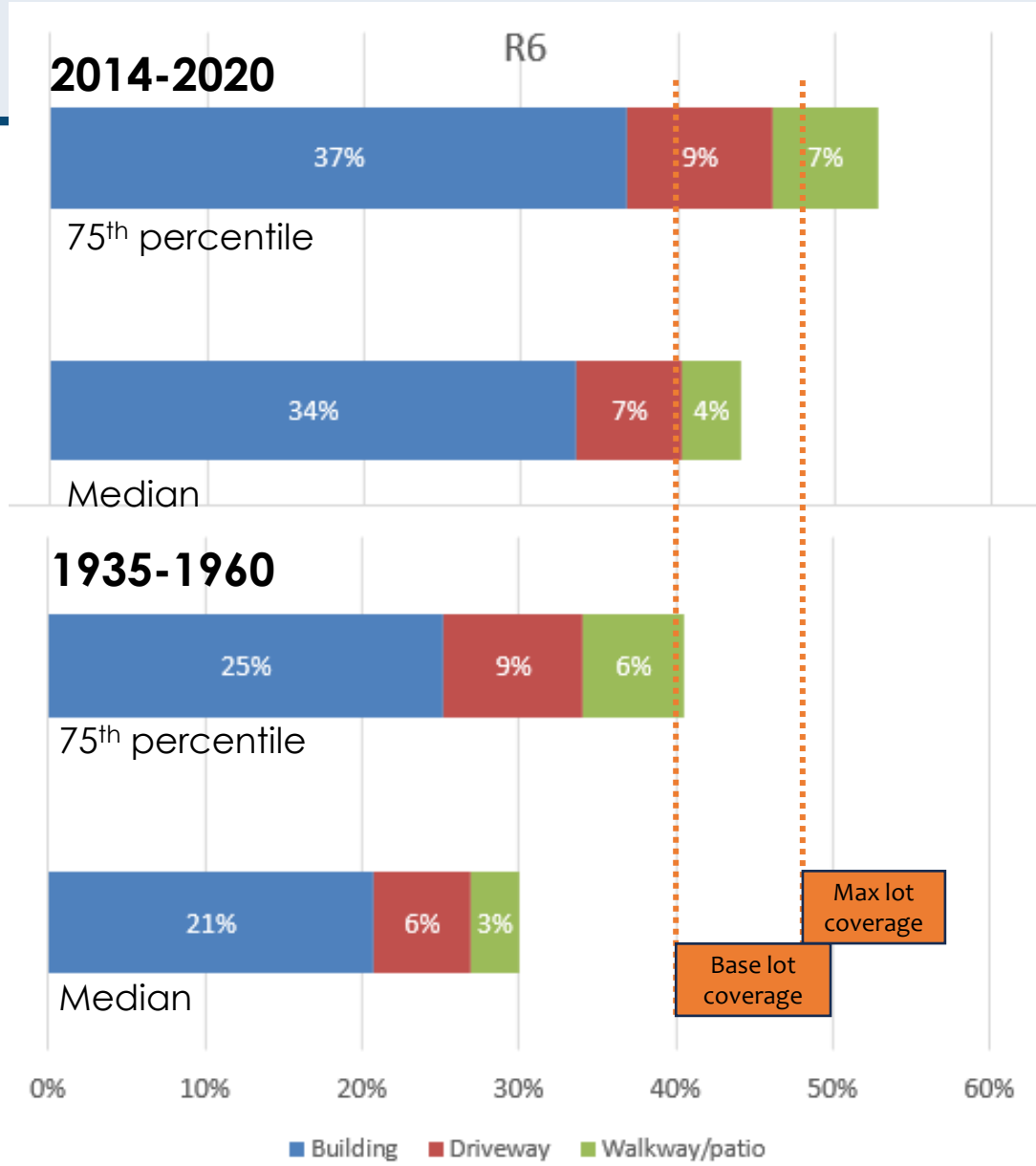
With larger building footprints:

- Median: Walkway/patio portion puts IA over base lot coverage
- 75th percentile: Walkway/patio portion puts IA over max lot coverage

1935-1960

With smaller building footprints:

- Median: Total IA below base lot coverage
- 75th percentile: Total IA at base lot coverage



R10 lots: Impervious area vs lot coverage

Most older homes: IA < lot coverage limits
Most newer homes: IA > lot coverage limits

2014-2020

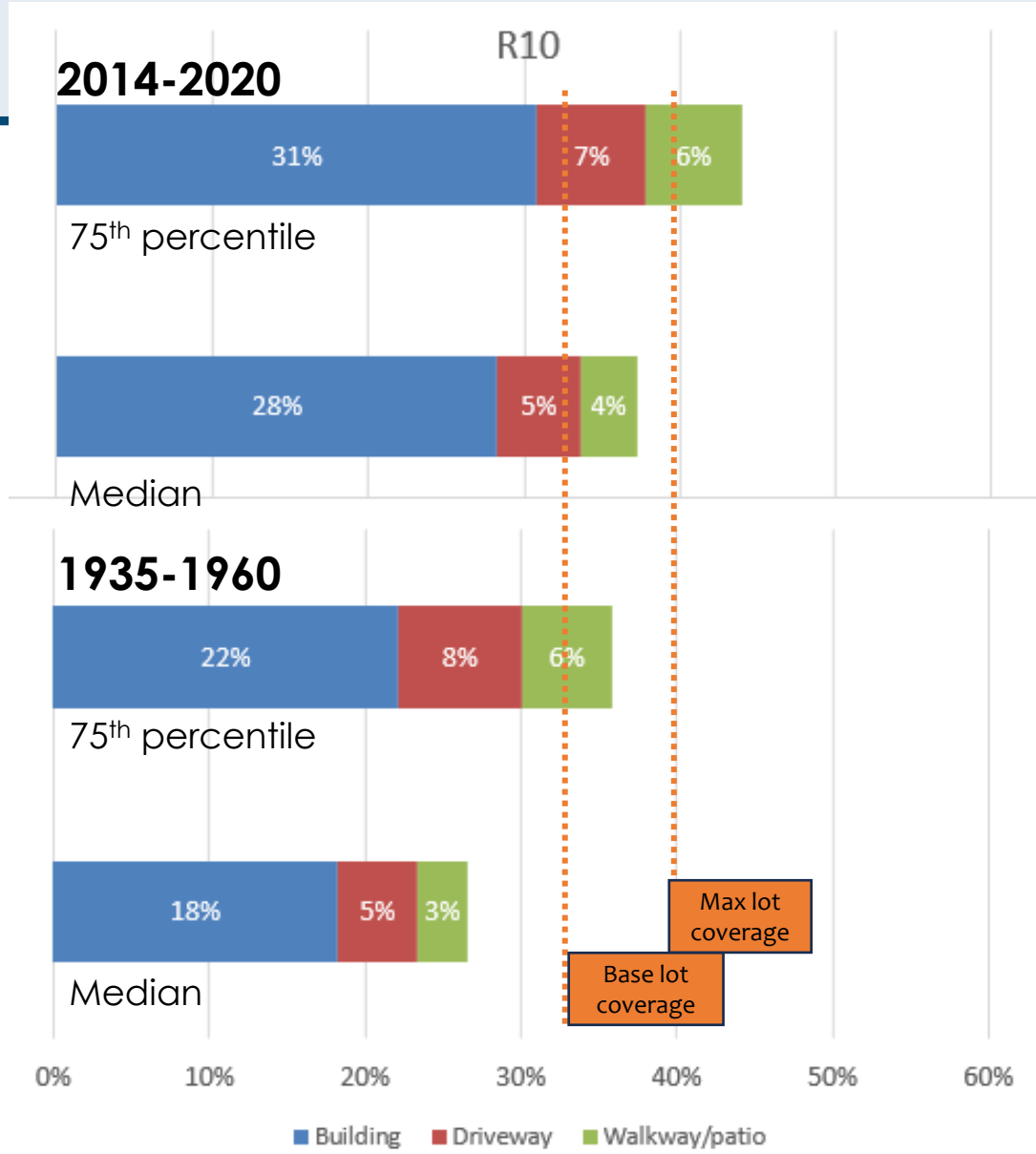
With larger building footprints:

- Median: Walkway/patio portion puts IA over base lot coverage
- 75th percentile: Walkway/patio portion puts IA over max lot coverage

1935-1960

With smaller building footprints:

- Median: Total IA below base lot coverage
- 75th percentile: Walkway/patio portion puts IA over base lot coverage



Break for questions

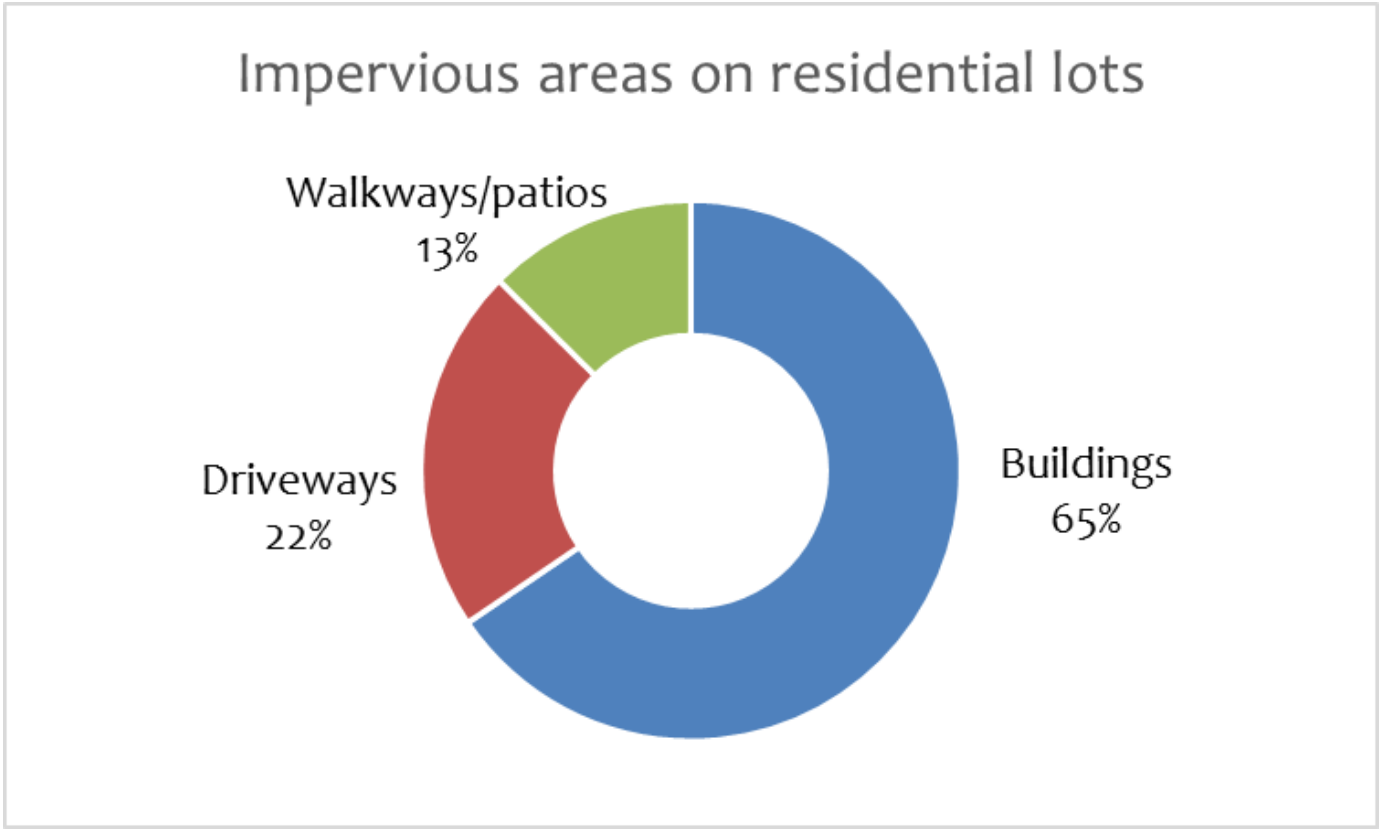
What proportion of impervious area is from surfaces that don't count as lot coverage?

Walkways and patios

Walkways, patios have significant combined footprint across the County

For all low residential parcels:

- 13% of all impervious area
- 36% of paved area
- 209 acres
  - ~7 Pentagons
  - ~Area of entire Crossman Run watershed



Walkways, patios add important impervious area on newer home lots

- These surfaces are the most discretionary of lot uses compared to main building and driveway
- These surfaces push impervious coverage above lot coverage limits
- And compete with the same limited remaining pervious spaces where stormwater and tree canopy needs are provided

The importance of pervious areas to achieve stormwater management and urban forestry objectives

Many needs for pervious spaces

Stormwater management

Where rainfall and runoff are absorbed and where SWM facilities are located.

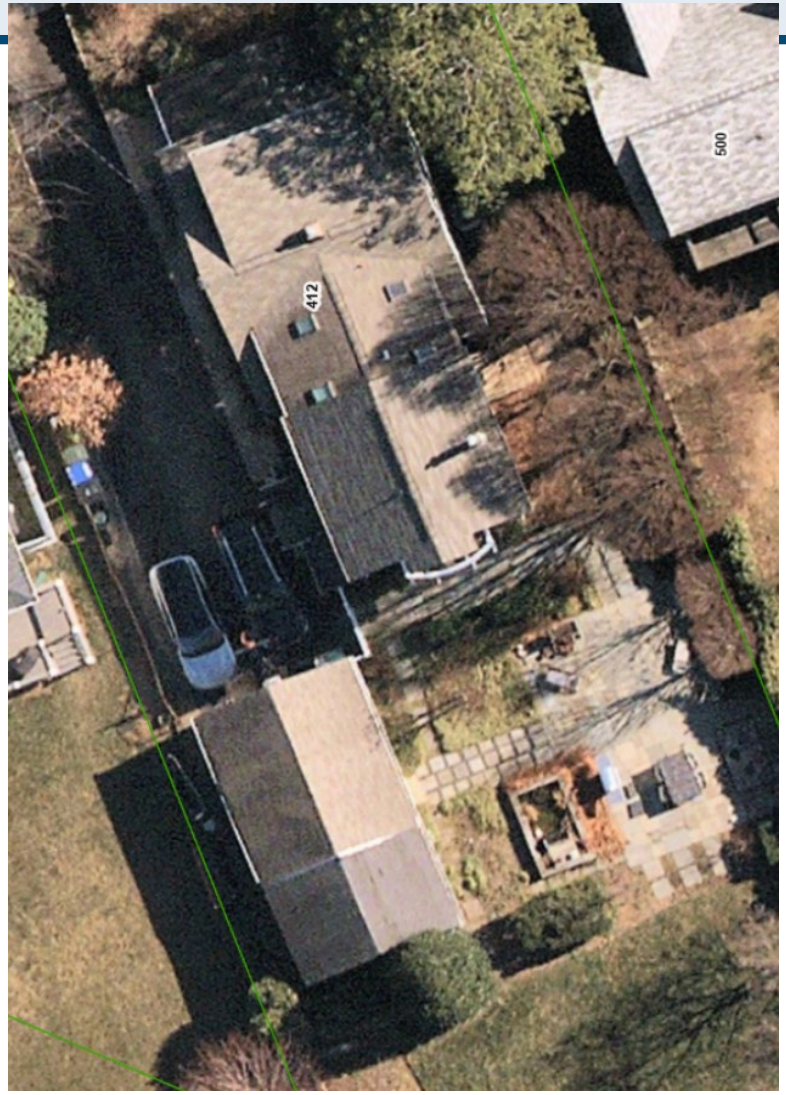
- Dry wells
- Rain gardens
- Private drainage pipes
- Swales
- Public storm pipes

Trees

- Conserving existing trees
- Planting new trees
- Expanding canopy over time

Owner wants and needs

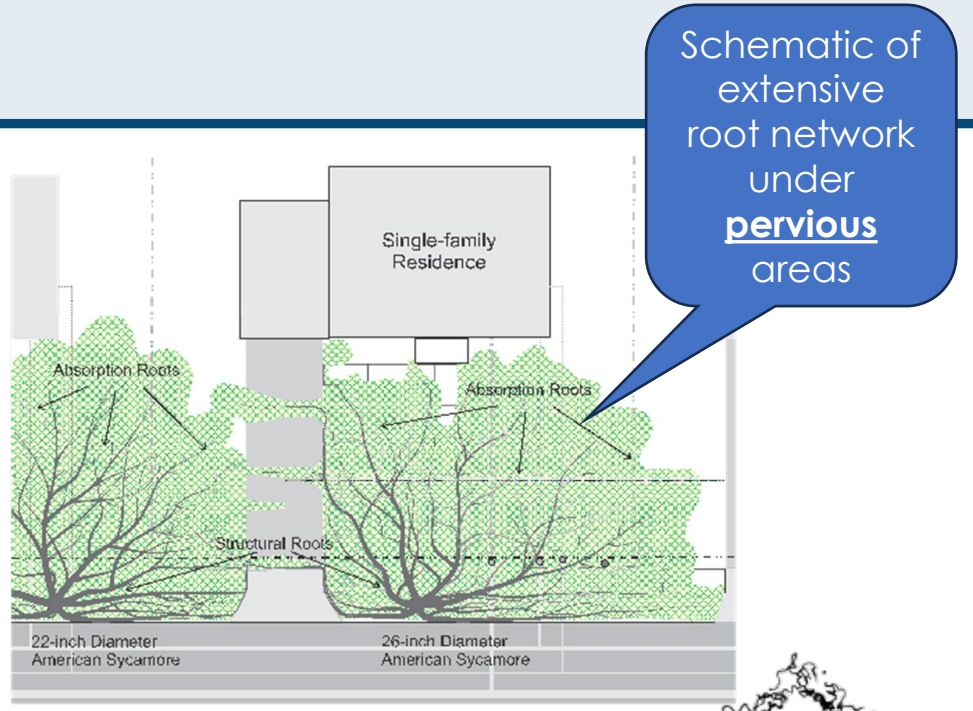
- General landscaping
- Food gardens
- Play space and equipment
- Decks and patios
- Utility connections
- And more



The importance of pervious areas for trees

- Tree roots cover extensive area
- Need contiguous pervious areas to support root space and soil volume needs for large trees
- The pervious space on a lot that can support tree roots is less than the total available
- Much of the pervious space on a lot is fragmented and/or unsuitable for planting trees

(next slides will illustrate)



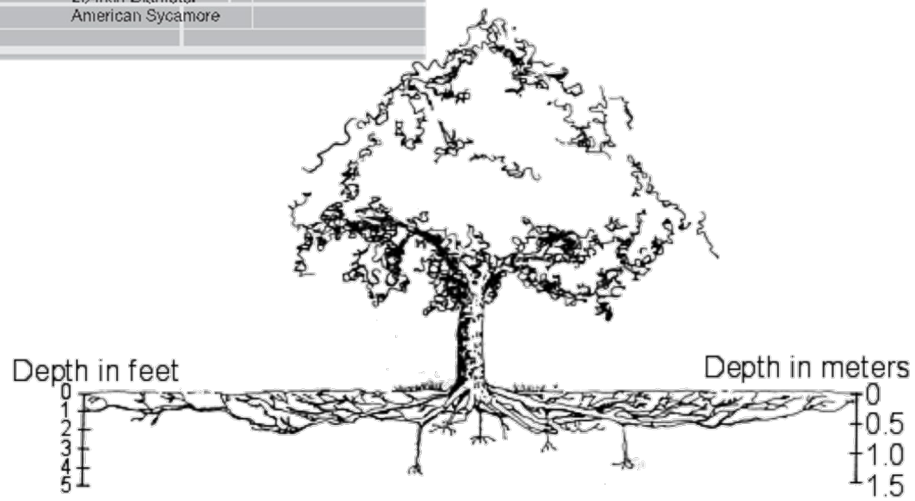


Figure 1. Diagram of a 'typical' root system

Tree canopy in low residential areas needs to host the bulk of our canopy to meet our goals

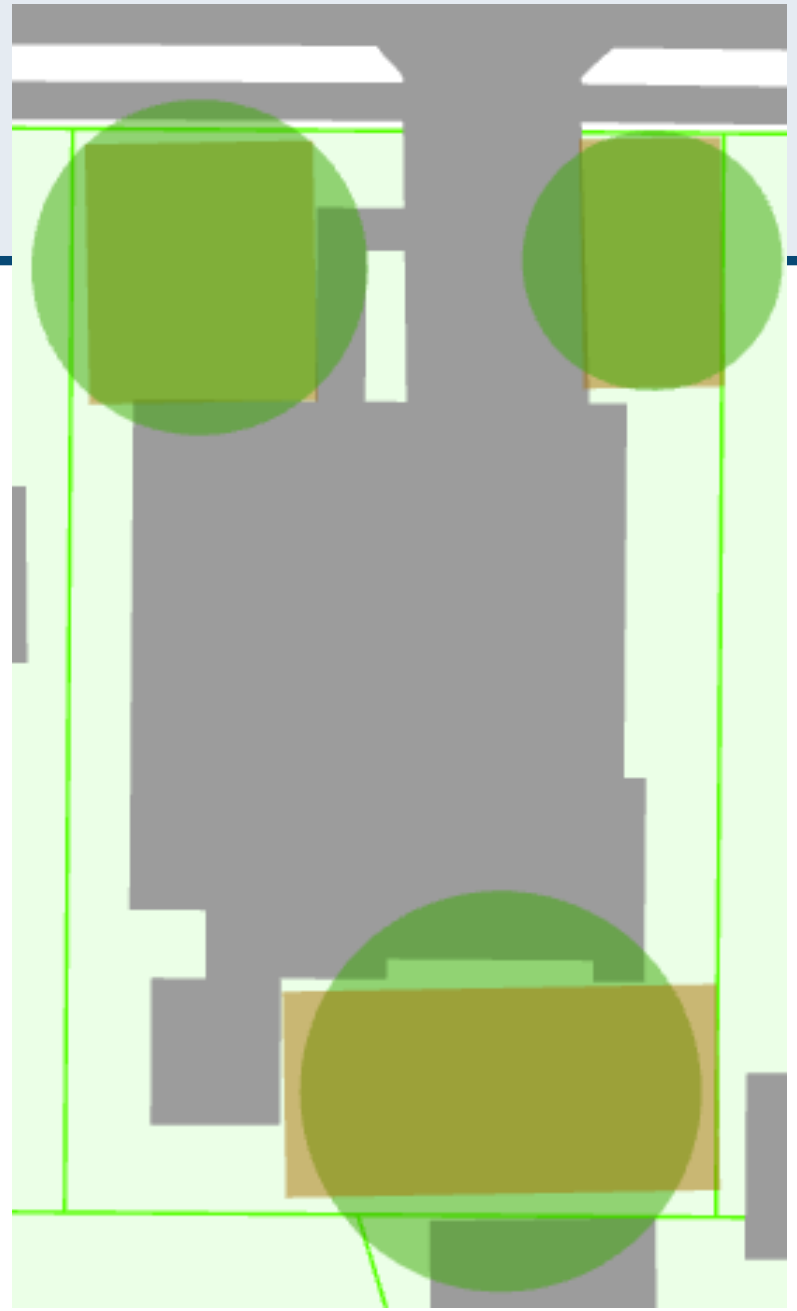
- Current Countywide canopy: 35%
- FNRP Countywide goal: 40%
- Low residential areas must achieve a higher canopy coverage to offset lower canopy in denser areas.
- MWCOG recommends 50-55% for Low to Medium density residential. Denser lots may fall under the High Density Residential target of 35%
- This tree canopy needs soil volume to reach these goals, and this soil volume needs to be largely contiguous, and soil spaces on new home lots can be especially fragmented
- Existing lots will also need to be part of the solution through additional planting (privately-funded planting or the tree canopy fund).

Canopy potential
R6 lot (newer homes)

- 51% impervious lot (75th percentile)
- Potential: ~25% of lot available for tree planting
- Supports ~40% tree canopy
- May not meet the needs for low residential lots to balance tree canopy with denser areas of the County, if they do not have the capacity to reach 50-55%

Comparison to older home, 75th percentile:

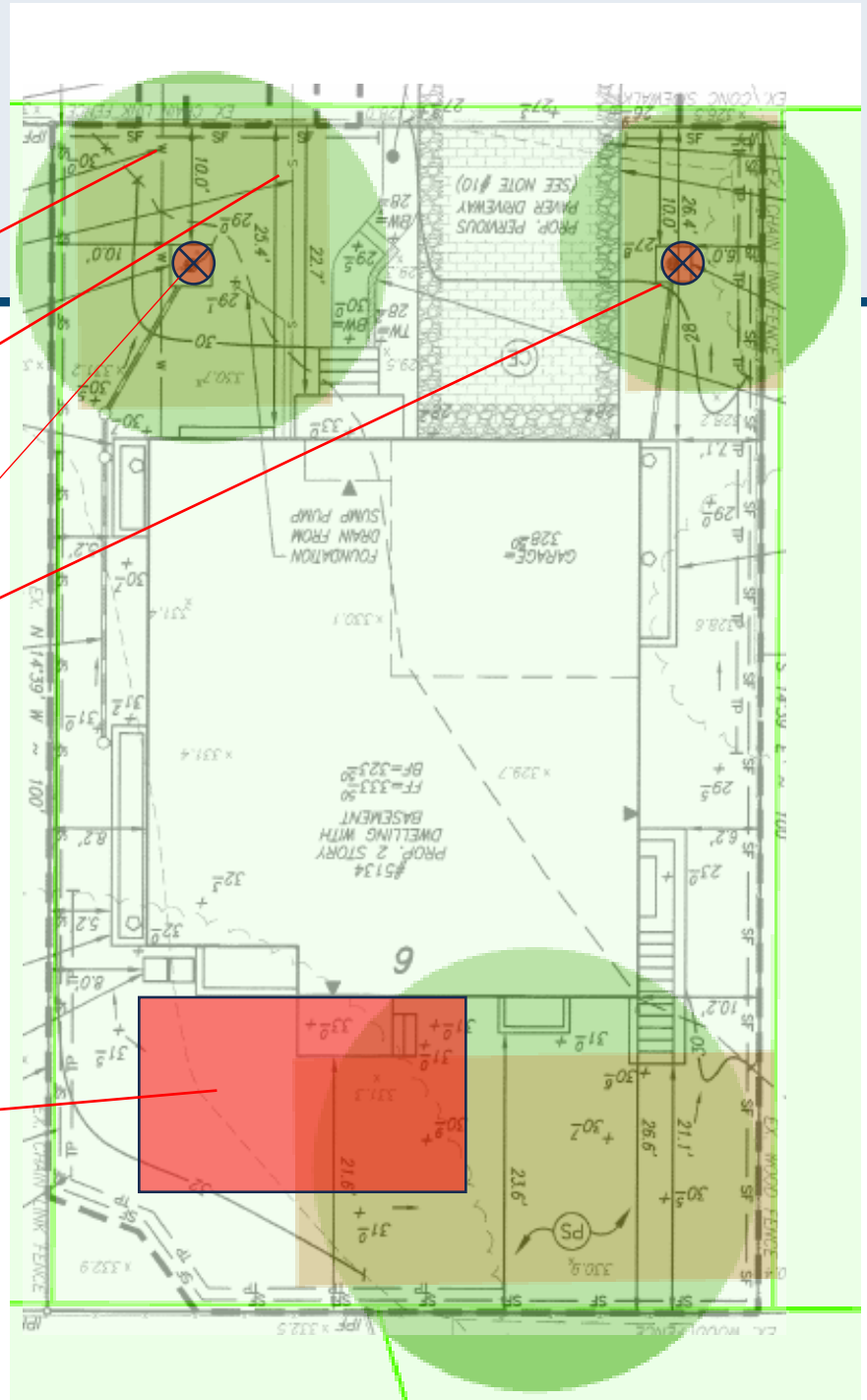
- *38% impervious*
- *~40% of lot available for tree planting*
- *~60% tree canopy potential*



Canopy potential vs other needs for pervious space

Tree canopy potential is often reduced in reality

SWM facility location constraints – cannot be located too close to house, adjacent properties, or public right-of-way (10' generally)

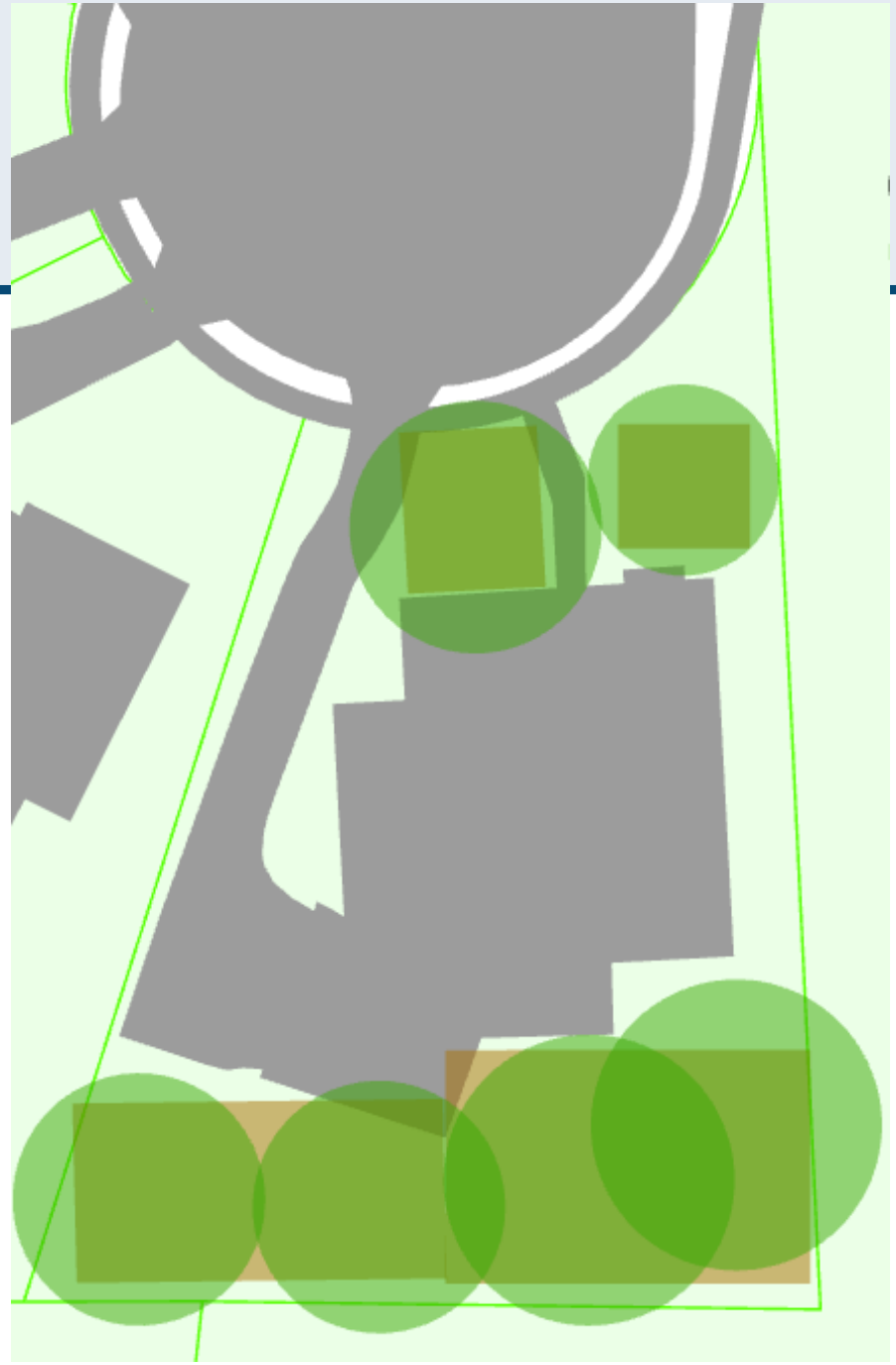


Canopy potential
R10 lot (newer homes)

- 42% impervious lot (75th percentile)
- Potential: ~35% of lot available for tree planting
- Supports ~53% tree canopy
- Has potential to meet the needs for low residential lots to balance tree canopy

Comparison to older home, 75th percentile:

- *34% impervious*
- *~40% of lot available for tree planting*
- *~60% tree canopy potential*



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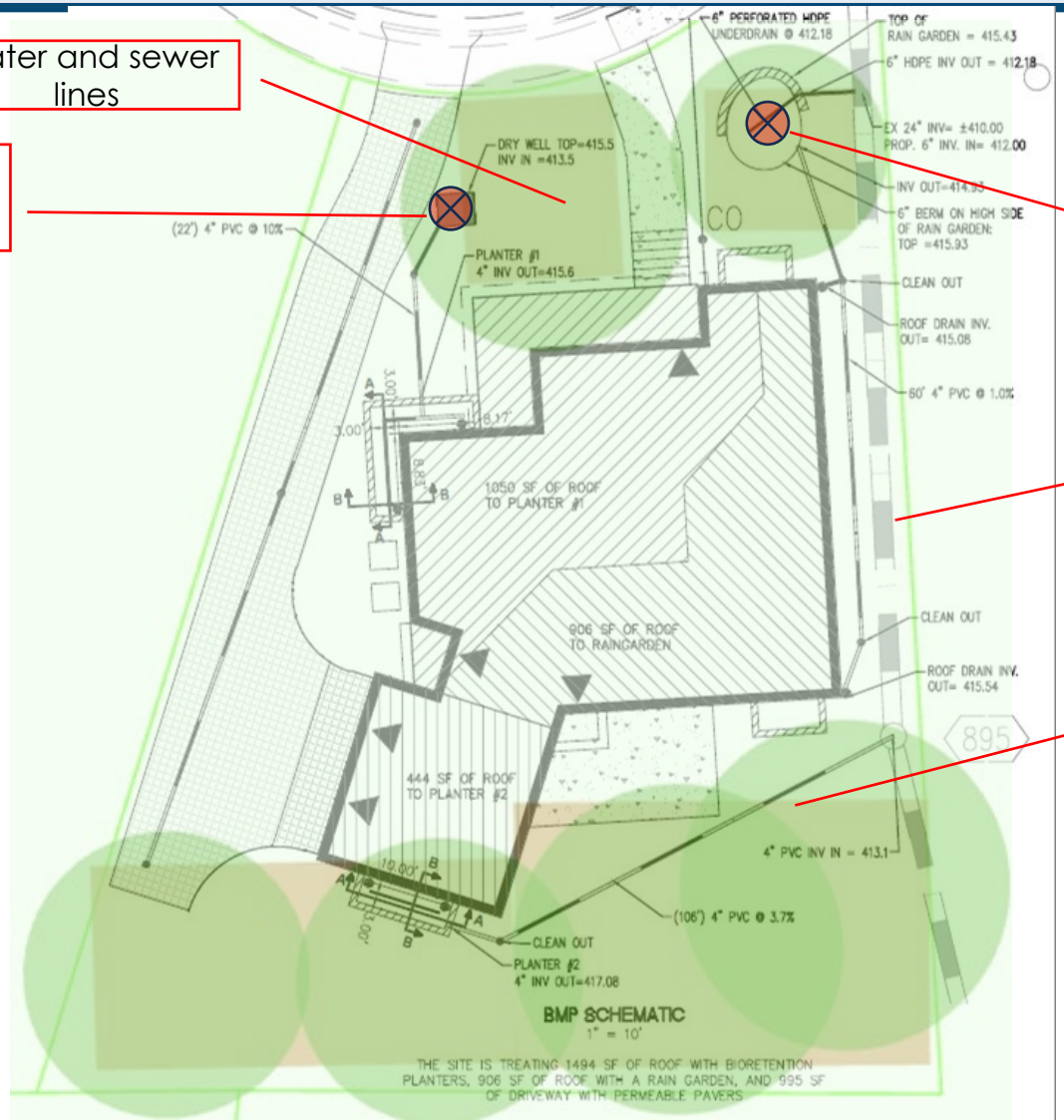


Water and sewer lines

Dry well

Rain garden

Public pipes

Private pipes

Summary of tree canopy dynamics

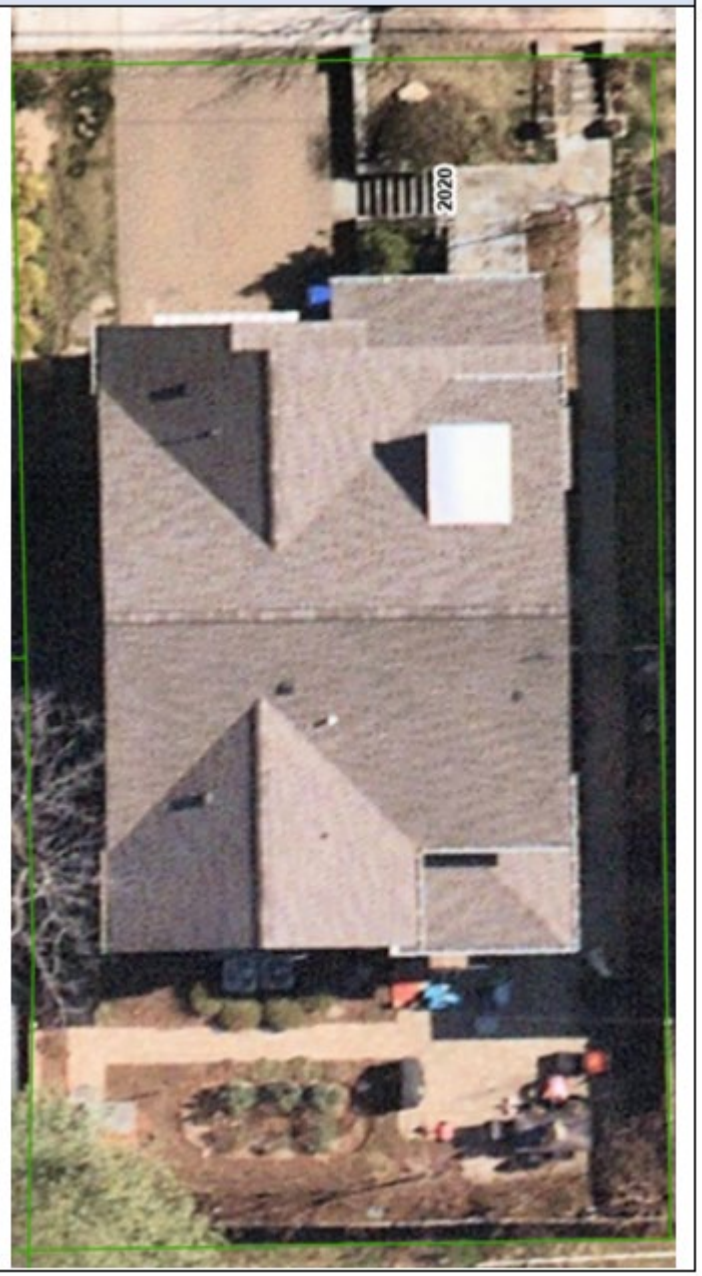
- Plantable space on newer home lots is already limited
- More so when a patio is added post-LDA
- Achieving long-term tree canopy targets will be difficult, especially in R6 zones as older homes are replaced by newer homes, and impervious area is added post-LDA.
- Land conversion to impervious area is often permanent and challenging to reverse.

Examples of impervious surfaces added post-LDA

- Primarily includes walkways and patios
- Absence of any permitting requirement or limits increases the burden on the Stormwater program
- Enforcement after the fact not sustainable nor good customer service

R5
60%
impervious

Zoning Lot coverage
Base 45%
Max 53%

March 2016 – construction completed	February 2020
	

R6
65% impervious

Zoning Lot coverage
Base 40%
Max 48%

February 2021 – construction completed	February 2022
	

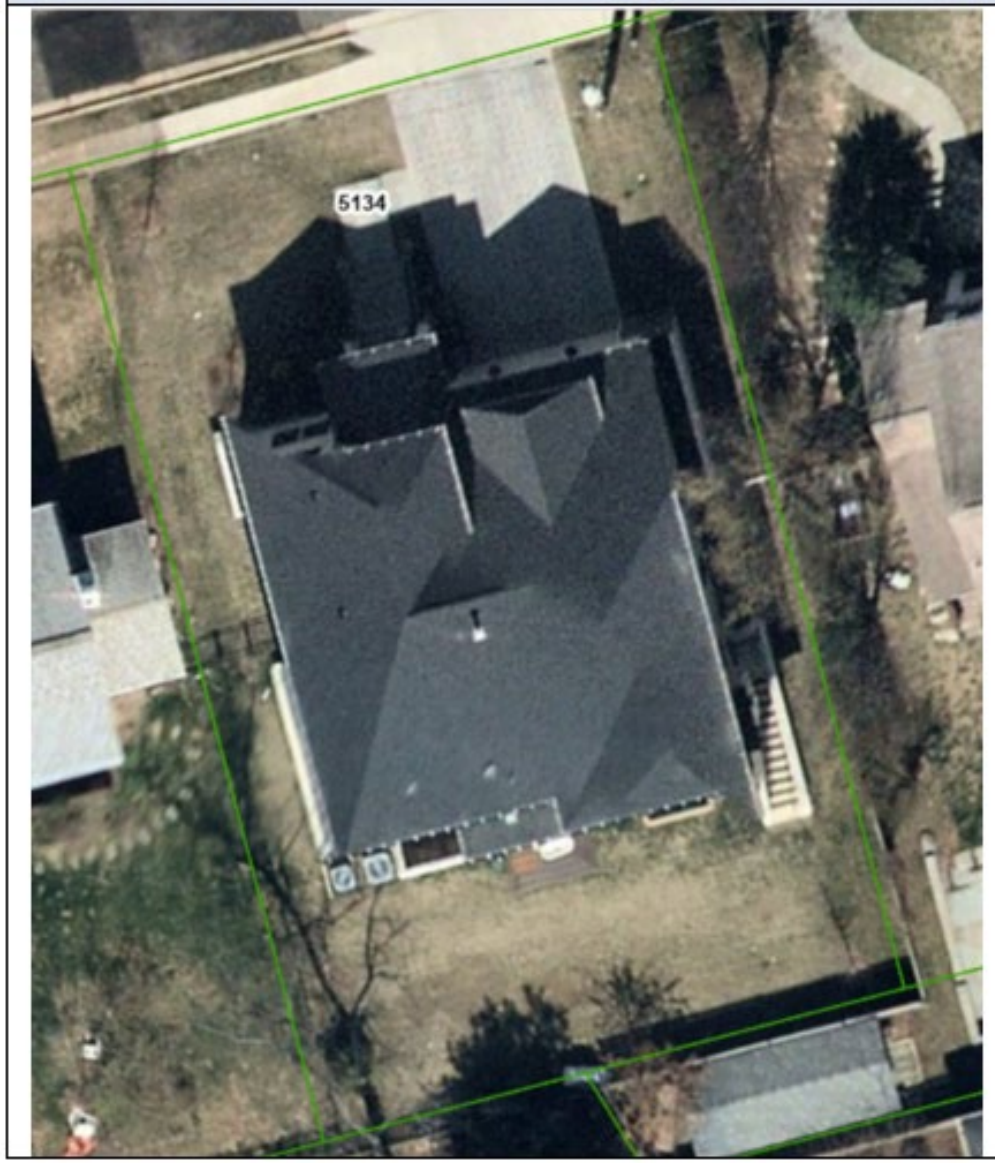
R6
70% impervious

Zoning Lot coverage
Base 40%
Max 48%

April 2023 – construction completed	February 2024
	

R6
51% impervious

Zoning Lot coverage
Base 40%
Max 48%

March 2018 – construction completed	February 2022
	

R6
38% impervious
Oversized lot at 8823 SF

Zoning Lot coverage
Base 40%
Max 48%

April 2023 – construction completed	October 2023
	

R10
43% impervious
Oversized lot at 12474 SF

Zoning Lot coverage
Base 32%
Max 40%

February 2023 – construction completed	February 2024
	

Incremental addition of impervious surfaces on older lots also occurs

72% impervious

2007	2009	2015
		

91% impervious

Break for questions

Snapshot of tools and programs used to mitigate the stormwater and tree impacts from impervious surfaces

Key Milestones and Actions over 30 years

Date	Program Milestones and Actions	Stormwater	Urban Forestry	Zoning
1992	1st Chesapeake Bay Preservation Ordinance	■	■	
1997	1st Stormwater Permit Issued	■		
2001	1st Chesapeake Bay Preservation Plan	■	■	
2001	Watershed Management Plan	■		
2002	2nd Stormwater Permit Issued	■		
2003	Chesapeake Bay Preservation Ordinance revised RPA map expanded to all streams and open channels, along with steep slopes; tree canopy requirements added	■	■	
2005	Zoning Text Amendments for Lot Coverage, Main Building Footprint, and Nonconforming Buildings			■
2008	Tree Canopy Fund established		■	
2011	Compliance policy change to regulate single family homes for SWM	■		
2013	3rd Stormwater Permit Issued with Chesapeake Bay Pollution Reductions (5%)	■		
2014	New Stormwater Management Ordinance (LDA program); Board chooses to continue to regulate single family homes for SWM Chesapeake Bay Preservation Ordinance revised , increased credit for tree conservation	■	■	
2014	Stormwater Master Plan	■		
2018	Resource Protection Area Map Update**	■	■	
2021	4th Stormwater Permit Issued with Chesapeake Bay Pollution Reductions (40%)	■		
2021	LDA 2.0: More SWM, soil decompaction and amendment; detention credit for trees, soil volume targets	■	■	

Lot Coverage and Related Limits, One-Family Dwellings
Reduced from 56% to lower limits in 2005

- Replaced a uniform 56% total coverage allowance with two lower coverage caps for each zoning district
  - Total coverage
  - Main building footprint
- Included coverage bonuses for detached garages and front porches

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Closing

Putting it together

- Larger building footprints of newer homes leave less space for other needs
- The limited and fragmented remaining pervious areas make it difficult to achieve both SWM and tree canopy objectives
- Adding a patio or other paved surface after an LDA permit area increases this difficulty
- For older home lots, it is also possible to add significant impervious surfaces not regulated by the LDA program
- Stormwater and urban forestry programs have pushed the limits of what they can do

What are some potential actions and tradeoffs to consider?

Potential actions and tradeoffs to consider

- Evaluate possible Zoning options, including but not limited to:
  - Including walkways/patios as lot coverage
  - Setting a separate limit for walkways/patios and/or total paved area
  - Reducing allowable building footprints
- Examine the tradeoffs of possible actions, including but not limited to:
  - Benefits for stormwater and urban forestry
  - Impacts to property owners and use
  - Dynamics for older homes vs newer homes
  - Equity
  - Administration and enforcement

Questions and Discussion