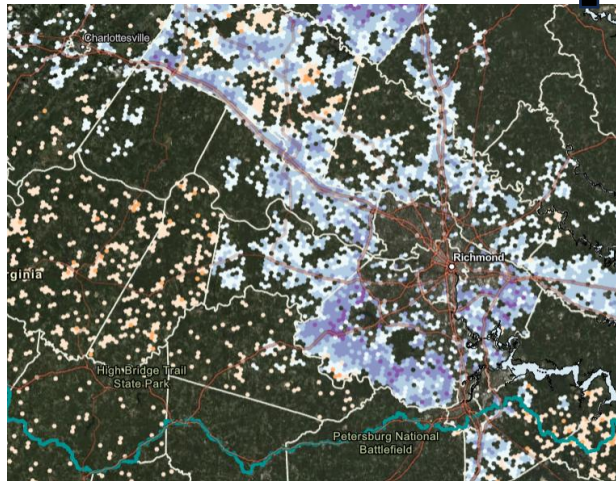


Chesapeake Bay Land Change Model (CBLCM)

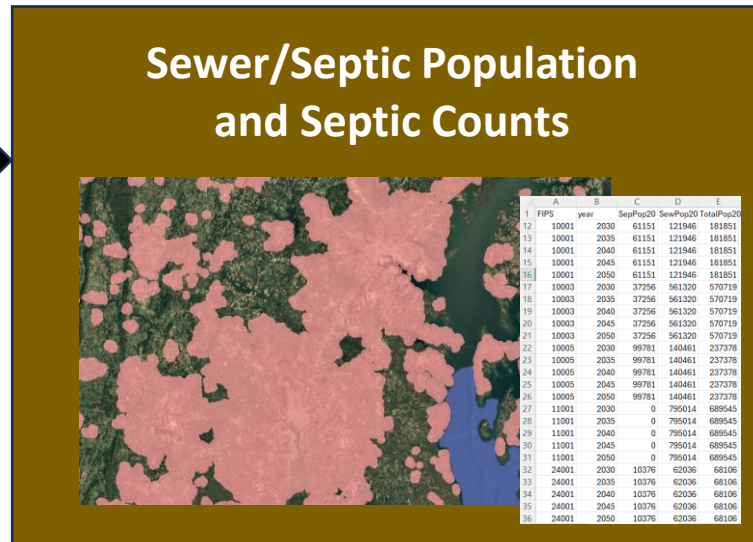
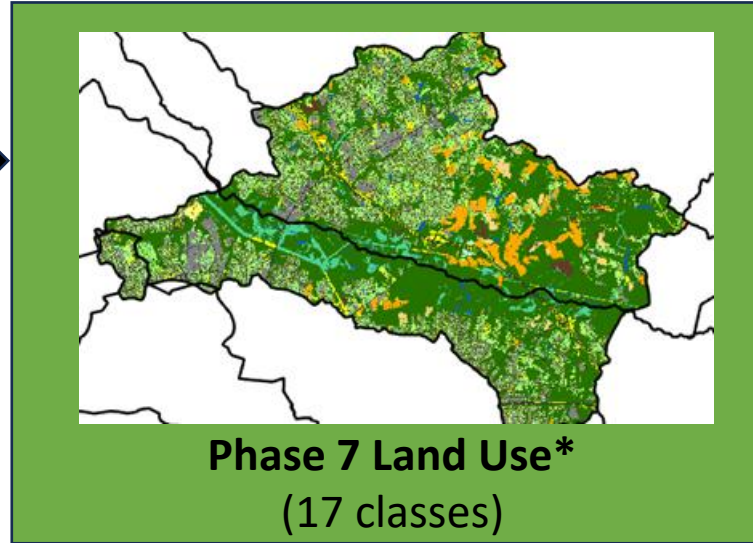
Translating Forecasted Development

Sarah M. McDonald, Jackie Pickford, Peter R. Claggett, Michelle Katoski, Labeeb Ahmed
Lower Mississippi-Gulf Water Science Center, U.S. Geological Survey

Translating Forecasted Development to Land Use: Process



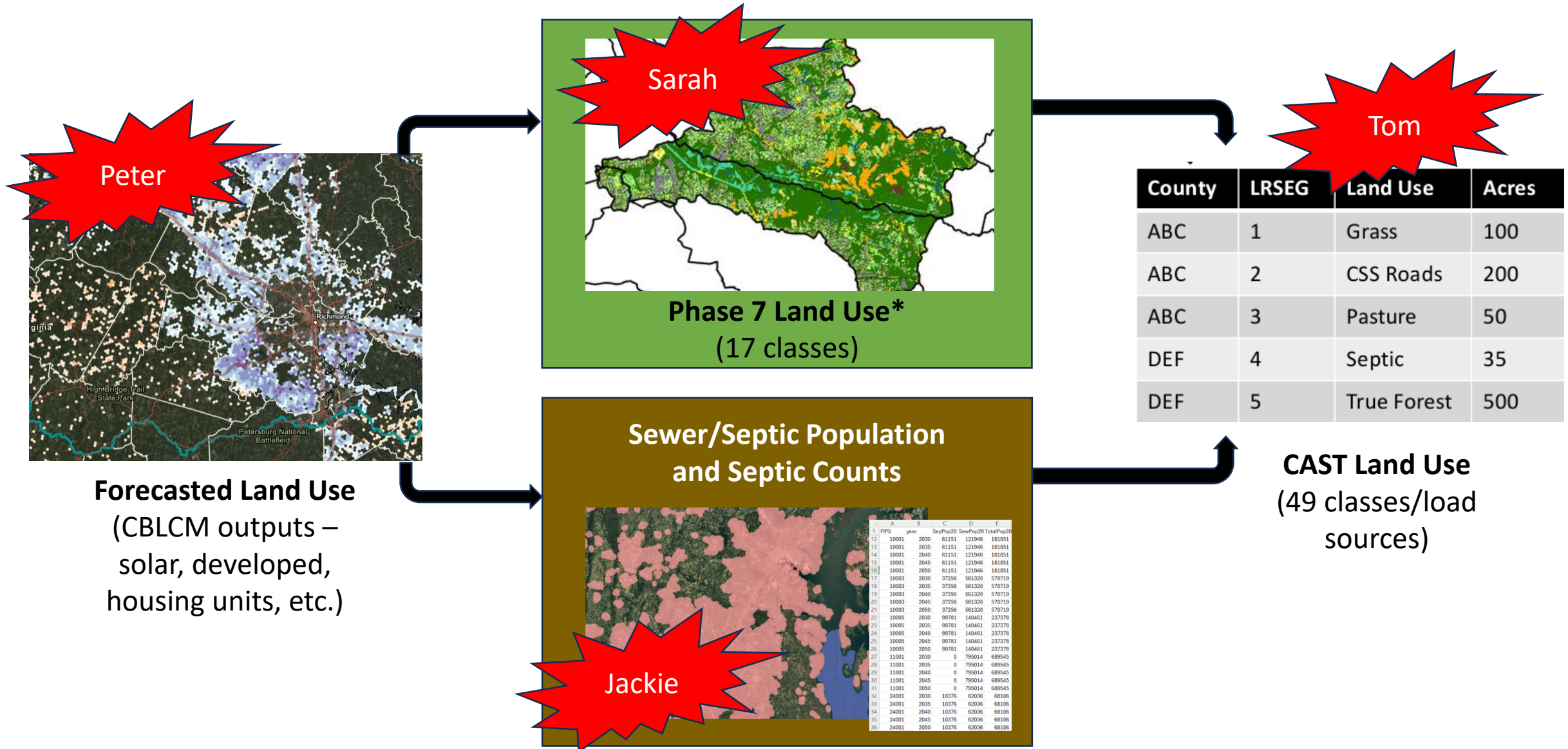
Forecasted Land Use
(CBLCM outputs –
solar, developed,
housing units, etc.)



County	LRSEG	Land Use	Acres
ABC	1	Grass	100
ABC	2	CSS Roads	200
ABC	3	Pasture	50
DEF	4	Septic	35
DEF	5	True Forest	500

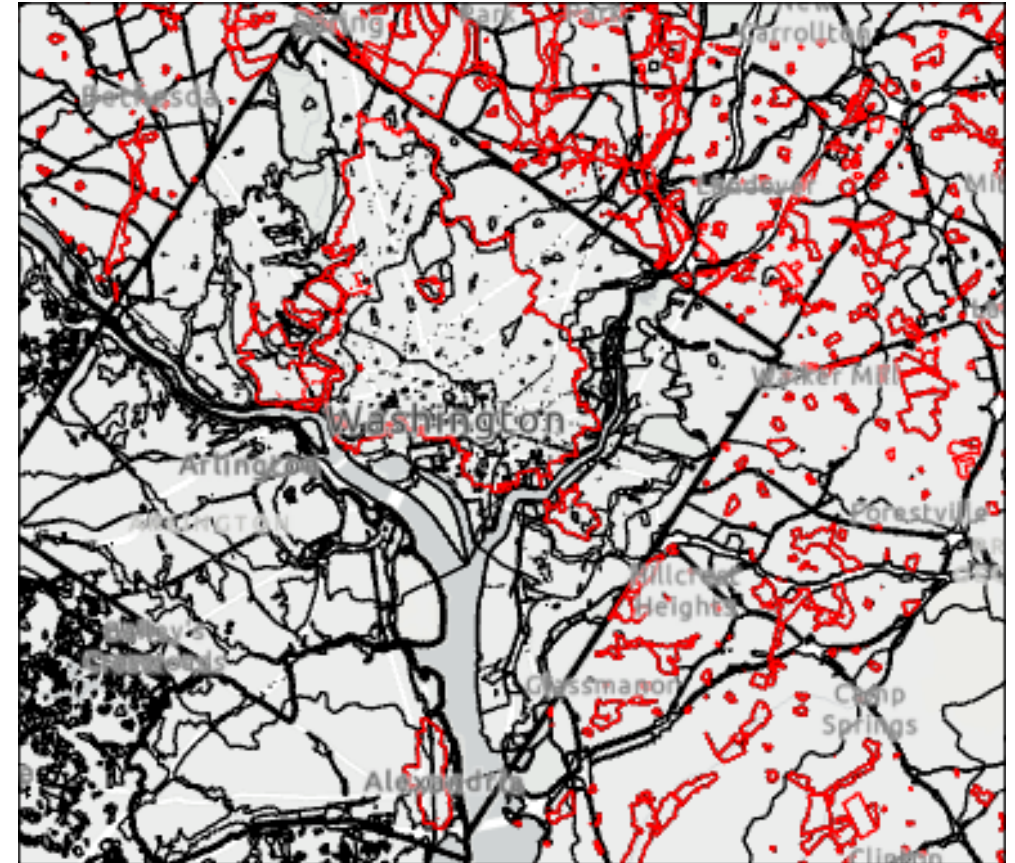
CAST Land Use
(49 classes/load
sources)

Translating Forecasted Development to Land Use: Process



Summary Units: A Refresher

- The analysis units used in CAST
- All land use data, including sewer/septic, are calculated at this scale
- Land-River segments (LRSEGs)
 - Land segments = county boundaries
 - River segments = 12-digit Hydrologic Unit Codes (HUCs)
 - Shoreline = tidal shoreline boundary
 - Climate boundaries = orographic regions
 - Along the Blue Ridge
- Summary Units
 - LRSEGs
 - Municipal Separate Storm Sewer Systems (MS4s)
 - Federal Lands
 - Combined Sewer Overflows (CSOs)
 - 1:100k National Hydrography Dataset (NHD) Catchments



Translating Forecasted Greenfield Development to Phase 7 Land Use

Aggregate (sum) all pixel-level metrics to the phase 7 summary units (i.e. the metrics available in the viewer, but by summary units)

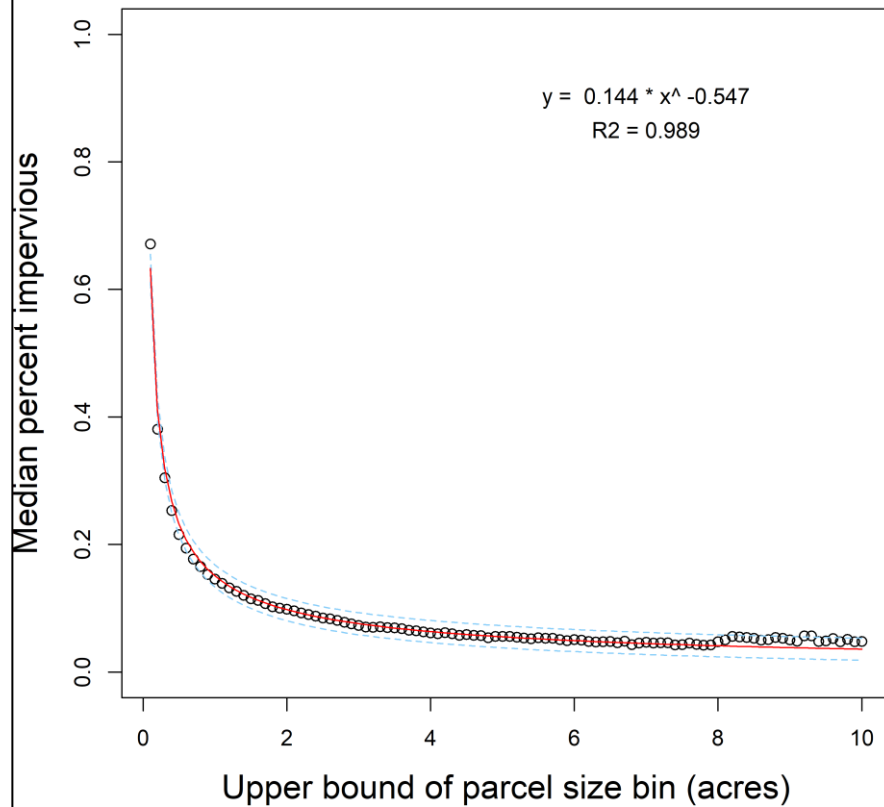
Convert these metrics to acres of land use change per phase 7 land use

Add change to 2022 phase 7 land use to produce future year land use

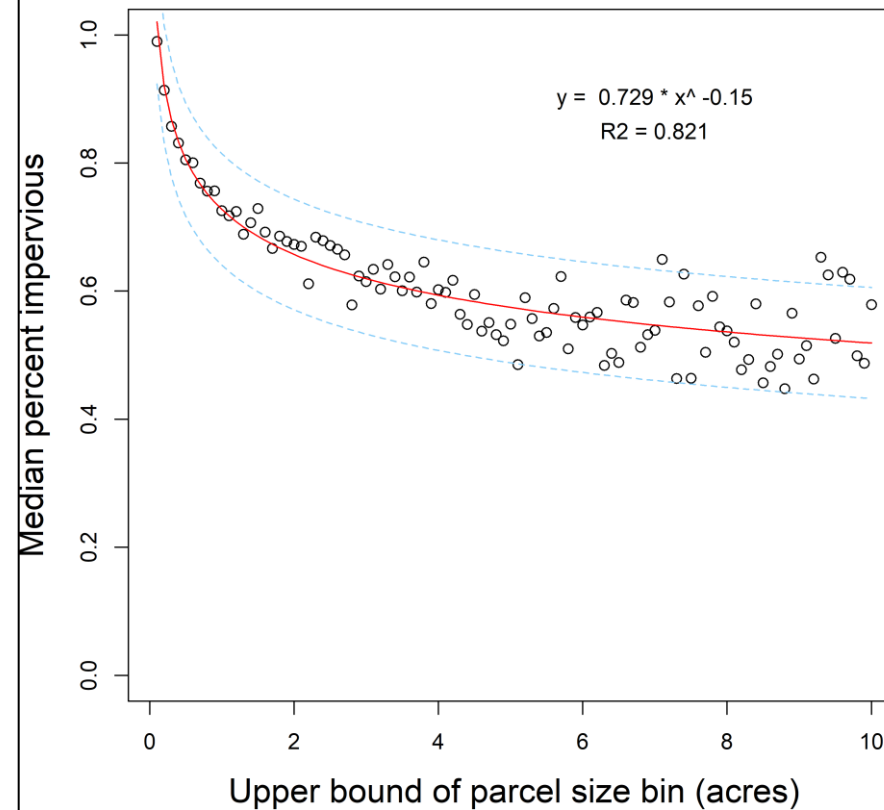
Phase 7 Land Use: Impervious

How much of the forecasted development is impervious?

Median impervious cover (%) for residential parcels in Maryland



Median impervious cover (%) for commercial parcels in Maryland

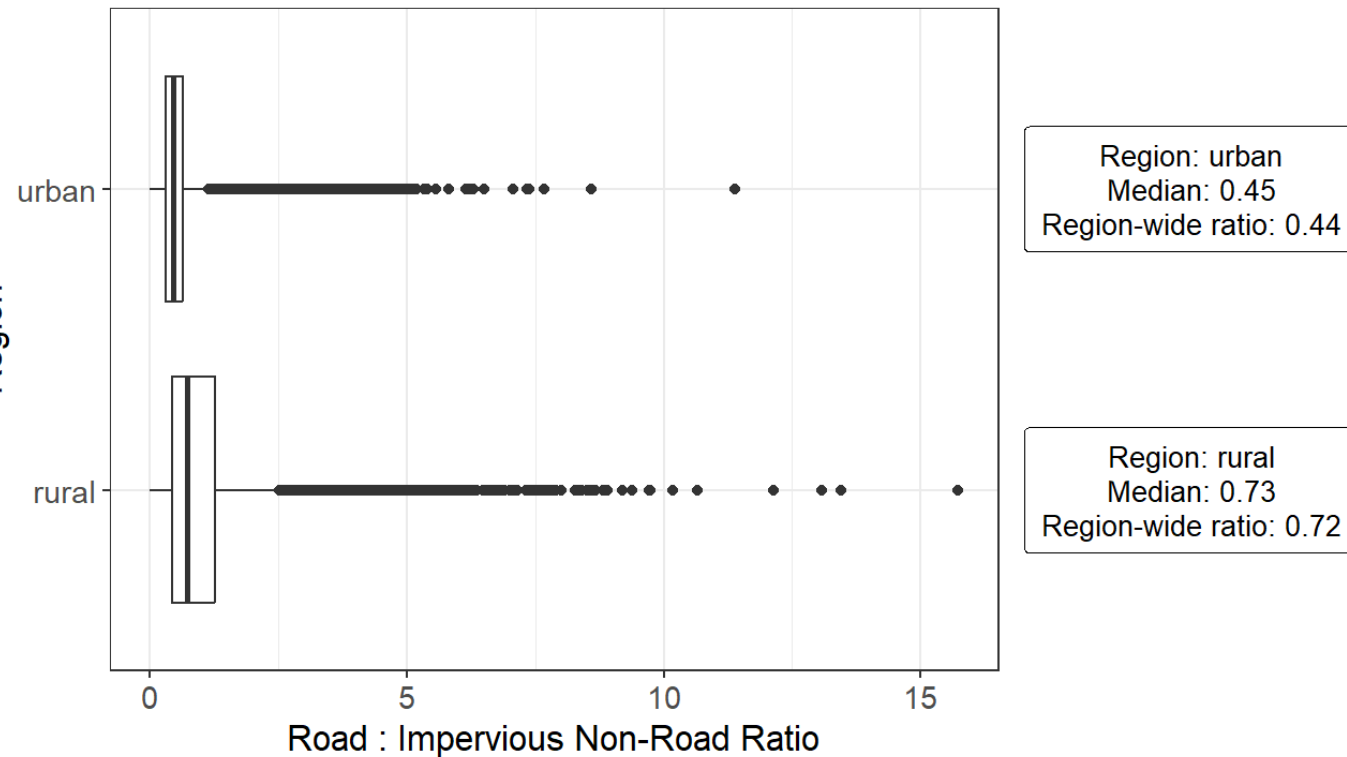


- State-specific equations relate lot size and % of the lot that is impervious
- Unique equations for residential development and commercial development

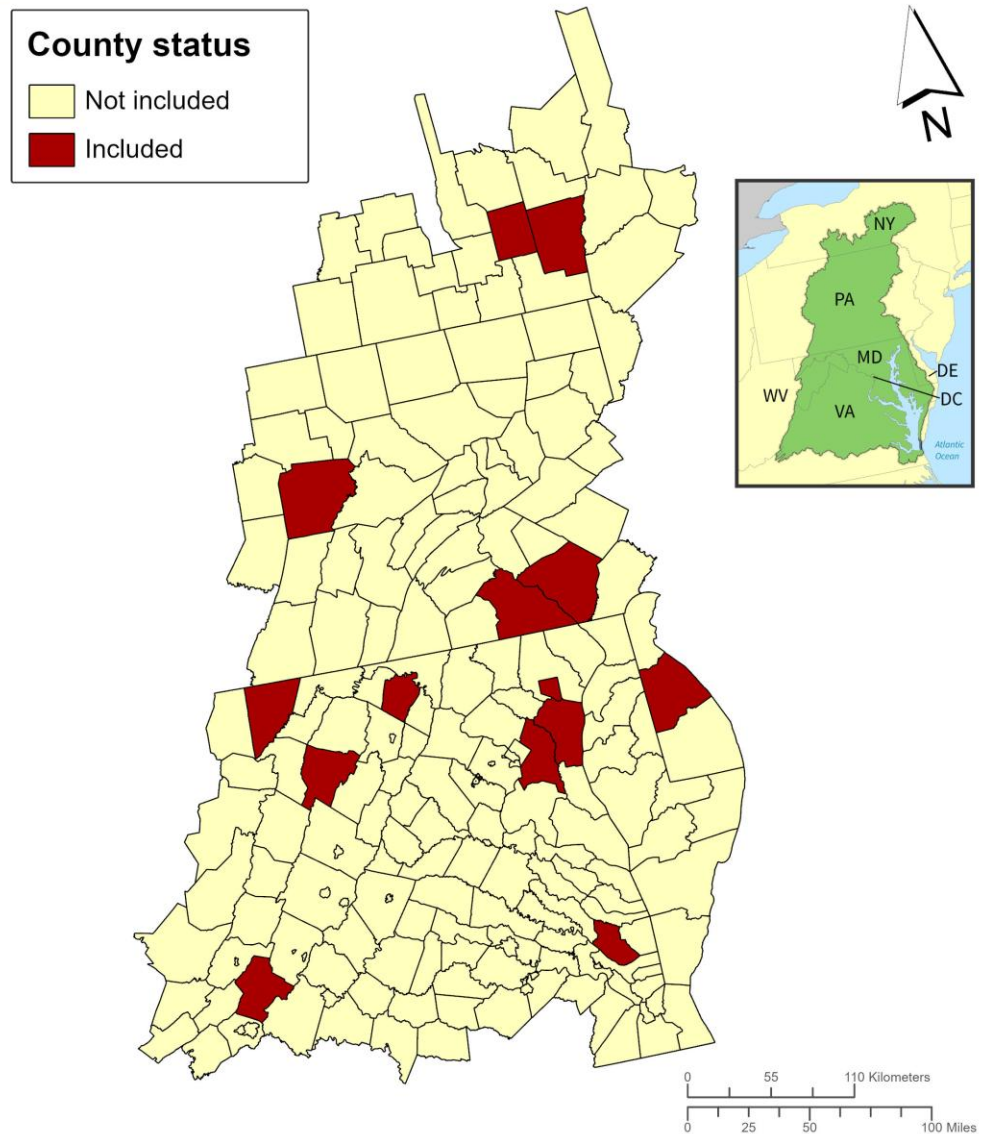
Phase 7 Land Use: Impervious Cont.

How much roads are associated with forecasted development?

- CBLCM forecasts new development, but not new roads associated with development
- This means we need to add impervious due to roads that was not simulated
- Sampled ratio of roads to impervious non-roads of all residential neighborhoods in 17 counties, grouped by urban and rural zones

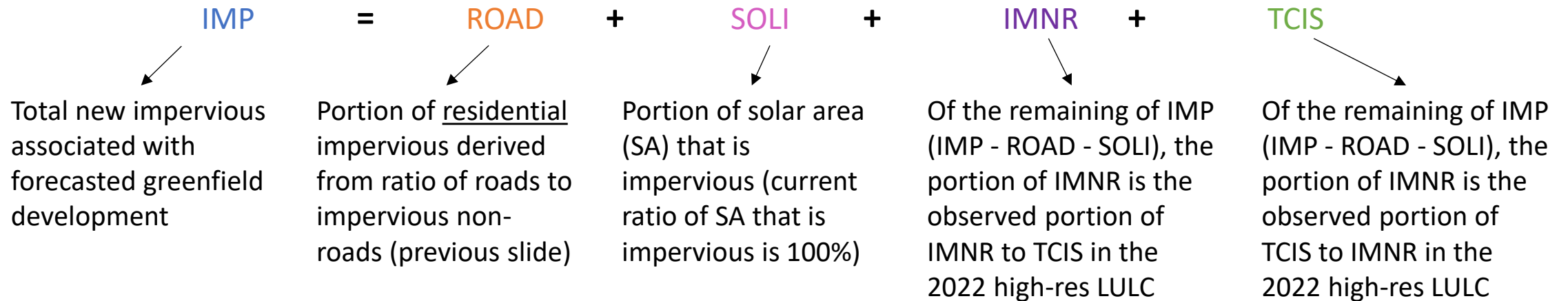


Sample counties used to develop impervious inflation factor



Phase 7 Land Use: Impervious Cont.

How much impervious (IMP) is Roads (ROAD), Non-roads (IMNR), Solar Infrastructure (SOLI), and Tree Canopy over Impervious (TCIS)?



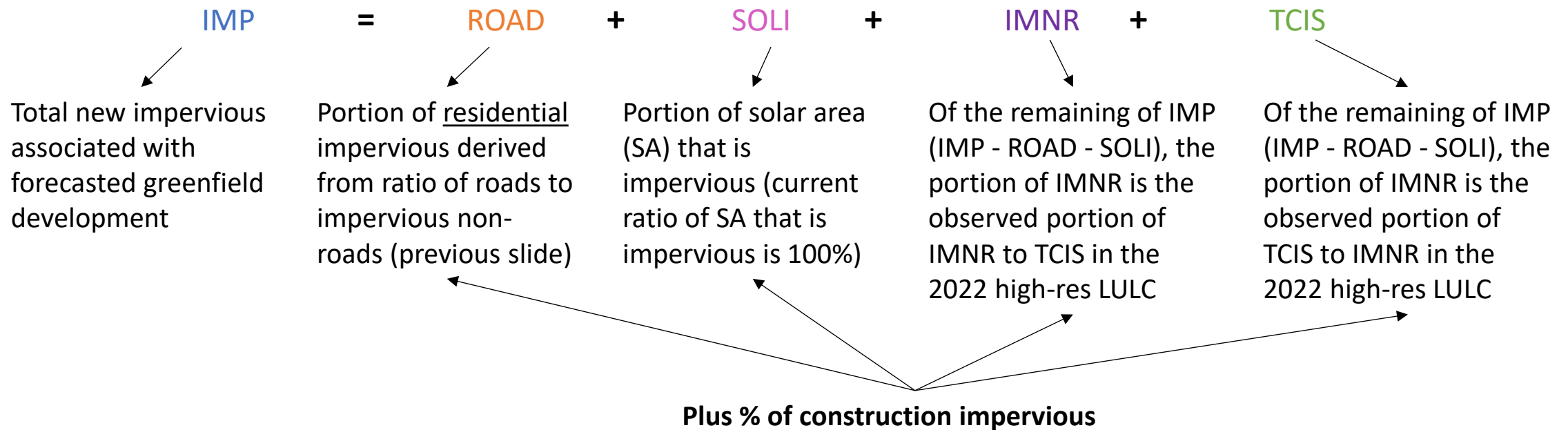
Changed from Phase 6: Updated total impervious with impervious equations and ratio of roads to non-roads, added solar, updated ratio of impervious non-roads (IMNR) to tree canopy over impervious (TCIS) with high-res ratios.

Phase 7 Land Use: Impervious Cont.

How much Construction is Roads (ROAD), Non-roads (IMNR), Solar Infrastructure (SOLI), and Tree Canopy over Impervious (TCIS)?

Impervious associated with Construction is computed using the observed ratio of impervious to pervious development from the high-res LULC

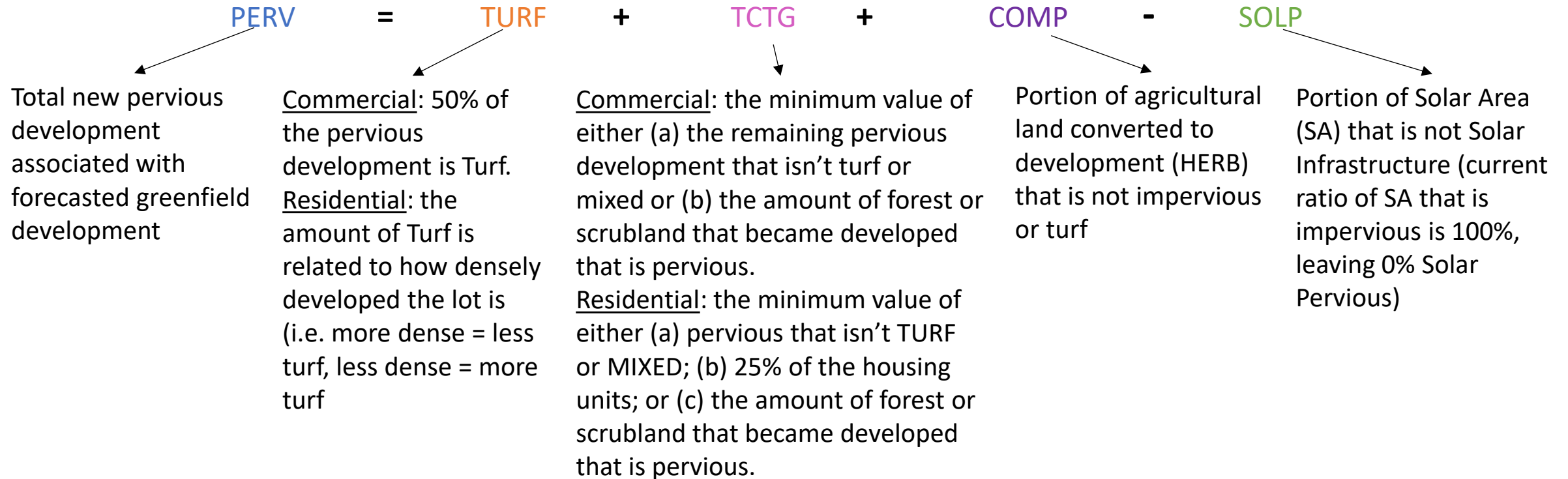
Impervious associated with construction is split into the impervious land uses using the same ratios described in the previous slide



Changed from Phase 6: With explicit mapping of Construction, an assumption has been added that all construction acres in a given year become developed in the next timestep.

Phase 7 Land Use: Pervious Development

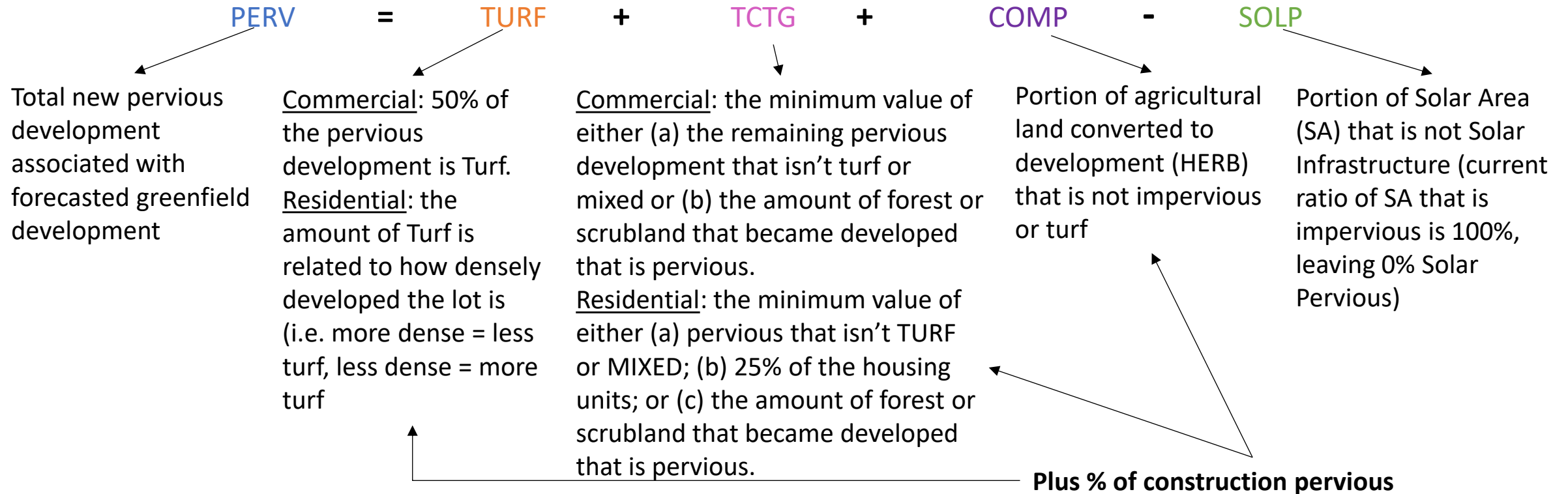
How much forecasted pervious development is Turf Grass (TURF), Tree Canopy over Turf Grass (TCTG), Compacted Pervious (COMP), and Solar Pervious (SOLP)?



Phase 7 Land Use: Pervious Development

How much forecasted pervious development is Turf Grass (TURF), Tree Canopy over Turf Grass (TCTG), Compacted Pervious (COMP), and Solar Pervious (SOLP)?

Pervious development associated with Construction is computed using the observed ratio of impervious to pervious development from the high-res LULC. Pervious development is then split to TURF, TCTG, and COMP using observed ratios from high-res LULC.



Changed from Phase 6: With explicit mapping of Construction, an assumption has been added that all construction acres in a given year become developed in the next timestep.

Phase 7 Land Use: Construction

How much forecasted development is Construction?

$$\text{CONS} = \text{DA} \div \text{Number of Years}$$

Diagram illustrating the calculation of Construction (CONS) as a percentage of forecasted development (DA) over a specific time period (Number of Years).

CONS (Total construction acres for the given year (i.e. 2030))

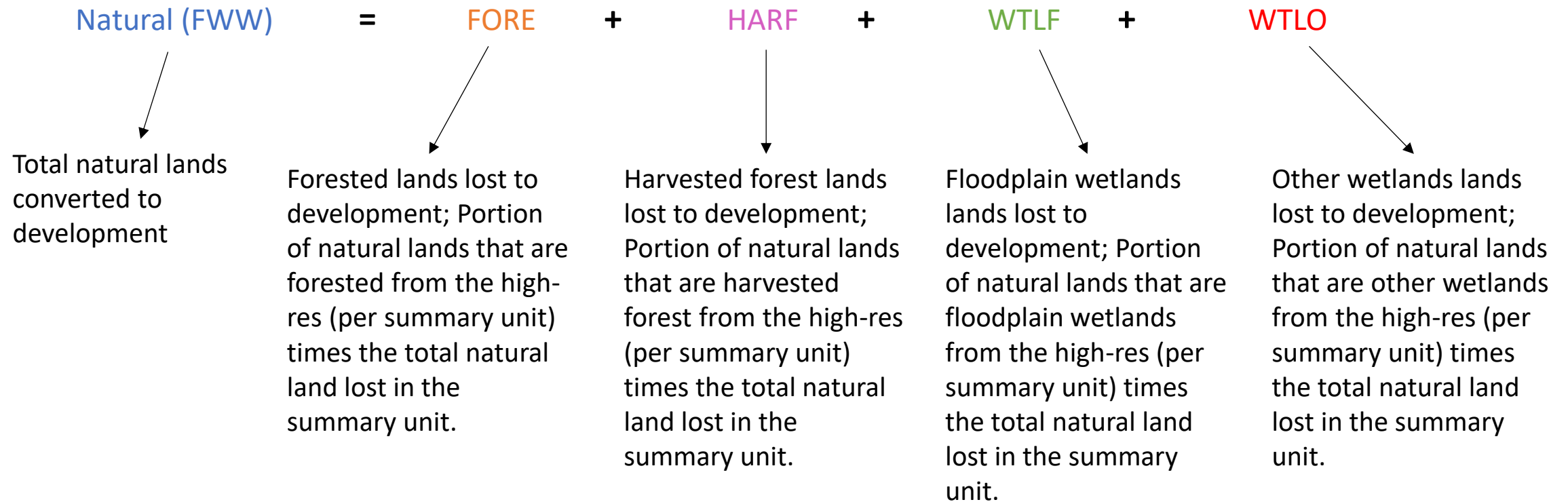
DA (Total forecasted developed area (commercial, residential, mixed, and solar area))

Number of Years (Number of years in the forecasted timestep (e.g. 10 year time step from 2020 to 2030))

Changed from Phase 6: Construction was not previously accounted for. The above methods were approved by WTWG for Phase 7.

Phase 7 Land Use: Natural

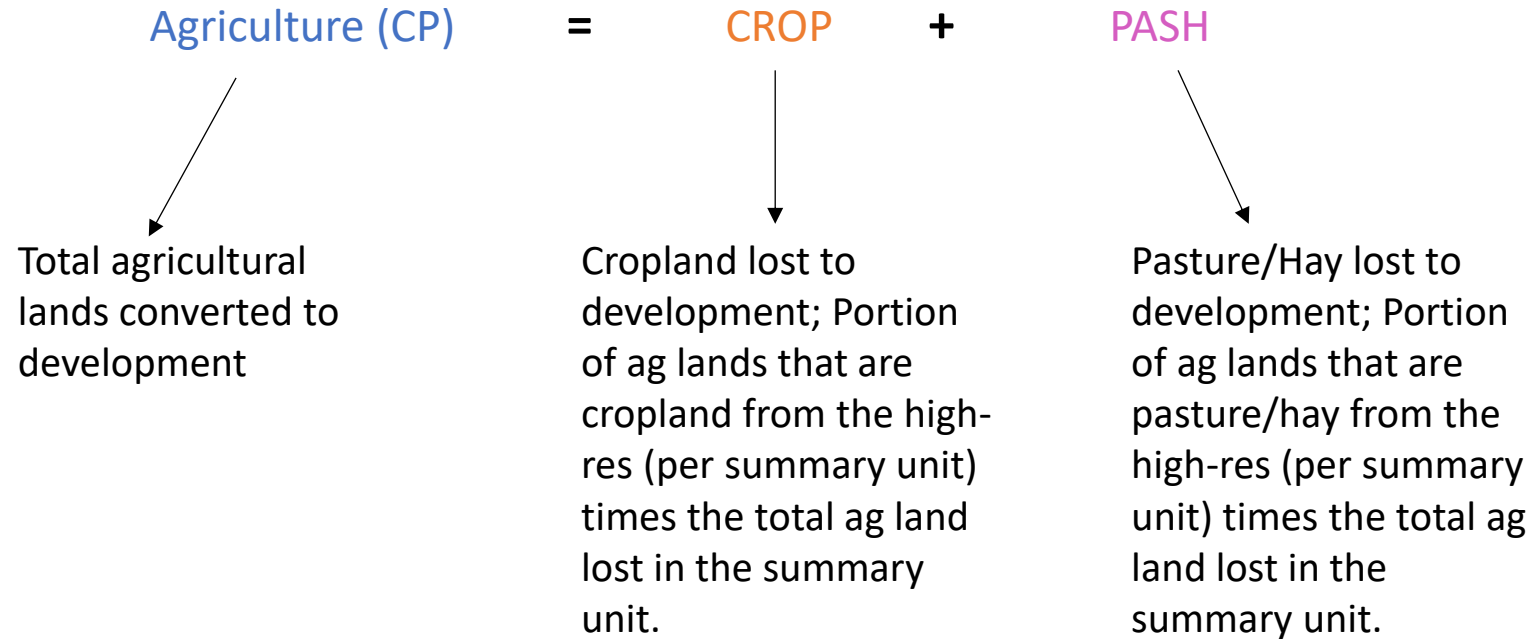
How much Forest (FORE), HARF (Harvested Forest), Floodplain Wetlands (WTLF) and Other Wetlands (WTLO) were lost to forecasted development ?



Changed from Phase 6: Added harvested forest to the natural sector (was previously mixed open)

Phase 7 Land Use: Agriculture

How much Cropland (CROP) and Pasture/Hay (PASH) were lost to forecasted development ?



Changed from Phase 6: No change

Forecasted Sewer Area and Septic Counts

- Expansion of Sewer Service Area = Current Sewer Service Area (2020) + 1km buffer (more generalized, not at parcel scale). Remains consistent throughout the entire forecast period.
- Growth simulated outside the SSA is assumed to be on septic, and growth within the SSA is assumed to be on sewer.

$$(gHU_sep \times (1 - VAC20)) + SepCnt20 = SepCnt$$

New development on septic (CBLCM output)

2020 vacancy rate (Census)

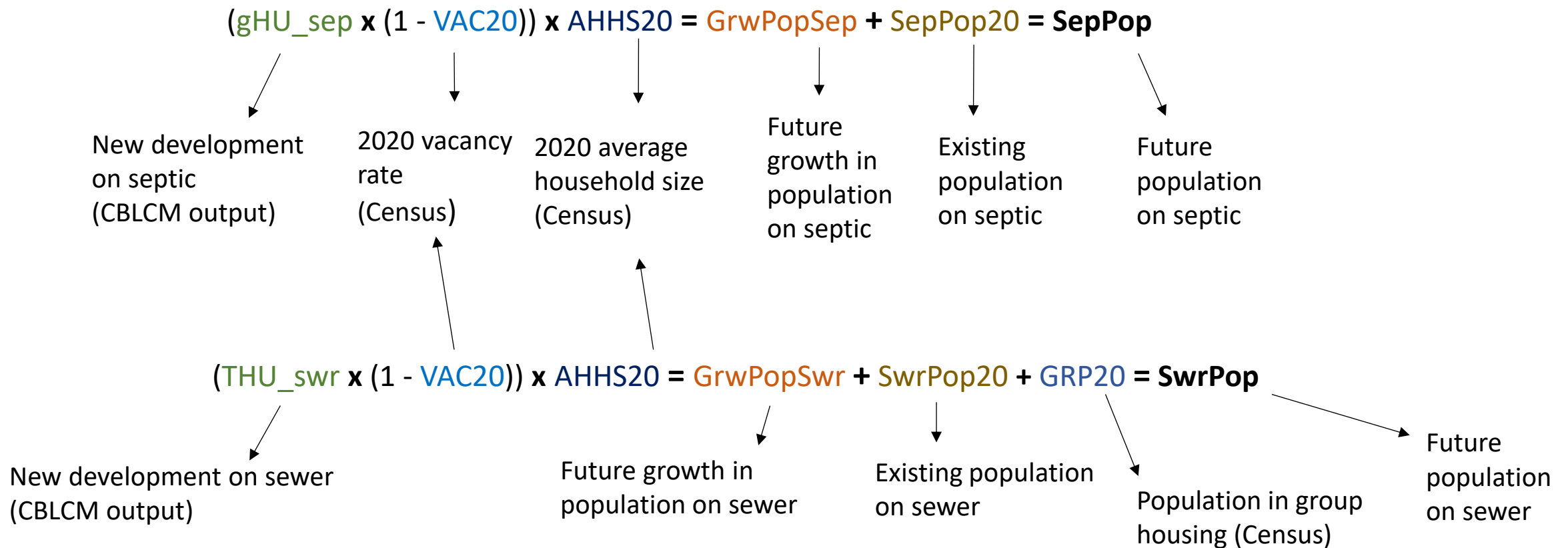
Existing development on septic (CBP data)

Total projected septic count

Note: Methods have not changed from Phase 6 to Phase 7.

Forecasted Population on Sewer/Septic

- Population on sewer & septic is calculated using county-specific average household size and population projections.
- All population in group housing (prisons, universities, etc.) is assumed to be on sewer.
- County-specific adjustment factors ensure that sewer and septic populations match county-submitted population projections.



Note: Methods have not changed from Phase 6 to Phase 7, aside from keeping group housing constant through time.