

**Table S1.** Remote sensing data for the summer and winter images used. Data are provided by USGS Earth Explorer.

Remote Sensing Datasets						
	Date Collected	Sensor Type	Satellite	Collection Category	Processing Level	Resolution
Summer	7/30/2017	OLI	Landsat 8	T1	L1TP	30m
Winter	12/21/2017	OLI	Landsat 8	T1	L1Tp	30m

**Table S2.** Total area converted from each experiment as shown by the percent change for the Lehigh Valley in km<sup>2</sup>

Cohort	10% Change	25% Change	50% Change
L2F	18823	47057	94115
I2F	25805	64513	129026
F2L	140113	350282	700564
F2I	140113	350282	700564

**Table S3.** Percent of the total area of the Lehigh Valley changed by each LULCC.

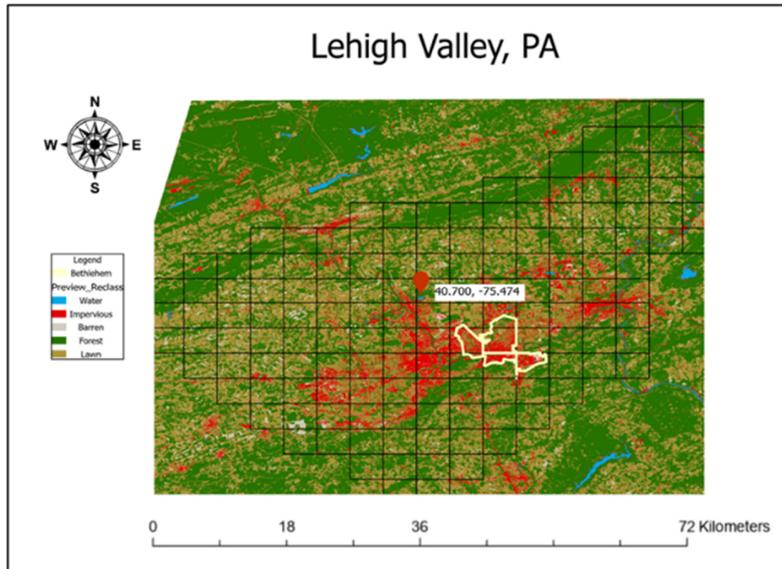
Percent of Total Area Converted			
Cohort	10% Change	25% Change	50% Change
L2F	1%	2%	4%
I2F	1%	3%	5%
F2L	6%	14%	29%
F2I	6%	14%	29%

**Table S4.** The percentage of each land use type within the four regions of Bethlehem, PA

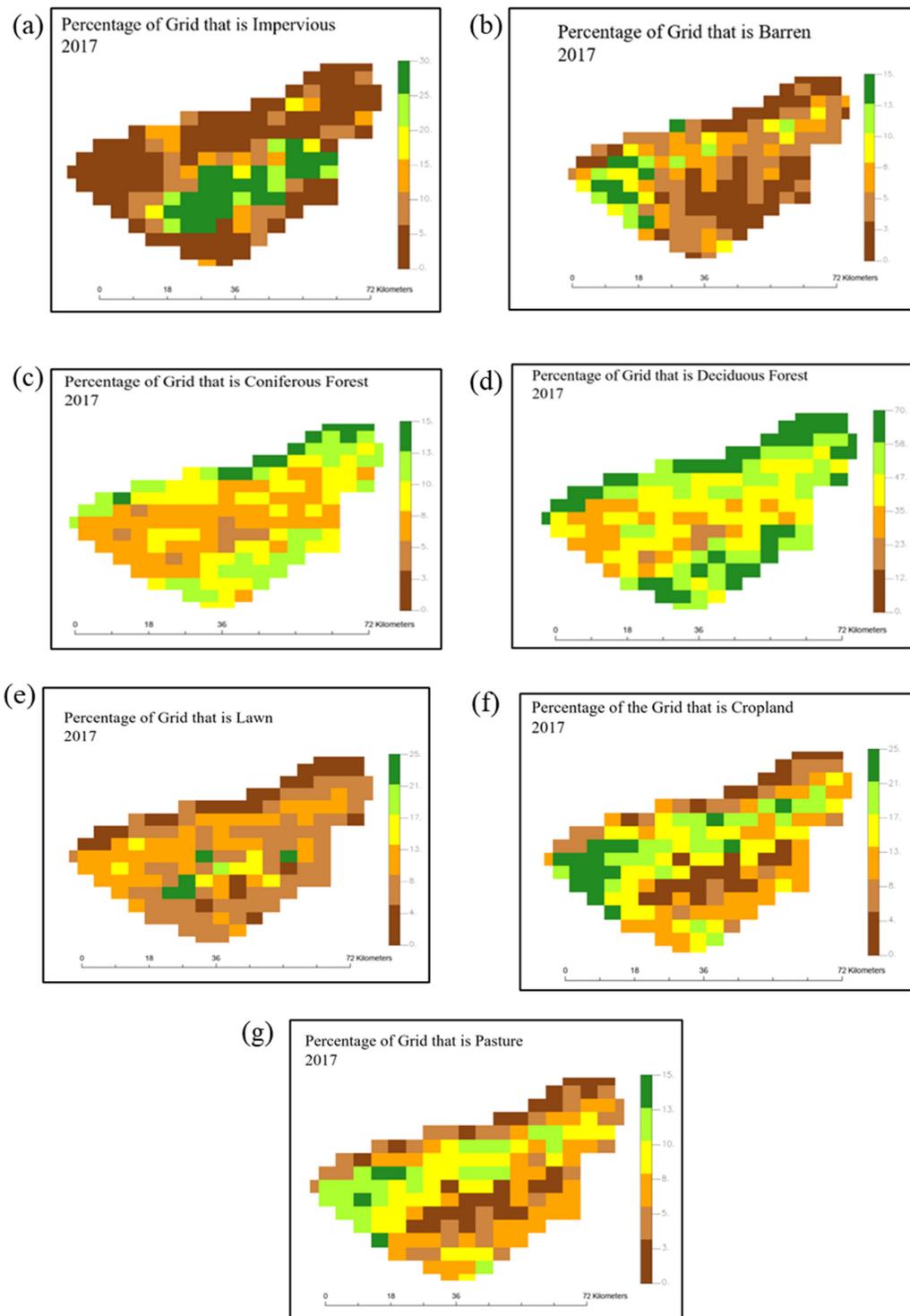
Percent of Each Land Use Type Per Region In Bethlehem				
Cohort	West	South	North	East
Impervious	61%	87%	45%	57%
Barren	1%	5%	2%	7%
Forest	26%	5%	38%	27%
Lawn	12%	4%	14%	9%

**Table S5.** Landsat Band wavelength and resolutions provided by USGS.

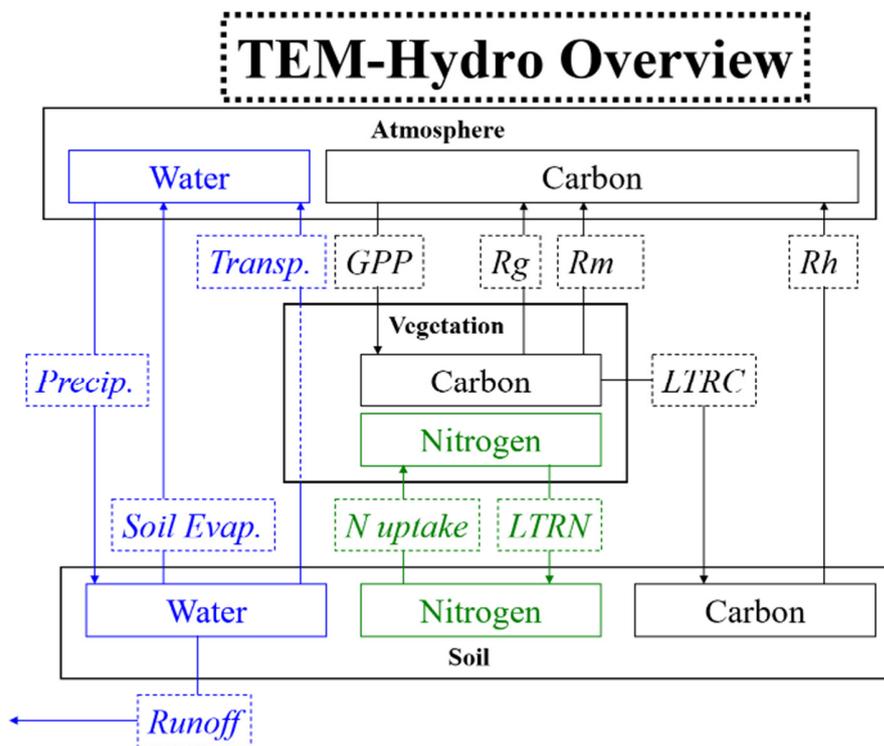
Bands	Wavelength (micrometers)	Resolution (meters)
<b>Band 1 - Coastal aerosol</b>	0.43-0.45	30
<b>Band 2 - Blue</b>	0.45-0.51	30
<b>Band 3 - Green</b>	0.53-0.59	30
<b>Band 4 - Red</b>	0.64-0.67	30
<b>Band 5 - Near Infrared (NIR)</b>	0.85-0.88	30
<b>Band 6 - SWIR 1</b>	1.57-1.65	30
<b>Band 7 - SWIR 2</b>	2.11-2.29	30
<b>Band 8 - Panchromatic</b>	0.50-0.68	15
<b>Band 9 - Cirrus</b>	1.36-1.38	30
<b>Band 10 - Thermal Infrared (TIRS) 1</b>	10.6-11.19	100
<b>Band 11 - Thermal Infrared (TIRS) 2</b>	11.50-12.51	100



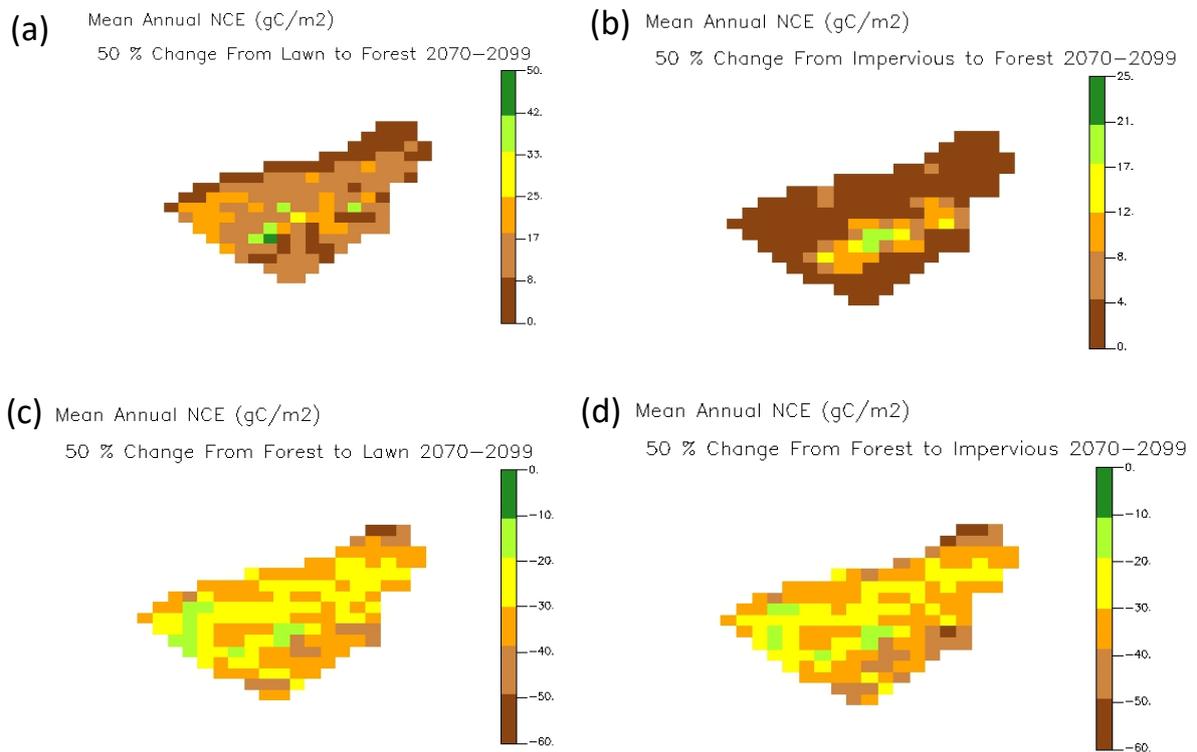
**Figure S1.** Gridded, random-trees classification of the Lehigh Valley overlaid with a 4 km fishnet. Bethlehem is shown as the highlighted region. Classification based on Landsat 8 imagery from July 30<sup>th</sup>, 2017.



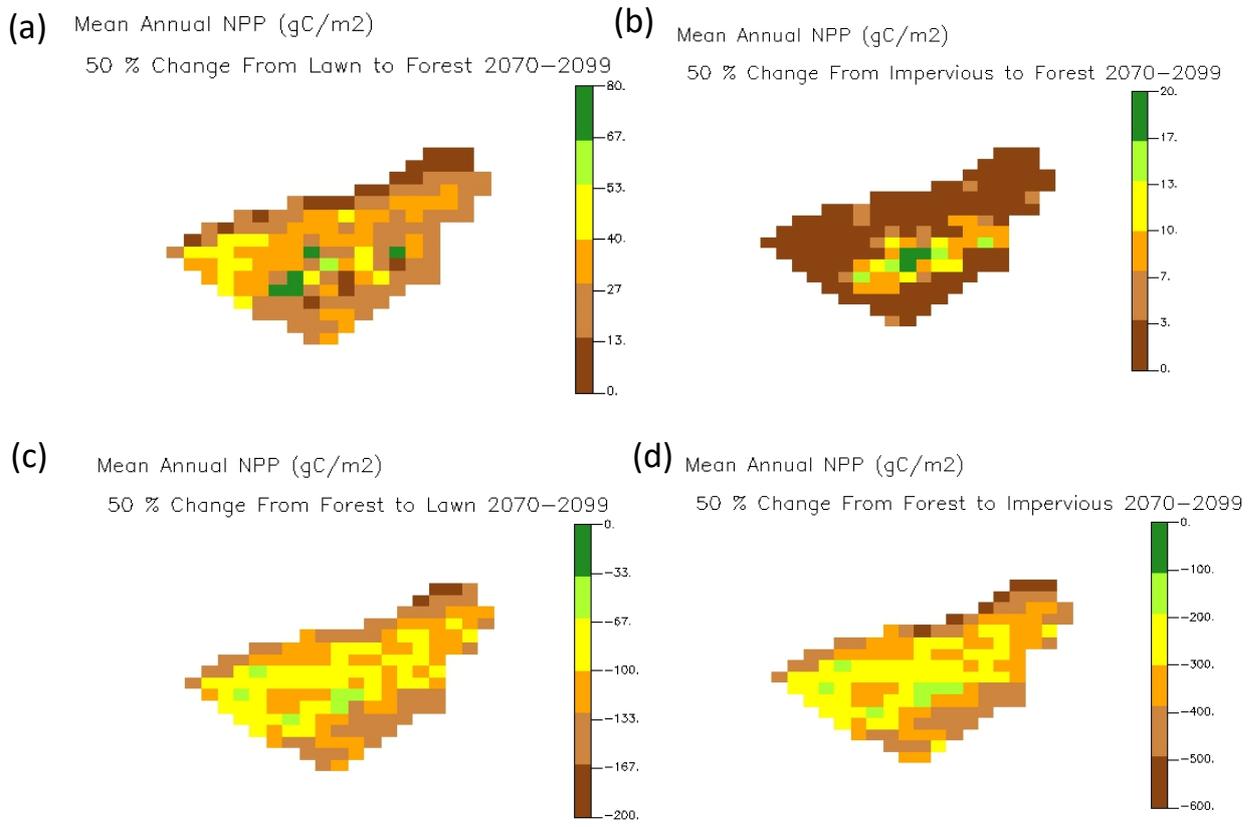
**Figure S2:** Fractional land cover based on aerial imagery from July 30, 2017. Values are displayed in percentages for a) impervious, b) barren, c) coniferous forest, d) deciduous forest, e) lawn, f) cropland, and g) pasture.



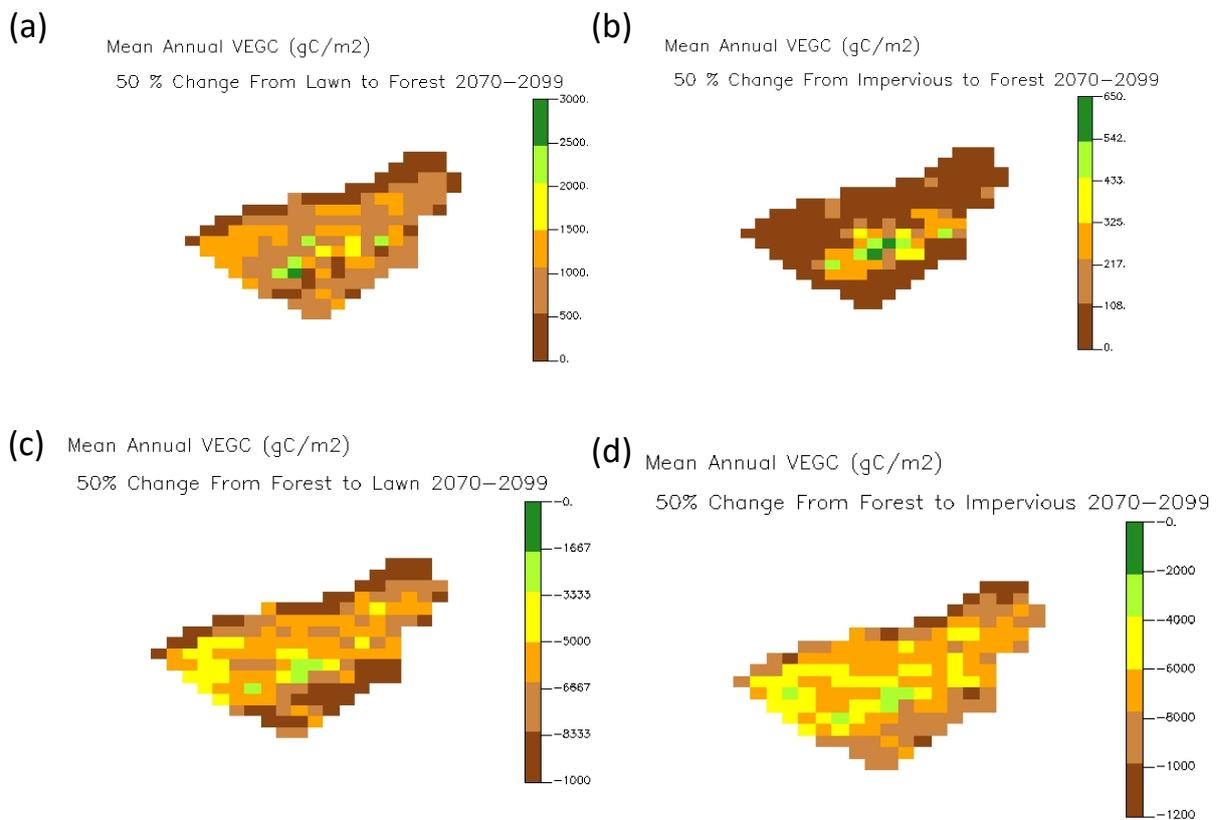
**Figure S3.** TEM flowchart showing the fluxes that move carbon, nitrogen, and water between the atmosphere, vegetation, and soil (Felzer et al. 2009).



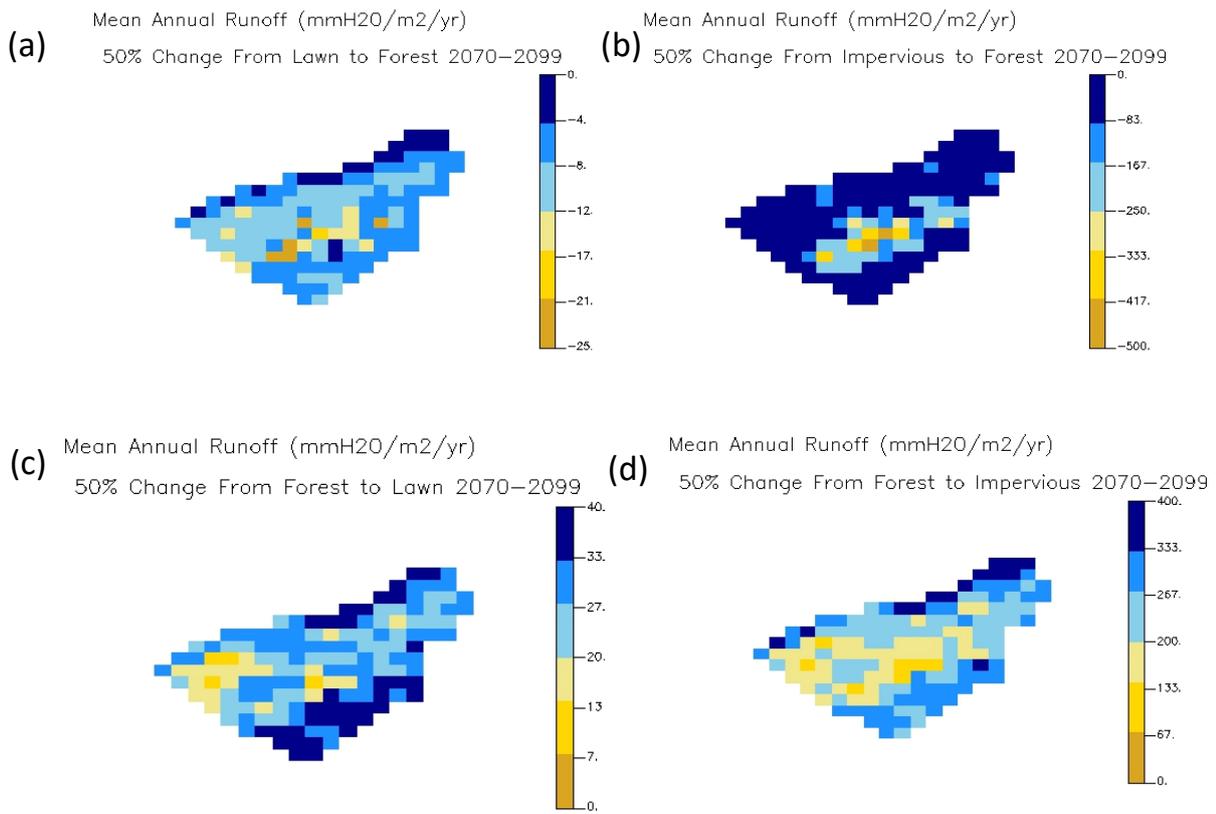
**Figure S4 a-d.** Mapped results of Net Carbon Exchange for the Lehigh Valley shown on 1/24<sup>th</sup> degree grids. Results reflect the difference between the control run and the 50% land use conversions for each of the experiments for the 2070-2099 period. a) Lawn to Forest, b) Impervious to Forest, c) Forest to Lawn, and d) Forest to Impervious.



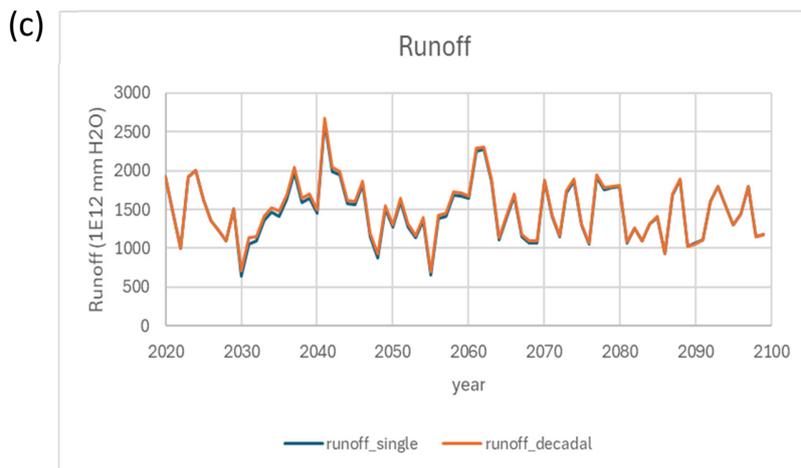
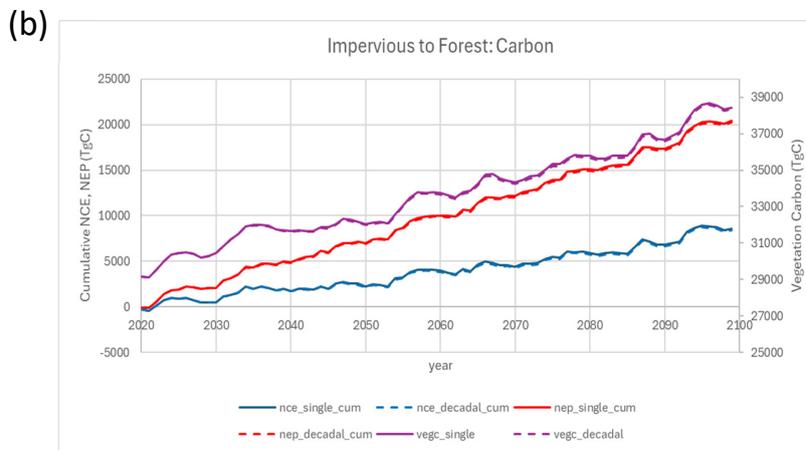
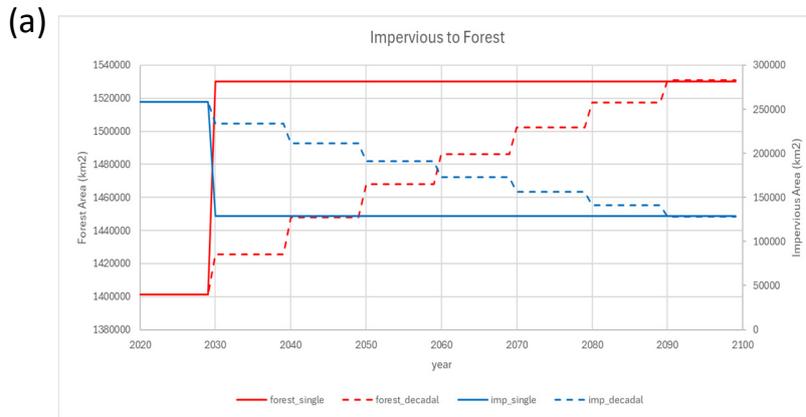
**Figure S5. a-d.** Mapped results of Net Primary Productivity for the Lehigh Valley shown on 1/24<sup>th</sup> degree grids. Results reflect the difference between the control and the 50% land use conversions for each of the experiments for the 2070-2099 period. a) Lawn to Forest, b) Impervious to Forest, c) Forest to Lawn, and d) Forest to Impervious.



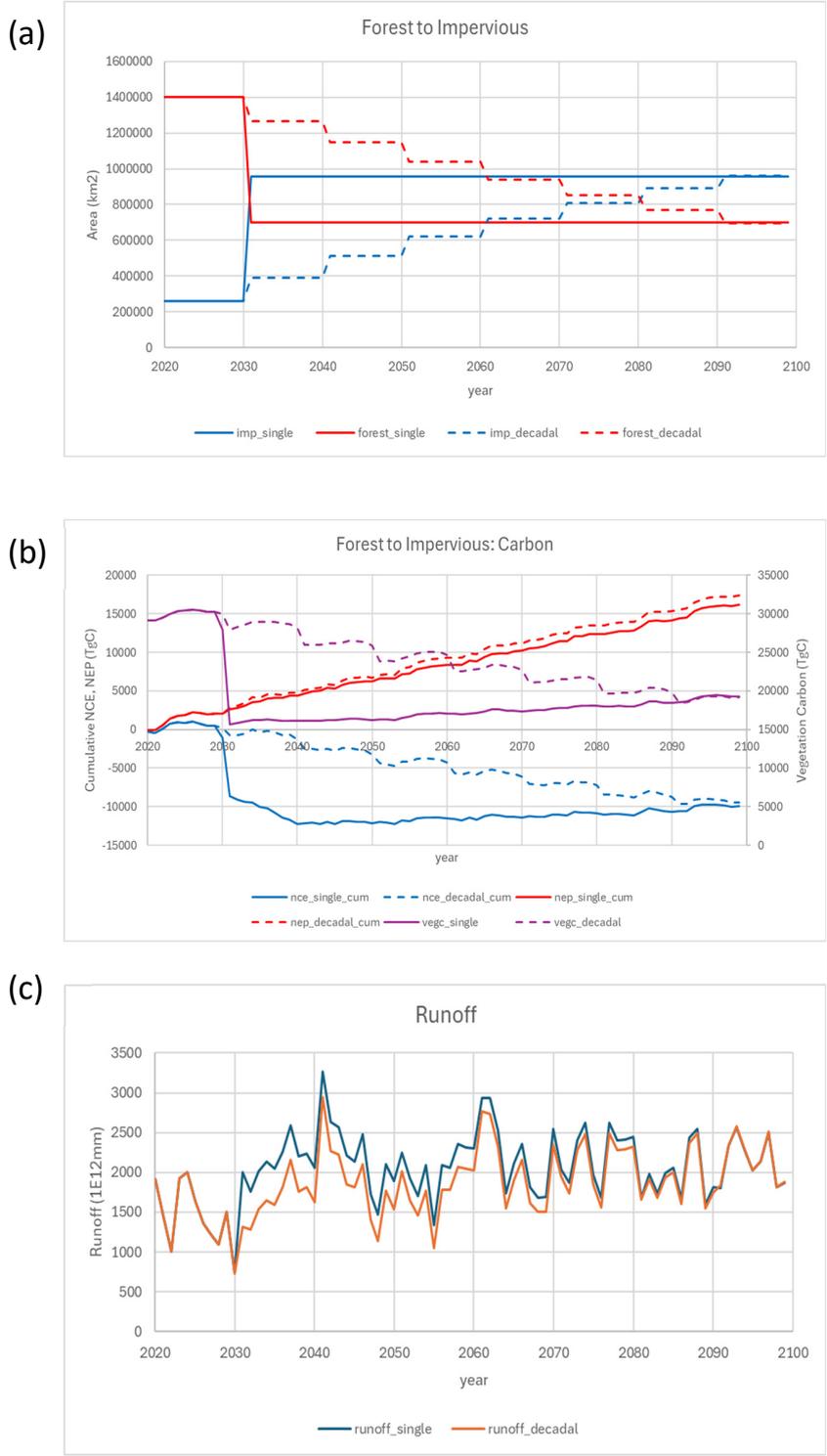
**Figure S6 a-d.** Mapped results of Vegetation Carbon for the Lehigh Valley shown on 1/24<sup>th</sup> degree grids. Results reflect the difference between the control and the 50% land use conversions for each of the experiments for the 2070-2099 period. a) Lawn to Forest, b) Impervious to Forest, c) Forest to Lawn, and d) Forest to Impervious.



**Figure S7 a-d.** Mapped results of runoff for the Lehigh Valley shown on 1/24<sup>th</sup> degree grids. Results reflect the difference between the control and the 50% land use conversions for each of the experiments for the 2070-2099 period. a) Lawn to Forest, b) Impervious to Forest, c) Forest to Lawn, and d) Forest to Impervious.



**Figure S8:** Repeat of experiment 6 (50% Impervious to Forest) with same areal change implemented each decade instead of in a single year. a) aerial change of forest and impervious surface, b) nep, nce, and vegetation carbon for the run with single disturbance and the run with decadal disturbances, and c) runoff for the single and decadal disturbance runs.



**Figure S9:** Repeat of experiment 12 (50% Forest to Impervious) with same areal change implemented each decade instead of in a single year. a) aerial change of forest and impervious surface, b) nep, nce, and vegetation carbon for the run with single disturbance and the run with decadal disturbances, and c) runoff for the single and decadal disturbance runs.