Development of a Regional Aggregated Crop Yield Index

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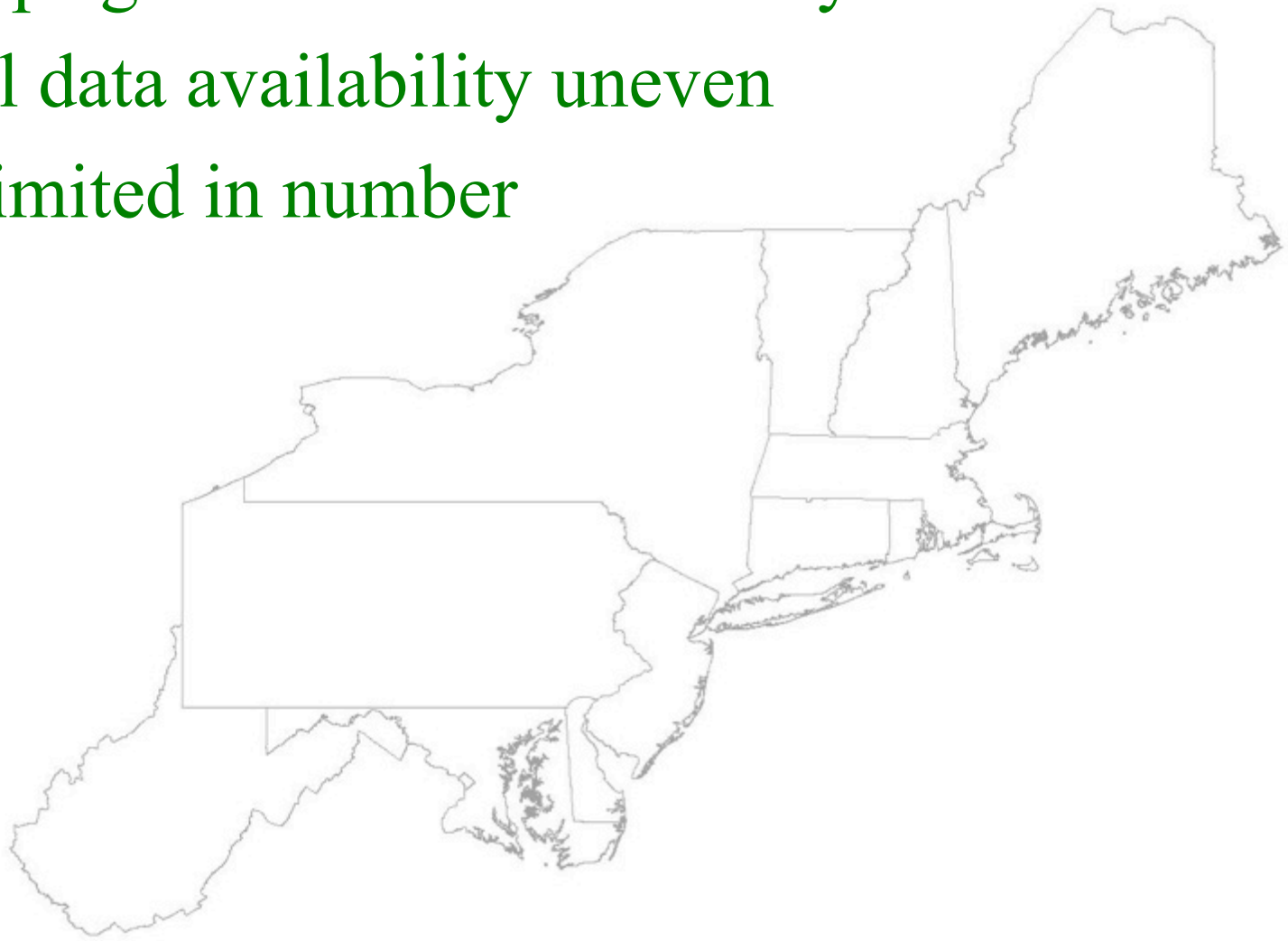
USDA-NIFA-Grant 2011-68004-30057

Northeast Region

- Many crops grown but dominated by a few
- Historical data availability uneven
- Models limited in number



Objectives

1. Establish temporal and spatial trends for crops yields and land use in the region that could be incorporated in projections of production capacity under climate change
2. Assess the potential for development of productivity index based on a single crop or multiple crops, to characterize potential productivity under climate change at different scales and for additional crops

$$Output_{Food\ Group} = [(Y_i\ reference / Y_{mean}\ reference) * Y_{food\ group}] * area_i$$

Reference could be a single crop or aggregate of multiple crops

Data Sources

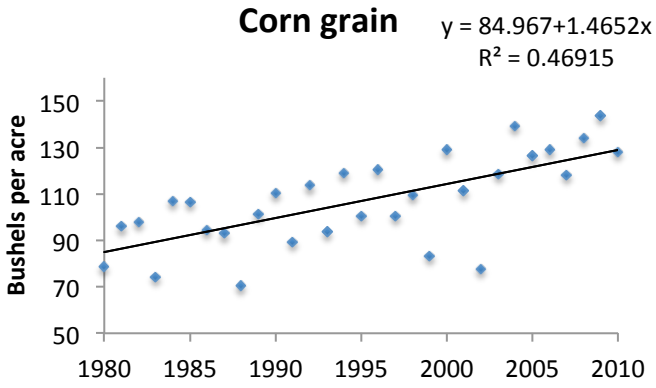
- Census of Agriculture and NASS Annual Surveys
  - 1981-2010 (county level)
  - Corn (grain and silage), soy, wheat, potato, hay
  - Yield and acreage
- Cropland Data Layer (CDL) 2008-2012
- Simulation model output (corn, wheat, potato)

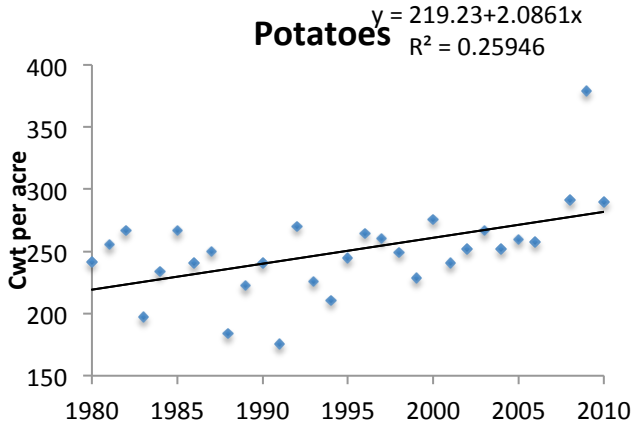
Methods

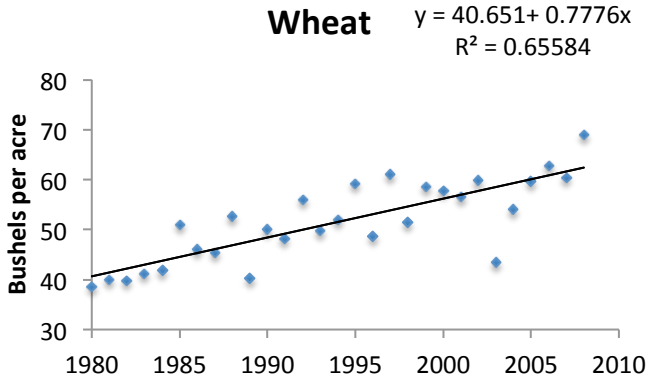
- Temporal yield changes: linear regression
- Yield relationship between crops: correlation
- Yield stability: normalized yields and GIS
- Land use: spatial interdependencies

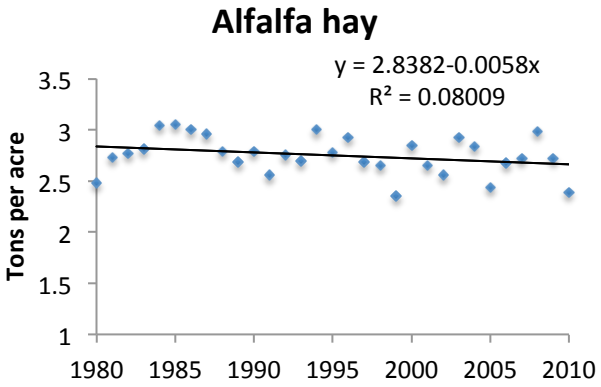
Framing Questions and Results

Q: How do yields change over time?









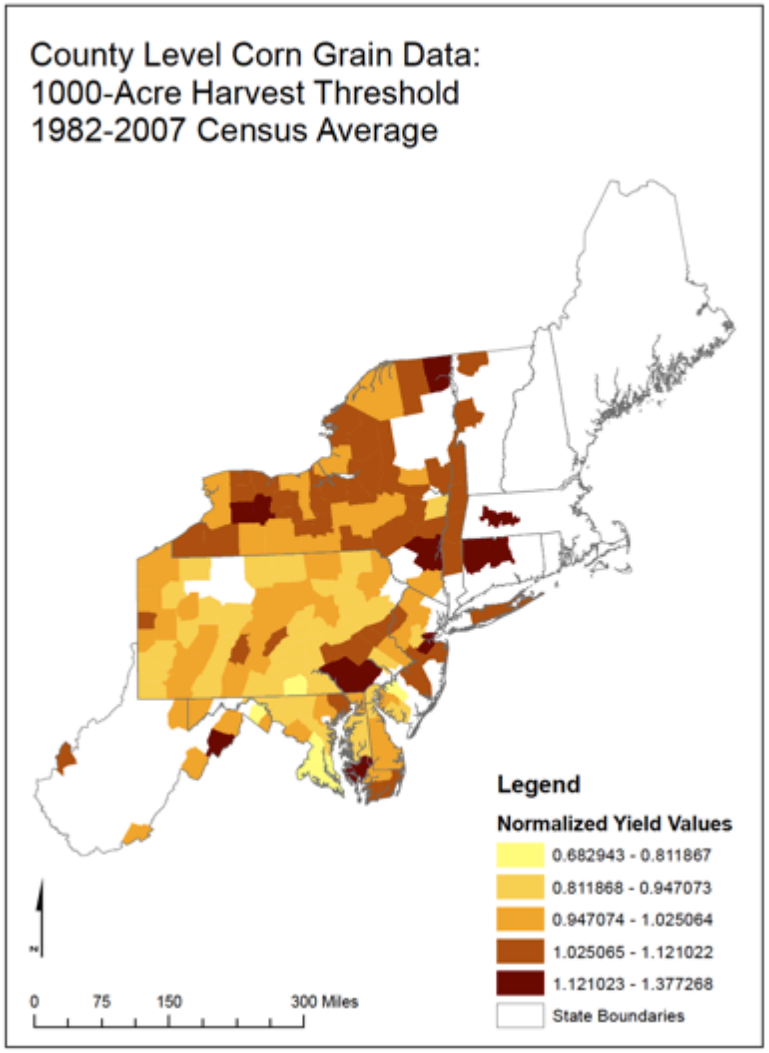
Q: How are yields of major crops related?

(includes all county*yr data points with at least 1000 acres)

	Corn grain	**Corn silage**	**Wheat**	**Potatoes**	**Soybeans**
Corn grain	1				
Corn silage	0.7399*** 3637	1			
Wheat	0.3181*** 2552	0.2331*** 1990	1		
Potatoes	0.4529*** 238	0.3505*** 173	0.1730* 196	1	
Soybeans	0.7053*** 2360	0.5989*** 1672	0.1654*** 1945	0.2688*** 171	1

Q: Are high or low yields stable over time?

(Uses weighted, normalized yields across the region)



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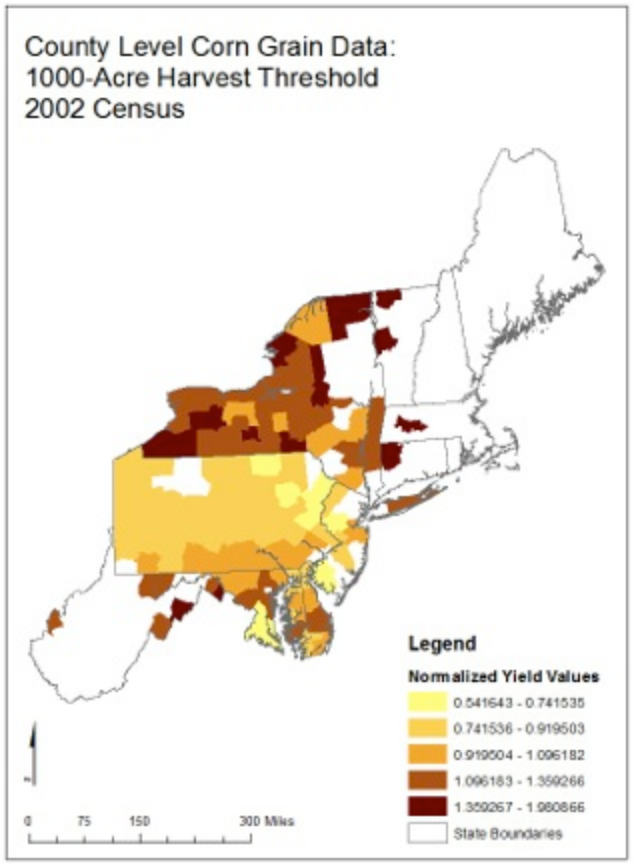
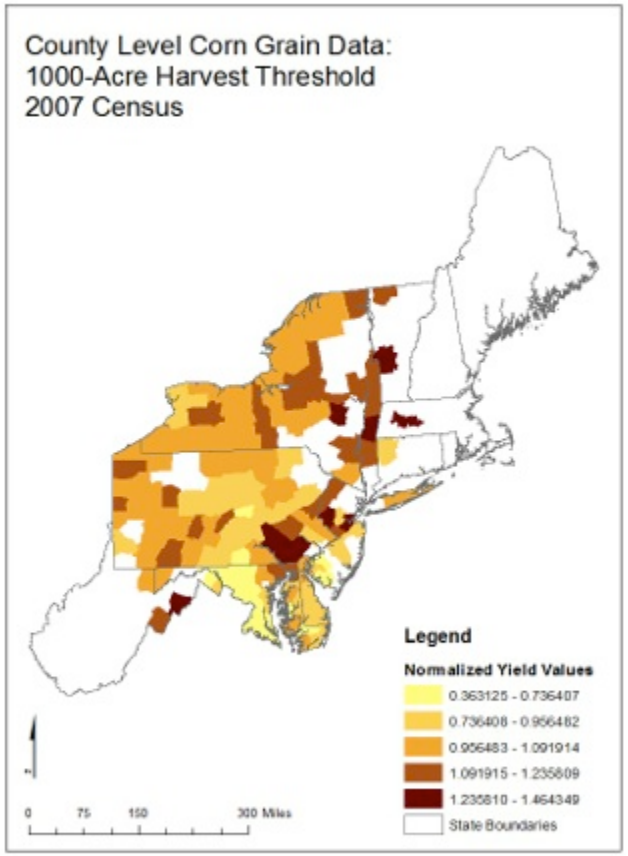
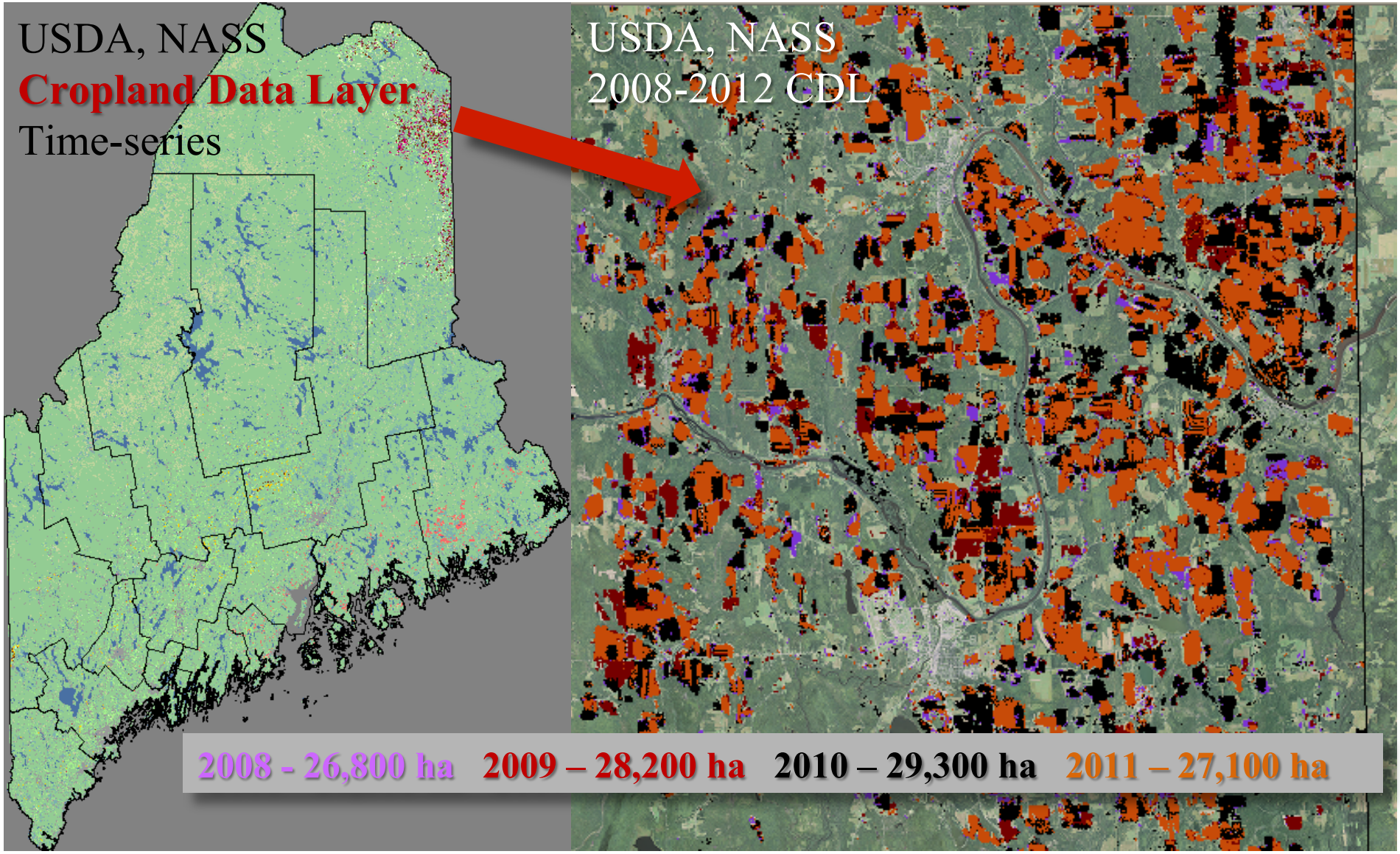




The “Year Effect” is much greater magnitude than “Location Effect”

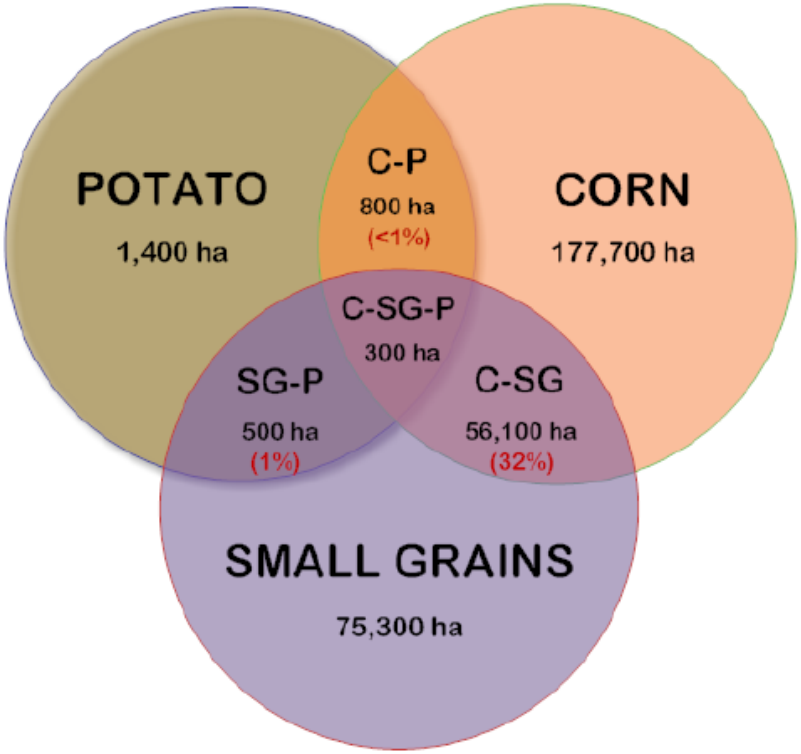
Q: What are Multi-Year Crop Production Footprints?



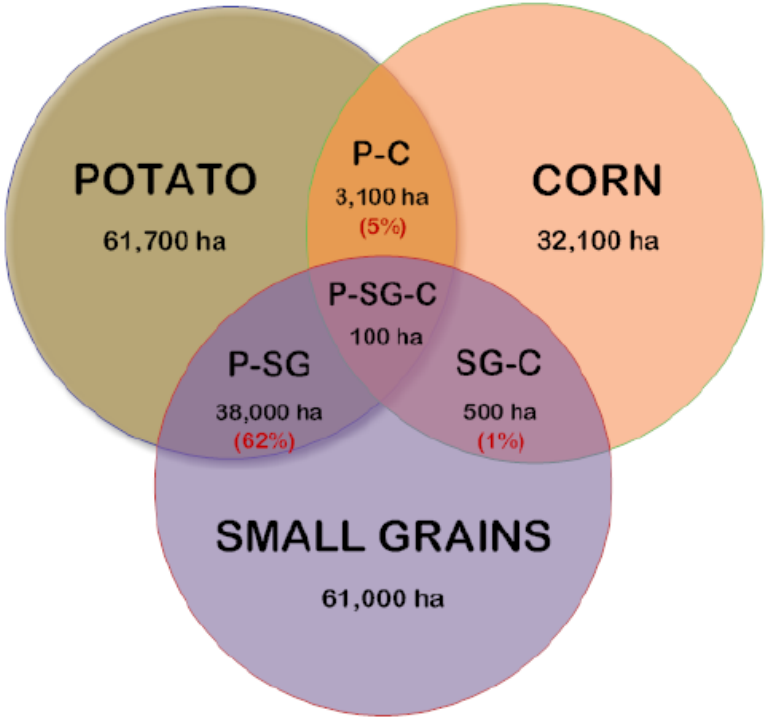
Scale 1:3,000,000

Scale 1:250,000

Q: Are target crops being grown on same landbase?



Delaware



Maine

Pulling it together…

- Simulation of climate impacts will be refined by trends identified
  - Yield trajectory
  - Rotation intensity
  - Assigning specific land base to specific crops
- If changes in land use occur, transition *between* crops will be important (rather than expansion)
- Indexing productivity allows assessment of broader range of crops in the region

Thank You