

# Piloting SEEA EEA accounting for the United States

August 2020

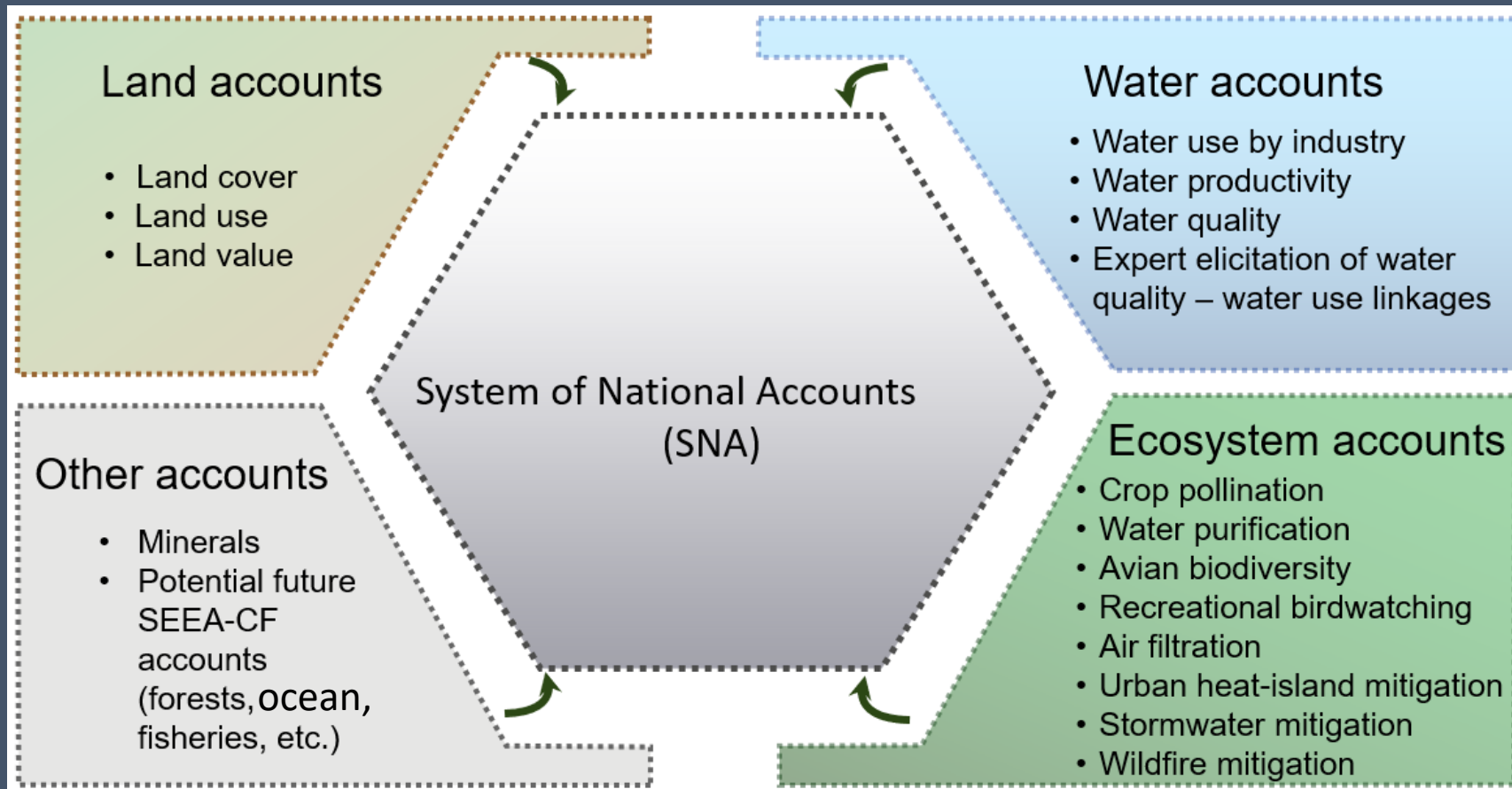
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[www.tinyurl.com/us-nca](http://www.tinyurl.com/us-nca)



# Piloting natural capital accounts for the U.S.

Nationwide;  
Wentland et  
al. in press  
(Ecosystem  
Services)

Guidance in  
development  
on data  
sources &  
participants  
needed for  
SEEA CF



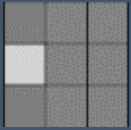
Nationwide;  
Bagstad et  
al. in review  
(Ecosystem  
Services)

10-state region:  
Warnell et al.  
2020  
(Ecosystem  
Services);  
Nationwide:  
Heris et al. in  
review (urban  
accounts)

# Key considerations:



Data should be publicly available on a national scale



Accounts summarized geographically and by ecosystem type



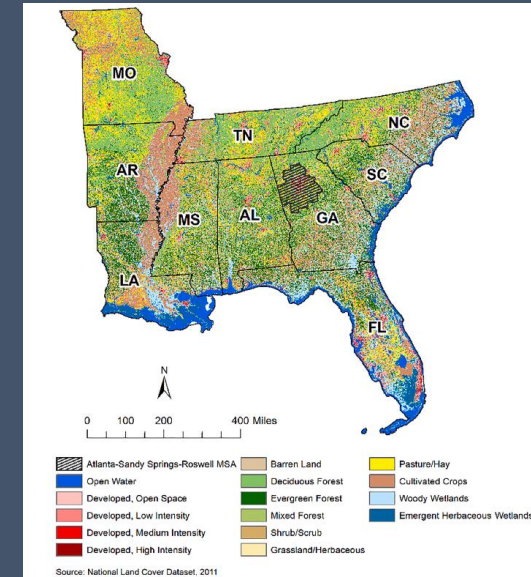
Analyses should be updateable – tracking over time is essential



Avoid proprietary tools and models

# Services measured: SEEA EEA

- 10-state region of the U.S. Southeast (Warnell et al. 2020)
  - Recreational birdwatching - PSUT
  - Air filtration by vegetation - PSUT
  - Carbon storage - Condition
  - Bird biodiversity - Condition
  - Water purification – Condition (functional state indicator)
  - Wild pollination – Condition (functional state indicator)
- National scale
  - Urban heat mitigation – Physical & monetary SUTs, Heris et al. in review
  - Rainfall interception – Physical & monetary SUTs, Heris et al. in review
  - Wild pollination – Heris et al. in prep

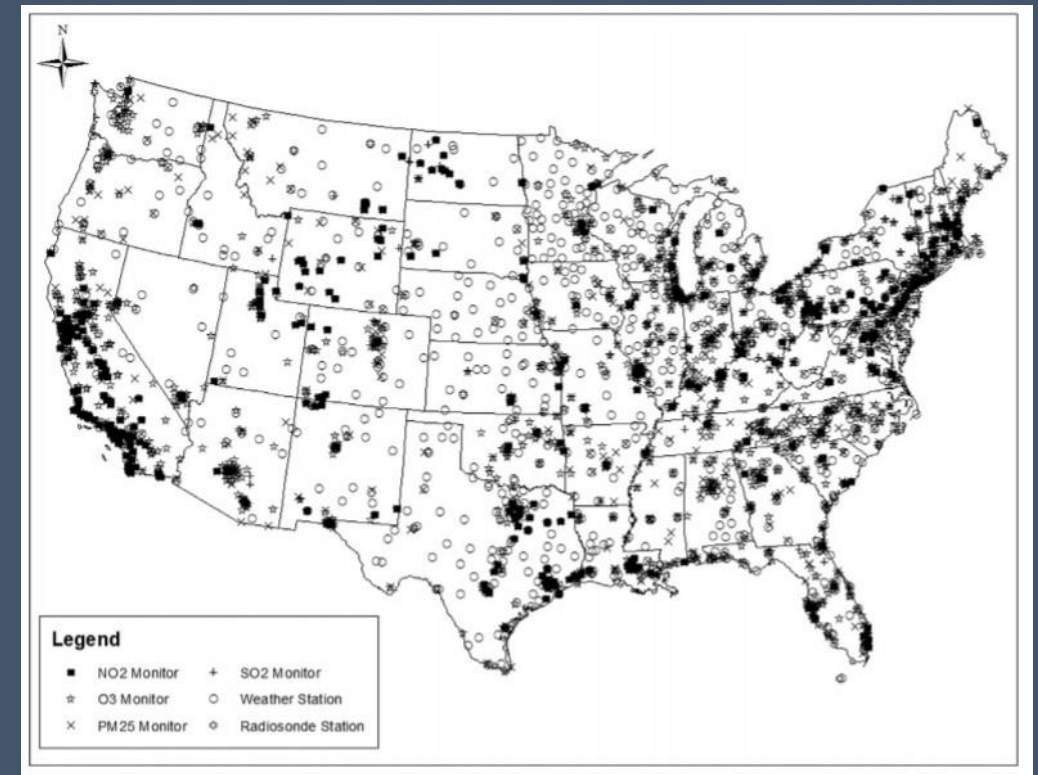
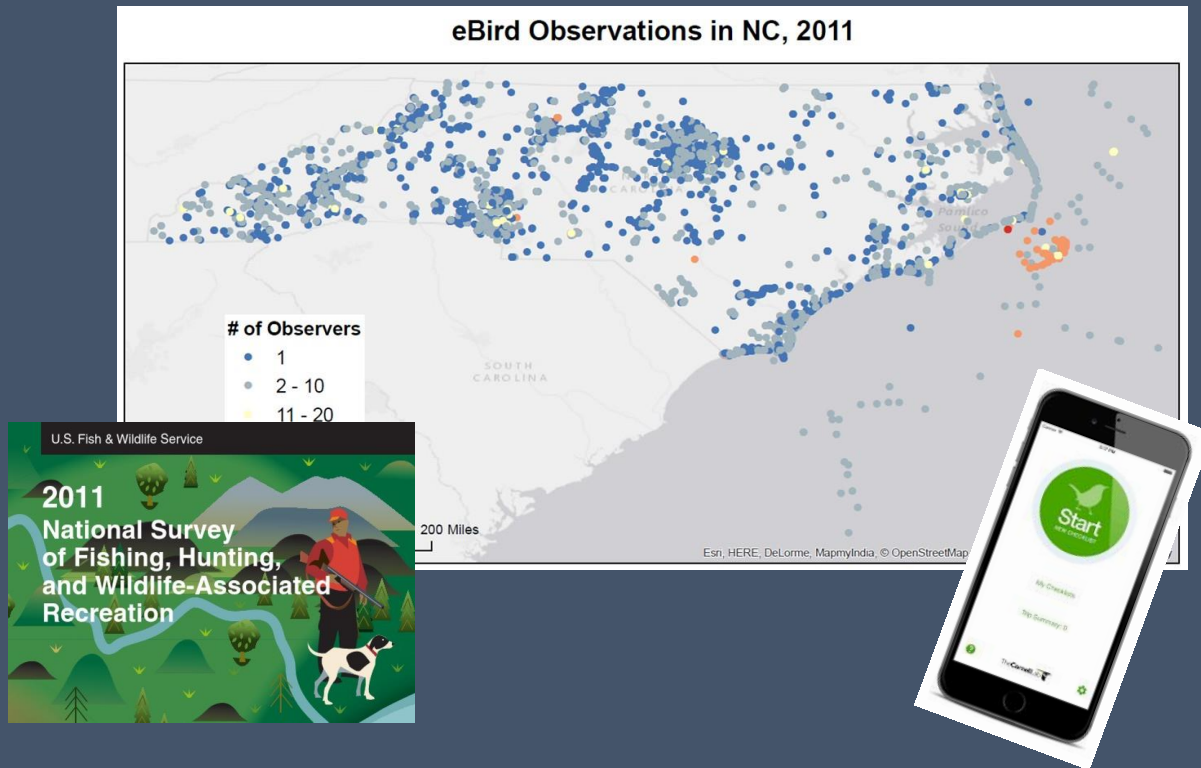




# Southeast U.S. - physical supply-use accounts (2001-2011)

Recreational birding  
(measured in birding days)

Air quality in developed areas  
(concentration of pollutants known to influence health)



# Southeast U.S. - ecosystem condition accounts (2001-2011)

Includes metrics related to:


- Wild pollination
- Purification of runoff water
- Bird species richness
- Air pollutant removal
- Carbon storage

			Ecosystem Types (Land Cover)																TOTAL	
			Offshore	Open Water - non-freshwater	Open Water - freshwater	Developed - Open	Developed - Low	Developed - Medium	Developed - High	Barren	Deciduous Forest	Evergreen Forest	Mixed Forest	Shrub/Scrub	Grassland/Herbaceous	Pasture/Hay	Cultivated Crops	Woody Wetlands		Emergent Herbaceous Wetlands
Wild pollination*	Area of pollinator habitat in flight range of pollinator-dependent crops (sq km)	2001									5,471	2,516	1,336	1,290	165			7,061	172	18,011
		2006									4,152	2,125	1,459	2,191	423			11,539	371	22,259
		2011									53,679	30,441	6,670	18,388	9,314			43,104	3,354	164,951
	Area of pollinator-dependent crops in flight range of pollinator habitat (sq km)	2001															11,182			11,182
		2006															21,581			21,581
		2011															65,818			65,818
	Ratio of pollinator habitat to pollinator dependent crops	2001															1.66			
		2006															1.05			
		2011															2.55			
Water purification	Area of purifying land cover types between NPS sources and waterways (sq km)	2001									31,542	20,238	6,959		5,385			25,463	3,379	92,966
		2006									31,453	19,780	6,678		5,997			25,427	3,504	92,840
		2011									31,005	19,330	6,353		6,192			25,151	3,789	91,820
	% of flowpath between NPS sources and waterways in purifying land cover types	2001			30.6%															
		2006			30.4%															
		2011			29.9%															

# Sub-state scale: from spatial data & models to accounts

- Atlanta MSA (right)
- New county-level GDP estimates from BEA enable finer scale analysis
- Ability to extract results for any geography e.g., watersheds, public lands

Warnell et al., 2020



Atlanta city limits

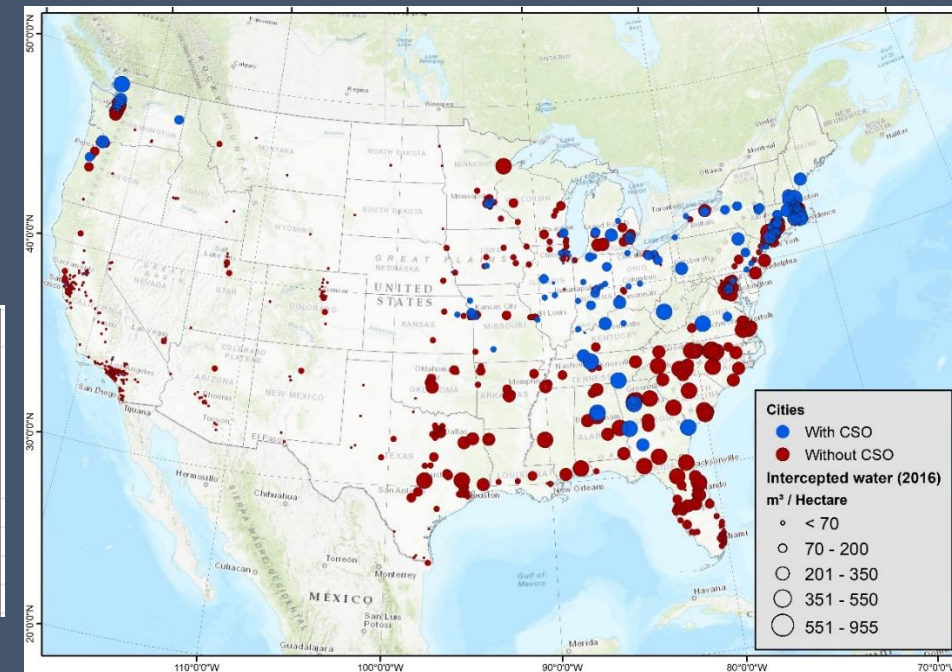
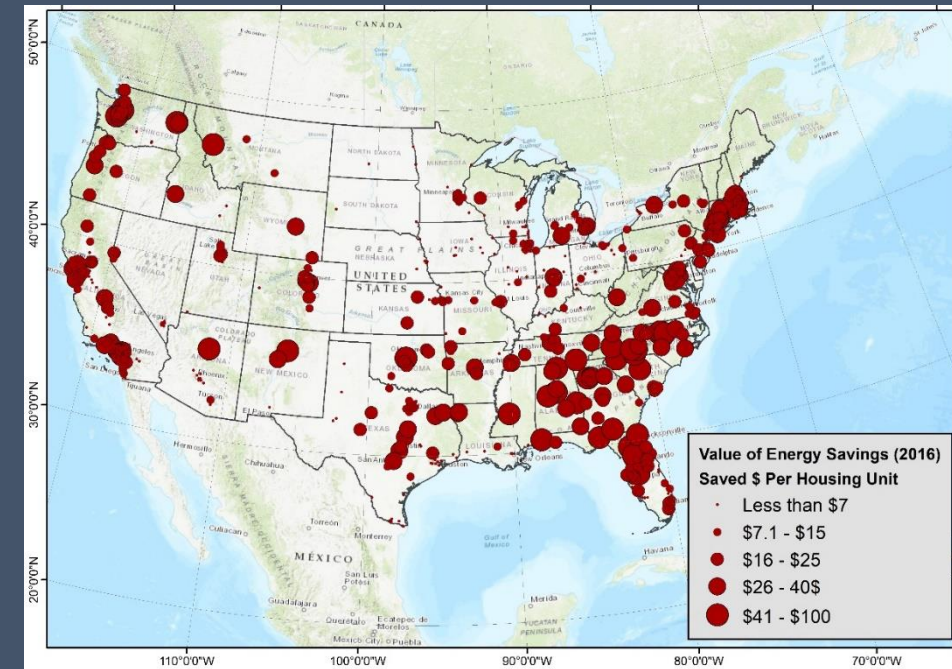
Account	Metric	% change, 2001-2011
Land accounts <sup>4</sup>	Developed land cover	17.2%
	Agricultural land cover	-6.3%
	Forested land cover	-9.3%
	Other land cover	18.6%
Water accounts	Total water use (million gallons/day, 2000-2010) <sup>5</sup>	-57.8%
	Water productivity (\$/100 gallons water use, 2000-2010) <sup>6</sup>	153.3%
	% of water-quality monitoring sites reporting significant declines, 2002-2012) <sup>7</sup>	Nitrate (n=7) 57%
		Specific conductance (n=6) 67%
		Total suspended solids (n=4) 25%
Ecosystem accounts <sup>8</sup>	% of flowpath in purifying land cover	-18.2%
	Mean annual concentration, CO (2010-2015)	21.3%
	Mean annual concentration, NO <sub>2</sub> (2010-2015)	-0.8%
	Mean annual concentration, O <sub>3</sub> (2010-2015)	-2.7%
	Mean annual concentration, PM <sub>10</sub> (2010-2015)	-18.2%
	Mean annual concentration, PM <sub>2.5</sub> (2010-2015)	-10.2%
	Mean annual concentration, SO <sub>2</sub> (2010-2015)	-57.0%
	Mean annual removal rates, CO (2010-2015)	25.3%
	Mean annual removal rates, NO <sub>2</sub> (2010-2015)	9.1%
	Mean annual removal rates, O <sub>3</sub> (2010-2015)	-2.7%
	Mean annual removal rates, PM <sub>10</sub> (2010-2015)	-20.5%
	Mean annual removal rates, PM <sub>2.5</sub> (2010-2015)	11.0%
	Mean annual removal rates, SO <sub>2</sub> (2010-2015)	-49.2%
	Total precipitation	31.9%
	Temperature	6.9%
	Recreational birding-days	209.6%
	Carbon storage (2001-2010)	-1.6%
Urban ecosystem accounts <sup>9</sup>	Energy savings due to cooling effect of urban trees	2%
	Rainfall intercepted by urban trees	-8%
Economic accounts <sup>10</sup>	GDP, all industries	8.8%
Population (2000-2010) <sup>11</sup>		24.0%



# Urban ecosystem accounts (2011-2016) – 768 cities with pop ≥ 50,000 (Heris et al. in review)

Ecosystem service	Year	Physical supply & use	Monetary supply & use
Energy savings (GWh & million \$)	2011	4,098.4	\$522.7
	2016	4,229.3	\$538.6
Rainfall interception ( $m^3 * 10^6$ & million \$)	2011	2,442.0	\$433.6
	2016	2,627.0	\$424.7

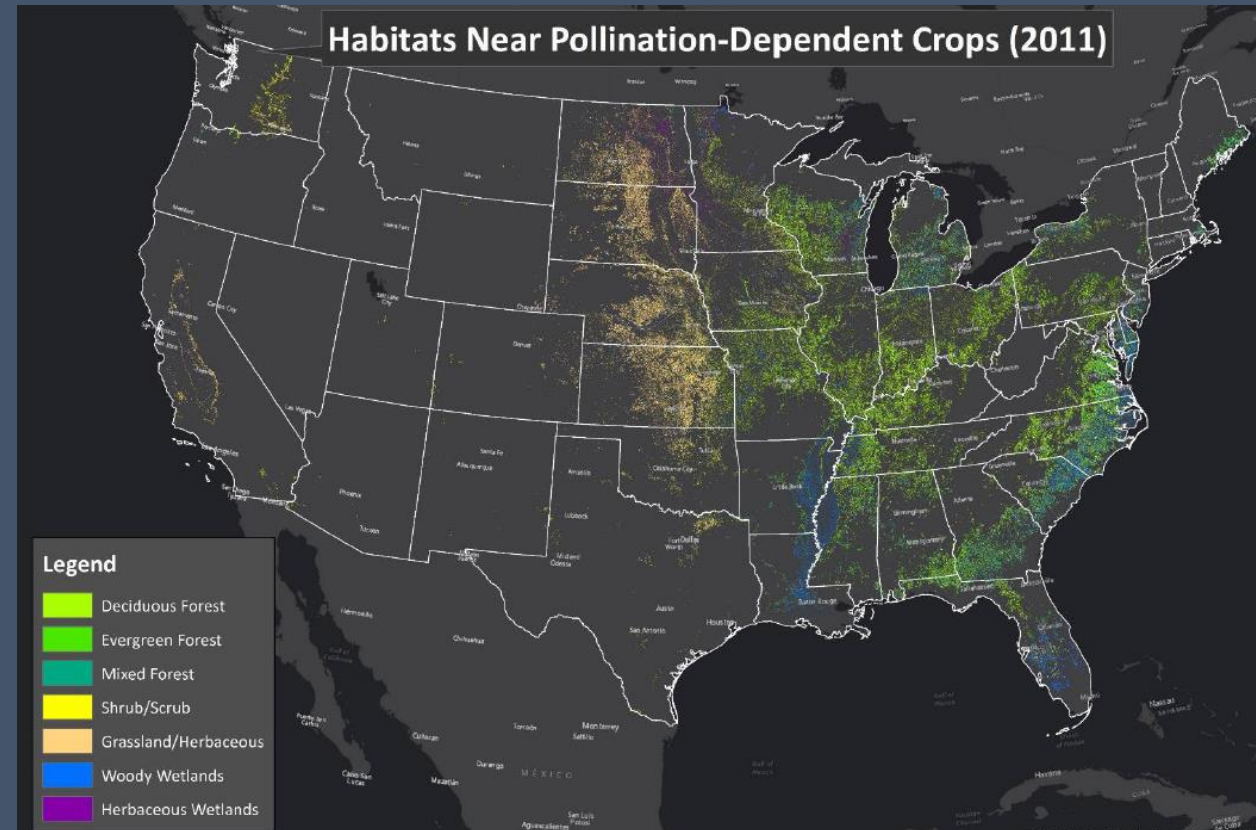
Ecosystem Accounting Area	Service Type	Year	Ecosystem Types (Land cover)															Total
			Open Water	Developed - Open	Developed - Low	Developed - Medium	Developed - High	Barren	Deciduous Forest	Evergreen Forest	Mixed Forest	Scrub/Shrub	Grassland/Herbaceous	Pasture/Hay	Cultivated Crops	Woody Wetlands	Emergent Herbaceous Wetlands	
736 cities with population >=50k and valid regression results	Energy Savings (GWh)	2011	0.0	1,224.6	1,891.8	596.4	41.2	0.9	124.0	107.1	24.5	25.3	20.9	10.3	3.2	25.4	2.8	4,098.4
		2016	0.0	1,228.8	1,970.8	633.1	42.3	1.5	104.3	104.9	62.0	21.5	14.7	14.8	3.4	24.2	3.0	4,229.3
130 cities with CSOs with population >=50k	Rainfall Interception over Impervious Surfaces ( $m^3 * 10^6$ )	2011	0.3	33.2	23.1	6.5	0.5	0.1	60.3	11.3	18.4	1.1	0.9	3.4	0.3	8.0	0.6	168.0
		2016	0.2	32.4	22.9	6.7	0.5	0.1	57.9	11.7	18.1	0.7	0.8	3.2	0.3	8.4	0.6	164.6





# National pollination account (Heris et al. in prep)

- Will cover 2008-2020 at 3-year intervals for the nation
- Also 1999-2020 at 3-year intervals for four states where earlier data are available
- Planned monetary supply-use account for California

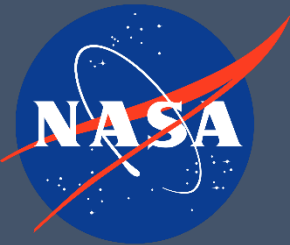
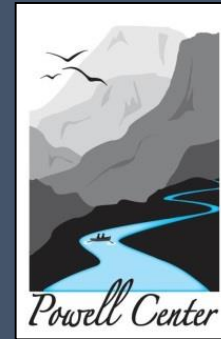


# Partners

- Project team:



- Funders:



# What worked well?

1. Series of 5 working group meetings, October 2016-March 2019
2. Group has stayed cohesive: monthly phone meetings & preparation of technical & written products has continued
3. Much larger critical mass of SEEA-savvy researchers & practitioners in the U.S.
4. Partnerships built between core U.S. government agencies, academics, international community
5. Use of NESCS to partition ecosystem services into condition & physical supply-use accounts
6. Data availability is fantastic (e.g., 30 m, annual cropland data; new LCMAP product gives annual 30 m land cover data for 1985-2017; 30 m land use dataset, crosswalked to NAICS codes)

# What didn't work well?

1. Working group model has kept people engaged but with limited dedicated time to develop or promote accounts
2. No mandates for SEEA in the U.S.
  - Status as experimental/pilot accounts
  - No guarantees of long-term support



# Challenges identified

1. Better knowledge of data & knowledge gaps to complete regular, national-scale accounts
2. Paradox of working in a data-rich, scientifically advanced setting: simple models are unlikely to be acceptable
3. How to code & store models to best support their reuse & recompilation?
  - “Kindness of strangers” approach – SE accounts
  - Code repositories a savvy programmer can adapt & reuse (e.g., Python) – nationwide accounts

# Use of results

- Water accounting in Hawai'i – state & local government + water users
- Urban ecosystem accounts: partnership with New York City – using urban SEDA for urban forest management
- Outreach to statewide conservation NGO in Florida
- Team is working on a paper about further potential “use cases” for national/state/local government, NGOs, private sector, etc.

For more information (+ [www.tinyurl.com/us-nca](http://www.tinyurl.com/us-nca))

- Boyd et al. 2018. “The natural capital accounting opportunity: Let’s really do the numbers” Bioscience.
- Warnell et al. 2020. “Testing ecosystem accounting in the U.S.: A case study for the Southeast” Ecosystem Services.
- Heris et al. in review. Piloting urban ecosystem accounting for the U.S. (Ecosystem Services)
- Heris et al. in prep. A national pollination account for the U.S. (journal TBD)
- Bagstad et al. in prep. Lessons learned from SEEA accounting in the U.S. & Europe (Ecosystem Services)
- Posner et al. in prep. Developing use cases for SEEA accounting in the U.S. (journal TBD)
- Bagstad et al. in review. Water accounts for the U.S. (Ecosystem Services)
- Wentland et al. in press. Land accounts for the U.S. (Ecosystem Services)
- Haas et al. in prep. Guidance for compiling SEEA CF accounts for the U.S.