National Park Service
U.S. Department of the Interior

Social Science Program

Valuing Terrestrial Carbon Sequestration in National Parks

Leslie Richardson, NPS Social Science Program
Chris Huber, USGS Fort Collins Science Center
Zhiliang Zhu, USGS National Center

EXPERIENCE YOUR AMERICA

Background

- Lands managed by the National Park Service (NPS) provide a wide range of social and economic benefits
- They serve as a destination for tourists, who spend money in parks and gateway communities, generating **economic impacts** in local economies
- In addition, park ecosystems provide a number of important services that have **economic value**
- There's a growing interest in valuing ecosystem services supported by federal lands
  - ✓ 2011 PCAST report
  - ✓ 2015 Executive memorandum on ES

USGS

NATIONAL PARK SERVICE

Background

- Climate regulation from terrestrial carbon sequestration is an ecosystem service that provides societal benefits
- Many of our protected lands likely sequester more CO_2 than they would if converted to other uses
- The purpose of this study is to assess the economic value of carbon sequestration on national park lands

USGS

NATIONAL PARK SERVICE

Background

- Climate change has the potential to impact society in many ways:


Agriculture


Human health


Water resources


Extreme weather events

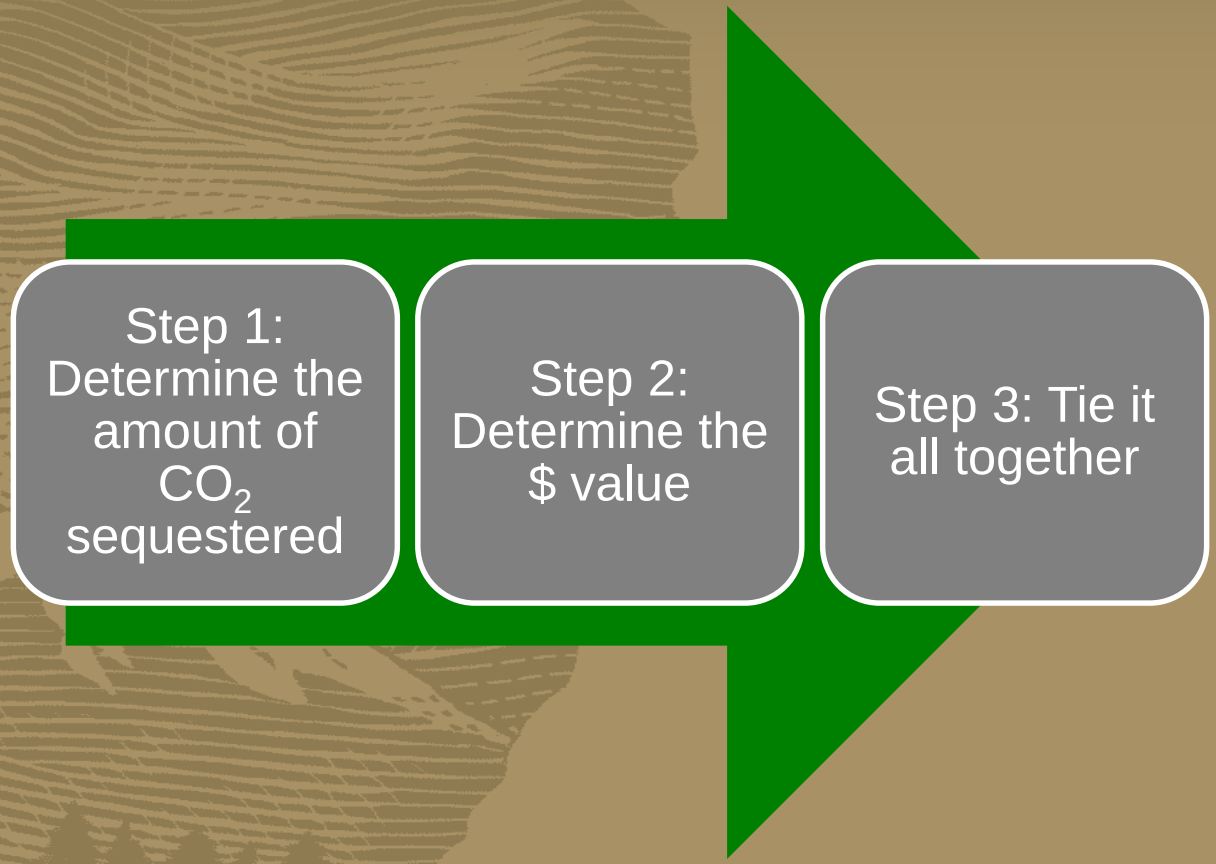

Species

USGS

NATIONAL PARK SERVICE

Background

- Valuing climate regulation in national parks:

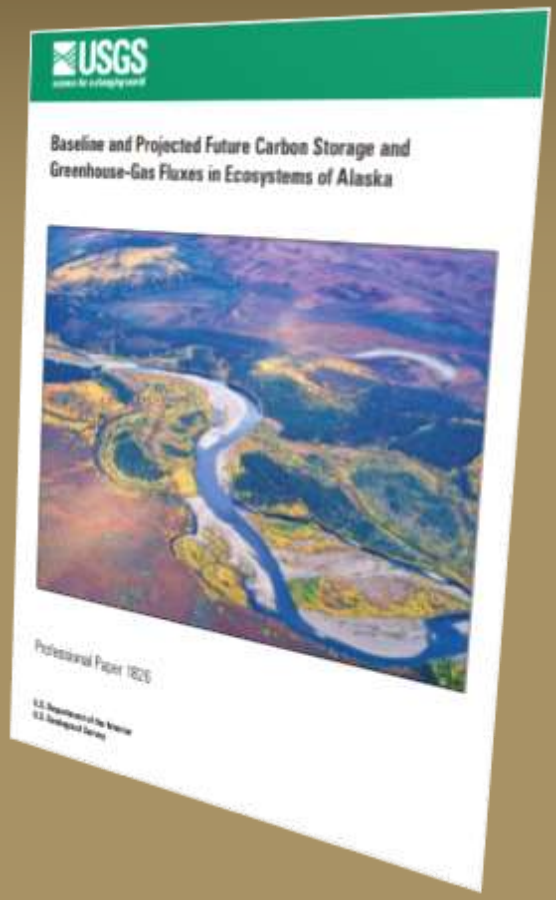


USGS

NATIONAL PARK SERVICE

Methodology – CO_2 sequestered

- Worked with the USGS LandCarbon program
  - Spatial map of average annual net ecosystem carbon balance for the conterminous U.S. & Alaska
  - Overlaid with park boundaries
  - Result is a spatial map of carbon flux per park unit
- Net carbon balance is multiplied by 3.667 to convert it to metric tons of carbon dioxide, which can be tied to a measure of economic value

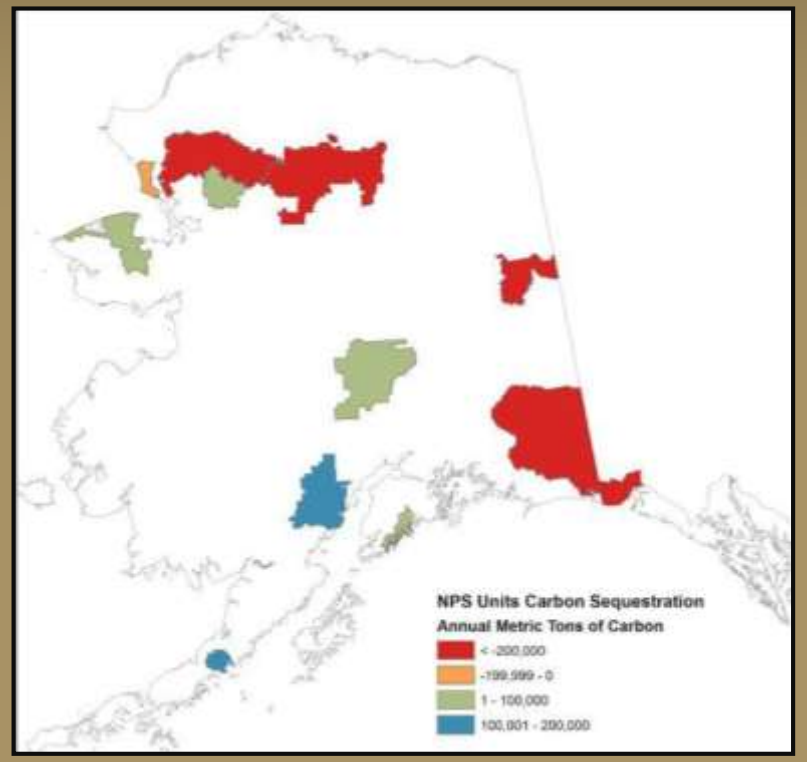


USGS

NATIONAL PARK SERVICE

Methodology – CO_2 sequestered

- Many parks are carbon sinks, sequestering more CO_2 than they emit
- But some are carbon sources, emitting more than they sequester
- For any given park, the carbon balance depends on land cover type, soil type, land uses, wildfire and other disturbances, and hydrologic and climatic conditions



USGS

NATIONAL PARK SERVICE

Methodology – Valuation

- Relied on Social Cost of Carbon (SCC) estimates
  - Developed by a U.S. Interagency working group
  - Based on 3 integrated assessment models
  - Capture future changes in ag. productivity, human health, damages from flooding, and the value of certain ecosystem services due to climate change
  - Designed to be used in regulatory analyses

- The following estimates were used in this analysis:

Discount Rate	2.5%	3%	5%	3% (95th)
SCC	$61.79	$39.32	$12.36	$113.47

USGS

NATIONAL PARK SERVICE

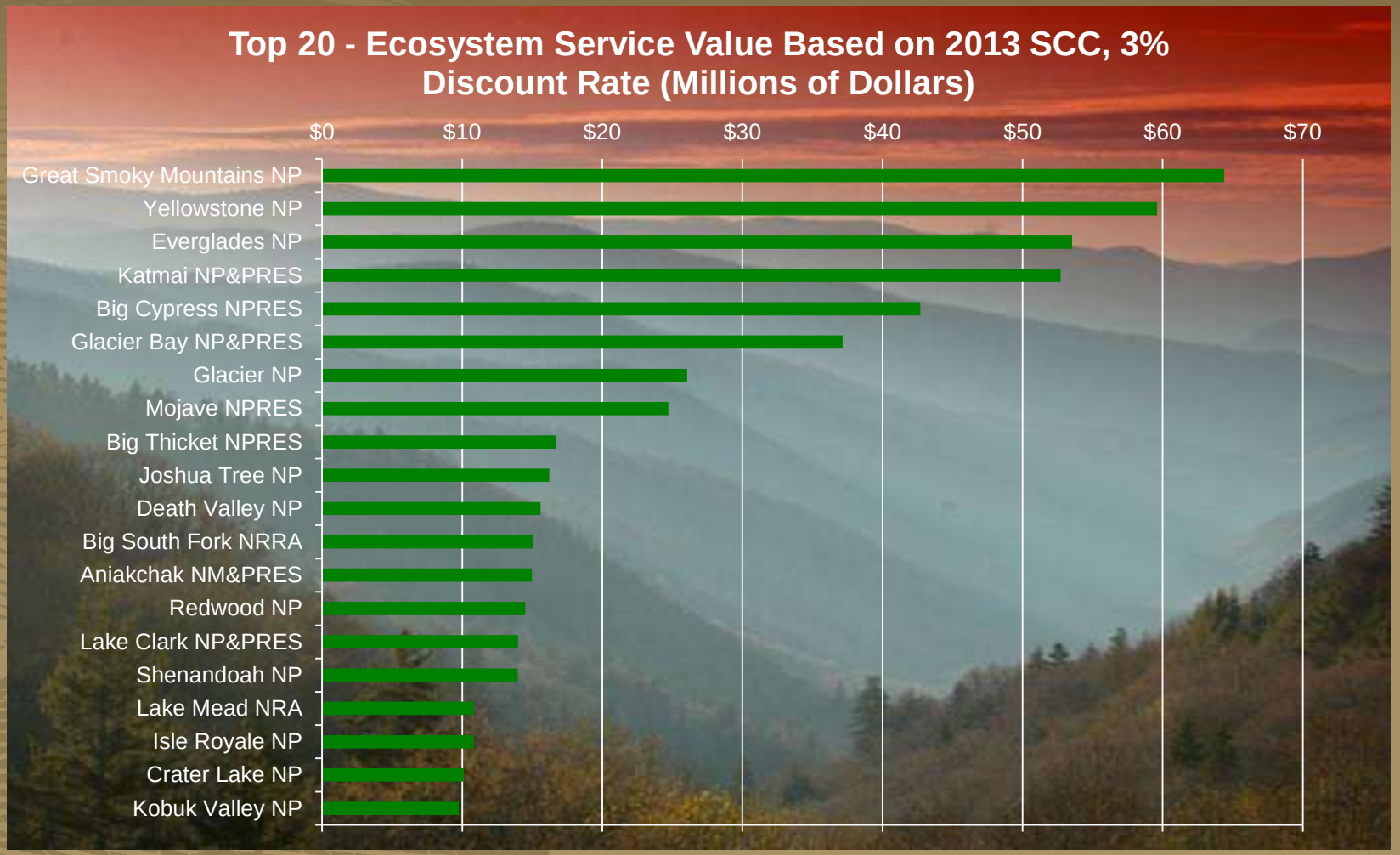
Results

Region	Annual metric tons of CO_2	Value by Discount Rate (Millions)			
		2.5%	3%	5%	3% (95th)
Intermountain	3,482,323	$215	$137	$43	$395
Midwest	1,527,841	$94	$60	$19	$173
National Capital	87,509	$5	$3	$1	$10
Northeast	1,139,938	$70	$45	$14.1	$129
Pacific West	3,230,205	$200	$127	$40	$367
Southeast	5,345,302	$330	$210	$66	$607
Alaska	-977,055	-$60	-$38	-$12	$-111
Total	**13,836,062**	**$855**	**$544**	**$171**	**$1,570**

USGS

NATIONAL PARK SERVICE

Results

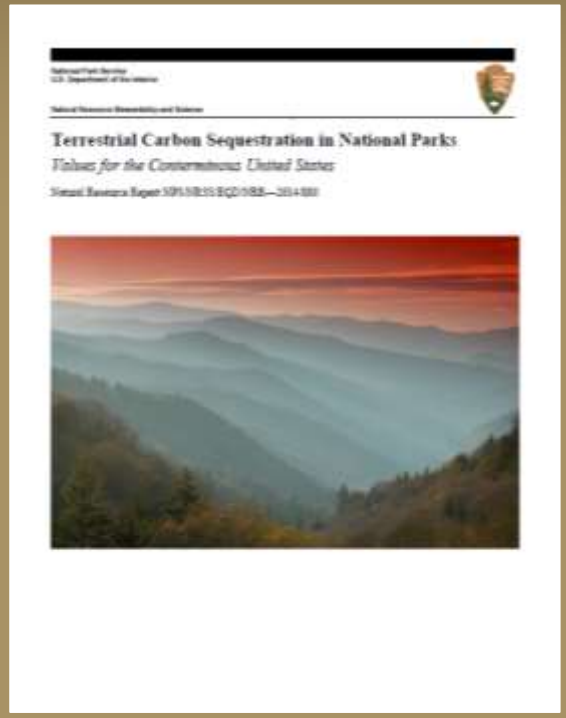


USGS

NATIONAL PARK SERVICE

Implications & Future Research

- Published results will be updated to include Alaska and Hawaii parks
- This assessment provides a broad-scale snapshot in time of the value of one ecosystem service provided by our national park lands
- More in-depth studies at the individual park level can be used to better understand how specific management actions will affect the value of carbon sequestration



USGS

NATIONAL PARK SERVICE