Measuring Tahoe's Greenhouse Gas Emissions

SIERRA BUSINESS COUNCIL

Spatial Informatics Group

CALIFORNIA TAHOE CONSERVANCY

50 YEARS TAHOE REGIONAL PLANNING AGENCY

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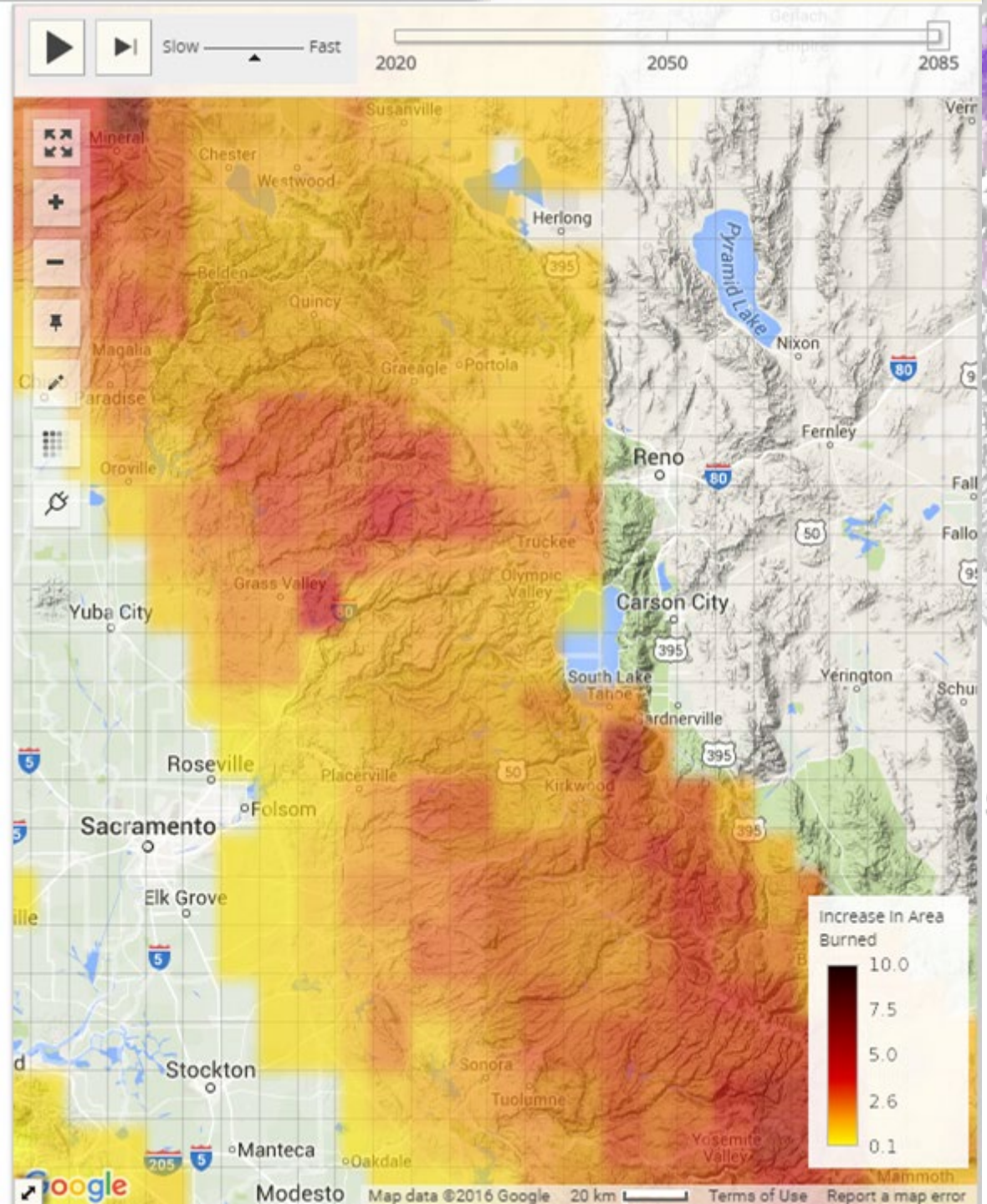
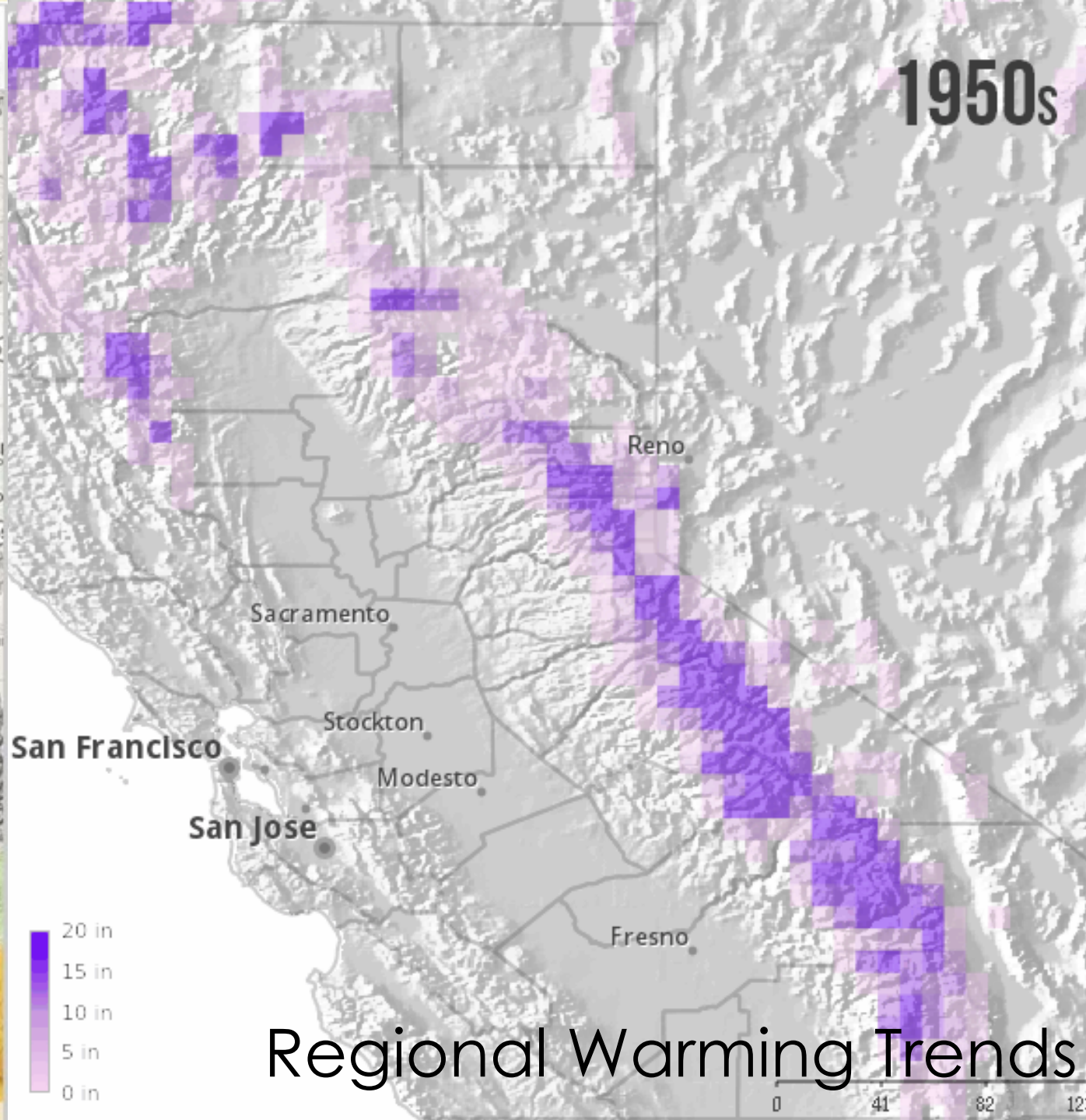




Regional Warming Trends

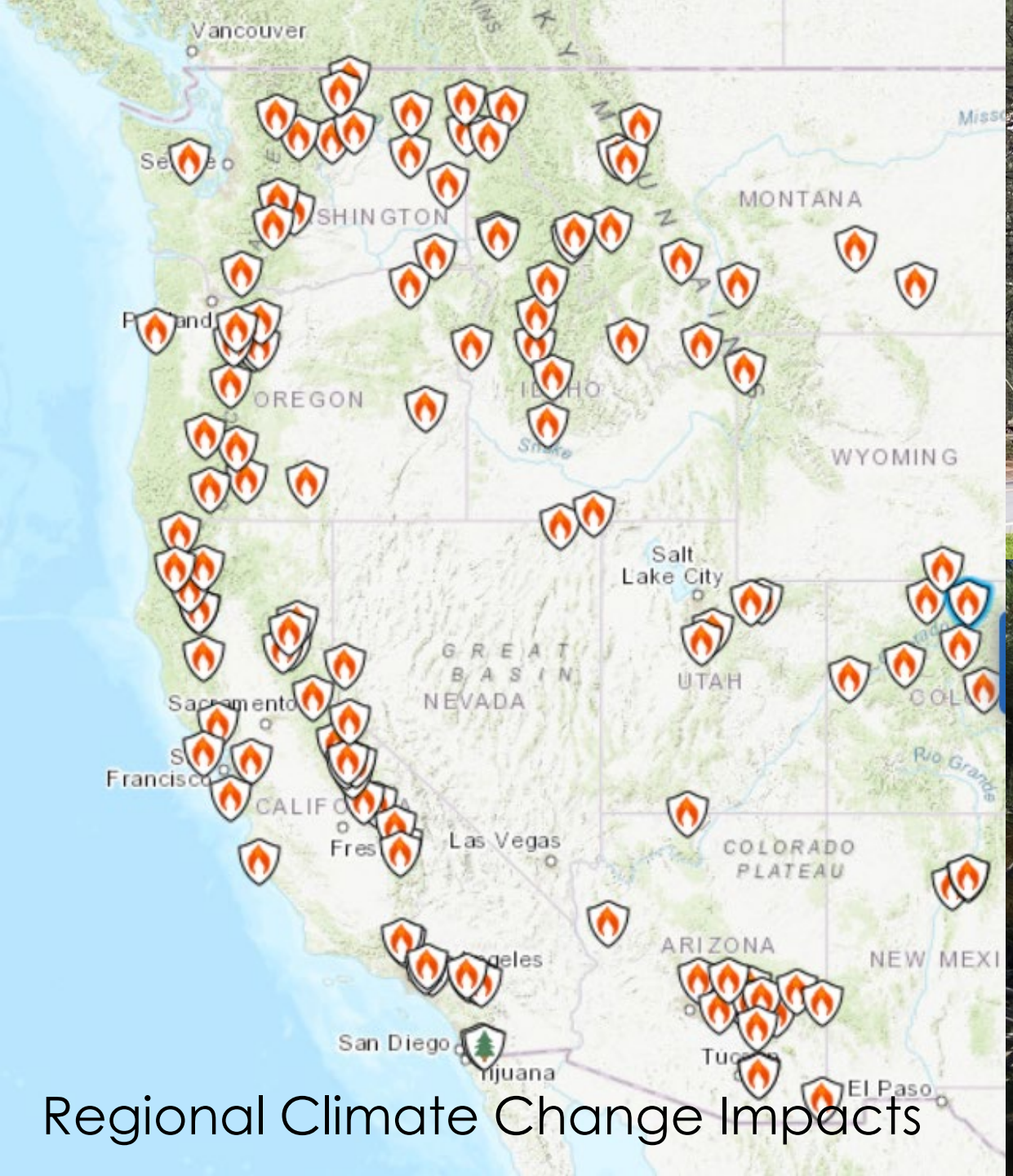
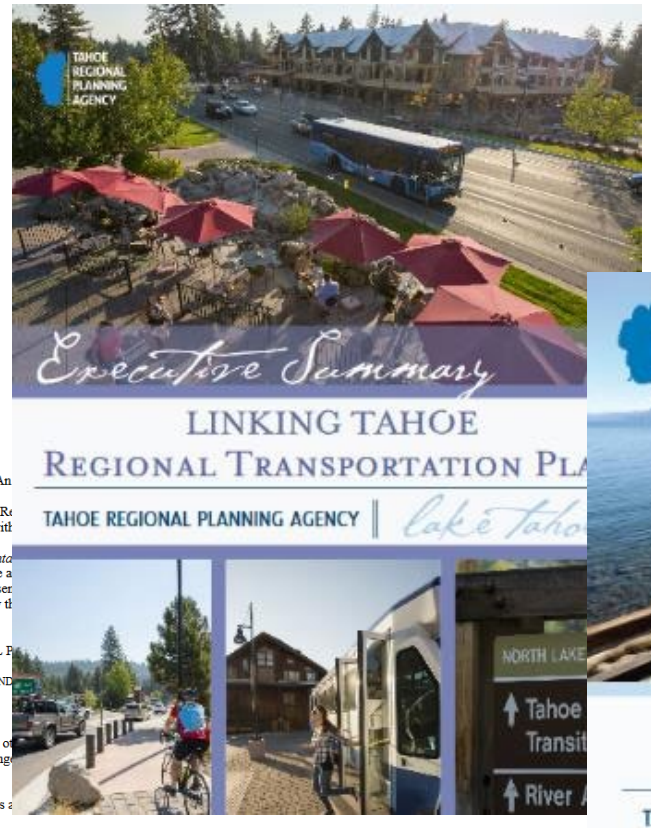


Photo Credit: Bob Becker, USFS

Regional Climate Change Impacts

Supporting Documents



PUBLIC LAW 96-551 – DEC. 19, 1980

Public Law 96-551
96th Congress

An

To grant the consent of the Congress to the Tahoe Re
Secretary of Agriculture and others to cooperate with

Be it enacted by the Senate and House of Representa
assembled, That in order to encourage the wise use a
the resources of the area around said lake, the conser
Regional Planning Compact heretofore adopted by th
reads as follows:

TAHOE REGIONAL P

ARTICLE I. - FINDINGS AND

(a) It is found and declared that:

(1) The waters of Lake Tahoe and o
deterioration or degeneration, which endang
the region.

(2) The public and private interests a

(3) The region exhibits unique environmental and ecological values which are irreplaceable.

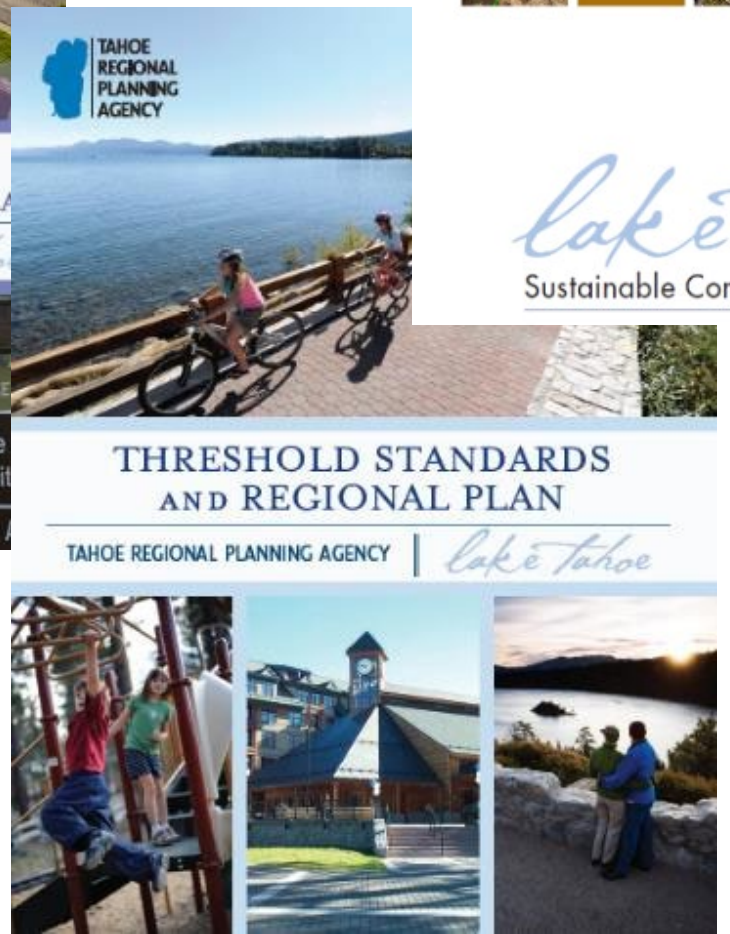
(4) By virtue of the special conditions and circumstances of the region's natural ecology, developmental pattern, population distributions and human needs, the region is experiencing problems of resource use and deficiencies of environmental control.

(5) Increasing urbanization is threatening the ecological values of the region and threatening the public opportunities for use of the public lands.

(6) Maintenance of the social and economic health of the region depends on maintaining the significant scenic, recreational, educational, scientific, natural public health values provided by the Lake Tahoe Basin.

(7) There is a public interest in protecting, preserving and enhancing these values for the residents of the region and for visitors to the region.

(8) Responsibilities for providing recreational and scientific opportunities, preserving scenic and natural areas, and safeguarding the public who live, work and play in or visit the region are divided among local governments, regional agencies, the States of California and Nevada, and the Federal Government.



Lake Tahoe Sustainable Communities Program Documents Series #3

Sustainability Action Plan:

A Sustainability Action Toolkit for Lake Tahoe

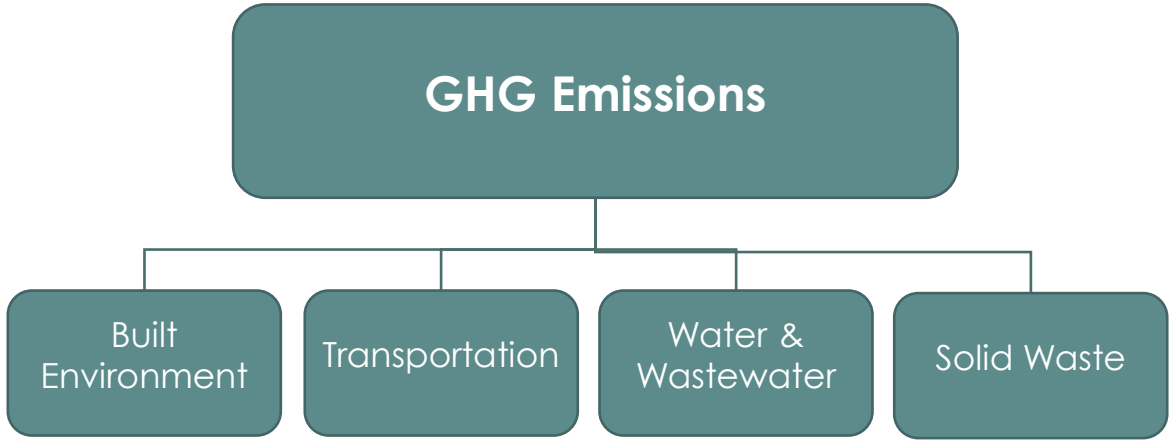
December 2013

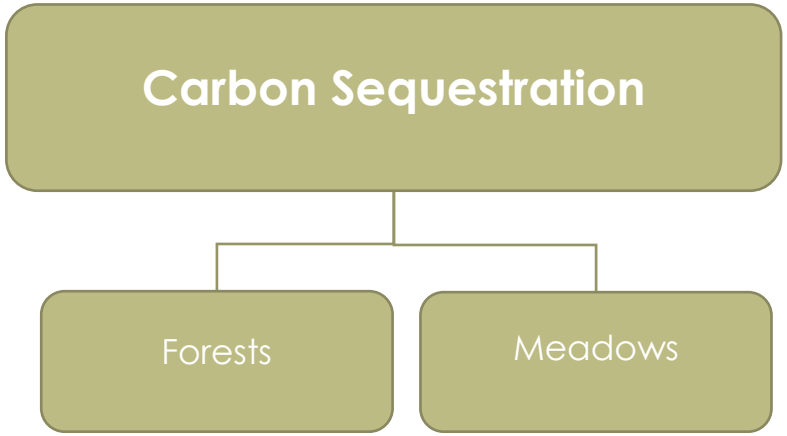
lake Tahoe
Sustainable Communities Program

ENVIRONMENTAL IMPROVEMENT PROGRAM
2018 ACCOMPLISHMENTS + A LOOK AHEAD

LAKE TAHOE
ENVIRONMENTAL
IMPROVEMENT
PROGRAM

What are we measuring?





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GHG Inventory Overview

- **Assessed 2015 and 2018 GHG emissions from 4 different sectors**
  - Energy
  - Transportation
  - Solid Waste
  - Water & Wastewater
- **Accounted for activities occurring within the basin that release emissions outside the basin as well as sources that generate emissions directly within the basin**
  - Electricity Consumption vs Natural Gas Combustion

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GHG Inventory Overview

- **Inventory accounts for the emission of carbon dioxide (CO2), methane (CH4) and Nitrous Oxide (N2O) and reports out in carbon dioxide equivalent (CO2e)**
  - CO2e is calculated based on each gases global warming potential
  - CO2e makes comparison between sectors and years easy
- **Emissions were quantified using calculation based methodologies**
  - Activity Data x Emissions Factor = Emissions

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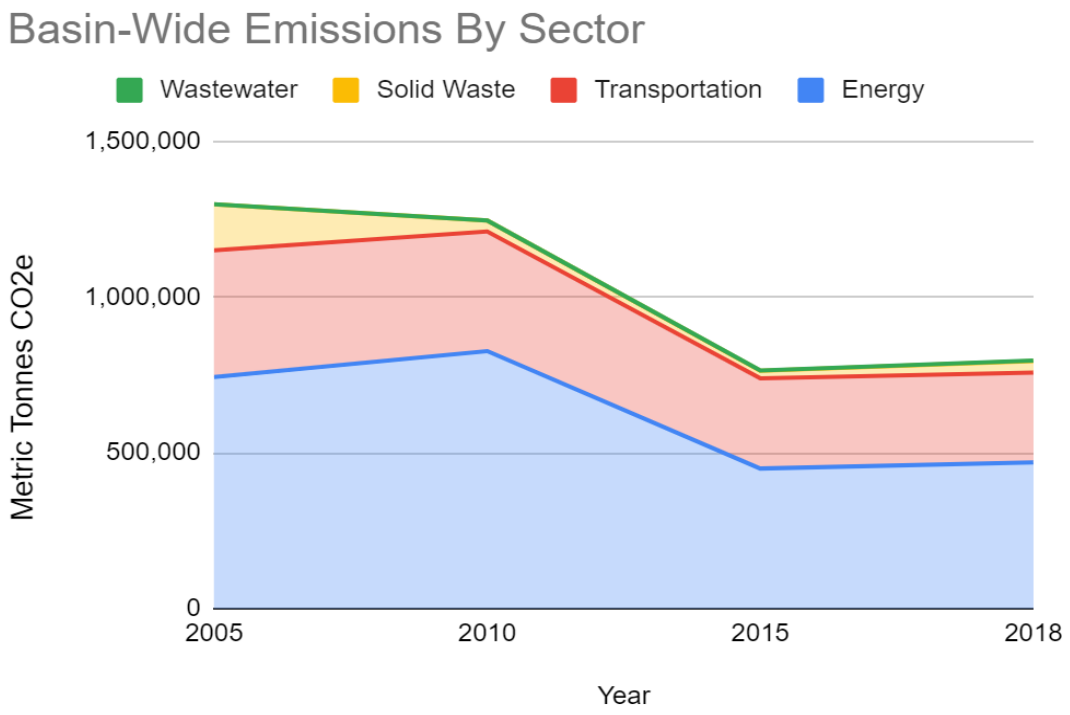
GHG Inventory Results



Percent of Total Emissions

Sector	2015	2018
Energy	58.80%	58.98%
Transportation	37.82%	36.22%
Solid Waste	3.27%	4.68%
Wastewater	0.12%	0.12%

Summary of Emissions

	MT CO2e		% Change	
Sector	2005	2018	2015 - 2018	2005 - 2018
Energy	743,426	469,379	4.40%	-36.86%
Transportation	406,615	288,207	-0.33%	-29.12%
Solid Waste	147,336	37,244	49.18%	-74.72%
Wastewater*	69	963	7.97%	1296.18%
Total	1,297,446	795,793	4.08%	-38.66%

- **Emissions decreased from 2005 to 2018 but, increased from 2015 to 2018**

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Key Takeaways

- GHG emissions **decreased** substantially from 2005 to 2018
- GHG emissions **increased** from 2015 to 2018
- The energy sector produces the most emissions (59%), followed by the transportation sector (37%)
- Ongoing GHG emissions inventories will continue to track emissions to monitor reductions efforts and inform future planning efforts
- Future inventories will continue to improve in accuracy

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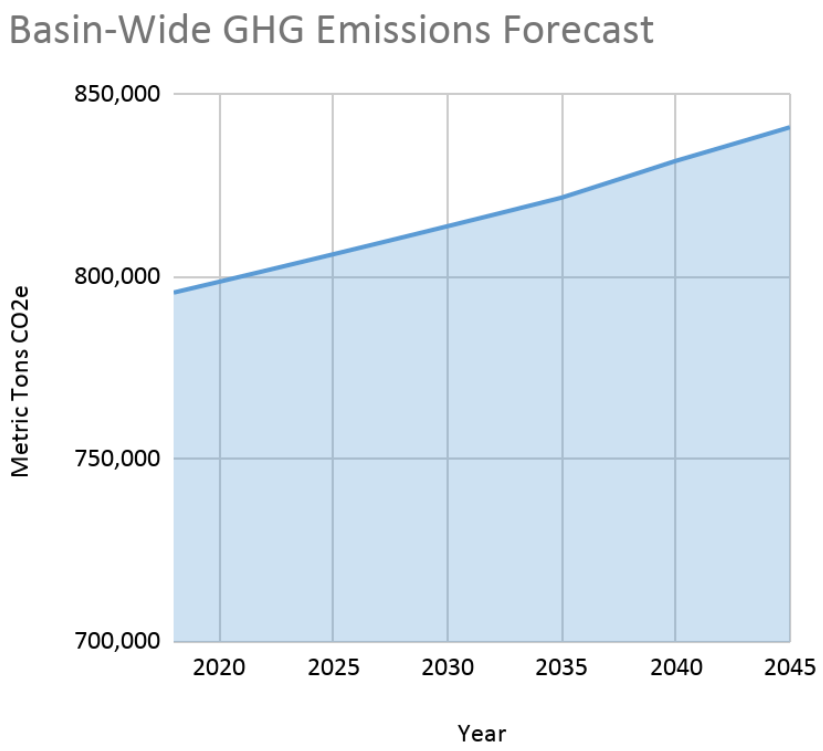
Emissions Business-As-Usual Forecast



Forecasted Emissions by Sector (MT CO2e)					
Year	Energy	Transportation	Solid Waste	Wastewater	Total
2018	469,380	288,207	37,244	963	795,794
2030	483,541	290,977	38,457	1,014	813,990
2035	489,592	292,221	38,976	1,037	821,826
2045	501,966	298,034	40,039	1,083	841,121
Net % Change	6.94%	3.41%	7.50%	12.43%	**5.70%**

- **If no action were taken, emissions would increase 5.7% by 2045, but…**

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Ongoing and Future Action

- **There are numerous planning efforts and regulations already underway**
  - By 2045 TRPA's Regional Transportation Plan is forecasted to reduce on-road transportation emissions by 13.7%
  - Regulations requiring utilities to source increased amounts of renewable electricity exist
    - CA: 60% renewable electricity by 2030, 100% carbon free electricity by 2045
    - NV: 50% renewable electricity by 2030, goal of 100% by 2050
- **Potential Next Steps: develop an adjusted scenario forecast that accounts for the impacts of these policies**

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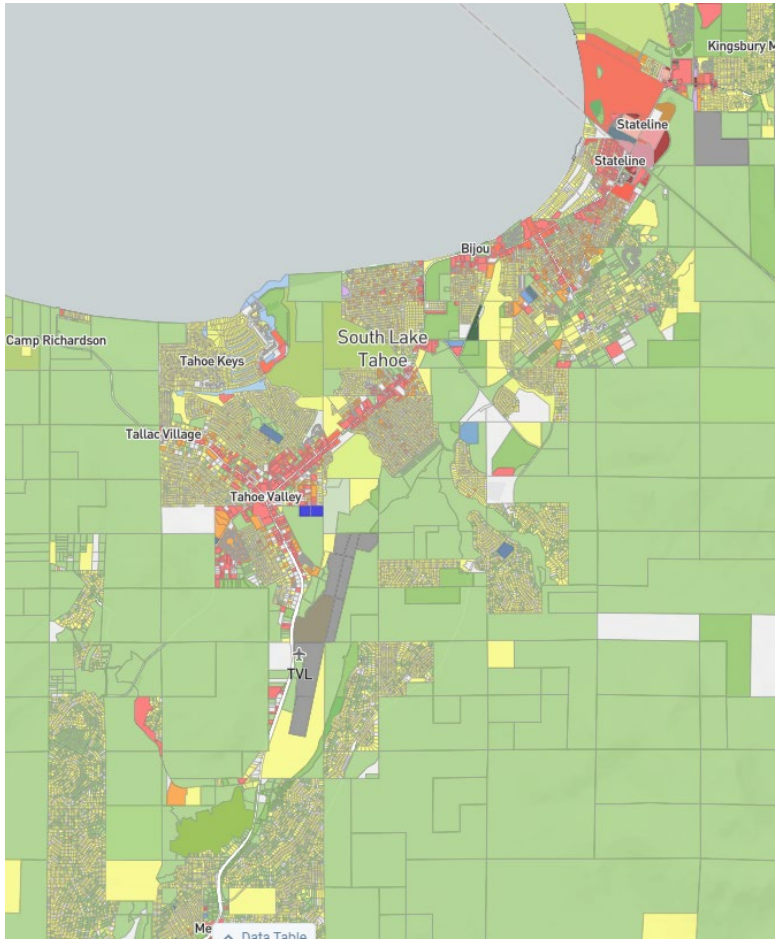
Aging Infrastructure Inventory



- Using UrbanFootprint, an inventory of building energy use is being developed by building type
- Building type and national average energy use intensities are used to estimate building energy use
- Enable the estimate of additional benefits for existing planning efforts that will transfer development out of stream environment zones

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Initial Findings

- **1/5 of building energy use is occurring in Stream Environment Zones**

Energy Type	Percent of Energy Use Occurring in SEZ
Electricity Use	22%
Natural Gas Use	19%
Total Energy Use	20%

Next Steps

- **Opportunities for the tool to be built out further in the future with additional analysis modules**
- **Continue to refine the tool's accuracy by sourcing more granular data**

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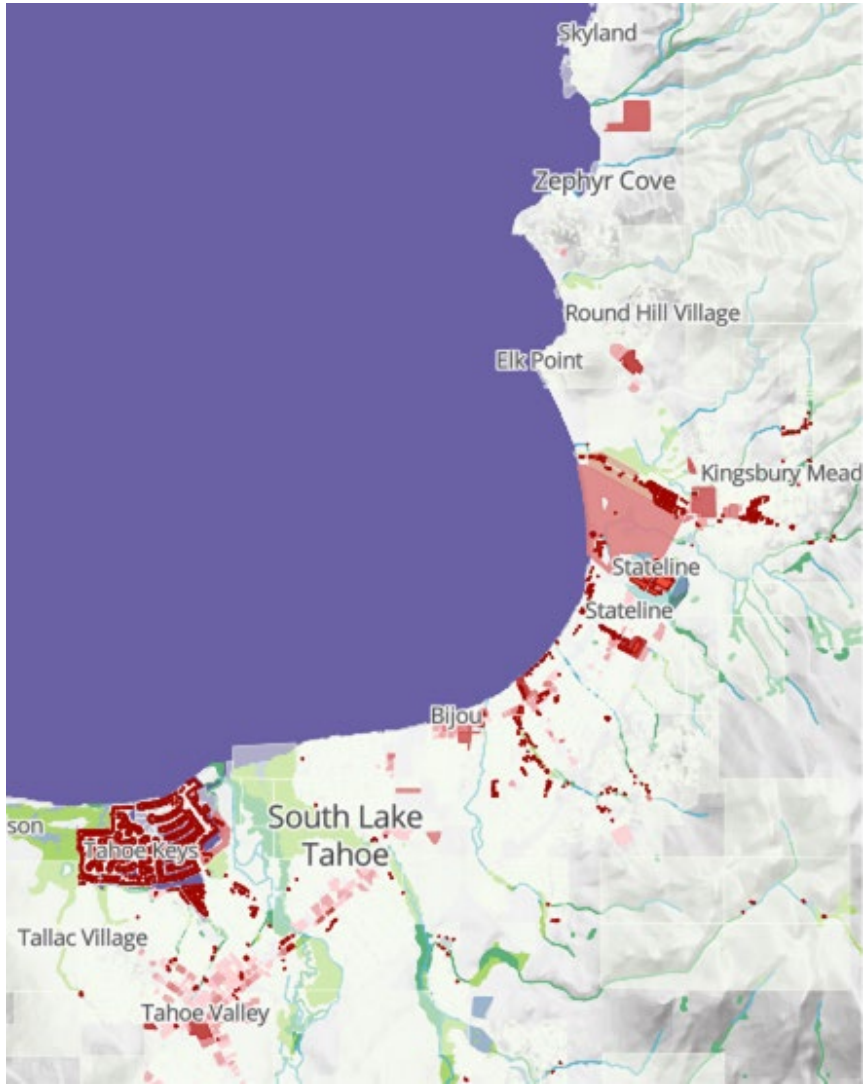
Aging Infrastructure Inventory - Maps

South shore demonstrated the highest energy use and greenhouse gas emissions in stream environment zones.



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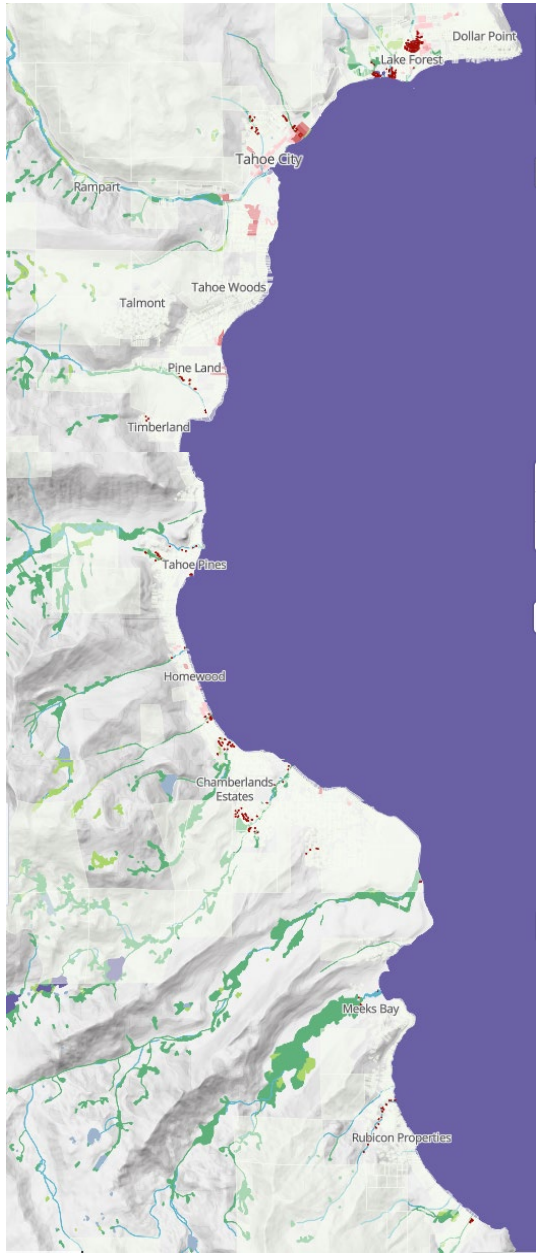
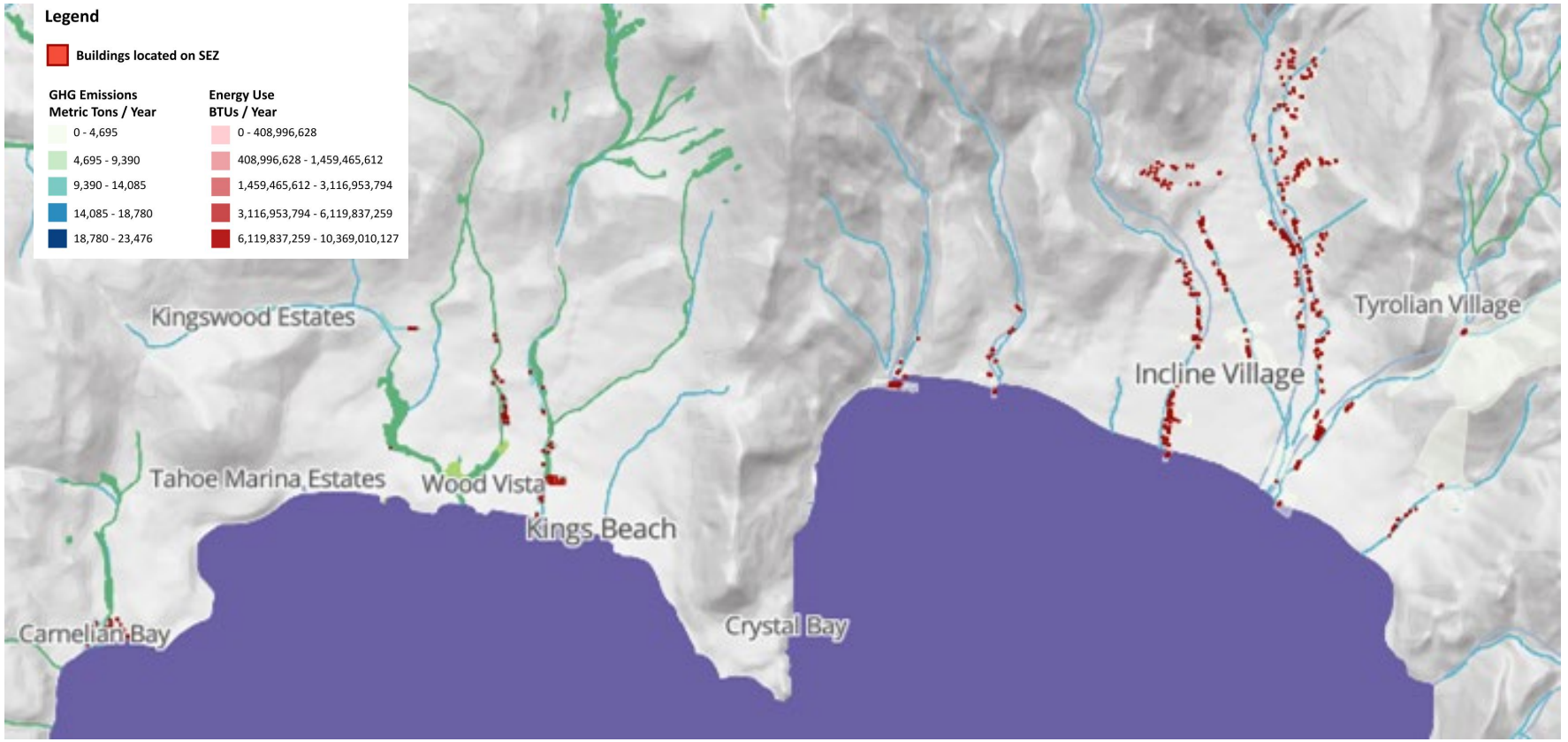
Aging Infrastructure Inventory - Maps



Map of the north shore energy use and GHG emissions in SEZs.



Map of the west shore energy use and GHG emissions SEZs. East shore energy use and GHG emissions output was less significant.

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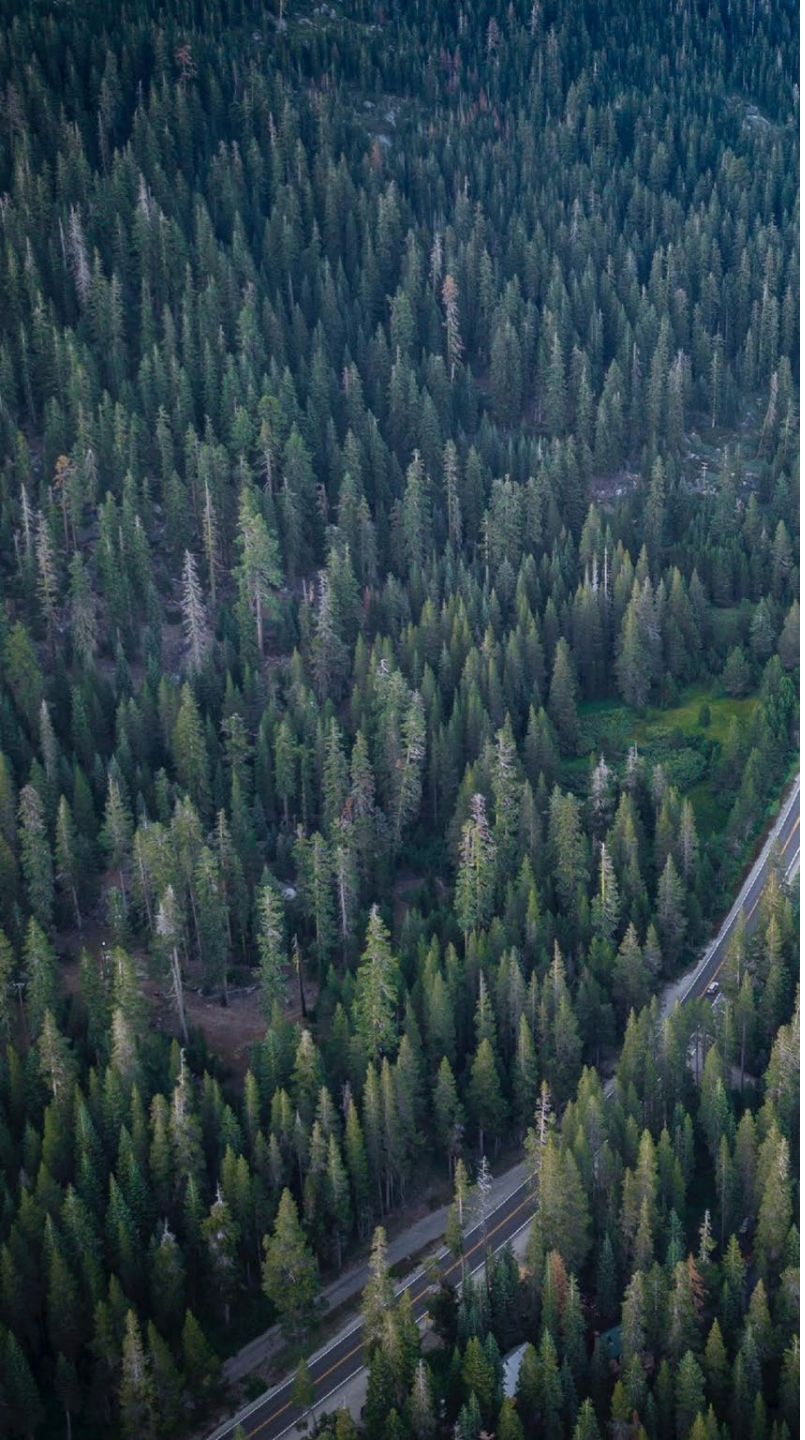

Carbon Inventory Overview

- **What is Carbon Sequestration?**
- **Tahoe's Carbon Sequestration**
  - Purpose
  - Forest carbon
  - Meadow carbon
- **Takeaways & Applications**

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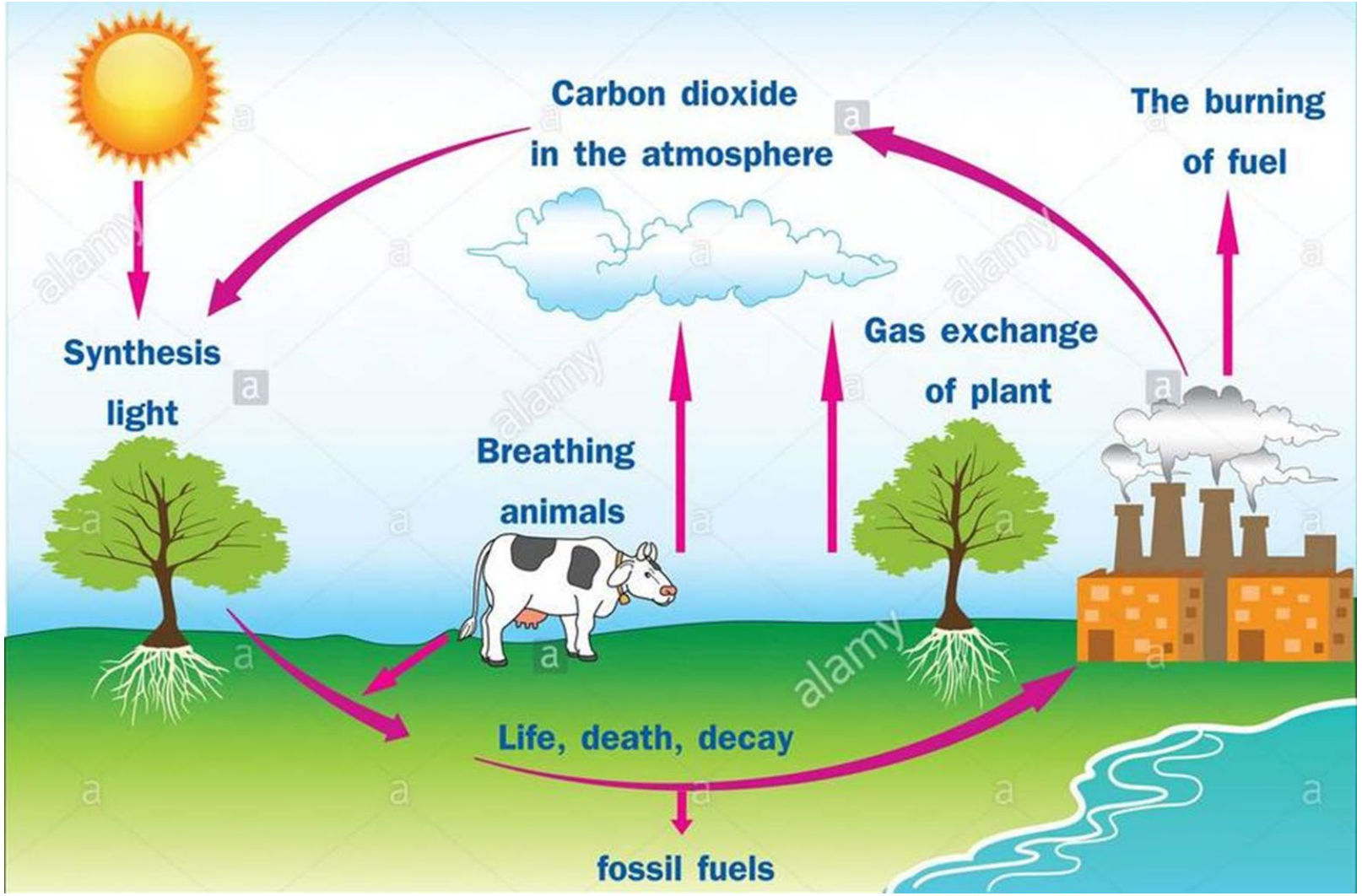
What is Carbon Sequestration?



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Carbon Sequestration Purpose

- **Aid development of carbon accounting balance sheet & carbon monitoring indicator**
- **Understand climate benefits of Tahoe's natural areas**
- **Help prioritize climate actions; drive efficient investment**

- **Quantify Tahoe's forest and meadow carbon using methods that are:**
  - ✔ **Accessible**
  - ✔ **Repeatable**
  - ✔ **Transparent**

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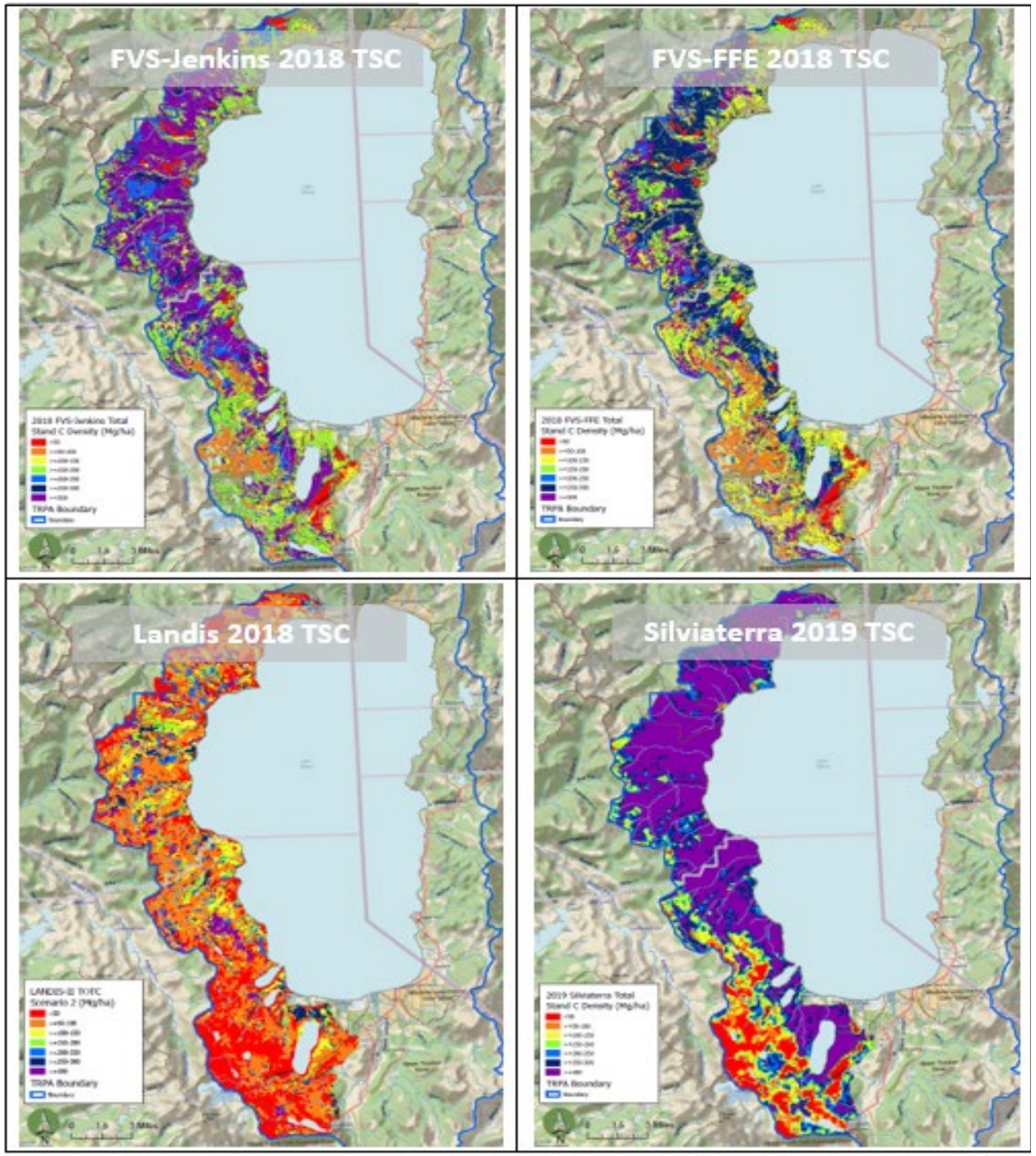
Forest Carbon



Total Stand Carbon

- Compares forest carbon modeled by FVS (using Jenkins equations), FVS (using FFE default), LANDIS-II, and Silviaterra
- Datasets represent same geographic area and time period
- Considerable variation in carbon results between datasets

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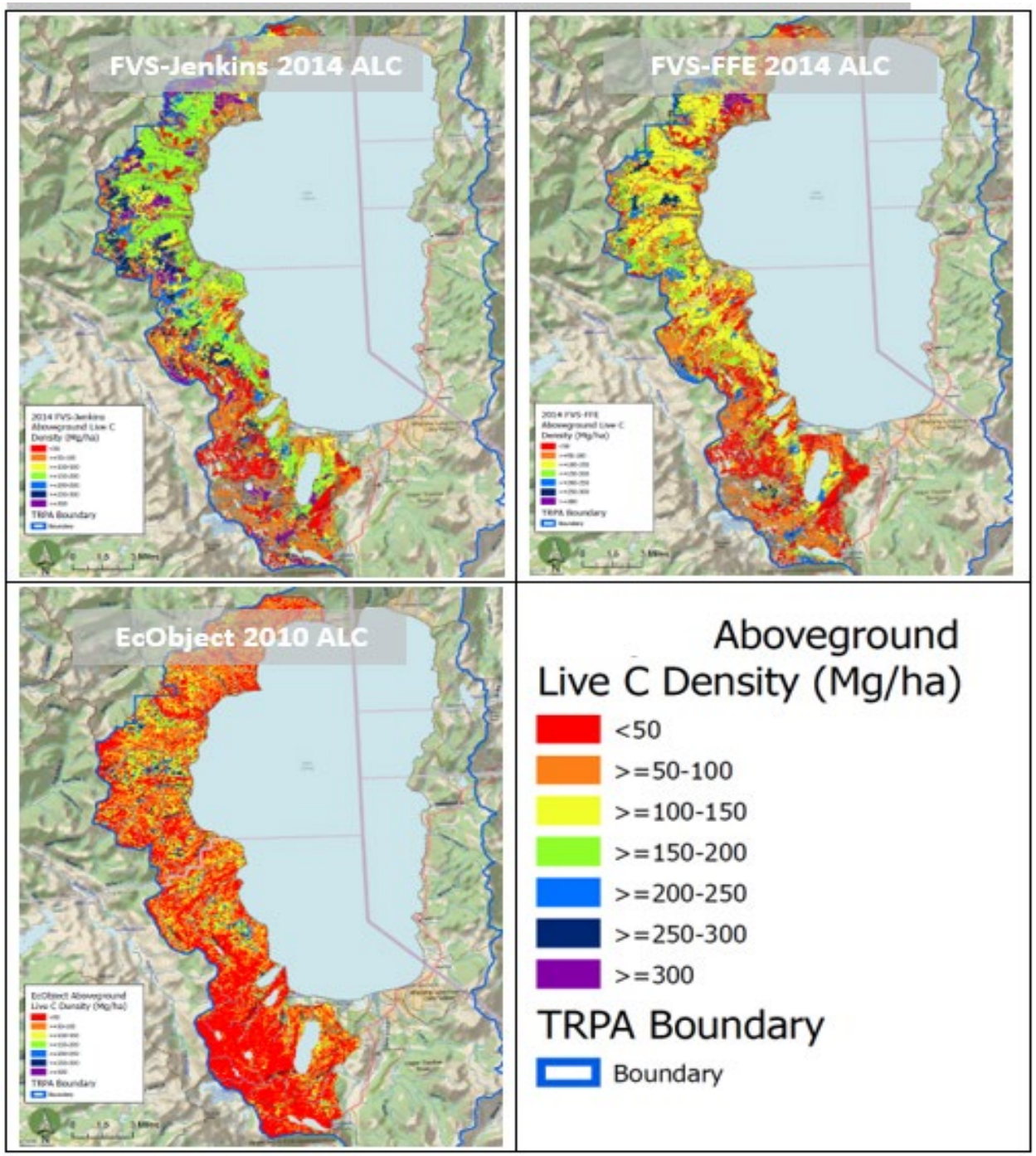

Aboveground Live Carbon

- Compares forest carbon modeled by FVS (using Jenkins equations), FVS (using FFE default), EcObject
- Datasets represent same geographic area and time period
- Considerable variation in carbon results between datasets

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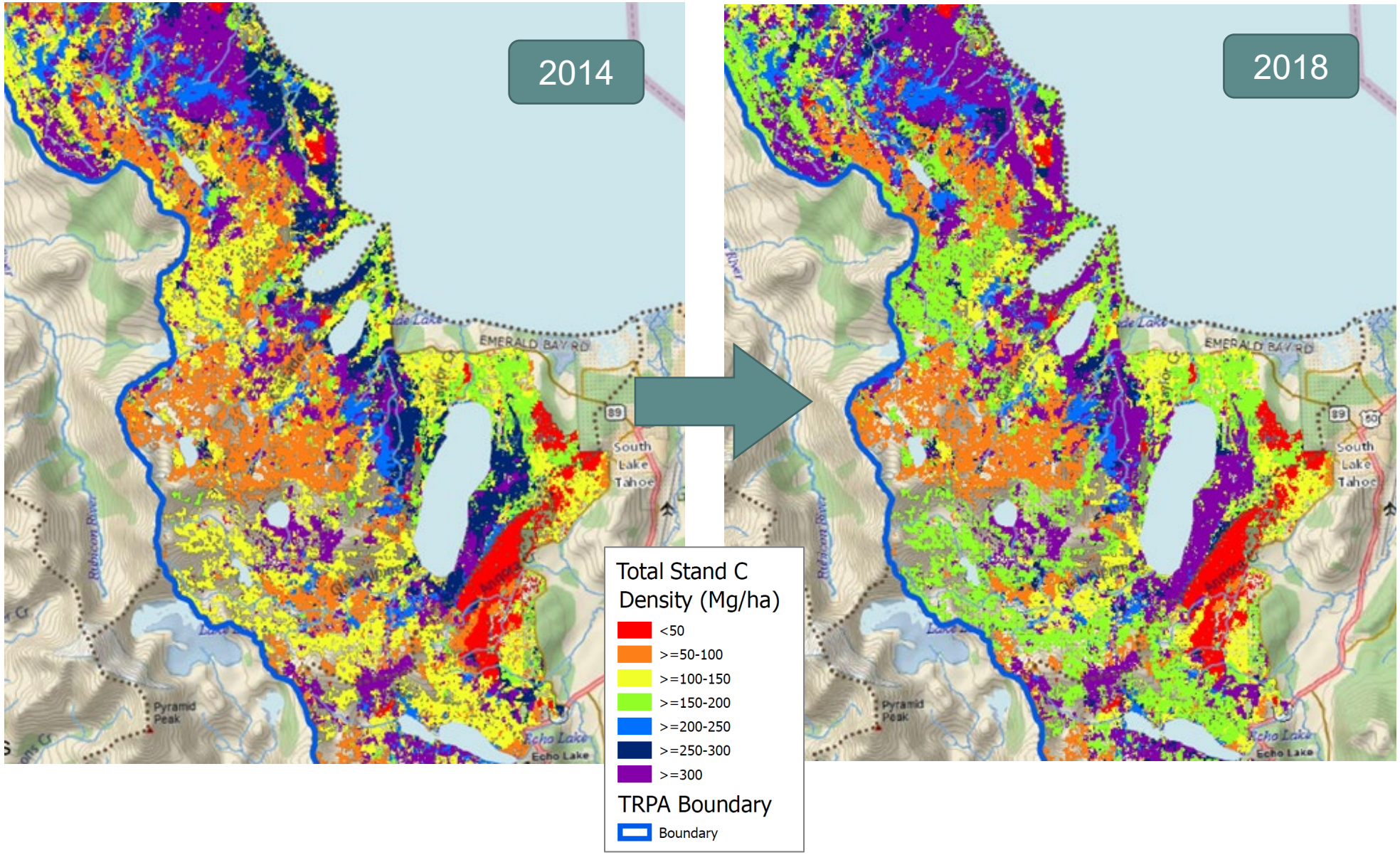
Forest Carbon Sequestration



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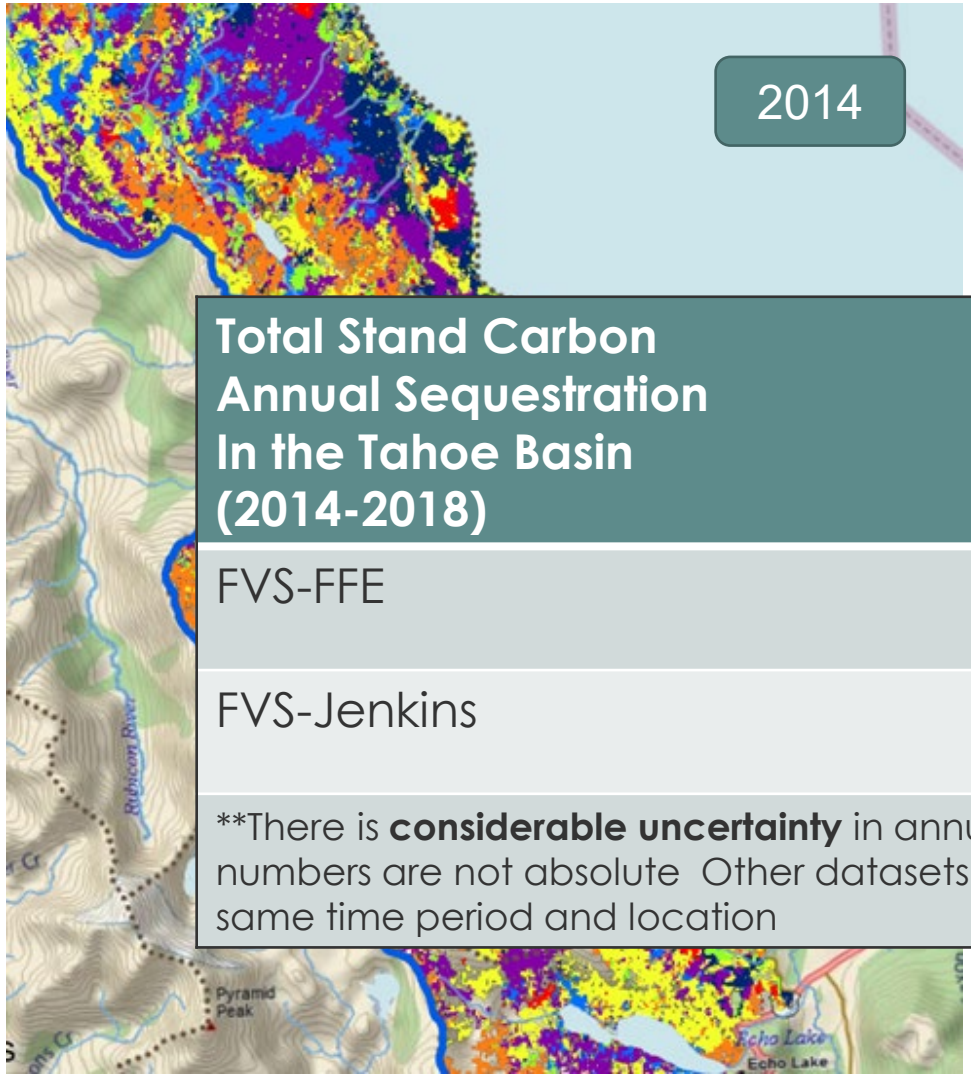
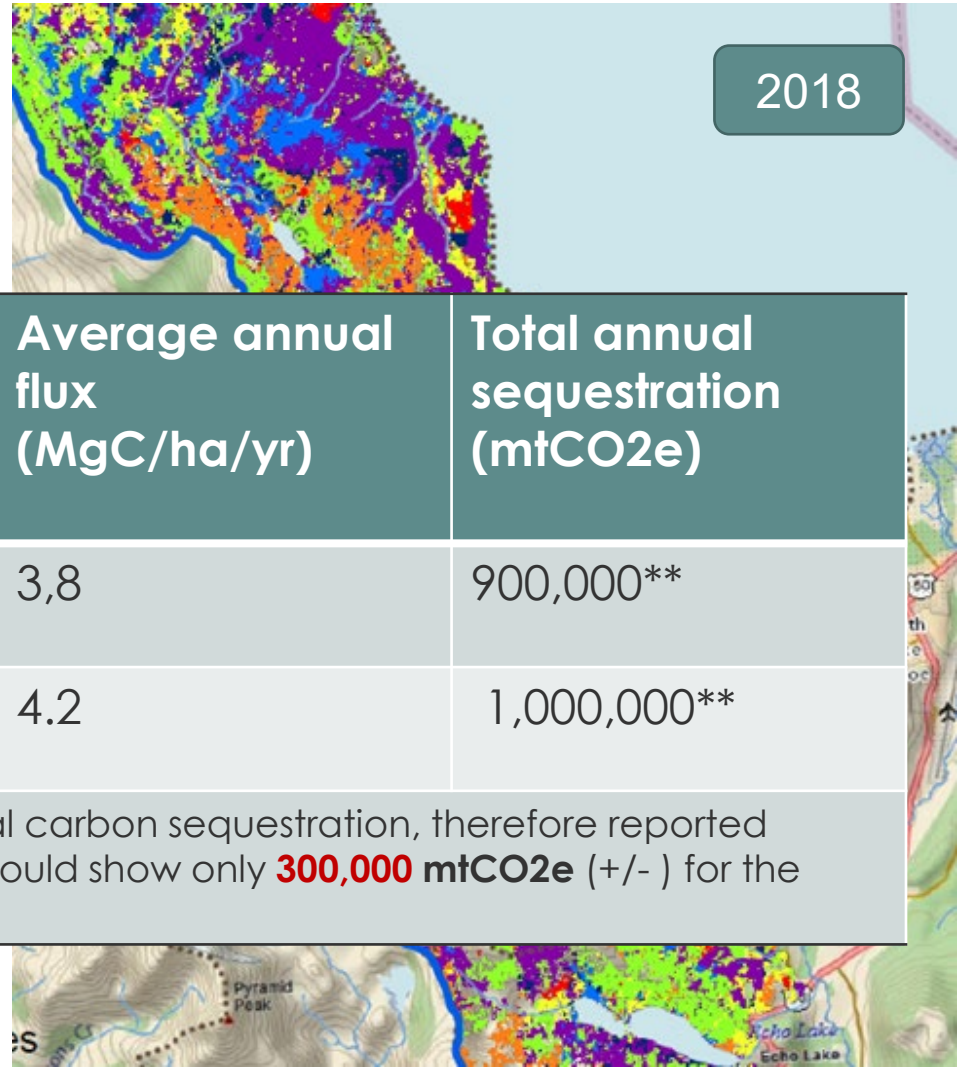
Forest Carbon Sequestration





Total Stand Carbon Annual Sequestration In the Tahoe Basin (2014-2018)	Average annual flux (MgC/ha/yr)	Total annual sequestration (mtCO2e)
FVS-FFE	3,8	900,000**
FVS-Jenkins	4.2	1,000,000**

There is **considerable uncertainty in annual carbon sequestration, therefore reported numbers are not absolute Other datasets could show only **300,000 mtCO2e** (+/-) for the same time period and location

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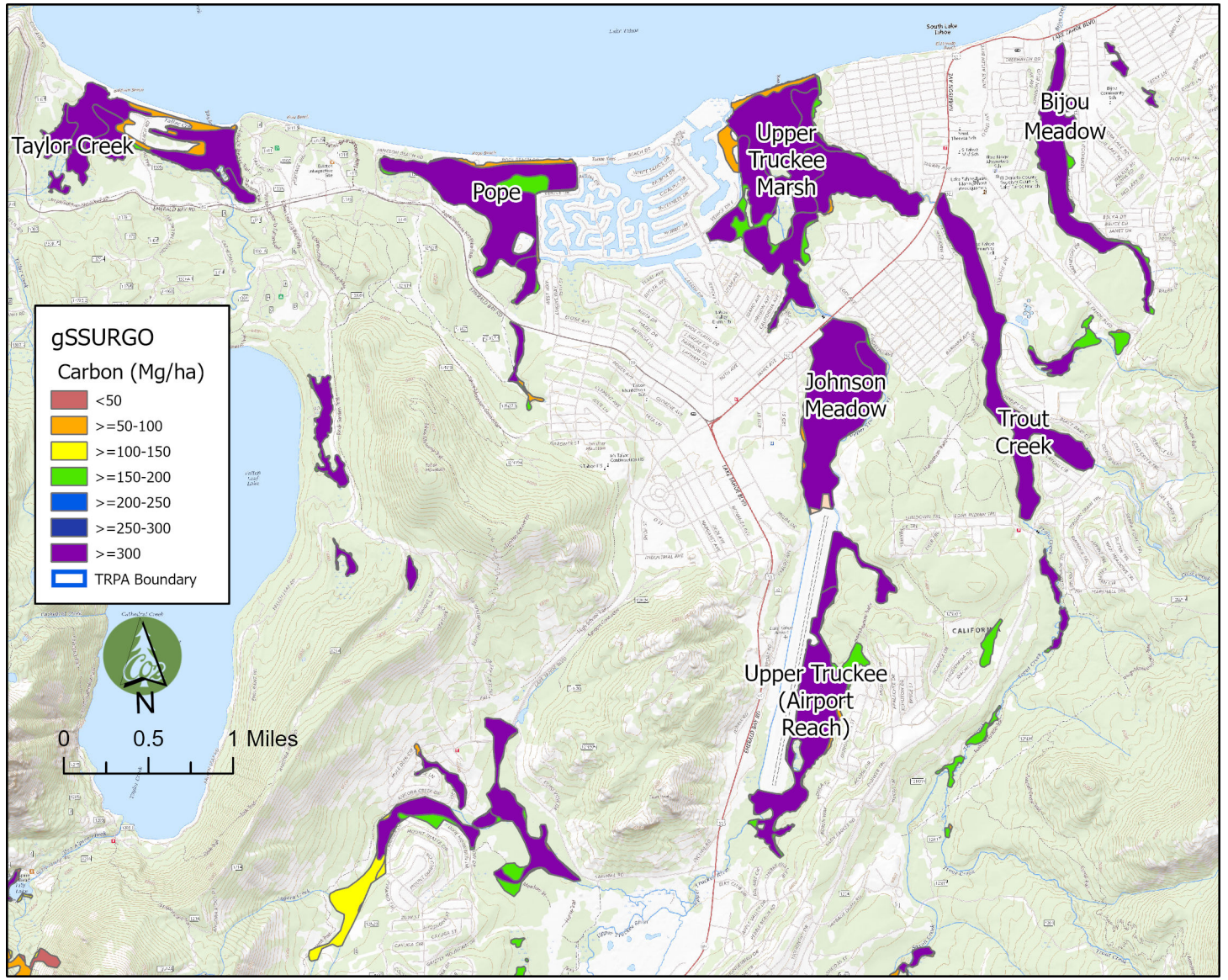
Meadow Carbon

Meadow Carbon



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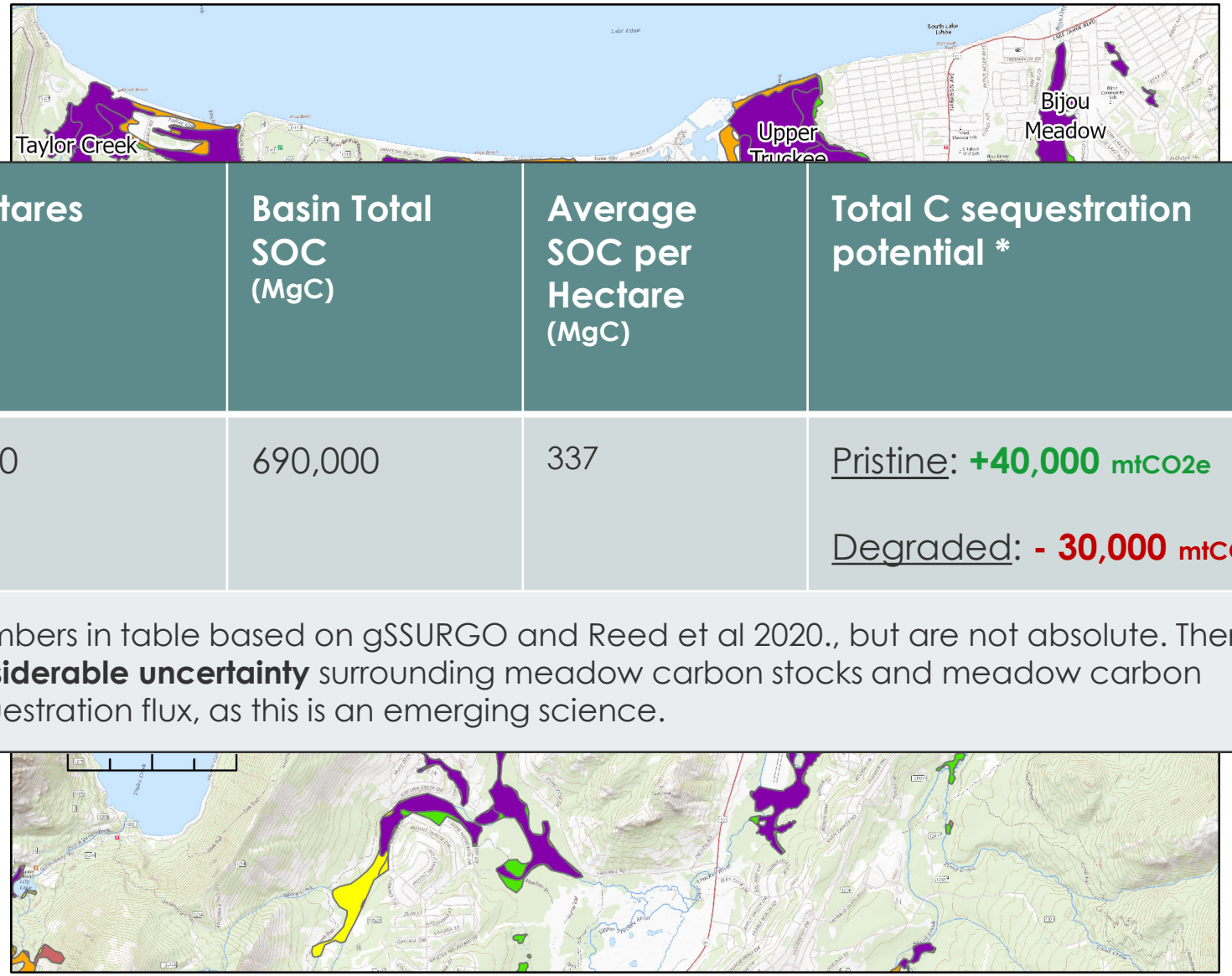
Meadow Carbon



Hectares	Basin Total SOC (MgC)	Average SOC per Hectare (MgC)	Total C sequestration potential *
2,060	690,000	337	Pristine: **+40,000** mtCO2e Degraded: **- 30,000** mtCO2e

*Numbers in table based on gSSURGO and Reed et al 2020., but are not absolute. There is **considerable uncertainty** surrounding meadow carbon stocks and meadow carbon sequestration flux, as this is an emerging science.

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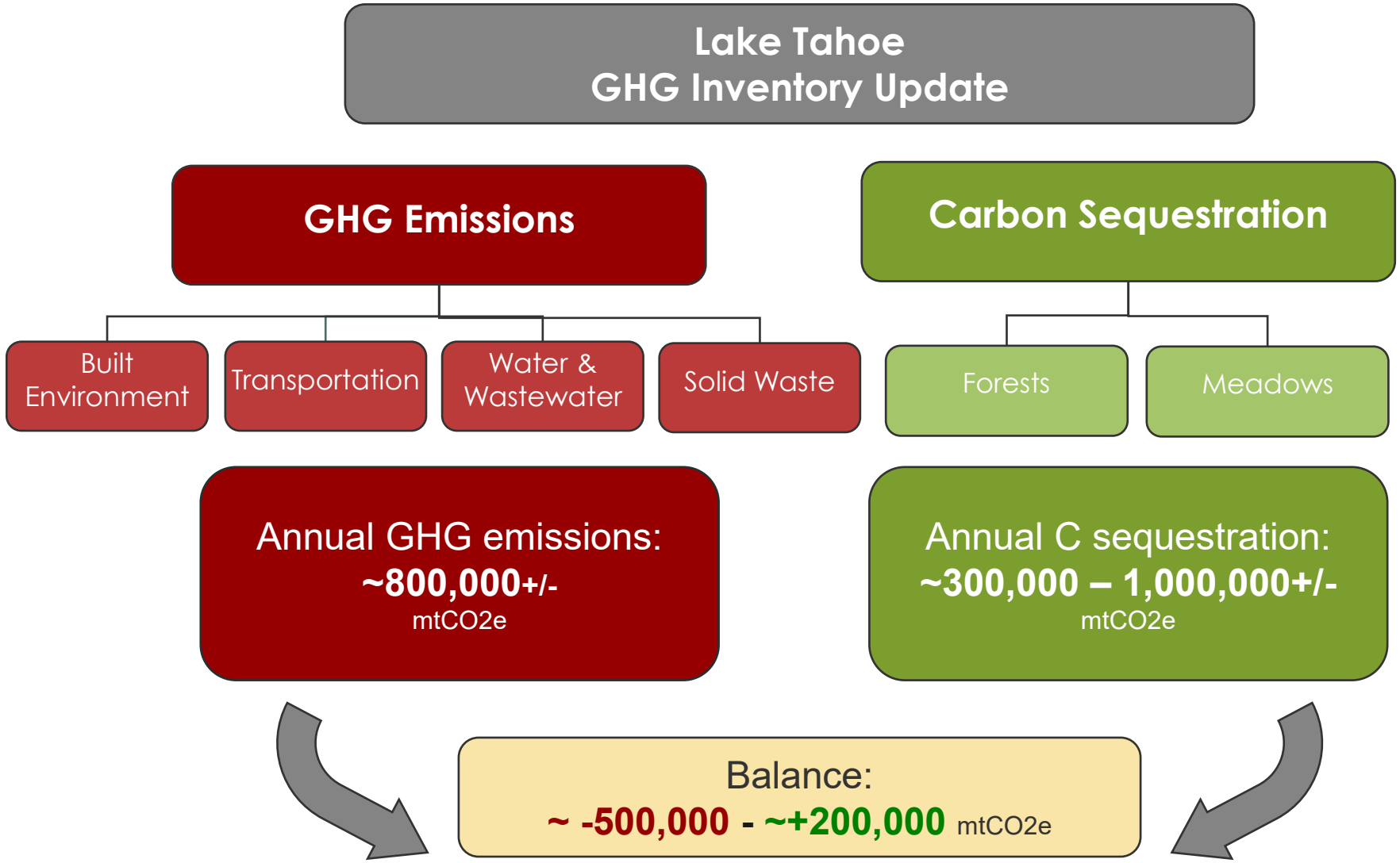
Accounting Snapshot - 2018



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Takeaways

- **Important to reduce emissions**
  - Can't sequester our way out of climate change
- **Forest resilience influences ability to offset emissions**
  - Avoided wildfire emissions protocol could show long-term carbon savings of forest health treatments
- **Meadows have potential to be important carbon sink**
  - Meadows are resource CA is quickly losing
- **More research needed to understand meadow & soil C flux**
  - Need long-term standardized monitoring
  - Engage with regional scientists to identify parameters/data needed to build meadow carbon flux models that aid management & policy
- **Data-driven policies based on transparent, repeatable results**
  - Allows integration of new science as it becomes available

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Applications

- **Assess and accelerate forest resilience & fuels reduction programs**
  - Access state & federal funding
- **Interagency/multi-stakeholder collaboration**
  - Collective research questions to reduce data uncertainty and inform climate action
- **Inform meadow restoration techniques to maximize sequestration**
  - Rough idea of which meadows are sinks vs. sources
  - Soil carbon metric to measure restoration success
  - Pair with SEZ Assessment & long-monitoring
- **Expand carbon offset market**
  - Get paid $ for your carbon sequestration contributions

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Conclusions & Next Steps

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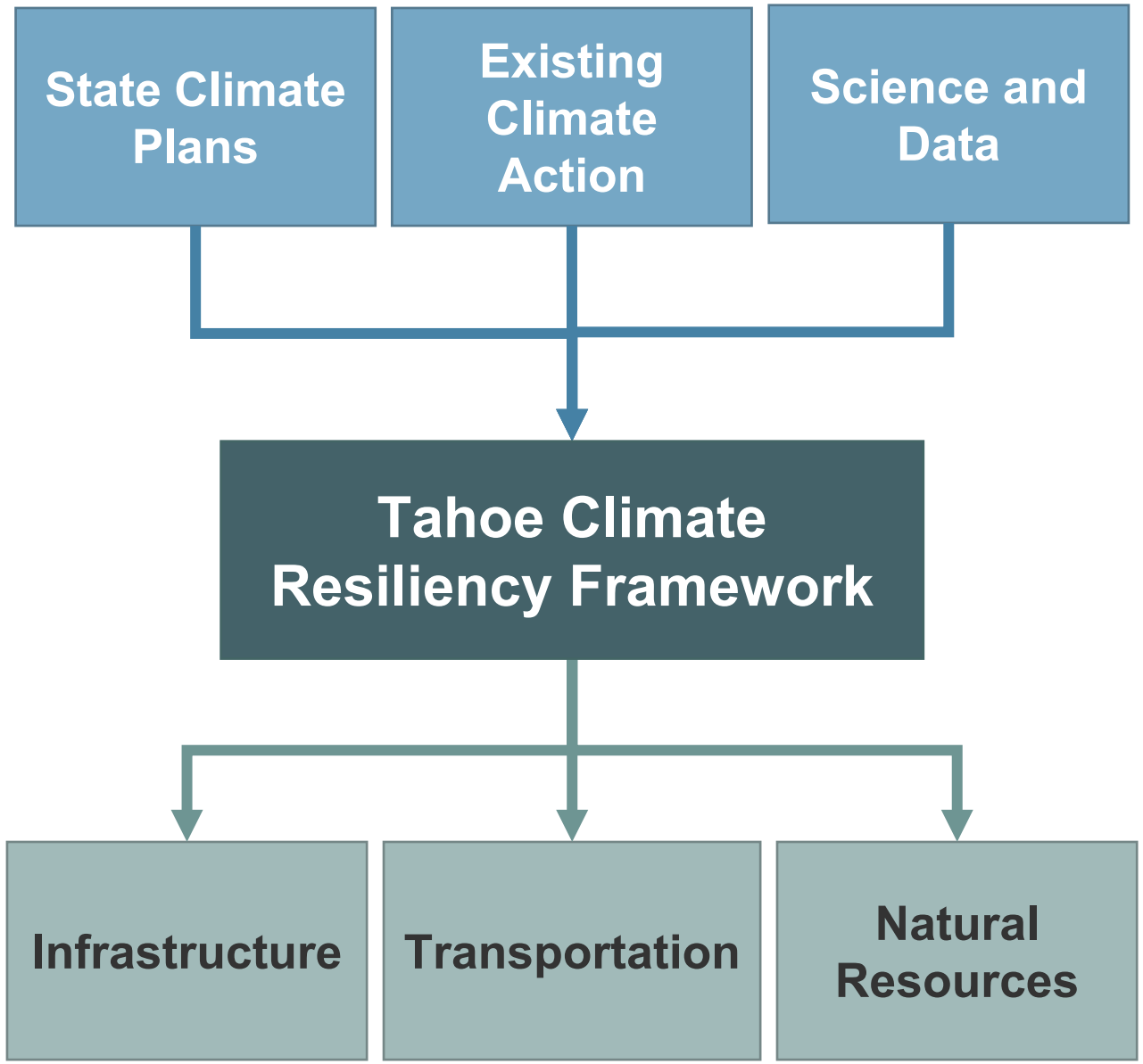

- ✔ Support Statewide Climate Goals informed by GHG inventory
- ✔ Identify Regionally Significant Priorities
- ✔ Engage Local Communities

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Sustainability Action Plan:

A Sustainability Action Toolkit for Lake Tahoe

December 2013

APA 2015 NATIONAL PLANNING AWARD RECIPIENT

lake Tahoe Sustainable Communities Program

THE INTEGRATED CLIMATE ADAPTATION AND RESILIENCY PROGRAM

GOVERNOR'S OFFICE OF PLANNING AND RESEARCH · STATE OF CALIFORNIA

COUNTY OF Placer

Climate Resiliency Framework

State of Nevada CLIMATE INITIATIVE

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Next Steps

- ✔ Address geographic issue that prevented use of TRPA-specific data for Aging Infrastructure analysis
- ✔ Develop adjusted scenario forecast that accounts for potential emissions reduction impacts of policies and actions already underway in California and Nevada
- ✔ Consider an Avoided Wildfire Emissions assessment
- ✔ Incorporate soil carbon sampling into meadow restoration; work with scientists to develop carbon flux models
- ✔ Employ Basin-wide coordination of planning efforts
- ✔ Conduct consumption-based lifecycle assessment of materials in landfills vs. only end-of-life impacts

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Thank You!

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