# Measuring Tahoe's Greenhouse Gas Emissions

SIERRA BUSINESS COUNCIL
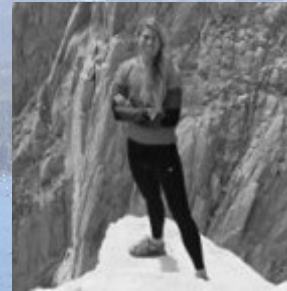
Spatial Informatics Group

CALIFORNIA TAHOE CONSERVANCY

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# AGENDA

1. **Introduction**

   a) Background

   b) Project Purpose & Context

2. **Inventory Presentations**

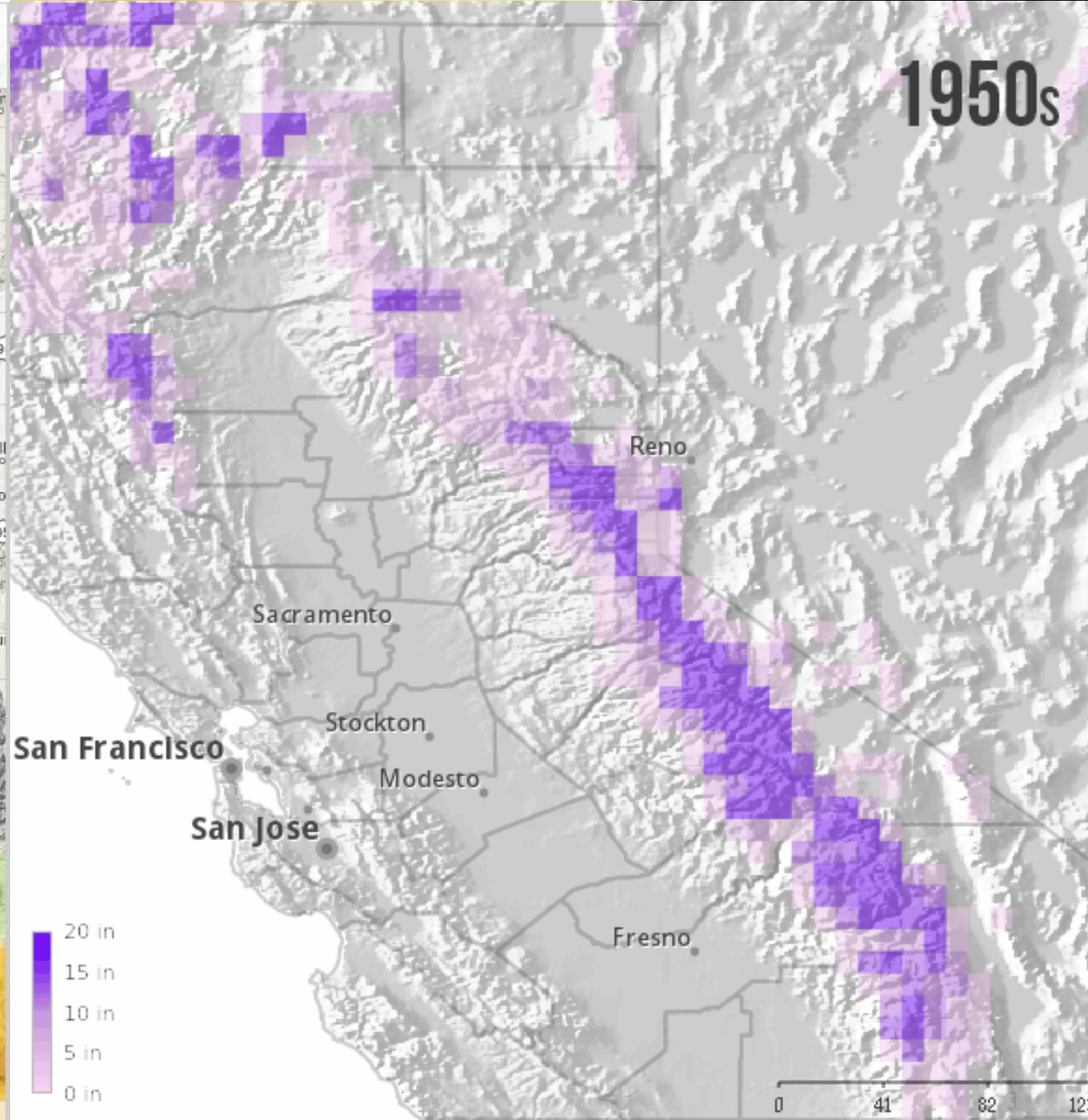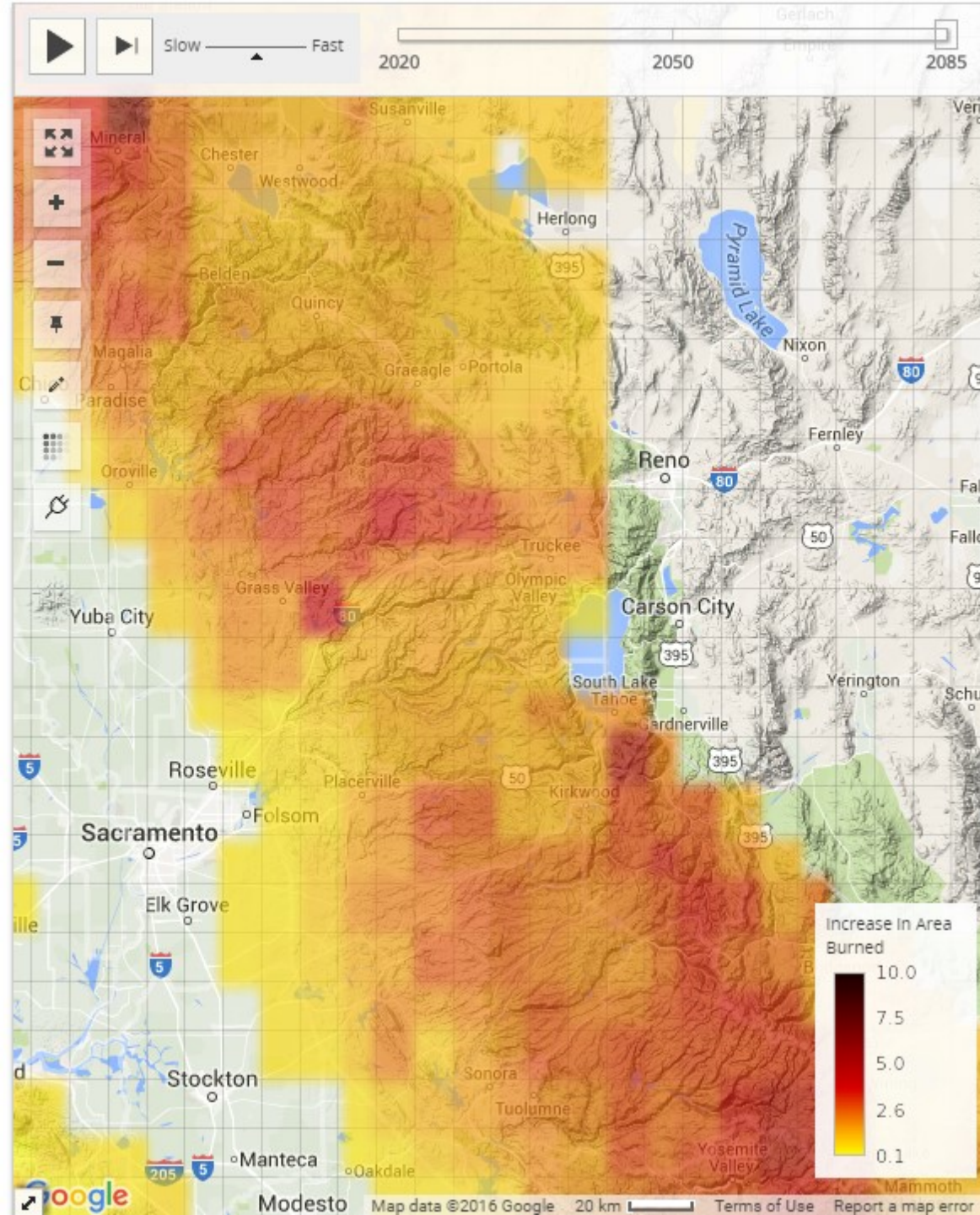   a) GHG Inventory

   b) Carbon Sequestration

3. **Q & A/Closing**

# Poll #1
What type of organization or industry do you represent?

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1950s

Increase in Area Burned

10.0
7.5
5.0
2.6
0.1

20 in
15 in
10 in
5 in
0 in

Susanville

Chester
Westwood

Mineral

Belden

Quincy

Magalia

Paradise

Graeagle    Portola

Oroville

Grass Valley

Yuba City

Roseville

Placerville

Folsom

Sacramento

Elk Grove

Stockton

Manteca

Modesto

Oakdale

Tuolumne

Sonora

Kirkwood

Yosemite Valley

Mammoth

Herlong

Pyramid Lake

Nixon

Reno

Fernley

Truckee

Olympic Valley

Carson City

South Lake Tahoe

Gardnerville

Yerington

Fallon

Schu

San Francisco

San Jose

Sacramento

Stockton

Modesto

Fresno

Reno

0      41      82

Lake Tahoe Sustainable Communities Program Documents Series #3

# Sustainability Action Plan:

## A Sustainability Action Toolkit for Lake Tahoe

December 2013

Executive Summary
LINKING TAHOE
REGIONAL TRANSPORTATION PLAN
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TAHOE REGIONAL PLANNING AGENCY

PUBLIC LAW 96-551 – DEC. 19, 1980

Public Law 96-551
96th Congress

An Ac

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

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

TAHOE REGIONAL PLANNING COMPACT

ARTICLE I. - FINDINGS AND DECLARATIONS OF POLICY

(a) It is found and declared that:

(1) The waters of Lake Tahoe and other resources of the region are threatened with
deterioration or degeneration, which endangers the natural beauty and economic productivity of
the region.

(2) The public and private interests and investments in the region are substantial.

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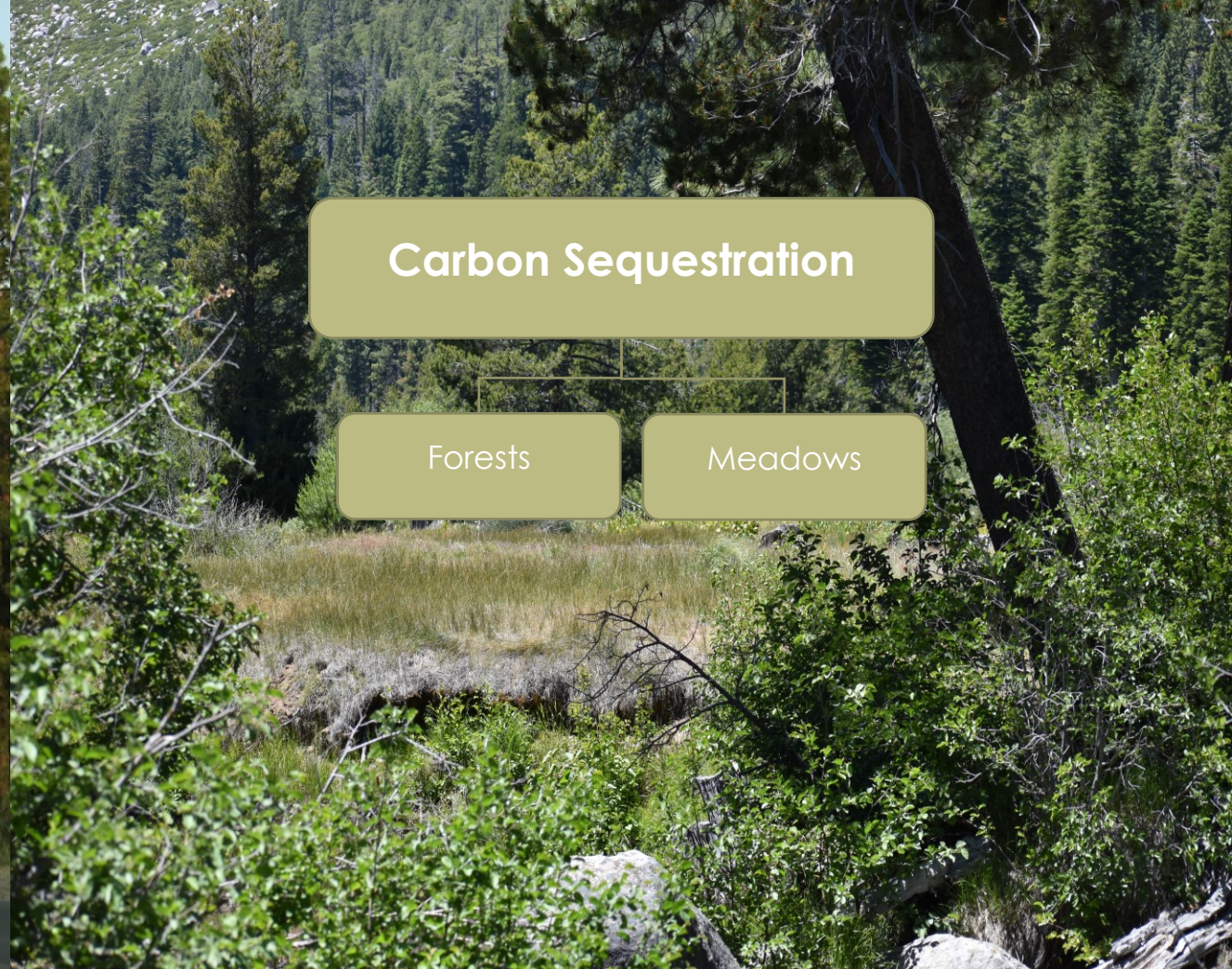
(8) Responsibilities for providing recreational and scientific opportunities, preserving
scenic and natural areas, and safeguarding the public who live, work and play in or visit the
region are divided among local governments, regional agencies, the States of California and
Nevada, and the Federal Government.

lake Tahoe
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THRESHOLD STANDARDS
AND REGIONAL PLAN
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ENVIRONMENTAL IMPROVEMENT PROGRAM
lake Tahoe
2018 ACCOMPLISHMENTS + A LOOK AHEAD

LAKE TAHOE
ENVIRONMENTAL
IMPROVEMENT
PROGRAM

**GHG Emissions**

Built Environment | Transportation | Water & Wastewater | Solid Waste

**Carbon Sequestration**

Forests | Meadows

# Poll #2
## Which emission source do you view as the most important to reduce?

# GHG Inventory Overview
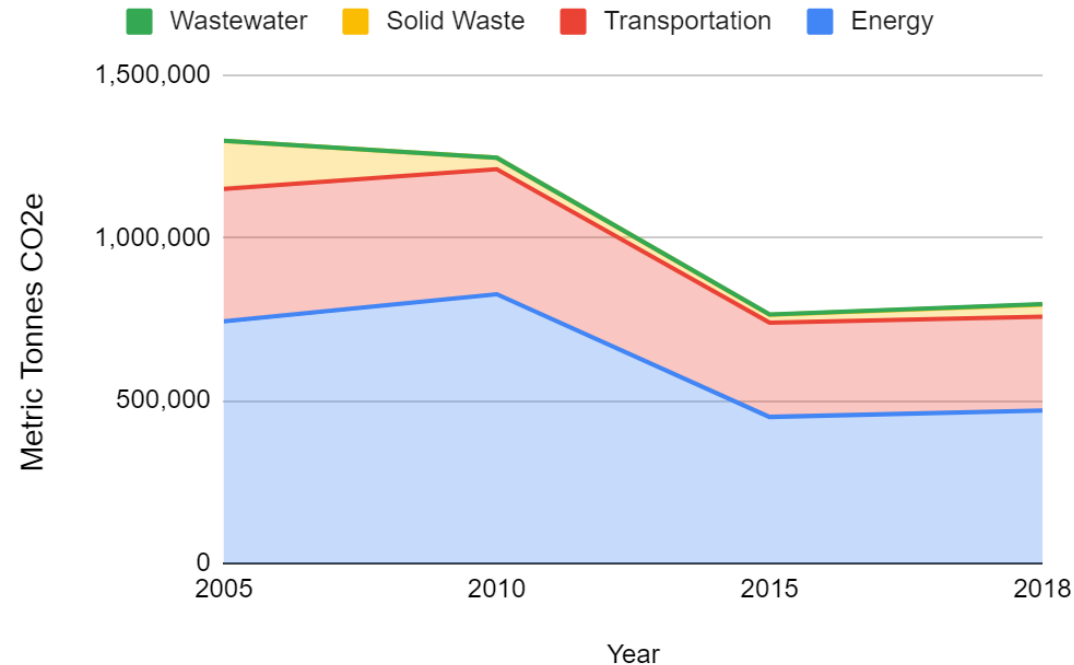
- **Assessed 2015 and 2018 GHG emissions from 4 different sectors**
  - Energy
  - Transportation
  - Solid Waste
  - Water & Wastewater
- **Accounted for activities occurring within the basin that release emissions outside the basin as well as sources that generate emissions directly within the basin**
  - 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

# 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**

| Sector | MT CO2e | | % Change | |
|---|---|---|---|---|
| | 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% |

## Basin-Wide Emissions By Sector



Legend: Wastewater, Solid Waste, Transportation, Energy

Y-axis: Metric Tonnes CO2e (0, 500,000, 1,000,000, 1,500,000)
X-axis: Year (2005, 2010, 2015, 2018)

▶ **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

## Basin-Wide GHG Emissions Forecast
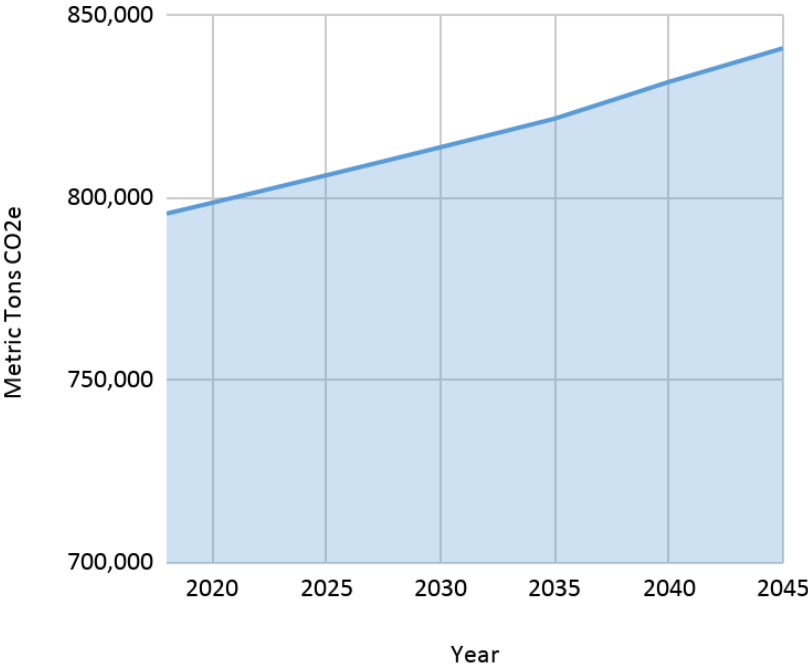


| Forecasted Emissions by Sector (MT CO2e) | | | | | |
|---|---|---|---|---|---|
| Year | Energy | Transportation | Solid Waste | Wastewater | Total |
| 2018 | 469,380 | 288,207 | 37,244 | 963 | 795,794 |
| 2030 | 483,541 | 290,977 | 38,457 | 1,014 | 813,990 |
| 2035 | 489,592 | 292,221 | 38,976 | 1,037 | 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…**

# 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
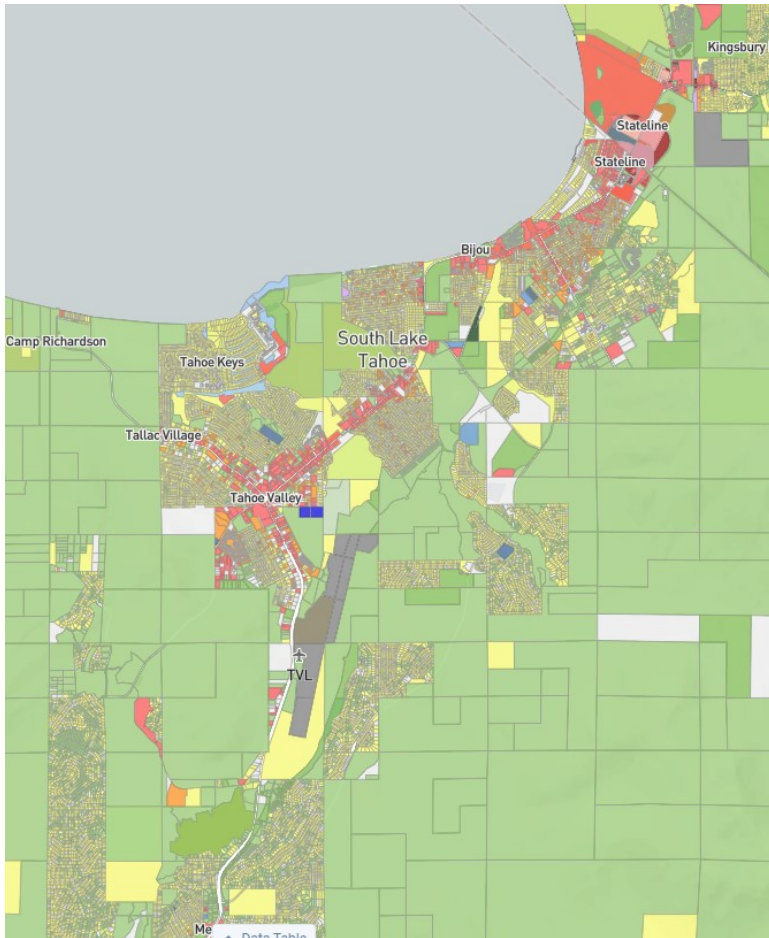


- **Using UrbanFootprint, an inventory of building energy use is being developed by building type**

- **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 | % 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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# Carbon Inventory Overview

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

# What is Carbon Sequestration?
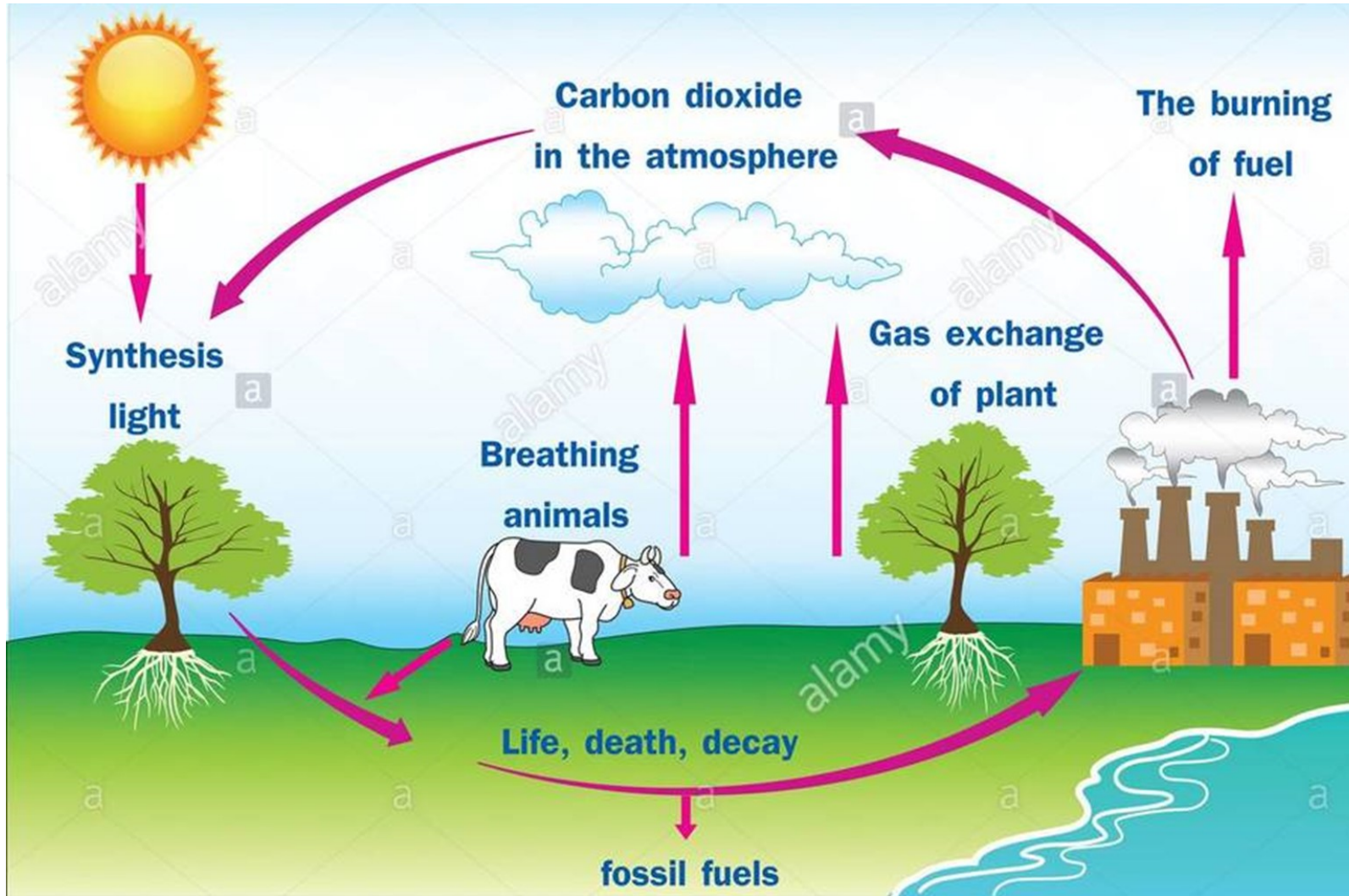
# Carbon Sequestration Purpose

▶ **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

# Forest Carbon Stocks

# Forest Carbon Stocks



2014

2018

| mtCO2e | 2014 | 2018 |
|---|---|---|
| Average per acre | 70.2 | 76.5 |
| Basin total | 11,567,223 | 12,613,395 |

Carbon

| | |
|---|---|
| | <10 |
| | >=10-20 |
| | >=20-30 |
| | >=30-40 |
| | >=40-50 |
| | >=50-60 |
| | >=60+ |

Carbon (Mg/ha)

| | |
|---|---|
| | <10 |
| | >=10-20 |
| | >=20-30 |
| | >=30-40 |
| | >=40-50 |
| | >=50-60 |
| | >=60+ |

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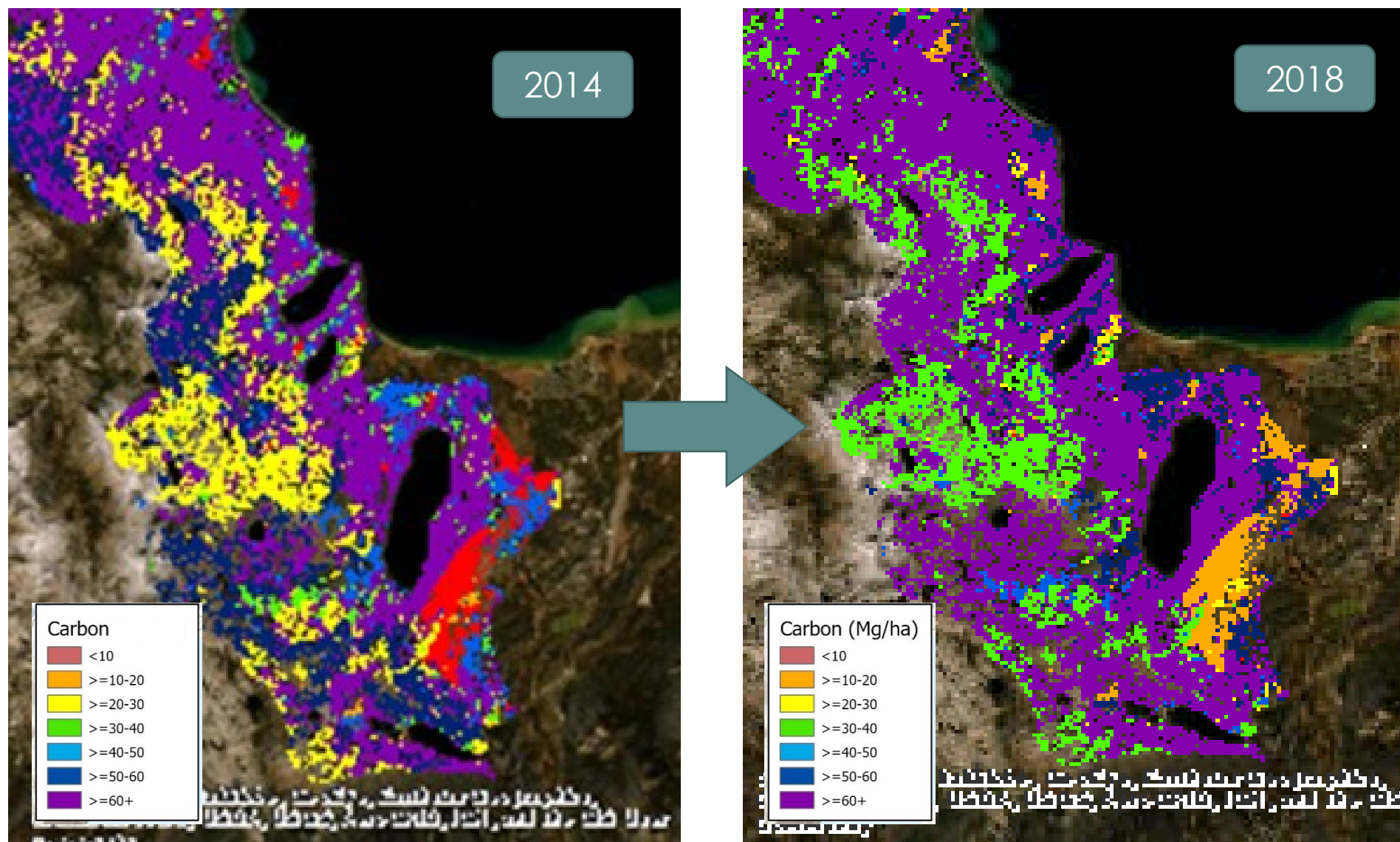
50 YEARS
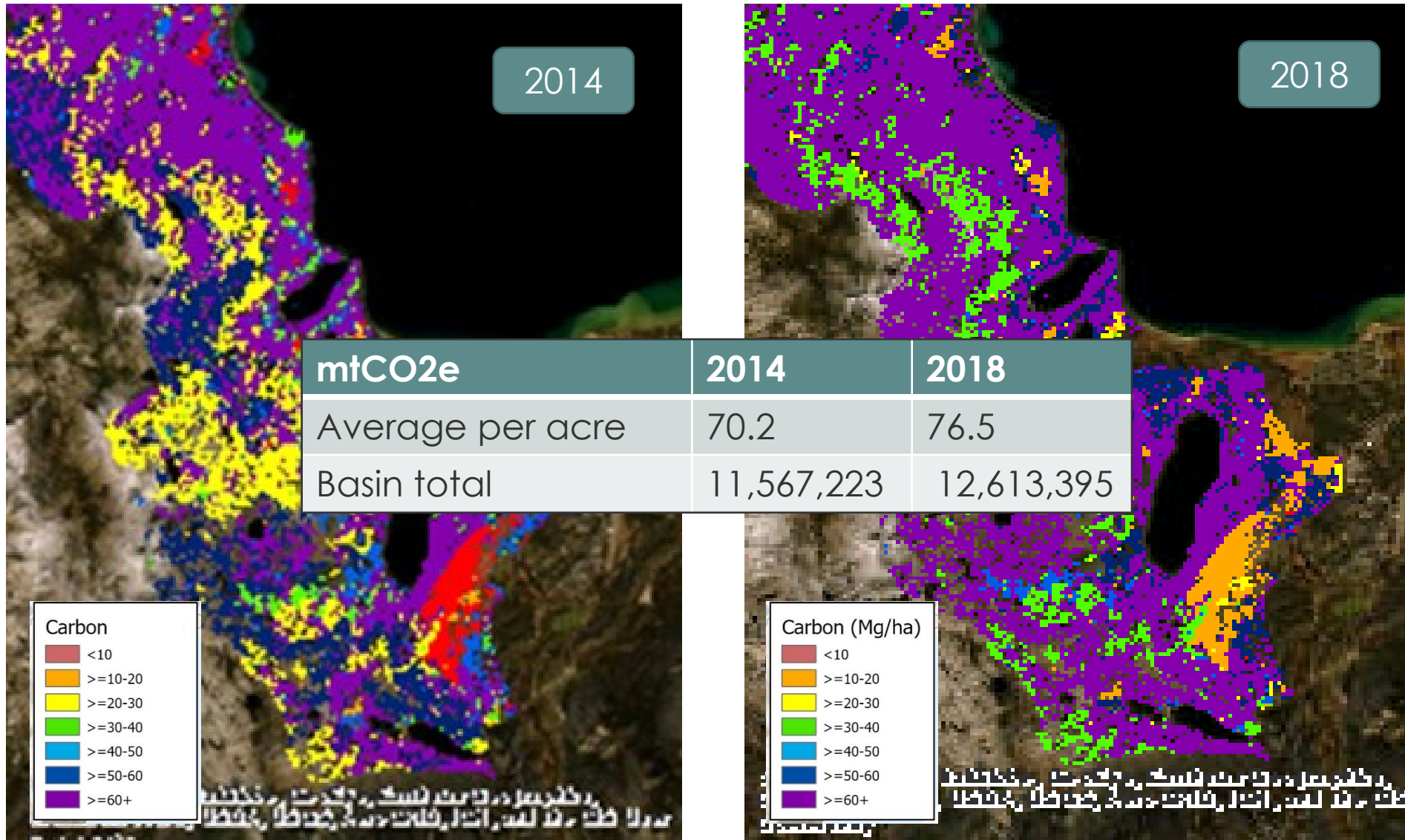
# Meadow Carbon
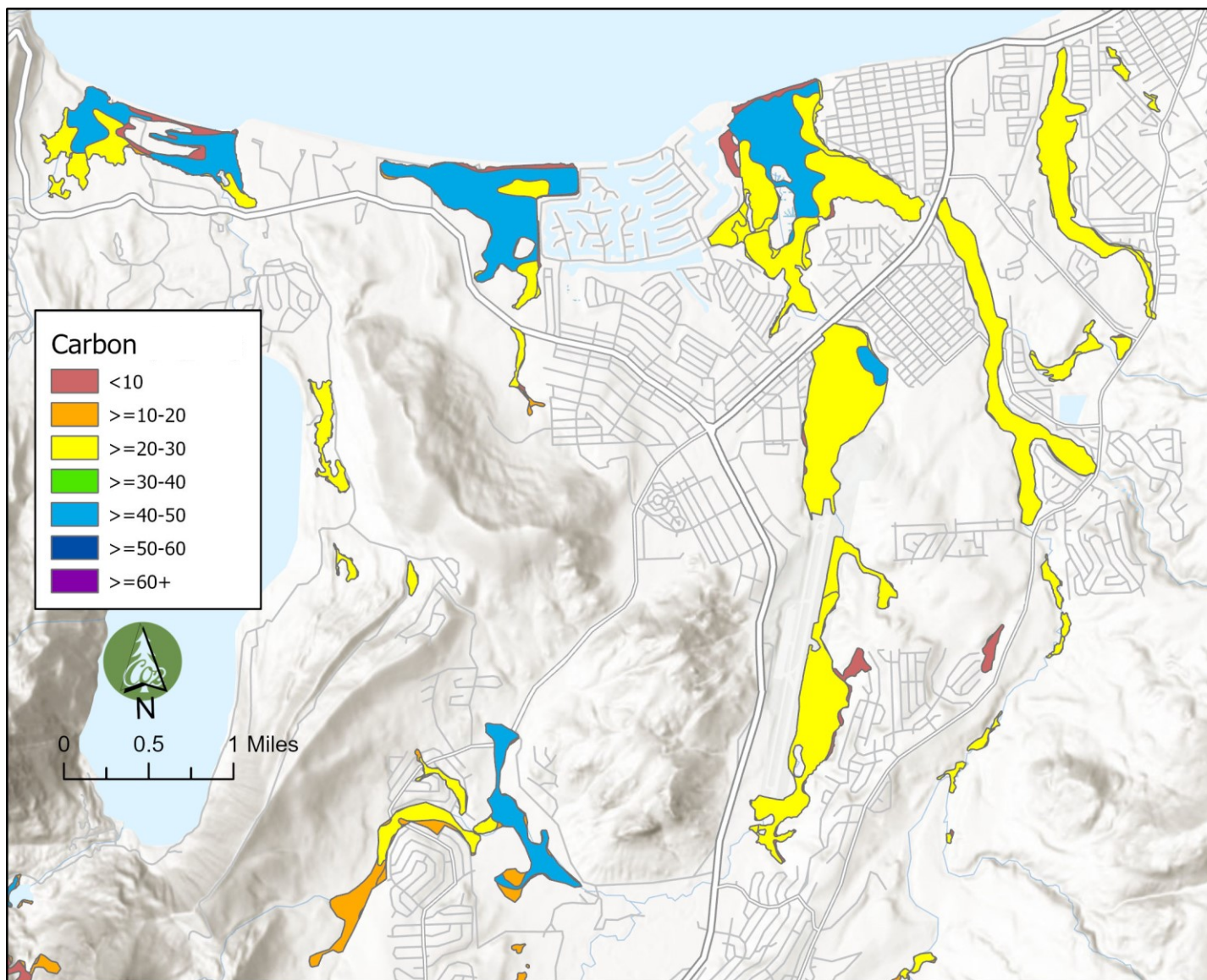
# Meadow Carbon
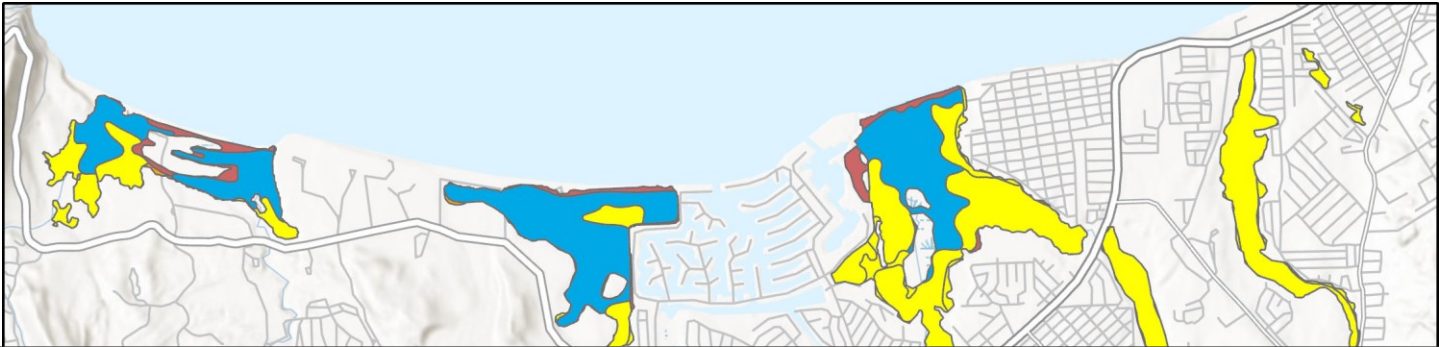


| Acres | Basin Total (mtCO2e) | Average per Acre (mtCO2e) | Total C sequestration potential * |
|-------|---------------------|---------------------------|-----------------------------------|
| 5,137 | 200,369 | 46.8 | Pristine: **+30,000**<br><br>Degraded: **- 20,000** |
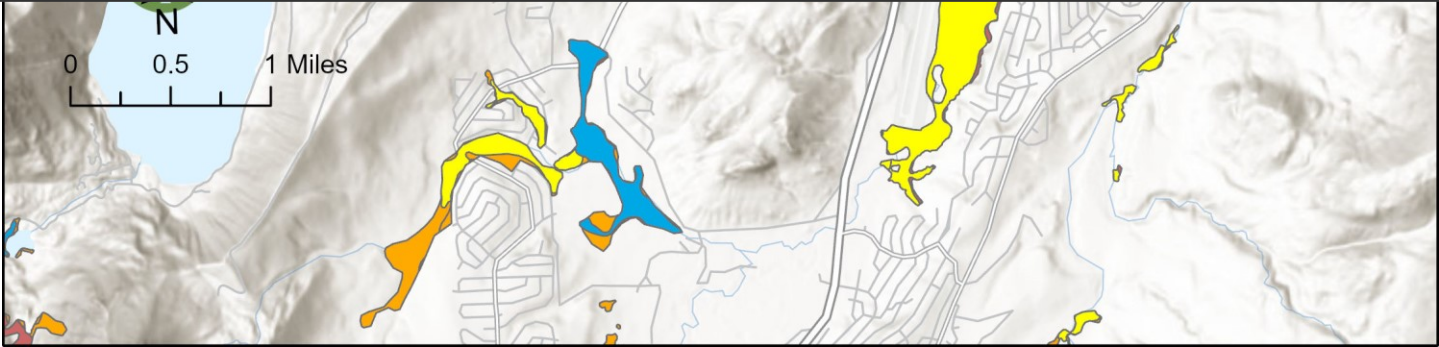
# Accounting Snapshot - 2018

**Lake Tahoe GHG Inventory Update**

**GHG Emissions**

- Built Environment
- Transportation
- Water & Wastewater
- Solid Waste

Annual GHG emissions:
**~800,000**
mtCO2e

**Carbon Sequestration**

- Forests
- Meadows

Annual C sequestration:
**~300,000 +/-**
mtCO2e

Balance:
**-500,000** mtCO2e

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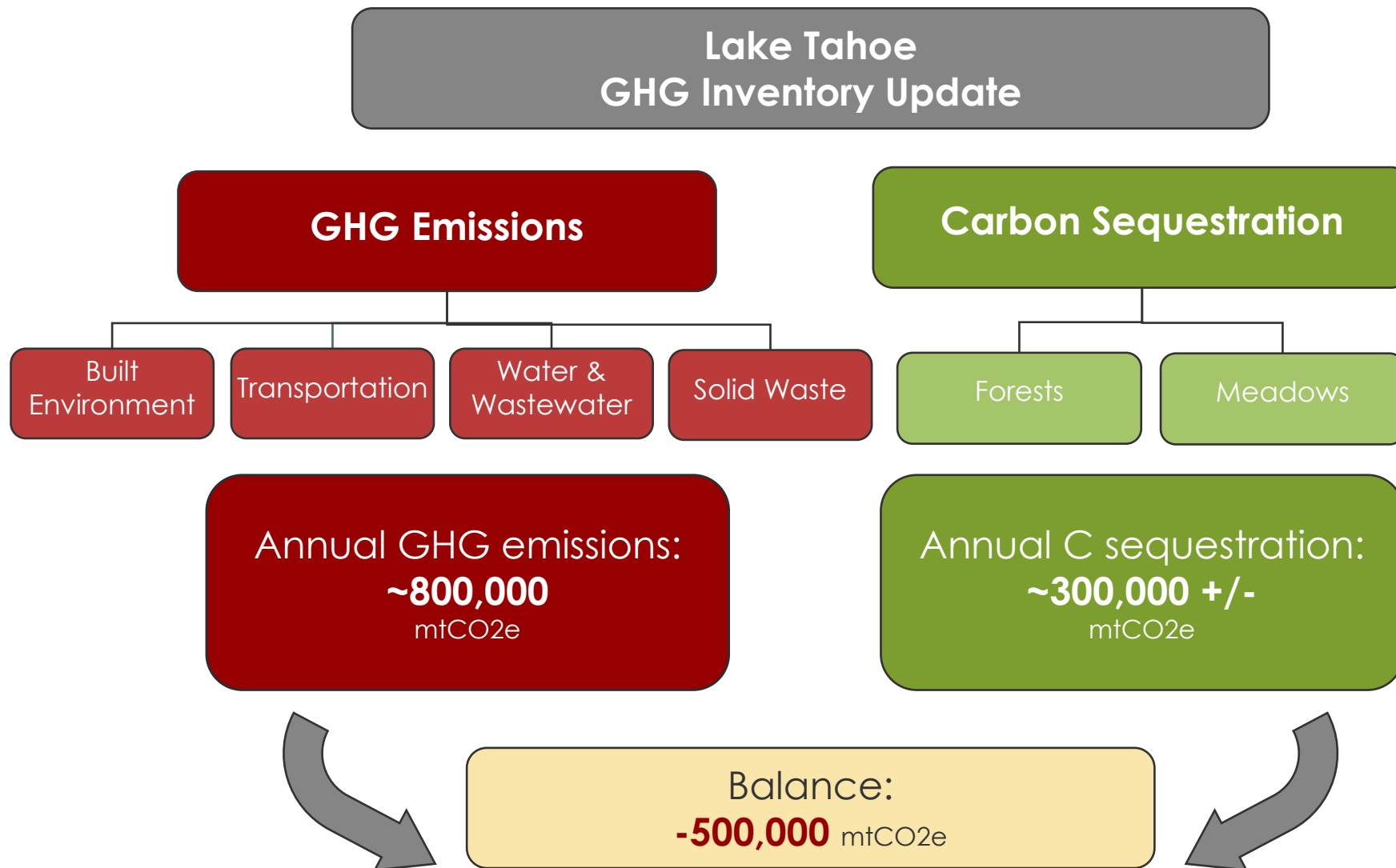
# Takeaways

- **Important to reduce emissions**
  - Can't sequester our way out of climate change

- **Forest resilience influences ability to offset emissions**

- **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 integrated with data-driven policy

- **Data-driven policies based on transparent, repeatable results**

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# Applications

- **Assess and accelerate forest resilience & fuels reduction programs**
  - Access state & federal funding

- **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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Q & A

Conclusion & Next Steps
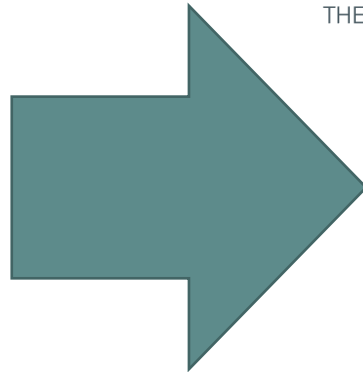
# Thank You!

*A survey will appear at the end of this meeting.*
*Your feedback will help shape our program!*

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