



GRAND CANYON
TRUST

GREENHOUSE GAS EMISSIONS ON THE COLORADO PLATEAU

AN OPPORTUNITY ROAD MAP TO CARBON NEUTRALITY

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REPORT



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Introduction

On October 8, 2018, the Intergovernmental Panel on Climate Change (IPCC) issued “Global warming of 1.5°C,” an IPCC special report. This groundbreaking report highlights the importance of preventing global temperatures from rising more than 1.5°C or 2.7°F above pre-industrial levels.¹ The report stresses that passing 1.5°C and approaching 2°C of warming and beyond would, in some cases, push the globe over a threshold, triggering positive feedback loops of further warming that could be nearly impossible to stop.² To date, the average global temperature has risen 1.0°C above pre-industrial levels and is likely to reach 1.5°C by 2030.³ To stay under this threshold will require aggressive action as a global community to reduce emissions by 45 percent from 2010 levels by 2030, and bring the planet to net-zero emissions by 2050.⁴

Then, in August 2021, the IPCC released “Climate Change 2021: The Physical Science Basis.”⁵ That report found that “unless there are immediate, rapid and large-scale reductions in greenhouse gas emissions, limiting warming to close to 1.5°C or even 2°C will be beyond reach.”⁶

In November 2018, the U.S. Global Change Research Program (USGCRP) released the fourth national climate assessment, “Impacts, Risks, and Adaptation in the United States.” This report studies the impacts of climate change on a regional level and highlights how incredibly susceptible the Southwest is to its impacts. Parts of the Southwest already reach some of the hottest temperatures on Earth,⁷ and with global warming, these temperatures are projected to rise along with the number of heat-associated deaths and illnesses in the region.⁸ Increased temperatures are significantly impacting the water cycle in the region, resulting in decreased snowpack and streamflow, and increases in the proportion of rain to snow.⁹ Water shortages and loss of ecosystem integrity are already occurring, while drought and wildfires are

¹ IPCC, 2018: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. In Press. Available at: https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf at page 79.

² *I.d.* at pages 262-263.

³ Intergovernmental Panel on Climate Change, Special Report: Global Warming Of 1.5°C, Summary for Policymakers, 1,6 (2018). Available at: https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_SPM_version_report_LR.pdf at page 4.

⁴ *I.d.* at page 12.

⁵ IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou (eds.)]. Cambridge University Press. In Press. Available at: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Full_Report.pdf.

⁶ IPCC, 2021: Press Release: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson Delmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou (eds.)]. Cambridge University Press. In Press, https://www.ipcc.ch/site/assets/uploads/2021/08/IPCC_WGI-AR6-Press-Release_en.pdf at page 1.

⁷ Gonzalez, P., G.M. Garfin, D.D. Breshears, K.M. Brooks, H.E. Brown, E.H. Elias, A. Gunasekara, N. Huntly, J.K. Maldonado, N.J. Mantua, H.G. Margolis, S. McAfee, B.R. Middleton, and B.H. Udall, 2018: Southwest. In *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 1101–1184. doi: 10.7930/NCA4.2018.CH25. Available at: https://nca2018.globalchange.gov/downloads/NCA4_Ch25_Southwest_Full.pdf at Southwest Chapter page 1108.

⁸ *I.d.* at page 1143.

⁹ *I.d.* at page 1108.

increasing.¹⁰ Trees are dying, bark beetle infestations are increasing, and wildfires are burning more acreage, more intensely, leading to increased erosion and damage to communities in fire-prone areas.¹¹ And the cultural resources and spiritual well-being of Indigenous peoples in the region are being affected by all of the above.¹² Drought from climate change in the Southwest has caused declines in Indigenous peoples' traditional staple foods and culturally significant crops, and it threatens water supplies in an already water-scarce region.¹³ For these reasons, and many more, it is imperative that organizations and communities in the Southwest and across the globe act quickly and with urgency to reduce greenhouse gas emissions.

Heeding the IPCC's recommendations, and the USGCRP's alarming report, the Grand Canyon Trust (the Trust) developed the goal of reaching carbon neutrality on the Colorado Plateau by 2035. Climate change is arguably the most consequential threat the world faces today, and it affects every aspect of the Trust's work. As an organization operating in one of the most vulnerable regions in the United States, it is a challenge that must be addressed. The Trust recognizes that this goal is ambitious, and given the urgency with which the world needs to act, anything less would not be suitable.

Understanding that policy changes must be supported by sound science to gain widespread acceptance, the Trust partnered with a firm in Colorado, Lotus Engineering & Sustainability, to complete a greenhouse gas emissions inventory and forecast to 2050 for the Colorado Plateau (the plateau).

The Colorado Plateau straddles the Four Corners region, where Arizona, Colorado, New Mexico, and Utah meet. It stretches north to south from the Uinta Mountains in northern Utah to the Mogollon Rim in northern Arizona, and west to east from the Great Basin in Utah to the western slope of the Rocky Mountains in Colorado and northwestern New Mexico. The plateau is characterized by mostly high desert landscapes.

Purpose

This document outlines the results of the Colorado Plateau Greenhouse Gas Emissions Inventory to identify the highest-value opportunities for emissions reductions across the plateau. It investigates emissions from each sector in the inventory from the highest emissions to the lowest. Within each sector are more granular categories of emissions called "subsectors." Subsectors are outlined from highest to lowest emissions within each sector. Within most subsectors are even more granular categories of emissions called "sources." Sources are outlined from highest to lowest emissions within each subsector. In some cases, the specific facility producing emissions is identified. Following this breakdown, the highest-value opportunities for emissions reductions across the plateau are identified, as well as policy levers that the Trust and other groups working on emissions reductions can activate to reduce emissions within each sector or subsector. This document will serve as a road map to guide entities seeking to reduce greenhouse gas emissions on the Colorado Plateau.

¹⁰ *I.d.* at page 1110.

¹¹ *I.d.* at page 1115-1116.

¹² *I.d.* at page 1137.

¹³ *I.d.* at page 1121-1122.

Executive Summary

The economy-wide greenhouse gas emissions inventory measures emissions across 41 counties that fall partially or completely within the plateau boundary. Measured emissions are from six sectors, including stationary energy emissions; fugitive emissions; transportation emissions; waste treatment and storage; agriculture, forestry, and other land use (includes wildfires); and emissions from industrial processes and product use.

Top three highest-value opportunities for emissions reductions on the Colorado Plateau

In 2018, 41 counties across the Colorado Plateau produced 106,550,612 metric tons of carbon dioxide equivalent (mtCO₂e) emissions, which amounts to approximately 1.8 percent of the total 2018 greenhouse gas emissions for the United States.¹⁴ Among those emissions, top contributors were electricity consumption, which accounted for 26.5 percent of total plateau emissions; on-road transportation, which accounted for 21.8 percent of total plateau emissions; and oil and gas systems, which accounted for 18.2 percent of total plateau emissions.

The sector producing the highest emissions on the Colorado Plateau is the stationary energy sector. This sector accounted for 36 percent of total plateau emissions. Within the stationary energy sector are the electricity consumption subsector and the stationary combustion subsector. The second-highest emitting sector on the plateau was fugitive emissions, which accounted for 30 percent of total Colorado Plateau emissions. And the third-highest emitting sector on the plateau was transportation, which accounted for 25 percent of total plateau emissions.

While looking at whole sectors paints a broad picture of emissions across the Colorado Plateau, narrowing this down by subsector and source provides more specific information that can be used to achieve ambitious emissions reduction goals. Subsector data provides more detail about where emissions problems are coming from on the plateau and thus allows for the identification of the most effective ways of getting there.

The electricity consumption subsector provides the highest-value opportunity for emissions reductions across the Colorado Plateau. It is the highest producing subsector out of all subsectors measured. Electricity consumption accounted for 27 percent of total Colorado Plateau emissions. This subsector accounts for the industrial, commercial, and residential use of electricity on the plateau, as well as emissions from transmission and distribution losses.

The on-road transportation subsector provides the second-highest-value opportunity for emissions reductions across the Colorado Plateau. It is the second-highest producing subsector, accounting for 22 percent of total plateau emissions. On-road transportation measures the emissions from the burning of gasoline, diesel, and ethanol in on-road vehicles, including passenger vehicles and large transport trucks. It also accounts for emissions from electric vehicles, including transmission and distribution loss. It takes into account light-duty gas cars and trucks, heavy-duty gas trucks, gas and ethanol motorcycles, ethanol cars, ethanol light and heavy trucks, light-duty diesel cars and trucks, heavy-duty diesel trucks, and electric vehicles.

¹⁴ According to the EPA, after accounting for sequestration from the land sector, net 2018 U.S. greenhouse gas emissions totaled 5,903 million mtCO₂e. United States Environmental Protection Agency. *Data Highlights: Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2018*. Available at: <https://www.epa.gov/sites/default/files/2020-04/documents/us-ghg-inventory-1990-2018-data-highlights.pdf> at page 1.

The oil and gas systems subsector presents the third-highest-value opportunity for emissions reductions across the Colorado Plateau. Oil and gas systems accounted for 18 percent of total Colorado Plateau emissions. This subsector accounts for fugitive emissions from oil and gas production including extraction, processing, and delivery. It does not account for the emissions caused by burning oil and gas. The majority of emissions within this subsector came from oil and gas wells.

Emissions from electricity generation

While the greenhouse gas emissions inventory measures emissions based on consumption occurring on the Colorado Plateau, it is important to note that the plateau is an energy exporting region. Emissions from electricity generated across plateau counties that is used both on and off the plateau totaled 75,424,796 mtCO_{2e}. To avoid double-counting of emissions and protect the integrity of the inventory, these emissions must be kept separate. They cannot simply be added to the total emissions or emissions by sector. And while many coal-fired power plants are being phased out, not every coal-fired power plant is scheduled to shut down in the near term, and generation-end emissions are still an undeniable part of the emissions problem on the plateau.

Smaller-impact areas of opportunity

While residential and commercial electricity consumption, on-road transportation, and oil and gas systems represent the largest proportion of emissions, reducing emissions across the rest of the sectors in the inventory would also be worthwhile. Combined, emissions from the coal mining; stationary combustion; off-road transportation; aviation; railways; and waterborne transportation subsectors; and the waste; industrial processes and product use; and agriculture, forestry, and other land use sectors together accounted for 34 percent of total plateau emissions.

Summary Graphics

Figure 1: Emissions on the Colorado Plateau by Sector—Largest to Smallest

Sector	Percent of total Colorado Plateau emissions	Top Emitting Counties
Stationary energy	35.62%	Garfield, CO; Yavapai, AZ; Coconino, AZ
Fugitive emissions	30.16%	San Juan, NM; Garfield, CO; Carbon, UT
Transportation	24.59%	Garfield, CO; Mesa, CO; Utah, UT
AFOLU	4.34%	Utah, UT; Coconino, AZ; Catron, NM
IPPU	3.20%	Yavapai, AZ; Juab, UT; Millard, UT
Waste	2.09%	Utah, UT; Mohave, AZ; Navajo, AZ

Figure 2: Emissions on the Colorado Plateau by Subsector—Largest to Smallest

Subsector	Percent of total Colorado Plateau emissions	Percent of total sector emissions	Top Emitting Counties
Electricity	26.47%	74.31%	Garfield, CO; Yavapai, AZ; Coconino, AZ
On-road transportation	21.81%	88.70%	Garfield, CO; Mesa, CO; Utah, UT
Oil and gas systems	18.18%	60.27%	San Juan, NM; Garfield, CO; Rio Arriba, NM
Coal mining	11.98%	39.73%	San Juan, NM; Carbon, UT; Sevier, UT
Stationary combustion	9.15%	25.69%	Utah, UT; San Juan, NM; La Plata, CO
Agriculture	2.43%	56.02%	Utah, UT; Millard, UT; Sanpete, UT
Off-road transportation	1.94%	7.88%	Coconino, AZ; Mohave, AZ; Apache, AZ
Biomass	1.91%	43.98%	Utah, UT; Coconino, AZ; Catron, NM
Solid waste	1.90%	90.97%	Utah, UT; Mohave, AZ; Navajo, AZ
Cement production	1.70%	53.16%	Yavapai, AZ; Juab, UT
Lime production	1.22%	38.22%	Yavapai, AZ; Millard, UT
Aviation activity	0.41%	1.66%	Yavapai, AZ; Mesa, CO; Catron, NM
Railway activity	0.40%	1.61%	McKinley, NM; Cibola, NM; Utah, UT
Electronics manufacturing	0.28%	8.63%	Utah, UT; Sandoval, NM
Wastewater	0.19%	9.03%	Utah, UT; Mohave, UT; Yavapai, AZ
Waterborne activity	0.03%	0.14%	Kane, UT; San Juan, UT; Garfield, UT

Figure 3: Emissions on the Colorado Plateau by Source—Largest to Smallest

Source	Percent of total Colorado Plateau emissions	Percent of total sector emissions	Percent of total subsector emissions	Top Emitting Counties
Active oil and gas wells	14.05%	46.60%	77.31%	San Juan, NM; Garfield, CO; Rio Arriba, NM
Active underground coal mines	11.35%	37.63%	94.71%	San Juan, NM; Carbon, UT; Sevier, UT
Commercial electricity consumption	10.21%	28.66%	38.57%	Garfield, CO; Yavapai, AZ; Coconino, AZ
Residential electricity consumption	9.18%	25.78%	34.70%	Yavapai, AZ; Coconino, AZ; Garfield, CO
Industrial electricity consumption	5.95%	16.70%	22.47%	Mesa, CO; Garfield, CO; Rio Blanco, CO
Large emitters stationary combustion	4.29%	12.03%	46.84%	San Juan, NM; La Plata, CO; Carbon, UT
Petroleum and natural gas systems	3.91%	12.97%	21.51%	La Plata, CO; San Juan, NM; Garfield, CO
Residential stationary combustion	2.81%	7.90%	30.75%	Utah, UT; Mesa, CO; Washington, UT
Commercial stationary combustion	2.05%	5.76%	22.41%	Utah, UT; Washington, UT; Yavapai, AZ
Enteric emissions	1.84%	42.44%	75.75%	Utah, UT; Sanpete, UT; Millard, UT
Municipal solid waste	1.75%	83.51%	91.80%	Utah, UT; Mohave, AZ; Yavapai, AZ
Transmission and distribution losses	1.13%	3.17%	4.26%	Garfield, CO; Mesa, CO; Yavapai, CO
Active surface coal mines	0.63%	2.10%	5.28%	McKinley, NM; Navajo, AZ; San Juan, NM
Manure management emissions	0.45%	10.44%	18.64%	Utah, UT; Millard, UT; Iron, UT
Septic systems	0.16%	7.88%	87.32%	Washington, UT; Yavapai, AZ; San Juan, NM
Industrial waste	0.11%	5.39%	5.93%	Navajo, AZ; Utah, UT
Petroleum refineries	0.11%	0.35%	0.59%	McKinley, NM
Natural gas leakage	0.10%	0.34%	0.57%	Utah, UT; Washington, UT; Mesa, CO
Fertilizer use on agriculture lands	0.09%	2.19%	3.91%	Coconino, AZ; Apache, AZ; Emery, UT
Construction and demolition waste	0.04%	2.07%	2.27%	Utah, UT; Yavapai, AZ; Iron, UT
Lime and dolomite emissions	0.03%	0.69%	1.23%	Emery, UT; San Juan, UT; Millard, UT
Wastewater treatment plants	0.02%	1.08%	11.94%	Utah, UT; Sandoval, NM; Mesa, CO
Urea emissions	0.01%	0.27%	0.48%	Emery, UT; San Juan, UT; Millard, UT
Abandoned and orphaned oil and gas wells	0.003%	0.011%	0.018%	Rio Blanco, CO; Uintah, UT; Garfield, CO
Lagoons	0.001%	0.07%	0.74%	Coconino, AZ; Montezuma, CO; Navajo, AZ
Abandoned underground coal mines	0.00027%	0.0009%	0.002%	Carbon, UT; Garfield, CO; Delta, CO
Emissions avoided from recycling	-0.65%	-31.03%	-34.11%	Mesa, CO; Yavapai, AZ; Sandoval, NM

Policy levers

Based on the analysis in this document, electricity generation and infrastructure; oil and gas reform; and advancement of innovation, technology, and environmental justice are the main areas where the Trust will be able to affect the most change.

GHG Emissions on the Colorado Plateau

In 2018, counties across the Colorado Plateau emitted 106,550,612 mtCO₂e, or 1.8 percent of the total 2018 greenhouse gas emissions for the United States.¹⁵ Of that, 62 percent or 65,561,956 mtCO₂e were estimated to have occurred within the Colorado Plateau boundary. This is equivalent to about 1.1 percent of the total greenhouse gas emissions of the United States. Furthermore, electricity that was generated on the plateau from coal-fired power plants but was used elsewhere generated 75,424,796 mtCO₂e. This number, however, cannot be added to the total emissions or emissions by sector generated on the plateau because these emissions were partially captured in the electricity subsector of the inventory, as some electricity produced by these power plants was consumed by plateau residents and businesses.

Policy Nexus—Areas of Focus for the Grand Canyon Trust

Reaching carbon neutrality on the Colorado Plateau by 2035 is an undeniably heavy lift and an undertaking that will require multifaceted legislative and regulatory actions. This section of the opportunity road map is intended to lay organizational groundwork within the Trust's areas of expertise, within which the Trust can conduct the most meaningful and impactful work that will reduce greenhouse gas emissions on the Colorado Plateau. The Trust has identified several areas of focus including electricity generation and infrastructure; oil and gas reform; and advancement of innovation, technology, and environmental justice.

Electricity generation and infrastructure on the Colorado Plateau

The Colorado Plateau is a net exporter of energy. While it contributes to economic growth across the West, the land and its people have also disproportionately suffered from lasting impacts to clean air, clean water, public health, and the degradation of ancestral homelands and ecosystems. There is ripe opportunity for the Colorado Plateau to move away from reliance on fossil fuels to a more sustainable energy future that will require accountability for those involved in current energy production, a just transition for energy production workers, and new incentives to develop clean (not including new nuclear energy) and renewable energy that reduces or eliminates carbon emissions and protects the living conditions and landscapes of the plateau. The following actions will directly reduce carbon emissions.

Electricity generation

The Grand Canyon Trust will support state and federal incentives for clean and renewable energy generation, excluding the establishment of new nuclear operations, to reduce carbon emissions from electricity generation on the Colorado Plateau. These incentives must prioritize frontline communities that stand to be, or are currently being, disproportionately affected by the impacts of climate change. They also must take into account impacts to land and the areas surrounding land where they'll be implemented. Incentives for clean energy generation may include and are not limited to loan guarantees, loan forgiveness, and grants for federal procurement of clean energy. The Trust will also support federal tax incentives for jobs created through clean energy generation, especially in communities that are disproportionately impacted by climate change and are/were hotspots for fossil fuel development. Programs to facilitate capacity-building for these jobs are also encouraged and supported.

The Trust is also in support of ambitious nationwide clean-electricity goals, and establishment of milestones for reaching those goals. These goals must take into account the full life cycle of resources required for clean electricity, and recycling of those resources at the end of their life cycle so that they may be reused in future clean-energy forms, and safe and ethical mining practices (IRMA standard) where mining is necessary. The Trust will support investment in clean energy (excluding new nuclear infrastructure),

¹⁵ According to the EPA, after accounting for sequestration from the land sector, 2018 U.S. greenhouse gas emissions totaled 5,903 million mtCO₂e. United States Environmental Protection Agency. *Data Highlights: Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2018*. Available at: <https://www.epa.gov/sites/default/files/2020-04/documents/us-ghg-inventory-1990-2018-data-highlights.pdf> at page 1.

grid infrastructure, and microgrids. Workers should be paid living wages for the construction of new clean-electricity generation facilities.

The Trust will support accelerator programs that help the nation transition to a clean economy on all levels—from companies to communities to entire states. These programs must prioritize investments in communities that are disproportionately affected by the impacts of climate change and must ensure fair treatment of workers.

In 2021, the Biden-Harris administration outlined key resources to invest in economic revitalization of coal and power plant communities. This is an important step in the transition to a more sustainable energy economy. The Trust will support energy revitalization initiatives that provide funding for coal communities to transition away from coal economies through economic diversification, job creation, capital investment, workforce development, and re-employment opportunities. The exploration of new technology is also critical to help reduce greenhouse gas emissions in the future. The Trust will also support general energy efficiency initiatives, especially those that assist low-income households that are underserved, frontline communities, particularly Indigenous communities and communities of color.

As wealthy communities are responsible for a disproportionate amount of carbon emissions, the Trust will support energy accountability in these communities including the reduction of energy use. Grid modernization will also reduce emissions on the plateau. The Trust will support policies that create jobs to improve grid resilience and new projects that connect modern renewable energy to the power demands of regional consumer markets.

As electric transportation will also result in emissions reductions on the plateau, the Trust will support initiatives that promote circular economies with regard to recycling batteries and other elements that go into electric transportation. The Trust will also support legislation that promotes electrification of the federal fleet, incentivizes the purchase of zero-emissions vehicles, and jump-starts the installation of charging infrastructure on the Colorado Plateau, especially that which makes this technology available to underserved communities, including Indigenous communities on the plateau.

Infrastructure

The Grand Canyon Trust will support initiatives aimed at cutting electricity bills and electricity pollution and that incentivize more efficient use of existing infrastructure, to move toward carbon-free power as quickly as possible. The Trust does not recognize nuclear power as clean energy and will not support new nuclear infrastructure, but it will not advocate for existing nuclear power plants to shut down before the end of their life cycles.

With regard to renewable energy, the Trust will support initiatives that take into account the full life cycle of renewable energy sources, from cradle to cradle. Infrastructure to facilitate large-scale recycling efforts of renewable energy sources and metals must occur in conjunction with clean energy initiatives, as more recycling will lend itself to less mining. And when mining is required, the Trust supports ethical mining practices, such as the IRMA Standard for Responsible Mining.

The Initiative for Responsible Mining Assurance (IRMA) released standards that define what responsible mining should look like at the industrial scale. This standard requires operating companies to be transparent, comply with applicable host country and international laws, respect human rights, and build trust and credibility with workers and communities. It also requires operating companies to engage from the early planning stages through the life cycle of the mine to ensure that projects are planned and managed to deliver positive economic, social, and environmental legacies for companies, workers, and

communities. Companies are also required to engage with workers, stakeholders, and rights holders to enhance the health, safety, cultural values, quality of life, and livelihoods of workers and communities. Finally, operating companies are also required to engage with stakeholders to ensure that mining is planned and carried out in a way that enhances environmental values and avoids or minimizes impacts to the environment and communities.¹⁶ The Trust supports these standards and other standards that are like it.

Oil and gas reform on the Colorado Plateau

Oil and gas was the third-highest contributing subsector to carbon emissions on the Colorado Plateau, representing 18 percent of total emissions. Achieving carbon neutrality will require reducing oil and gas emissions. This will have widespread ecological benefits and will improve public health in all communities, especially those disproportionately impacted by emissions and climate change. As frontline communities, including Indigenous communities and communities of color, have historically shouldered a disproportionate share of the impacts of emissions from oil and gas operations, reducing emissions from oil and gas operations will assist in addressing long-standing inequities in the Southwest. The following actions will directly reduce carbon emissions.

The Trust supports a full suite of oil and gas regulatory reforms and will continue to support state-based emission controls in the Southwest. This includes more stringent monitoring and enforcement regarding super pollutants like methane and carcinogens like volatile organic compounds such as benzene. Improvement and innovation of technologies that will help reduce emissions in this subsector must be taken into account. As significant emissions are associated with active oil and gas production, pipelines, storage, and abandoned wells, the Trust supports investment in technology to modernize and reduce emissions, leaks, spills, and contamination. In addition to better technology to facilitate emissions reductions from active sources, the Trust supports an orphan well cleanup fund to plug and reclaim abandoned oil and gas wells as future accountability in bonding reform for oil and gas leases that ensures taxpayers are not responsible for damage done to public lands by private business on the plateau.

Current oil and gas leasing processes reflect outdated resource management plans and fail to account for interconnectivity and complex uses and values embedded across regions. The Trust supports cross-departmental agency work to determine where oil and gas development can occur with limited or no negative impact, and where development would pose both direct, adjacent, and/or cumulative impacts to natural resources and/or public health.

The Trust will support bills that are aimed at reducing carbon emissions and reforming the oil and gas leasing process that will have a direct impact on plateau emissions. The Trust will prioritize bills that ensure workers in oil and gas communities that are making this transition are not left behind.

The current oil and gas leasing process creates imbalance, uncertainty, and strips away market-driven economics. This has resulted in millions of acres in the West being handed over to private industry. As a result, federal land managers must manage leased public lands for extractive use, and significant carbon emissions are permitted. This imbalance has resulted in cumulative emissions in all phases of oil and gas development. The Trust supports comprehensive reform of the federal oil and gas leasing process. This reform will reduce emissions and restore future balance between market demand and public trust.

¹⁶ Initiative for Responsible Mining Assurance (IRMA). *IRMA Standard for Responsible Mining IRMA-STD-001*. June 2018. Available at : https://responsiblemining.net/wp-content/uploads/2018/07/IRMA_STANDARD_v1.0_FINAL_2018-1.pdf at pages 8-9.

During its tenure, the Trump administration mandated that oil and gas producing states hold quarterly lease sales. This resulted in the leasing of millions of acres of land and availability of land for non-competitive purchase. The Trust supports rescission of this mandate. Market-based federal leasing should be based on multiple factors versus mandated sales that force the availability of public lands for drilling regardless of demand. Climate change and the reduction of carbon emissions must be a part of all federal leasing analyses by federal land managers as well. In addition, the U.S. Department of the Interior (DOI) should use its jurisdictional authority to mandate material cooperation regarding leasing proposed on public lands with potential impacts to adjacent lands managed by tribes, the National Park Service, and the Bureau of Indian Affairs. Public participation and tribal consultation also must be required (as opposed to the Trump administration's attempt to make this optional) during the decision-making process for leasing permitting, and for all oil and gas activity on public lands.

The "informal" lease nominations process has been used since 1987 and allows anyone to anonymously nominate any parcel of public land for leasing. The U.S. Bureau of Land Management (BLM) should exercise regulatory authority to employ a "formal" lease nominations process, which would allow strategic identification of lands that are suitable for nomination. The BLM should revoke authorization of anonymous lease nominations and issue a new policy that requires anyone nominating public lands for leasing to disclose their identity and the identities of third parties they are representing.

Another side effect of the current federal leasing process is that millions of acres in the West are currently available for non-competitive purchase. This is a direct result of the anonymous lease nominations process that undermines taxpayer returns for leasing public lands. Recalling non-competitive leases will increase tax revenue for the U.S. and reduce future carbon emissions by limiting acreage leased to mirror market demand. The Trust will support legislation that ends non-competitive leasing on lands on the Colorado Plateau, including the rescission of leases that were issued under previous administrations' leasing processes that were opposed by tribes, municipalities, counties, and impacted communities. Legislation that will promote tribal sovereignty, protect cultural resources, and reduce potential future emissions on leases on the Colorado Plateau is critical.

Many across the plateau have repeatedly faced binary decisions regarding deleterious industrial practices in or near their communities. The hope for economic progress comes at the expense of pollution, contamination, and exploitation. Often proposals to reduce emissions, stop contamination, or contain pollution are not met with complete solutions. And those who are impacted continue to suffer the fallout of marred air, water, and land. In addition, the removal of dangerous industrial activity leaves communities seeking economic opportunity without the assistance of state and federal governments or advocates who supported the conservation-based solutions but failed to account for the human costs. In light of this, the Trust supports funds to compensate communities disproportionately impacted by current and past carbon emissions, including public health, ecological impacts, and/or financial exploitation. Additionally, the Trust supports funding expansion of the Conservation Reserve Program¹⁷ to tribal communities in the Southwest who have historically shouldered the burden of the negative impacts of oil and gas extraction. The Trust also supports programs aimed at cutting greenhouse gases by fairly compensating allottees¹⁸ and tribal communities who choose to opt out of oil permitting and gas development on their land. This will preserve land and give allottees an income stream that mirrors oil and gas royalties they would receive otherwise.

¹⁷ United States Department of Agriculture. Conservation Reserve Program. *About the Conservation Reserve Program*. Available at: <https://www.fsa.usda.gov/programs-and-services/conservation-programs/conservation-reserve-program/>.

¹⁸ Native individuals who were allotted lands under the General Allotment Act.

The Trust also supports a robust accounting of the historic inequities regarding oil and gas development. Inequity and exploitation have been common themes across the plateau, particularly in disenfranchised Native communities. A true presentation of the facts will drive industry accountability and full understanding of the history that has led to emissions and contamination issues in the Southwest. In addition, a study should be commissioned that is aimed at analyzing the history of inequity in compensation from oil and gas developers. This study should provide a comprehensive review of industry and federal engagement with tribes, allottees, and communities impacted by oil and gas development. It also should propose solutions to address historic and future challenges. Finally, a centralized oil and gas information system should be developed for tribes to ensure full transparency and access to the most up-to-date information, should tribal members choose to develop resources on their land. This system should provide expertise regarding best practices for emissions controls, state of the art technology, historic royalty compensation, and information about the history and track record of the developer.

Advancement of innovation, technology, and environmental justice

Carbon neutrality can only be achieved and sustained if greenhouse gas emissions reductions are coupled with initiatives that empower communities to make meaningful changes. These initiatives should harness innovations that diversify economies and address some of the long-standing inequities that have perpetuated the disproportionate generation and impact of carbon emissions on the plateau.

Environmental justice

The Grand Canyon Trust supports legislation that addresses environmental disparities in frontline communities across the country, and particularly across the Colorado Plateau. In 2020, Rep. Raúl Grijalva, D-AZ, introduced the Environmental Justice for All Act, aimed at addressing justice and equity issues in the frame of conservation and climate change. The Trust supports this and other similar efforts.

In addition, grants that support research, education, outreach, development, and implementation of projects to address environmental and public health issues in underserved and frontline communities should be funded yearly. The Trust believes that federal agencies should develop comprehensive environmental justice outreach and data collection strategies that regularly report on the implementation and progress of measures aimed at improving disparities in impacted communities. This is best achieved through meaningful engagement, which includes both outreach and reporting back to frontline communities regarding the ongoing public health impacts, research, and future community risks. In addition, the Trust supports policies that take next steps to fund communities in transition. The establishment of a federal energy transition economic development assistance fund would direct revenues from fees on the oil, gas, and coal industries to support communities and workers as they transition away from greenhouse-gas-dependent economies.

When proposing an action affecting surrounding communities, especially historically underserved and underrepresented communities including Indigenous and communities of color, federal agencies must provide early and meaningful community involvement opportunities under the National Environmental Policy Act (NEPA). This means that federal agencies must engage with communities on the ground to make meaningful choices about how to deal with carbon emissions rather than taking a top-down approach that is not informed by daily life in such communities. Robust tribal representation and coordination throughout the NEPA process for any activities that may impact tribes, including activities that may impact off-reservation lands and sacred sites, must also be required.

This includes creation of a tribal loan fund for business development, tribal colleges and universities, and partnerships to provide innovative solutions to economic disenfranchisement. Limited economic opportunity has forced economic migration to urban areas from rural and tribal communities. The Trust

supports legislation that will authorize funding for economic opportunities in tribal communities. The Trust also supports legislation that will help fund the formation of tribal-based economic development initiatives to market and brand Native products and businesses, similar to existing federal programs that currently promote products made in the United States. The Trust also supports legislation that funds entrepreneurship and management training targeted at residents of the Colorado Plateau and members of tribal communities.

Innovation and technology

The majority of the Colorado Plateau is rural land, and an all-of-government approach is needed to build and support infrastructure necessary for a 21st century regenerative economy. Rural communities should be ensured a 21st century standard of living and should not be left out as the world advances in technology and moves toward a less carbon-intensive future. The barriers to economic development faced by these communities must be removed. Federal assets should be leveraged to provide electricity, water, and other common amenities available in the United States to all communities, including those on the Colorado Plateau. The Trust supports legislation that is also supported by tribes that will authorize investments in infrastructure to benefit Native families and communities in the Four Corners states. The end goal is to stimulate and implement innovative economic policy, while removing these barriers and ensuring sustained reduction of carbon emissions.

As the Colorado Plateau is incredibly vulnerable to the impacts of climate change, the Trust supports legislation that addresses challenges associated with drought, wildfire, and climate change. This includes investments in job training and jobs to support conservation programs and reforestation efforts, programs that support improved access to clean drinking water, and mitigation of risk of catastrophic wildfire. The Trust also supports legislation that creates jobs and enhances public safety through the cleanup of abandoned coal mines on public and private lands.

As extreme weather events such as wildfires become increasingly common, microgrids can mitigate the impacts of grid outages and public safety power shutoffs within communities using cleaner energy sources. The Trust supports legislation that creates tax credits for microgrids. In addition to this, the Trust supports expanded broadband access for rural, underserved communities, especially Indigenous communities and communities of color.

The IPCC report highlights that staying below the 1.5° C threshold will require carbon capture and storage.¹⁹ As carbon capture and storage are important pieces of the puzzle, the Grand Canyon Trust supports legislation that invests in advancement of this technology both financially and through research and development to make it a more viable option moving forward.

Achieving carbon neutrality across the Colorado Plateau will require collaboration and meaningful regulatory and legislative reforms. It will require collaboration between state and federal partners, as well as businesses and local community leaders across the political spectrum. The Trust supports and would like to participate in collaborative working groups aimed at reducing emissions, inequity, and historic impacts of pollution and climate change on the plateau.

¹⁹ Intergovernmental Panel on Climate Change, Special Report: Global Warming Of 1.5°C, Summary for Policymakers, 1,6 (2018). Available at: https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_SPM_version_report_LR.pdf at page 14.

The Highest Plateau Emitter: Stationary Energy

Stationary energy refers to combustion of fuels in sources that are not used for transport. This sector is broken down into the electricity consumption and stationary combustion sectors. Stationary energy accounted for 35.6 percent of total plateau emissions, or 37,954,742 mtCO_{2e}, and was the highest emitting sector across Colorado Plateau counties.

Stationary energy	mtCO _{2e}	Percent of total stationary energy sector emissions	Percent of total subsector emissions	Percent of total plateau emissions
Subsector				
Total electricity subsector emissions	28,203,618	74.31%		26.47%
Total stationary combustion subsector emissions	9,751,124	25.69%		9.15%
Total stationary energy sector emissions	37,954,742			35.62%
Sources				
Transmission and distribution losses	1,202,876	3.17%	4.26%	1.13%
Industrial electricity consumption	6,337,951	16.70%	22.47%	5.95%
Commercial electricity consumption	10,876,804	28.66%	38.57%	10.21%
Residential electricity consumption	9,785,986	25.78%	34.70%	9.18%
Commercial stationary combustion	2,185,113	5.76%	22.41%	2.05%
Residential stationary combustion	2,998,256	7.90%	30.75%	2.81%
Large emitters stationary combustion	4,567,756	12.03%	46.84%	4.29%

Electricity emissions subsector

The electricity emissions subsector refers to the industrial, commercial, and residential use of electricity on the Colorado Plateau, as well as emissions from transmission and distribution losses. Electricity was the highest emitting subsector on the Colorado Plateau, emitting 26.5 percent of total plateau emissions and 74.3 percent of total sector emissions. It accounted for 28,203,618 mtCO_{2e}. The top emitting counties for overall electricity emissions were Garfield County, Colorado with 3,334,028 mtCO_{2e} (11.8 percent of total emissions for this subsector), Yavapai County, Arizona with 3,128,582 mtCO_{2e} (11.09 percent of total emissions for this subsector), and Coconino County, Arizona, with 3,121,477 mtCO_{2e} (11.07 percent of total emissions for this subsector).

Top emitting counties for the electricity consumption subsector	mtCO _{2e}	Percent of electricity consumption subsector emissions	Percent of stationary energy sector emissions	Percent of total plateau emissions
Garfield, CO	3,334,028	11.82%	8.78%	3.13%
Yavapai, AZ	3,128,582	11.09%	8.24%	2.94%
Coconino, AZ	3,121,477	11.07%	8.22%	2.93%
Total plateau emissions	106,550,612			
Total stationary energy sector emissions	37,954,742			35.62%
Total electricity consumption subsector emissions	28,203,618		74.31%	26.47%

Commercial and industrial utilities in Garfield County, Colorado include the city of Glenwood Springs, Grand Valley Power, Holy Cross Electric Association, Moon Lake Electric Association, Public Service Corporation of Colorado, White River Electric Association, and the Yampa Valley Electric Association.

Commercial and industrial utilities in Yavapai County, Arizona include Arizona Public Service, the city of Mesa, Mohave Electric Cooperative, Salt River Project, Unisource Electric, USBIA San Carlos Project, and seven others that aren't identified in the data.

Commercial and industrial utilities in Coconino County, Arizona include Arizona Public Service, Garkane Energy Cooperative, Mohave Electric Cooperative, Navajo Tribal Utility Authority, Navopache Electric Cooperative, Page Utility Enterprises, Unisource Electric, USBIA San Carlos Project, and two more that are not identified in the data.

Key problem areas, opportunities for emissions reduction in the electricity subsector

Commercial electricity consumption source

Commercial electricity consumption is the highest emitting source under electricity consumption across plateau counties. There were 10,876,804 mtCO_{2e} emitted in 2018 from this subsector, which accounted for 28.7 percent of total sector emissions and 10.2 percent of total plateau emissions. Garfield County, Colorado had the highest emissions from commercial electricity consumption in 2018, with 1,420,391 mtCO_{2e} (13 percent of total emissions for this source). This was followed by Yavapai County, Arizona with 1,353,850 mtCO_{2e} (12 percent of total emissions for this source), and then Coconino County, Arizona with 1,348,259 mtCO_{2e} (12 percent of total emissions for this source).

Top emitting counties for the commercial electricity consumption source	mtCO _{2e}	Percent of commercial electricity consumption source emissions	Percent of electricity consumption subsector emissions	Percent of stationary energy sector emissions	Percent of total plateau emissions
Garfield, CO	1,420,391	13.06%	5.04%	3.74%	1.33%
Yavapai, AZ	1,353,850	12.45%	4.80%	3.57%	1.27%
Coconino, AZ	1,348,259	12.40%	4.78%	3.55%	1.27%
Total plateau emissions	106,550,612				
Total stationary energy sector emissions	37,954,742				35.62%
Total electricity subsector emissions	28,203,618			74.31%	26.47%
Total commercial electricity consumption source emissions	10,876,804		38.57%	28.66%	10.21%

Residential electricity consumption source

The second-highest emitting source within electricity is residential electricity consumption. There were 9,785,986 mtCO₂e (34.7 percent of total emissions from the electricity consumption subsector, and 9.2 percent of total plateau emissions) emitted from this subsector across Colorado Plateau counties in 2018. Yavapai County in Arizona contributed the highest emissions with 1,409,173 mtCO₂e (14.4 percent of total emissions from this source), followed by Coconino County, Arizona with 1,404,245 mtCO₂e (14.4 percent of total emissions from this source), and then Garfield County Colorado, with 1,055,337 mtCO₂e (10.8 percent of total emissions from this source).

Top emitting counties for the residential electricity consumption source	mtCO ₂ e	Percent of commercial electricity consumption source emissions	Percent of electricity consumption subsector emissions	Percent of stationary energy sector emissions	Percent of total plateau emissions
Yavapai, AZ	1,409,173	14.40%	5.00%	3.71%	1.32%
Coconino, AZ	1,404,245	14.35%	4.98%	3.70%	1.32%
Garfield, CO	1,055,337	10.78%	3.74%	2.78%	0.99%
Total plateau emissions	106,550,612				
Total stationary energy sector emissions	37,954,742				35.62%
Total electricity subsector emissions	28,203,618			74.31%	26.47%
Total residential electricity consumption source emissions	9,785,986		34.70%	25.78%	9.18%

Industrial electricity consumption source

The third-highest emitting source under the electricity consumption subsector was industrial electricity consumption, which accounted for 6,337,952 mtCO₂e, 22.4 percent of total electricity consumption emissions, and 6 percent of total plateau emissions. Counties that contributed the most emissions from this source were Mesa County, Arizona with 828,361 mtCO₂e (13 percent of total emissions for this source), Garfield County, Colorado with 695,908 mtCO₂e (11 percent of total emissions for this source), and Rio Blanco County, Colorado with 629,773 mtCO₂e (10 percent of total emissions for this source).

Top emitting counties for the industrial electricity consumption source	mtCO ₂ e	Percent of commercial electricity consumption source emissions	Percent of electricity consumption subsector emissions	Percent of stationary energy sector emissions	Percent of total plateau emissions
Mesa, CO	828,361	13.07%	2.94%	2.18%	0.78%
Garfield, CO	695,908	10.98%	2.47%	1.83%	0.65%
Rio Blanco, CO	629,773	9.94%	2.23%	1.66%	0.59%
Total plateau emissions	106,550,612				
Total stationary energy sector emissions	37,954,742				35.62%
Total electricity subsector emissions	28,203,618			74.31%	26.47%
Total industrial electricity consumption source emissions	6,337,952		22.47%	16.70%	5.95%

Transmission and distribution loss source

The fourth-highest emitting source under the electricity consumption subsector was transmission and distribution loss, which contributed 1,202,876 mtCO_{2e}, or 1.1 percent of total plateau emissions, and 4 percent of total emissions for the electricity consumption subsector. Garfield County, Colorado contributed the most emissions from this source with 162,391 mtCO_{2e} (13.5 percent of total emissions for this source). Mesa County, Colorado contributed 142,587 mtCO_{2e} (11.8 percent of total emissions for this source), and Yavapai County, Arizona contributed 119,985 mtCO_{2e} (1.9 percent of total emissions for this source).

Top emitting counties for the transmission and distribution loss source	mtCO _{2e}	Percent of commercial electricity consumption source emissions	Percent of electricity consumption subsector emissions	Percent of stationary energy sector emissions	Percent of total plateau emissions
Garfield, CO	162,391	13.50%	0.58%	0.43%	0.15%
Mesa, CO	142,587	11.85%	0.51%	0.38%	0.13%
Yavapai, AZ	119,984	9.97%	0.43%	0.32%	0.11%
Total plateau emissions	106,550,612				
Total stationary energy sector emissions	37,954,742				35.62%
Total electricity subsector emissions	28,203,618			74.31%	26.47%
Total transmission and distribution loss source emissions	1,202,876		4.26%	3.17%	1.13%

Stationary combustion subsector

Another subsector of stationary energy is stationary combustion, which refers to the combustion of propane, natural gas and wood in uses that are not for transportation like furnaces and ovens. It includes residential stationary combustion from wood, propane, and natural gas; commercial stationary combustion from propane and natural gas; and industrial stationary combustion. Stationary combustion was the fifth-highest emitting subsector on the Colorado Plateau, accounting for 9.2 percent of total plateau emissions with 9,751,124 mtCO_{2e}. The top emitting counties in this subsector were Utah County, Utah with 188,404 mtCO_{2e} (19.3 percent of total emissions from this subsector and 1.8 percent of total plateau emissions), San Juan County, New Mexico with 1,404,019 mtCO_{2e} (14.4 percent of total emissions from this subsector and 1.3 percent of total plateau emissions), and LaPlata County, Colorado with 716,452 mtCO_{2e} (7.3 percent of total emissions from this subsector and 0.7 percent of total plateau emissions).

Top emitting counties for the stationary combustion subsector	mtCO _{2e}	Percent of stationary combustion subsector emissions	Percent of stationary energy sector emissions	Percent of total plateau emissions
Utah, UT	1,882,404	19.30%	4.96%	1.77%
San Juan, NM	1,404,019	14.40%	3.70%	1.32%
LaPlata, CO	716,452	7.35%	1.89%	0.67%
Total plateau emissions	106,550,612			
Total stationary energy sector emissions	37,954,742			35.62%
Total stationary combustion subsector emissions	9,751,124		25.69%	9.15%

Key problem areas, opportunities for emissions reduction in the stationary combustion subsector

Large emitters (industrial) source

Across Colorado Plateau counties, stationary combustion from large emitters (industrial) was the top emitting source, with 4,567,756 mtCO_{2e}. San Juan County, New Mexico had the highest emissions in this subsector, with 1,222,785 mtCO_{2e}, followed by La Plata County, Colorado, with 580,073 mtCO_{2e}, and then by Carbon County, Utah, with 558,603 mtCO_{2e}. This part of the inventory identifies the specific large emitters across Colorado Plateau counties.

Top emitting counties for the large emitters source	mtCO _{2e}	Percent of large emitters source emissions	Percent of stationary combustion subsector emissions	Percent of stationary energy sector emissions	Percent of total plateau emissions
San Juan, NM	1,222,785	26.77%	12.54%	3.22%	1.15%
LaPlata, CO	580,073	12.70%	5.95%	1.53%	0.54%
Carbon, UT	558,603	12.23%	5.73%	1.47%	0.52%
Total plateau emissions	106,550,612				
Total stationary energy sector emissions	37,954,742				35.62%
Total stationary combustion subsector emissions	9,751,124			25.69%	9.15%
Total large emitters source emissions	4,567,756		46.84%	12.03%	4.29%

Top large emitters

The largest emitters are Sunnyside Power Plant in Carbon County, Utah, with 476,593 mtCO_{2e} (10.4 percent of total emissions from this source), Graymont Western U.S. in Millard County, Utah with 347,200 mtCO_{2e} (7.6 percent of total emissions from this source), Chaco Gas Plant in San Juan County, New Mexico, with 338,425 mtCO_{2e} (7.4 percent of total emissions from this source), and Milagro Cogeneration and Gas Plant in San Juan County, New Mexico, with 266,058 mtCO_{2e}.

Top emitting large emitters	mtCO _{2e}	Percent of large emitters source emissions	Percent of stationary combustion subsector emissions	Percent of stationary energy sector emissions	Percent of total plateau emissions
Sunnyside Cogeneration Associates: Carbon, UT	476,593	10.43%	4.89%	1.26%	0.45%
Graymont Western, U.S.: Millard, UT	347,200	7.60%	3.56%	0.91%	0.33%
Chaco Gas Plant: San Juan, NM	338,425	7.41%	3.47%	0.89%	0.32%
Milagro Cogeneration and Gas Plant: San Juan, NM	266,058	5.82%	2.73%	0.70%	0.25%
Total plateau emissions	106,550,612				
Total stationary energy sector emissions	37,954,742				35.62%
Total stationary combustion subsector emissions	9,751,124			25.69%	9.15%
Total large emitters source emissions	4,567,756		46.84%	12.03%	4.29%

Residential stationary combustion source

Residential stationary combustion was the second-highest emitting source from the stationary combustion subsector across Colorado Plateau counties with 2,998,256 mtCO₂e (31 percent of total emissions from this subsector, and 2.8 percent of total plateau emissions). The top emitting counties for this source were Utah County, Utah with 760,544 mtCO₂e (25 percent of total emissions from this source); Mesa County, Colorado with 277,210 mtCO₂e (9 percent of total emissions from this source); and Washington County, Utah with 209,506 mtCO₂e (7 percent of total emissions from this source). Note that this source can be further broken down into residential stationary combustion from natural gas, propane, and wood (natural gas is the highest emitting of these).

Top emitting counties for the residential stationary combustion source	mtCO ₂ e	Percent of residential stationary combustion source emissions	Percent of stationary combustion subsector emissions	Percent of stationary energy sector emissions	Percent of total plateau emissions
Utah, UT	760,544	25.37%	7.80%	2.00%	0.71%
Mesa, CO	277,210	9.25%	2.84%	0.73%	0.26%
Washington, UT	209,506	6.99%	2.15%	0.55%	0.20%
Total plateau emissions	106,550,612				
Total stationary energy sector emissions	37,954,742				35.62%
Total stationary combustion subsector emissions	9,751,124			25.69%	9.15%
Total residential stationary combustion source emissions	2,998,256		30.75%	7.90%	2.81%

Commercial stationary combustion source

Commercial stationary combustion was the third-highest emitting source from the stationary combustion subsector across Colorado Plateau counties with 2,185,113 mtCO₂e (22 percent of total emissions from this subsector, and 2.1 percent of total plateau emissions). The top emitting counties for this source were Utah County, Utah with 893,543 mtCO₂e (41 percent of total emissions from this source), Washington County, Utah with 231,238 mtCO₂e (11 percent of total emissions from this source), and Yavapai County, Arizona with 126,802 mtCO₂e (6 percent of total emissions from this source). This source can be further broken down into commercial stationary combustion from propane or natural gas (natural gas has the highest emissions).

Top emitting counties for the commercial stationary combustion source	mtCO ₂ e	Percent of commercial stationary combustion source emissions	Percent of stationary combustion subsector emissions	Percent of stationary energy sector emissions	Percent of total plateau emissions
Utah, UT	893,543	40.89%	9.16%	2.35%	0.84%
Washington, UT	231,238	10.58%	2.37%	0.61%	0.22%
Yavapai, AZ	126,802	5.80%	1.30%	0.33%	0.12%
Total plateau emissions	106,550,612				
Total stationary energy sector emissions	37,954,742				35.62%
Total stationary combustion subsector emissions	9,751,124			25.69%	9.15%
Total commercial stationary combustion source emissions	2,185,113		22.41%	5.76%	2.05%

Second-highest Emitter: Fugitive Emissions Sector

Fugitive emissions are emissions released during the production of oil and gas and coal, including the extraction, processing, and delivery of those fossil fuels. This does not account for emissions from their use. Fugitive emissions was the second-highest emitting sector across the Colorado Plateau, and accounted for 30 percent of plateau counties' total emissions, contributing 32,132,253 mtCO₂e. It is divided into the oil and gas systems and coal mining subsectors.

Fugitive emissions	mtCO ₂ e	Percent of total fugitive emissions sector emissions	Percent of total subsector emissions	Percent of total plateau emissions
Subsector				
Total oil and gas systems subsector emissions	19,366,455	60.27%		18.18%
Total coal mining subsector emissions	12,765,798	39.73%		11.98%
Total fugitive emissions sector emissions	32,132,253			30.16%
Sources				
Petroleum and natural gas systems	4,166,484	12.97%	21.51%	3.91%
Petroleum refineries	113,323	0.35%	0.59%	0.11%
Active oil and gas wells	14,972,968	46.60%	77.31%	14.05%
Abandoned and orphaned oil and gas wells	3,397	0.01%	0.02%	0.003%
Natural gas leakage	110,283	0.34%	0.57%	0.10%
Active underground coal mines	12,091,081	37.63%	94.71%	11.35%
Active surface coal mines	674,427	2.10%	5.28%	0.63%
Abandoned underground coal mines	290	0.0009%	0.002%	0.00027%

Oil and gas systems subsector

The oil and gas systems subsector refers to emissions from both the intentional and unintentional release of greenhouse gases during the extraction, processing, and delivery of fossil fuels from oil and gas systems. It was the third-highest emitting subsector on the Colorado Plateau. Oil and gas systems accounted for 18.2 percent of total plateau emissions, and 60.3 percent of all fugitive emissions.

Key problem areas, opportunities for emissions reduction in the oil and gas systems subsector

Oil and gas systems was the third-highest emitting subsector on the plateau. San Juan County, New Mexico had the highest emissions in this subsector with 5,056,987 mtCO_{2e} (26.11 percent of all oil and gas emissions, 4.8 percent of total plateau emissions), followed by Garfield County, Colorado with 3,814,532 mtCO_{2e} (19.7 percent of total oil and gas emissions and 3.6 percent of total plateau emissions) and then by Rio Arriba County, New Mexico, with 2,547,182 mtCO_{2e} (13.2 percent of total oil and gas emissions, and 2.4 percent of total plateau emissions).

Top emitting counties for the oil and gas systems subsector	mtCO _{2e}	Percent of oil and gas systems subsector emissions	Percent of fugitive emissions sector	Percent of total plateau emissions
San Juan, NM	5,056,987	26.11%	15.74%	4.75%
Garfield, CO	3,814,532	19.70%	11.87%	3.58%
Rio Arriba, NM	2,547,182	13.15%	7.93%	2.39%
Total plateau emissions	106,550,612			
Total fugitive emissions sector emissions	32,132,253			30.16%
Total oil and gas systems subsector emissions	19,366,455		60.27%	18.18%

Top emitting oil and gas systems facilities

The top emitting oil and gas system facilities across Colorado Plateau counties include Red Cedar Gathering in La Plata County, Colorado, which contributed 525,117 mtCO_{2e} (2.7 percent of total oil and gas emissions). This was followed by Val Verde Treater in San Juan County, New Mexico, which emitted 480,791 mtCO_{2e} (2.5 percent of total oil and gas emissions). The Ignacio Gas Plant located in La Plata County, Colorado was the third-highest emitting facility with 417,359 mtCO_{2e} (2.2 percent of total oil and gas emissions).

Top emitting oil and gas systems facilities	mtCO _{2e}	Percent of oil and gas systems subsector emissions	Percent of fugitive emissions sector emissions	Percent of total plateau emissions
Red Cedar Gathering San Juan Basin Gathering & Boosting – LaPlata, CO	525,117	2.71%	1.63%	0.49%
Val Verde Treater – San Juan, NM	480,791	2.48%	1.50%	0.45%
Ignacio Gas Plant – LaPlata, CO	417,359	2.16%	1.30%	0.39%
Total plateau emissions	106,550,612			
Total fugitive emissions sector emissions	32,132,253			30.16%
Total oil and gas systems subsector emissions	19,366,455		60.27%	18.18%

The oil and gas systems sector is further broken down into emissions from the following sources: Subpart W petroleum and natural gas systems, Subpart Y petroleum refineries, oil and gas wells, and natural gas leakage.

Active oil and gas wells source

The active oil and gas wells source was the highest emitting source on the Colorado Plateau, contributing 14,972,968 mtCO₂e to plateau emissions (14.1 percent of total plateau emissions). San Juan County, New Mexico had the highest emissions from this source with 3,681,614 mtCO₂e (emitting 24.6 percent of total emissions for this source) and 12,381 oil and gas wells across the county. Garfield County, Colorado had the second-highest emissions with 3,229,330 mtCO₂e (21.6 percent of total emissions for this source) and 10,860 oil and gas wells across the county. Rio Arriba County, New Mexico had the third-highest emissions with 2,532,912 mtCO₂e (16.9 percent of total emissions for this source) and 8,518 oil and gas wells across the county.

Top emitting counties for the active oil and gas wells source	mtCO ₂ e	Percent of active oil and gas wells source emissions	Percent of oil and gas systems subsector emissions	Percent of fugitive emissions sector emissions	Percent of total plateau emissions
San Juan, NM	3,681,614	24.59%	19.01%	11.46%	3.46%
Garfield, CO	3,229,330	21.57%	16.67%	10.05%	3.03%
Rio Arriba, NM	2,532,912	16.92%	13.08%	7.88%	2.38%
Total plateau emissions	106,550,612				
Total fugitive emissions sector emissions	32,132,253				30.16%
Total oil and gas systems subsector emissions	19,366,455			60.27%	18.18%
Total active oil and gas source emissions	14,972,968		77.31%	46.60%	14.05%

Petroleum and natural gas systems source

Subpart W²⁰ petroleum and natural gas systems was the second-highest emitting source, with 4,166,484 mtCO₂e (3.3 percent of total plateau emissions). La Plata County, Colorado had the highest emissions from Subpart W petroleum and natural gas systems with 1,462,584 mtCO₂e (35 percent of total emissions for this source, and 7.6 percent of total emissions from this subsector). San Juan County, New Mexico had the second-highest emissions in this source with 1,371,634 mtCO₂e (32.9 percent of total emissions for this source, and 7.1 percent of total emissions from this subsector), followed by Garfield County, Colorado with 581,782 mtCO₂e (14 percent of total emissions for this source and 3.0 percent of total emissions from this subsector).

Top emitting counties for the petroleum and natural gas systems source	mtCO ₂ e	Percent of petroleum and natural gas systems source emissions	Percent of oil and gas systems subsector emissions	Percent of fugitive emissions sector emissions	Percent of total plateau emissions
La Plata, CO	1,462,584	35.10%	7.55%	4.55%	1.37%
San Juan, NM	1,371,634	32.92%	7.08%	4.27%	1.29%
Garfield, CO	581,782	13.96%	3.00%	1.81%	0.55%
Total plateau emissions	106,550,612				
Total fugitive emissions sector emissions	32,132,253				30.16%
Total oil and gas systems subsector emissions	19,366,455			60.27%	18.18%
Total petroleum and natural gas systems source emissions	4,166,484		21.51%	12.97%	3.91%

²⁰ According to the U.S. EPA, "Subpart W of part 98 requires petroleum and natural gas facilities to report annual methane (CH₄) and carbon dioxide (CO₂) emissions from equipment leaks and venting, and emissions of CO₂, CH₄, and nitrous oxide (N₂O) from flaring, onshore production stationary and portable combustion emissions, and combustion emissions from stationary equipment involved in natural gas distribution." United States Environmental Protection Agency. Frequently Asked Questions: Q436. What GHG emissions at oil and natural gas systems facilities are covered under the rule? Available at: <https://ccdsupport.com/confluence/pages/viewpage.action?pageId=98009236>.

Petroleum refineries source

The third-highest emitting source was Subpart Y petroleum refineries with 113,323 mtCO_{2e} (0.11 percent of total plateau emissions). McKinley County, New Mexico had the highest emissions for this source with 113,323 mtCO_{2e} (0.6 percent of total emissions for this subsector). No other plateau counties had data for this source.

Top emitting counties for the petroleum refineries source	mtCO _{2e}	Percent of petroleum refineries source emissions	Percent of oil and gas wells subsector emissions	Percent of fugitive emissions sector emissions	Percent of total plateau emissions
McKinley, NM	113,323	100.00%	0.59%	0.35%	0.11%
Total plateau emissions	106,550,612				
Total fugitive emissions sector emissions	32,132,253				30.16%
Total oil and gas systems subsector emissions	19,366,455			60.27%	18.18%
Total petroleum refineries source emissions	113,323		0.59%	0.35%	0.11%

Natural gas leakage source

Natural gas leakage was the second-lowest emitting source within the oil and gas systems subsector, with 110,283 mtCO_{2e} (0.6 percent of total emissions for this subsector and 0.10 percent of total plateau emissions). Utah County, Utah had the highest emissions from this source with 38,273 mtCO_{2e} (34.7 percent of total emissions for this source), followed by Washington County, Utah with 10,021 mtCO_{2e} (9.1 percent of total emissions for this source). Mesa County, Colorado had the third-highest emissions from natural gas leakage with 8,304 mtCO_{2e} (7.5 percent of total emissions for this source).

Top emitting counties for the natural gas leakage source	mtCO _{2e}	Percent of petroleum and natural gas systems source emissions	Percent of oil and gas wells subsector emissions	Percent of fugitive emissions sector emissions	Percent of total plateau emissions
Utah, UT	38,273	34.67%	0.20%	0.12%	0.04%
Washington, UT	10,021	9.09%	0.05%	0.03%	0.01%
Mesa, CO	8,304	7.53%	0.04%	0.03%	0.01%
Total plateau emissions	106,550,612				
Total fugitive emissions sector emissions	32,132,253				30.16%
Total oil and gas systems subsector emissions	19,366,455			60.27%	18.18%
Total natural gas leakage source emissions	110,283		0.57%	0.34%	0.10%

Orphaned or abandoned oil and gas wells (unplugged) source

The orphaned or abandoned oil and gas wells source measures emissions from oil and gas wells that are not producing actively, but also have not been plugged. This was the smallest source of emissions in the oil and gas subsector. Orphaned or abandoned oil and gas wells contributed 3,397 mtCO₂e (0.02 percent of total emissions for this subsector) to total Colorado Plateau emissions. Rio Blanco County, New Mexico had the highest emissions from this source with 593 mtCO₂e (17.5 percent of total emissions for this source), followed by Uintah County, Utah with 489 mtCO₂e (14.4 percent of total emissions for this source). Garfield County, Colorado had the third-highest emissions for this source with 312 mtCO₂e (9.2 percent of total emissions for this source).

Top emitting counties for the abandoned and orphaned oil and gas wells source	mtCO ₂ e	Percent of abandoned oil and gas wells source emissions	Percent of oil and gas systems subsector emissions	Percent of fugitive emissions sector emissions	Percent of total plateau emissions
Rio Blanco, CO	593	17.46%	0.0031%	0.0018%	0.0006%
Uintah, UT	489	14.40%	0.0025%	0.0015%	0.0005%
Garfield, CO	312	9.20%	0.0016%	0.0010%	0.0003%
Total plateau Emissions	106,550,612				
Total fugitive emissions sector emissions	32,132,253				30.16%
Total oil and gas systems subsector emissions	19,366,455			60.27%	18.18%
Total abandoned and orphaned oil and gas wells source emissions	3,397		0.018%	0.011%	0.003%

Coal mining subsector

The coal mining subsector refers to emissions generated from both the intentional and unintentional release of greenhouse gases during activities associated with coal mining. It does not account for emissions generated from the use of that coal as an energy source. This subsector generated 12,765,798 mtCO₂e across plateau counties, and accounted for 10.3 percent of total plateau emissions, and 39.7 percent of all fugitive emissions.

Key problem areas, opportunities for emissions reduction in the coal mining subsector

The coal mining subsector was the fourth-highest emitting subsector across Colorado Plateau counties. The top emitting counties for this sector include San Juan County, New Mexico with 3,499,330 mtCO₂e (27.4 percent of total emissions for this subsector), followed by Carbon County, Utah with 2,959,355 mtCO₂e (23.2 percent of total emissions for this subsector). The third-highest emitting county in this sector was Sevier County, Utah with 2,514,892 mtCO₂e (19.7 percent of total emissions for this subsector).

Top emitting counties for the coal mining subsector	mtCO ₂ e	Percent of coal mining subsector emissions	Percent of fugitive emissions sector emissions	Percent of total plateau emissions
San Juan, NM	3,499,330	27.41%	10.89%	3.28%
Carbon, UT	2,959,355	23.18%	9.21%	2.78%
Sevier, UT	2,514,892	19.70%	7.83%	2.36%
Total plateau emissions	106,550,612			
Total fugitive emissions sector emissions	32,132,253			30.16%
Total coal mining subsector emissions	12,765,798		39.73%	11.98%

The coal sector is broken down into the following sources: active underground coal mines, active surface coal mines, and abandoned underground coal mines.

Active underground coal mines source

Active underground coal mines was the highest emitting source in the coal mining subsector, contributing 12,091,081 mtCO_{2e} (94.7 percent of total emissions for this subsector, and 9.75 percent of total plateau emissions). The top emitting counties in this source were San Juan County, New Mexico with 3,384,132 mtCO_{2e} (27.9 percent of source emissions), followed by Carbon County, Utah with 2,959,250 mtCO_{2e} (24.4 percent of source emissions). The third-highest emitting county for this source was Sevier County, Utah with 2,514,892 mtCO_{2e} (20.8 percent of source emissions).

Top emitting counties for the active underground coal mines source	mtCO _{2e}	Percent of active underground coal mines source emissions	Percent of coal mining subsector emissions	Percent of fugitive emissions sector emissions	Percent of total plateau emissions
San Juan, NM	3,384,132	27.99%	26.51%	10.53%	3.18%
Carbon, UT	2,959,250	24.47%	23.18%	9.21%	2.78%
Sevier, UT	2,514,892	20.80%	19.70%	7.83%	2.36%
Total plateau emissions	106,550,612				
Total fugitive emissions sector emissions	32,132,253				30.16%
Total coal mining subsector emissions	12,765,798			39.73%	11.98%
Total active underground coal mine source emissions	12,091,081		94.71%	37.63%	11.35%

Active surface coal mines source

Active surface coal mines were the second-highest emitting source contributing 674,427 mtCO_{2e} (5.3 percent of total emissions for this subsector and 0.63 percent of total plateau emissions). The highest emitting counties for this source were McKinley County, New Mexico with 205,856 mtCO_{2e} (30.5 percent of total emissions for this source), followed by Navajo County, Arizona, with 196,338 mtCO_{2e} (29.1 percent of total emissions for this source). The third-highest emitting county for this source was San Juan County, New Mexico, with 115,181 mtCO_{2e} (17.1 percent of total emissions for this source).

Top emitting counties for the active surface coal mines source	mtCO _{2e}	Percent of active surface coal mines source emissions	Percent of coal mining subsector emissions	Percent of fugitive emissions sector emissions	Percent of total plateau emissions
McKinley, NM	205,856	30.52%	1.61%	0.64%	0.19%
Navajo, AZ	196,338	29.11%	1.54%	0.61%	0.18%
San Juan, NM	115,181	17.08%	0.90%	0.36%	0.11%
Total plateau emissions	106,550,612				
Total fugitive emissions sector emissions	32,132,253				30.16%
Total coal mining subsector emissions	12,765,798			39.73%	11.98%
Total active surface coal mine source emissions	674,427		5.28%	2.10%	0.63%

Abandoned underground coal mines source

Abandoned underground coal mines emitted the least, and only contributed 290.15 mtCO₂e (.002 percent of total emissions for this subsector and .0003 percent of total plateau emissions). The highest emitting counties for this source were Carbon County, Utah with 104.59 mtCO₂e (36 percent of total emissions for this source), Garfield County, Colorado with 50.06 mtCO₂e (17 percent of total emissions for this source), and Delta County, Colorado with 30.77 mtCO₂e (10.6 percent of total emissions for this source).

Top emitting counties for the abandoned underground coal mines source	mtCO ₂ e	Percent of abandoned underground coal mines source emissions	Percent of coal mining subsector emissions	Percent of fugitive emissions sector emissions	Percent of total plateau emissions
Carbon, UT	105	36.05%	0.0008%	0.0003%	0.0001%
Garfield, CO	50	17.25%	0.0004%	0.0002%	0.00005%
Delta, CO	31	10.61%	0.0002%	0.0001%	0.00003%
Total plateau emissions	106,550,612				
Total fugitive emissions sector emissions	32,132,253				30.16%
Total coal mining subsector emissions	12,765,798			39.73%	11.98%
Total abandoned underground coal mine source emissions	290		0.0023%	0.0009%	0.0003%

Third-highest Emitter: Transportation Sector Emissions

The transportation sector accounts for emissions from various types of transportation occurring on the Colorado Plateau. It was the third-highest emitting sector on the plateau, with 21.8 percent of total plateau county emissions, contributing 26,202,965 mtCO₂e.

Transportation	mtCO ₂ e	Percent of total transportation sector emissions	Percent of total plateau emissions
Subsectors			
On-road transportation	23,242,424	88.70%	21.81%
Off-road transportation	2,065,638	7.88%	1.94%
Waterborne activity	36,594	0.14%	0.03%
Aviation activity	436,125	1.66%	0.41%
Railway activity	422,184	1.61%	0.40%
Total transportation sector emissions	26,202,965		24.59%

Key problem areas, opportunities for emissions reduction in the transportation sector

The top emitting counties in the transportation sector include: Garfield County, Colorado with 2,459,043 mtCO₂e (2.3 percent of total plateau emissions), Mesa County, Colorado with 2,242,718 mtCO₂e, and Utah County, Utah with 1,944,204 mtCO₂e. The transportation sector is broken down into the following subsectors: on-road transportation, off-road transportation, waterborne transportation, aviation, and railways.

Top emitting counties for the transportation sector	mtCO ₂ e	Percent of transportation sector emissions	Percent of total plateau emissions
Garfield, CO	2,459,043	9.38%	2.31%
Mesa, CO	2,242,718	8.56%	2.10%
Utah, UT	1,944,204	7.42%	1.82%
Total plateau emissions	106,550,612		
Total transportation sector emissions	26,202,965		24.59%

On-road transportation subsector

The on-road transportation subsector was the highest emitting subsector under the transportation sector on the plateau. It contributed 23,242,424 mtCO₂e (88.7 percent of total emissions from this sector, and 21.8 percent of total plateau emissions). This subsector accounts for emissions from the burning of gasoline, diesel, and ethanol in on-road vehicles, including passenger vehicles and large transport trucks. It also accounts for emissions from electric vehicles, including transmission and distribution loss, as well as light-duty gas cars and trucks, heavy-duty gas trucks, gas and ethanol motorcycles, ethanol cars, ethanol light and heavy trucks, light-duty diesel cars and trucks, heavy-duty diesel trucks, and electric vehicles (data is available for each of these vehicle types). The top emitting counties for on-road transportation were: Garfield County, Colorado with 2,377,934 mtCO₂e (10 percent of total emissions from this subsector), Mesa County, Colorado with 2,107,162 mtCO₂e (9 percent of total emissions from this subsector), and Utah County, Utah with 1,849,060 mtCO₂e (8 percent of total emissions from this subsector).

Top emitting counties for the on-road transportation subsector	mtCO ₂ e	Percent of on-road transportation subsector emissions	Percent of transportation sector emissions	Percent of total plateau emissions
Garfield, CO	2,377,934	10.23%	9.08%	2.23%
Mesa, CO	2,107,162	9.07%	8.04%	1.98%
Utah, UT	1,849,060	7.96%	7.06%	1.74%
Total plateau emissions	106,550,612			
Total transportation sector emissions	26,202,965			24.59%
Total on-road transportation subsector emissions	23,242,424		88.70%	21.81%

Off-road transportation subsector

The off-road transportation subsector was the second-highest emitting subsector under the transportation sector on the plateau. It accounted for 2,065,683 mtCO₂e (7.9 percent of total emissions from the transportation sector, and 1.9 percent of total plateau emissions). This subsector accounts for emissions from vehicular activity that doesn't occur on a highway or paved road. It includes diesel and gasoline emissions from agricultural use, construction use, lawn and garden fuel use, recreational fuel use, military fuel use, and "other fuel use" (data is available for these categories). The top emitting counties in the off-road transportation subsector were Coconino County, Arizona with 284,043 mtCO₂e (13.7 percent of total emissions from this subsector), Mohave County, Arizona with 204,530 mtCO₂e (9.9 percent of total emissions from this subsector), and Apache County, Arizona with 180,530 mtCO₂e (8.7 percent of total emissions from this subsector).

Top emitting counties for the off-road transportation subsector	mtCO ₂ e	Percent of off-road transportation subsector emissions	Percent of transportation sector emissions	Percent of total plateau emissions
Coconino, AZ	284,043	13.75%	1.08%	0.27%
Mohave, AZ	204,530	9.90%	0.78%	0.19%
Apache, AZ	180,530	8.74%	0.69%	0.17%
Total plateau emissions	106,550,612			
Total transportation sector emissions	26,202,965			24.59%
Total off-road transportation subsector emissions	2,065,683		7.88%	1.94%

Aviation subsector

The aviation subsector was the third-highest emitting subsector under transportation. It accounted for 436,125 mtCO₂e, 0.4 percent of total plateau emissions across Colorado Plateau counties. Aviation accounts for the emissions produced by the burning of aviation gasoline and jet fuel in airplanes, helicopters, and other aircraft. The aviation sector was calculated using a percentage, taking the total amount of aviation gasoline used in the state, multiplied by the number of airports and heliports in each county, divided by the number of airports and heliports in the state. Leading counties for aviation emissions on the plateau were Yavapai County, Arizona, with 51,391 mtCO₂e (11.8 percent of total emissions from this subsector), Mesa County, Colorado with 49,535 mtCO₂e (11.4 percent of total emissions from this subsector), and Catron County, New Mexico with 44,100 mtCO₂e (10.1 percent of total emissions from this subsector).

Top emitting counties for the aviation subsector	mtCO ₂ e	Percent of aviation subsector emissions	Percent of transportation sector emissions	Percent of total plateau emissions
Yavapai, AZ	51,391	11.78%	0.20%	0.05%
Mesa, CO	49,535	11.36%	0.19%	0.05%
Catron, NM	44,100	10.11%	0.17%	0.04%
Total plateau emissions	106,550,612			
Total transportation sector emissions	26,202,965			24.59%
Total aviation subsector emissions	436,125		1.66%	0.41%

Railways subsector

The railways subsector was the fourth-highest emitting subsector under transportation. It accounted for 422,184 mtCO₂e across plateau counties (1.6 percent of total emissions from the transportation sector and 0.4 percent of total plateau emissions). This subsector accounts for emissions from diesel and electric engines when in operation. This number was calculated using the percentage of statewide railway miles per county, multiplied by state railway diesel use. The top emitting counties in this subsector were McKinley County, New Mexico with 86,927 mtCO₂e (20.6 percent of total emissions from this subsector), Cibola County, New Mexico with 31,457 mtCO₂e (7.5 percent of total emissions from this subsector), and Utah County, Utah with 31,301 mtCO₂e (7.4 percent of total emissions from this subsector).

Top emitting counties for the railways subsector	mtCO ₂ e	Percent of railways subsector emissions	Percent of transportation sector emissions	Percent of total plateau emissions
McKinley, NM	86,927	20.59%	0.33%	0.08%
Cibola, NM	31,457	7.45%	0.12%	0.03%
Utah, UT	31,301	7.41%	0.12%	0.03%
Total plateau emissions	106,550,612			
Total transportation sector emissions	26,202,965			24.59%
Total railways subsector emissions	422,184		1.61%	0.40%

Waterborne activity subsector

The waterborne activity subsector was the lowest emitting subsector under transportation with 36,594 mtCO₂e (0.14 percent of total emissions from the transportation sector and 0.03 percent of total plateau emissions). This included emissions from gasoline fuel used in boats on Lake Powell. It was calculated using the percentage of Lake Powell that falls within the plateau boundary. Counties with the most emissions in this subsector include Kane County, Utah with 17,694 mtCO₂e (48.4 percent of total emissions from this subsector), San Juan County, Utah with 12,035 mtCO₂e (32.9 percent of total emissions from this subsector), and Garfield County, Utah with 3,699 mtCO₂e (10.1 percent of total emissions from this subsector).

Top emitting counties for the waterborne activity subsector	mtCO ₂ e	Percent of waterborne activity subsector emissions	Percent of transportation sector emissions	Percent of total plateau emissions
Kane, UT	17,694	48.35%	0.07%	0.017%
San Juan, UT	12,035	32.89%	0.05%	0.011%
Garfield, UT	3,699	10.11%	0.01%	0.004%
Total plateau emissions	106,550,612			
Total transportation sector emissions	26,202,965			24.59%
Total waterborne activity subsector emissions	36,594		0.14%	0.03%

Fourth-Highest Emitter: Agriculture, Forestry, and Other Land Use (AFOLU) Emissions

The agriculture, forestry, and other land use (AFOLU) sector measures emissions from the methane produced by the digestive process in animals, namely livestock (enteric emissions), emissions from manure management, application of crop or soil amendments during agricultural processes such as lime (a soil additive made from pulverized limestone or chalk used to help maximize crop yields) and urea (a nitrogen fertilizer), direct and indirect nitrous oxide from managed soils, and biomass burning (emissions from wildfires). This sector emitted 4,623,225 mtCO₂e across plateau counties and accounted for 3.9 percent of total plateau county emissions. AFOLU is broken into the agriculture subsector and the biomass subsector. AFOLU was the fourth-highest emitting sector across Colorado Plateau counties.

Agriculture, forestry, and other land use (AFOLU)	mtCO ₂ e	Percent of total AFOLU sector emissions	Percent of total subsector emissions	Percent of total plateau emissions
Subsector				
Agriculture emissions	2,589,880	56.02%		2.43%
Biomass emissions	2,033,344	43.98%		1.91%
Total AFOLU sector emissions	4,623,225			4.34%
Source				
Enteric emissions	1,961,893	42.44%	75.75%	1.84%
Manure management emissions	482,663	10.44%	18.64%	0.45%
Lime and dolomite emissions	31,850	0.69%	1.23%	0.03%
Urea emissions	12,339	0.27%	0.48%	0.01%
Direct/indirect N ₂ O emissions	101,135	2.19%	3.91%	0.09%

Key problem areas, opportunities for emissions reduction in the AFOLU sector

The counties with the highest emissions from AFOLU were Utah County, Utah, with 712,601 mtCO₂e (15.4 percent of total emissions from the AFOLU sector), Coconino County, Arizona with 293,797 mtCO₂e (6.4 percent of total emissions from AFOLU), and Duchesne County, Utah with 221,991 mtCO₂e (4.8 percent of total emissions from AFOLU). The agriculture subsector accounted for the majority of AFOLU emissions, with emissions from biomass (wildfires) following closely behind.

Top emitting counties for the AFOLU Sector	mtCO ₂ e	Percent of AFOLU sector emissions	Percent of total plateau emissions
Utah, UT	712,601	15.41%	0.67%
Coconino, AZ	293,797	6.35%	0.28%
Duchesne, UT	221,991	4.80%	0.21%
Total plateau emissions	106,550,612		
Total AFOLU sector emissions	4,623,225		4.34%

Agriculture subsector

The agriculture subsector was the highest emitting subsector under AFOLU. This subsector emitted 2,589,880 mtCO₂e across plateau counties (56 percent of total AFOLU emissions and 2.4 percent of total plateau emissions). The top emitting counties for this subsector were Utah County, Utah with 218,266 mtCO₂e (8.4 percent of total emissions from this subsector), Millard County, Utah with 195,528 mtCO₂e (7.5 percent of total emissions from this subsector), and Sanpete County, Utah with 168,563 mtCO₂e (6.5 percent of total emissions from this subsector). The agriculture subsector is broken into the following sources: enteric emissions, manure management, liming emissions, urea emissions, and direct and indirect N₂O emissions.

Top emitting counties for the agriculture subsector	mtCO ₂ e	Percent of agriculture subsector emissions	Percent of AFOLU sector emissions	Percent of total plateau emissions
Utah, UT	218,266	8.43%	4.72%	0.20%
Millard, UT	195,528	7.55%	4.23%	0.18%
Sanpete, UT	168,563	6.51%	3.65%	0.16%
Total plateau emissions	106,550,612			
Total AFOLU sector emissions	4,623,225			4.34%
Total agriculture subsector emissions	2,589,880		56.02%	2.43%

Enteric emissions source

Emissions from the enteric emissions source were highest with 1,961,893 mtCO₂e (75.7 percent of total emissions from this subsector, 2.6 percent of total emissions from the AFOLU sector, and 1.8 percent of total plateau emissions). Counties with the highest emissions from this source were Utah County, Utah with 119,719 mtCO₂e (6.1 percent of total emissions from this source), Sanpete County, Utah with 116,417 mtCO₂e (5.9 percent of total emissions from this source), and Millard County, Utah with 111,646 mtCO₂e (5.6 percent of total emissions from this source).

Top emitting counties for the enteric emissions source	mtCO ₂ e	Percent of enteric emissions source emissions	Percent of agriculture subsector emissions	Percent of AFOLU sector emissions	Percent of total plateau emissions
Utah, UT	119,719	6.10%	4.62%	2.59%	0.11%
Sanpete, UT	116,417	5.93%	4.50%	2.52%	0.11%
Millard, UT	111,646	5.69%	4.31%	2.41%	0.10%
Total plateau emissions	106,550,612				
Total AFOLU sector emissions	4,623,225				4.34%
Total agriculture subsector emissions	2,589,880			56.02%	2.43%
Total enteric emissions source emissions	1,961,893		75.75%	42.44%	1.84%

Manure management source

Emissions from the manure management source were the second-highest emitting source in this subsector with 482,663 mtCO₂e (17.6 percent of total emissions from this subsector, and 0.4 percent of total plateau emissions). Counties with the highest emissions from this source were Utah County, Utah with 92,359 mtCO₂e (19.1 percent of total emissions from this source), Millard County, Utah, with 74,164 mtCO₂e (15.4 percent of total emissions from this source), and Iron County, Utah with 68,888 mtCO₂e (14.3 percent of total emissions from this source).

Top emitting counties for the manure management emissions source	mtCO ₂ e	Percent of manure management source emissions	Percent of agriculture subsector emissions	Percent of AFOLU sector emissions	Percent of total plateau emissions
Utah, UT	92,359	19.14%	3.57%	2.00%	0.09%
Millard, UT	74,164	15.37%	2.86%	1.60%	0.07%
Iron, UT	68,888	14.27%	2.66%	1.49%	0.06%
Total plateau emissions	106,550,612				
Total AFOLU sector emissions	4,623,225				4.34%
Total agriculture subsector emissions	2,589,880			56.02%	2.43%
Total manure management source emissions	482,663		18.64%	10.44%	0.45%

Fertilizer use on agriculture lands source

Emissions from the fertilizer use on agricultural lands source was the third-highest emitting source under this subsector, with 101,135 mtCO₂e (3.9 percent of total emissions from the agriculture subsector, 2.2 percent of total emissions from the AFOLU sector, and 0.1 percent of total plateau emissions). Counties with the highest emissions for this source were Coconino County, Arizona with 12,438 mtCO₂e (12.3 percent of total emissions from this source), Apache County, Arizona with 9,704 mtCO₂e (9.6 percent of total emissions from this source), and Emery County, Utah with 7,461 mtCO₂e (7.4 percent of total emissions from this source).

Top emitting counties for the fertilizer use on agriculture lands source	mtCO ₂ e	Percent of fertilizer use on ag. lands source emissions	Percent of agriculture subsector emissions	Percent of AFOLU sector emissions	Percent of total plateau emissions
Coconino, AZ	12,438	12.30%	0.48%	0.27%	0.012%
Apache, AZ	9,704	9.59%	0.37%	0.21%	0.009%
Emery, UT	7,461	7.38%	0.29%	0.16%	0.007%
Total plateau emissions	106,550,612				
Total AFOLU sector emissions	4,623,225				4.34%
Total agriculture subsector emissions	2,589,880			56.02%	2.43%
Total fertilizer use on ag. land source emissions	101,135		3.91%	2.19%	0.09%

Liming emissions source

Emissions from lime application was the fourth-highest emitting source under the agriculture subsector with 31,850 mtCO_{2e} (1.2 percent of total emissions from the agriculture subsector, and 0.7 percent of total emissions from the AFOLU sector). Counties with the highest emissions from this source were Emery County, Utah with 3,773 mtCO_{2e}, San Juan County, Utah with 3,247 mtCO_{2e}, and Millard County, Utah with 2,911 mtCO_{2e}.

Top emitting counties for the liming emissions source	mtCO _{2e}	Percent of liming emissions source	Percent of agriculture subsector emissions	Percent of AFOLU sector emissions	Percent of total plateau emissions
Emery, UT	3,773	11.85%	0.15%	0.08%	0.004%
San Juan, UT	3,247	10.19%	0.13%	0.07%	0.003%
Millard, UT	2,911	9.14%	0.11%	0.06%	0.003%
Total plateau emissions	106,550,612				
Total AFOLU sector emissions	4,623,225				4.34%
Total agriculture subsector emissions	2,589,880			56.02%	2.43%
Total liming emissions source emissions	31,850		1.23%	0.69%	0.03%

Urea emissions source

Urea application to agricultural land was the source with the least emissions under the agriculture subsector with 12,339 mtCO_{2e} (0.5 percent of total emissions from the agriculture subsector, and 0.3 percent of total emissions from the AFOLU sector). Counties with the highest emissions from urea were Emery County, Utah with 1,362 mtCO_{2e} (11 percent of total emissions from this source), San Juan County, Utah with 1,172 mtCO_{2e} (9.5 percent of total emissions from this source), and Millard County, Utah with 1,050 mtCO_{2e} (8.5 percent of total emissions from this source).

Top emitting counties for the urea emissions source	mtCO _{2e}	Percent of urea emissions source	Percent of agriculture subsector emissions	Percent of AFOLU sector emissions	Percent of total plateau emissions
Emery, UT	1,362	11.03%	0.05%	0.03%	0.0013%
San Juan, UT	1,172	9.50%	0.05%	0.03%	0.0011%
Millard, UT	1,050	8.51%	0.04%	0.02%	0.0010%
Total plateau emissions	106,550,612				
Total AFOLU sector emissions	4,623,225				4.34%
Total agriculture subsector emissions	2,589,880			56.02%	2.43%
Total urea source emissions	12,339		0.48%	0.27%	0.01%

Biomass subsector

The biomass subsector was the second-highest emitting subsector under AFOLU with 2,033,244 mtCO₂e (43.9 percent of total emissions from the AFOLU source, and 1.9 percent of total plateau emissions). This subsector accounts for emissions from wildfires. The counties with the highest emissions from wildfires were Utah County, Utah with 494,335 mtCO₂e (24.3 percent of total emissions from this subsector), Coconino County, Arizona with 193,700 mtCO₂e (9.5 percent of total emissions from this subsector), and Catron County, New Mexico with 177,210 mtCO₂e (8.7 percent of total emissions from this subsector).

Top emitting counties for the biomass subsector	mtCO ₂ e	Percent of biomass subsector emissions	Percent of AFOLU sector emissions	Percent of total plateau emissions
Utah, UT	494,335	24.31%	10.69%	0.46%
Coconino, AZ	193,700	9.53%	4.19%	0.18%
Catron, NM	177,210	8.72%	3.83%	0.17%
Total plateau emissions	106,550,612			
Total AFOLU sector emissions	4,623,225			4.34%
Total biomass subsector emissions	2,033,244		43.98%	1.91%

Fifth-Highest Emitter: Industrial Processes and Product Use (IPPU)

The industrial processes and product use (IPPU) sector measures emissions from the following sources: cement production, electronics manufacturing, and lime production across Colorado Plateau counties. This sector accounted for 3,408,638 mtCO₂e, or 3.2 percent of total plateau county emissions. IPPU was the fifth-highest emitting sector across Colorado Plateau counties.

Industrial processes and product use (IPPU)	mtCO ₂ e	Percent of total IPPU sector emissions	Percent of total plateau emissions
Subsector			
Cement production emissions	1,811,961	53.16%	1.70%
Lime production emissions	1,302,675	38.22%	1.22%
Electronics manufacturing emissions	294,002	8.63%	0.28%
Total IPPU sector emissions	3,408,638		3.20%

Key problem areas, opportunities for emissions reduction in the IPPU sector

The counties with the highest emissions from IPPU were Yavapai County, Arizona, with 1,964,302 mtCO₂e (57.6 percent of total emissions from this sector), Juab County, Utah, with 658,070 mtCO₂e (19.3 percent of total emissions from this sector), and Millard County, Utah with 492,263 mtCO₂e (14.4 percent of total emissions from this sector). The inventory measured emissions from seven facilities.

Top emitting counties for the IPPU sector	mtCO ₂ e	Percent of IPPU sector emissions	Percent of total plateau emissions
Yavapai, AZ	1,964,302	57.63%	1.84%
Juab, UT	658,070	19.31%	0.62%
Millard, UT	492,263	14.44%	0.46%
Total plateau emissions	106,550,612		
Total IPPU sector emissions	3,408,638		3.20%

Top emitting facilities

The highest emitting facility was Lhoist North America, a lime production facility located in Yavapai County Arizona, with 810,412 mtCO₂e (23.8 percent of total emissions from this sector). Ash Grove Cement Company in Leamington, a cement production facility located in Juab County, Utah was the second-highest emitting facility with 658,070 mtCO₂e (19.3 percent of total emissions from this sector). The third-highest emitting facility was Phoenix Cement Company's Clarkdale Facility, a cement production facility located in Yavapai County, Arizona with 652,949 mtCO₂e (19.2 percent of total emissions from this sector).

Top emitting facilities for the IPPU Sector	mtCO ₂ e	Percent of IPPU sector emissions	Percent of total plateau emissions
Lhoist North America	810,412	23.78%	0.76%
Ash Grove Cement Company Leamington	658,070	19.31%	0.62%
Phoenix Cement Company's Clarkdale Facility	652,949	19.16%	0.61%
Total plateau emissions	106,550,612		
Total IPPU sector emissions	3,408,638		3.20%

Cement production subsector

The cement production subsector was the highest emitting subsector under IPPU with 1,811,961 mtCO₂e (53.2 percent of total emissions from the IPPU sector). The highest emitting counties for this subsector were Yavapai County, Arizona with 1,153,980 mtCO₂e (63.7 percent of total emissions for this subsector) and Juab County, Utah with 658,070 mtCO₂e (19.3 percent of total emissions from this subsector). Cement production emissions in Yavapai County were from Phoenix Cement Company's Clarkdale facility (652,949 mtCO₂e), and Drake Cement (500,941 mtCO₂e). Emissions in Juab County were from Ash Grove Cement Company in Leamington (658,070 mtCO₂e).

Top emitting counties for the cement subsector	mtCO ₂ e	Percent of cement subsector emissions	Percent of IPPU sector emissions	Percent of total plateau emissions
Yavapai, AZ	1,153,890	63.68%	33.85%	1.08%
Juab, UT	658,070	36.32%	19.31%	0.62%
Total plateau emissions	106,550,612			
Total IPPU sector emissions	3,408,638			3.20%
Total cement subsector emissions	1,811,961		53.16%	1.70%

Lime production subsector

The lime production subsector was the second-highest emitting subsector under the IPPU sector with 1,302,675 mtCO₂e (38.2 percent of total emissions from the IPPU sector). The highest emitting counties for this subsector were Yavapai County, Arizona with 810,412 mtCO₂e (62.2 percent of total emissions for this subsector) and Millard County, Utah with 492,263 mtCO₂e (37.8 percent of total emissions from this subsector). Lime production emissions from Yavapai County, Arizona were from Lhoise North America (810,412 mtCO₂e). Lime production emissions from Millard County were from Graymont Western U.S. Inc., Cricket Mountain (492,263 mtCO₂e).

Top emitting counties for the lime production subsector	mtCO ₂ e	Percent of lime production subsector emissions	Percent of IPPU sector emissions	Percent of total plateau emissions
Yavapai, AZ	810,412	62.21%	23.78%	0.76%
Millard, UT	492,263	37.79%	14.44%	0.46%
Total plateau emissions	106,550,612			
Total IPPU sector emissions	3,408,638			3.20%
Total lime production subsector emissions	1,302,675		38.22%	1.22%

Electronics manufacturing subsector

The electronics manufacturing subsector was the third-largest emitting subsector under IPPU with 294,002 mtCO₂e (8.6 percent of total IPPU emissions). The highest emitting counties for this subsector were Utah County, Utah with 253,818 mtCO₂e (86.3 percent of total emissions from this subsector) and Sandoval County, New Mexico with 40,184 mtCO₂e (13.7 percent of total emissions from this subsector). Electronics manufacturing emissions in Utah County, Utah were from I.M. Flash Technologies, LLC (253,818 mtCO₂e). Electronics manufacturing emissions in Sandoval County, New Mexico were from Intel Corporation Rio Rancho Facility (40,184 mtCO₂e).

Top emitting counties for the electronics manufacturing subsector	mtCO ₂ e	Percent of electronics manufacturing subsector emissions	Percent of IPPU sector emissions	Percent of total plateau emissions
Utah, UT	253,818	86.33%	7.45%	0.24%
Sandoval, NM	40,184	13.67%	1.18%	0.04%
Total plateau emissions	106,550,612			
Total IPPU sector emissions	3,408,638			3.20%
Total electronics manufacturing subsector emissions	294,002		8.63%	0.28%

Sixth-Highest Emitter: Waste

The waste sector includes emissions from the generation and disposal of community-generated solid waste, residential and commercial waste, construction and demolition waste, and industrial waste. It was the sixth-highest emitting sector across Colorado Plateau counties, contributing 1.9 percent and 2,228,789 mtCO₂e of total emissions across Colorado Plateau counties. This sector is broken down into the solid waste and wastewater subsectors.

Waste	mtCO ₂ e	Percent of total waste sector emissions	Percent of total subsector emissions	Percent of total plateau emissions
Subsector				
Total solid waste emissions	2,027,601	90.97%		1.90%
Total wastewater emissions	201,188	9.03%		0.19%
Total waste sector emissions	2,228,789			2.09%
Sources				
Municipal solid waste	1,861,356	83.51%	91.80%	1.75%
Construction and demolition waste	46,074	2.07%	2.27%	0.04%
Industrial waste	120,171	5.39%	5.93%	0.11%
Emissions avoided from recycling	(691,628)	-31.03%	-34.11%	-0.65%
Wastewater treatment plants	24,020	1.08%	11.94%	0.02%
Septic systems	175,680	7.88%	87.32%	0.16%
Lagoons	1,488	0.07%	0.74%	0.001%

Key problem areas, opportunities for emissions reduction in the waste sector

Solid waste produced 91 percent of emissions in the waste sector, and Utah county, Utah produced 31.4 percent of those emissions.

Solid waste subsector

The solid waste subsector includes emissions from community-generated waste and measures methane generated from landfills. It accounted for 2,027,601 mtCO₂e across plateau counties (91 percent of total emissions from the waste sector, and 1.9 percent of total plateau emissions). Counties with the highest emissions in this subsector include Utah County, Utah, with 653,943 mtCO₂e (32.3 percent of total emissions from this subsector), Mohave County, Arizona with 209,829mtCO₂e (10.4 percent of total emissions from this subsector), and Navajo County, Arizona with 136,635 mtCO₂e (6.7 percent of total emissions from this subsector). The solid waste subsector is broken down into the following sources: municipal solid waste, construction and demolition waste, industrial waste, and emissions avoided from recycling.

Top emitting counties for the solid waste subsector	mtCO ₂ e	Percent of solid waste subsector emissions	Percent of waste sector emissions	Percent of total plateau emissions
Utah, UT	653,943	32.25%	29.34%	0.61%
Mohave, AZ	209,829	10.35%	9.41%	0.20%
Navajo, AZ	136,635	6.74%	6.13%	0.13%
Total plateau emissions	106,550,612			
Total waste sector emissions	2,228,789			2.09%
Total solid waste subsector emissions	2,027,601		90.97%	1.90%

Municipal solid waste source

The municipal solid waste source was the highest source of emissions in the solid waste subsector across plateau counties with 1,861,356 mtCO₂e (91.8 percent of total emissions from this subsector, and 1.8 percent of total plateau emissions). Plateau counties with the highest emissions in this source were Utah County, Utah with 617,837 mtCO₂e (33.2 percent of total emissions from this source), Mohave County, Arizona with 209,829 mtCO₂e (11.3 percent of total emissions from this source), and Yavapai County, Arizona with 112,796mtCO₂e (1.1 percent of total emissions from this source).

Top emitting counties for the municipal solid waste source	mtCO ₂ e	Percent of municipal solid waste source emissions	Percent of solid waste subsector emissions	Percent of waste sector emissions	Percent of total plateau emissions
Utah, UT	617,837	33.19%	30.47%	27.72%	0.58%
Mohave, AZ	209,829	11.27%	10.35%	9.41%	0.20%
Yavapai, AZ	112,796	6.06%	5.56%	5.06%	0.11%
Total plateau emissions	106,550,612				
Total waste sector emissions	2,228,789				2.09%
Total solid waste subsector emissions	2,027,601			90.97%	1.90%
Total municipal solid waste source emissions	1,861,356		91.80%	83.51%	1.75%

Industrial waste source

The industrial waste source was the second-highest emitting source in the solid waste subsector with 120,171 mtCO₂e (5.9 percent of emissions from the solid waste subsector, and 5.4 percent of total emissions from the waste sector). Counties with the highest emissions in this source were Navajo County, Arizona with 110,734 mtCO₂e (92.2 percent of total emissions from this source) and Utah County, Utah with 9,437 mtCO₂e (7.9 percent of total emissions from this source).

Top emitting counties for the industrial waste source	mtCO ₂ e	Percent of industrial waste source emissions	Percent of solid waste subsector emissions	Percent of waste sector emissions	Percent of total plateau emissions
Navajo, AZ	110,734	92.15%	5.46%	4.97%	0.10%
Utah, UT	9,437	7.85%	0.47%	0.42%	0.01%
Total plateau emissions	106,550,612				
Total waste sector emissions	2,228,789				2.09%
Total solid waste subsector emissions	2,027,601			90.97%	1.90%
Total industrial waste source emissions	120,171		5.93%	5.39%	0.11%

Construction and demolition waste source

The construction and demolition waste source was the lowest emitting source in the solid waste subsector with 46,074 mtCO₂e (2.3 percent of total emissions from the solid waste subsector and 0.04 percent of total plateau emissions). Counties with the highest emissions in this source were Utah County, Utah with 26,669 mtCO₂e (57.9 percent of total emissions from this source), Yavapai County, Arizona with 5,064 mtCO₂e (11 percent of total emissions from this source), and Iron County, Utah with 2,244 mtCO₂e (4.9 percent of total emissions from this source).

Top emitting counties for the construction and demolition waste source	mtCO ₂ e	Percent of construction & demolition waste source emissions	Percent of solid waste subsector emissions	Percent of waste sector emissions	Percent of total plateau emissions
Utah, UT	26,669	57.88%	1.32%	1.20%	0.025%
Yavapai, AZ	5,064	10.99%	0.25%	0.23%	0.005%
Iron, UT	2,244	4.87%	0.11%	0.10%	0.002%
Total plateau emissions	106,550,612				
Total waste sector emissions	2,228,789				2.09%
Total solid waste subsector emissions	2,027,601			90.97%	1.90%
Total construction and demolition waste source emissions	46,074		2.27%	2.07%	0.04%

Emissions avoided from recycling source

Colorado Plateau counties avoided 691,628 mtCO_{2e} from recycling efforts. While we can't subtract this from total waste generated across plateau counties, without recycling there would have been 34 percent more emissions from solid waste and 0.6 percent more emissions across the entire Colorado Plateau. Mesa County, Colorado avoided the greatest number of emissions from recycling efforts, at 146,401 mtCO_{2e} (21.2 percent of total emissions from this source). Without recycling, Mesa County would have contributed 7.2 percent more emissions to the solid waste subsector. Yavapai County, Arizona avoided 110,049 mtCO_{2e} (15.9 percent of total emissions from this source). Without recycling, Yavapai County would have contributed 5.4 percent more emissions to the solid waste sector. Sandoval County, New Mexico avoided 82,045 mtCO_{2e} (11.9 percent of total emissions from this source). Without recycling, Sandoval County would have contributed 4.1 percent more emissions to the solid waste subsector.

Top counties with emissions avoided from recycling	mtCO _{2e}	Percent of emissions avoided from recycling source	Percent of solid waste subsector emissions	Percent of waste sector emissions	Percent of total plateau emissions
Mesa, CO	146,401	21.17%	7.22%	6.57%	0.14%
Yavapai, AZ	110,049	15.91%	5.43%	4.94%	0.10%
Sandoval, NM	82,045	11.86%	4.05%	3.68%	0.08%
Total plateau emissions	106,550,612				
Total waste sector emissions	2,228,789				2.09%
Total solid waste subsector emissions	2,027,601			90.97%	1.90%
Total emissions avoided from recycling	691,628		34.11%	31.03%	0.65%

Wastewater subsector

The wastewater subsector refers to both process and fugitive emissions of nitrous oxide and methane from the treatment of wastewater in wastewater treatment plants, lagoons, and septic tanks. It accounted for 201,188 mtCO_{2e} (9 percent of total emissions from the waste sector and 0.2 percent of total emissions across Colorado Plateau counties). Plateau counties with the highest emissions in this subsector were Utah County, Utah, with 33,014 mtCO_{2e} (16.4 percent of total emissions from this subsector), Mohave County, Arizona with 22,048 mtCO_{2e} (11 percent of total emissions from this subsector), and Yavapai County, Arizona with 18,868 mtCO_{2e} (9.4 percent of total emissions from this subsector). Washington County, Utah was close behind with 18,647 mtCO_{2e}. The wastewater subsector is broken into the following sources: wastewater treatment plants, septic systems, and lagoons.

Top emitting counties for the wastewater subsector	mtCO _{2e}	Percent of wastewater subsector emissions	Percent of waste sector emissions	Percent of total plateau emissions
Utah, UT	33,014	16.41%	1.48%	0.03%
Mohave, AZ	22,048	10.96%	0.99%	0.02%
Yavapai, AZ	18,868	9.38%	0.85%	0.02%
Total plateau emissions	106,550,612			
Total waste sector emissions	2,228,789			2.09%
Total wastewater subsector emissions	201,188		9.03%	0.19%

Septic systems source

The septic systems source had the highest emissions in the wastewater subsector across counties with 175,680 mtCO₂e (8.7 percent of total emissions for the wastewater subsector, and 7.9 percent of total emissions for the waste sector). Utah County, Utah had the highest emissions from this source with 25,062 mtCO₂e (14.3 percent of total emissions from this source). Mohave County, Arizona had the second-highest with 21,442 mtCO₂e (12.2 percent of total emissions from this source), followed by Washington County, Utah with 18,592mtCO₂e (10.6 percent of total emissions from this source).

Top emitting counties for the septic systems source	mtCO ₂ e	Percent of septic systems source emissions	Percent of wastewater subsector emissions	Percent of waste sector emissions	Percent of total plateau emissions
Utah, UT	25,062	14.27%	12.46%	1.12%	0.024%
Mohave, AZ	21,442	12.21%	10.66%	0.96%	0.020%
Washington, UT	18,592	10.58%	9.24%	0.83%	0.017%
Total plateau emissions	106,550,612				
Total waste sector emissions	2,228,789				2.09%
Total wastewater subsector emissions	201,188			9.03%	0.19%
Total septic systems source emissions	175,680		8.66%	7.88%	0.16%

Wastewater treatment plants source

Wastewater treatment plants was the second-highest emitting source in the wastewater subsector with 24,020 mtCO₂e (1.2 percent of total emissions from the wastewater subsector). Utah County, Utah had the highest emissions from this source with 7,952 mtCO₂e (33.1 percent of total emissions from this source), followed by Sandoval County, New Mexico with 2,342 mtCO₂e (9.8 percent of total emissions from this source), and then by Mesa County, Colorado with 2,047mtCO₂e (8.5 percent of total emissions from this source).

Top emitting counties for the wastewater treatment plants source	mtCO ₂ e	Percent of wastewater treatment plants source emissions	Percent of wastewater subsector emissions	Percent of waste sector emissions	Percent of total plateau emissions
Utah, UT	7,952	33.11%	3.95%	0.36%	0.007%
Sandoval, NM	2,342	9.75%	1.16%	0.11%	0.002%
Mesa, CO	2,047	8.52%	1.02%	0.09%	0.002%
Total plateau emissions	106,550,612				
Total waste sector emissions	2,228,789				2.09%
Total wastewater subsector emissions	201,188			9.03%	0.19%
Total wastewater treatment plants source emissions	24,020		1.18%	1.08%	0.02%

Lagoons source

The lagoons source had the least emissions with 1,488 mtCO₂e (0.04 percent of emissions from the wastewater subsector). Coconino County, Arizona had the highest emissions from this source with 868 mtCO₂e (58.3 percent of total emissions from this source), followed by Montezuma County, Colorado with 445 mtCO₂e (29.9 percent of total emissions from this source), and then by Navajo County, Arizona with 118 mtCO₂e (7.9 percent of total emissions from this source).

Top emitting counties for the lagoons source	mtCO ₂ e	Percent of lagoons source emissions	Percent of wastewater subsector emissions	Percent of waste sector emissions	Percent of total plateau emissions
Coconino, AZ	868	58.31%	0.043%	0.04%	0.0008%
Montezuma, CO	445	29.94%	0.022%	0.02%	0.0004%
Navajo, AZ	118	7.95%	0.006%	0.01%	0.0001%
Total plateau emissions	106,550,612				
Total waste sector emissions	2,228,789				2.09%
Total wastewater subsector emissions	201,188			9.03%	0.19%
Total lagoons source emissions	1,488		0.07%	0.07%	0.001%

A Note on Carbon Sequestration

Carbon sequestration accounts for carbon as it is absorbed through different land types and land uses across the region. It includes forests, croplands, grasslands, wetlands, and other lands such as open space parks. There were an estimated 2,480,633 metric tons of carbon stored across the entire region, the majority of which was stored in grasslands or shrublands. While this total can't be subtracted from total plateau emissions, it is important to preserve these carbon sinks.

Conclusion

The highest value opportunities for emissions reductions across the Colorado Plateau fall under the stationary energy sector, which accounts for 36 percent of total plateau emissions. Within this sector, the electricity generation subsector accounts for roughly 74 percent of total emissions from the stationary energy sector, and 26 percent of emissions across the Colorado Plateau.

Not far behind the stationary energy sector, the fugitive emissions sector accounts for roughly 30 percent of total emissions on the Colorado Plateau. Within this sector, the oil and gas subsector accounts for 60 percent of total sector emissions, and roughly 18 percent of total emissions across the Colorado Plateau.

Finally, the transportation sector accounts for about 25 percent of total plateau emissions, the majority of these emissions coming from on-road transportation. On-road transportation accounted for roughly 22 percent of total emissions across the Colorado Plateau, and 89 percent of total emissions from the transportation subsector.

Achieving carbon neutrality on the Colorado Plateau will require substantial actions from diverse stakeholders and communities. The Trust will be able to conduct the most meaningful and impactful work through initiatives that support emissions reductions in the electricity generation subsector and support the necessary infrastructure to do so. The Trust will also support a full suite of oil and gas regulatory reform, and emissions controls within this subsector. And as climate change and environmental justice go hand in hand, the Trust will support the advancement of innovation, technology, and environmental justice, to ensure that all communities progress together toward a more carbon neutral future, and that underserved communities, including Indigenous and communities of color, are not once again left behind to shoulder disproportionate impacts from climate change.



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