Pacific Northwest
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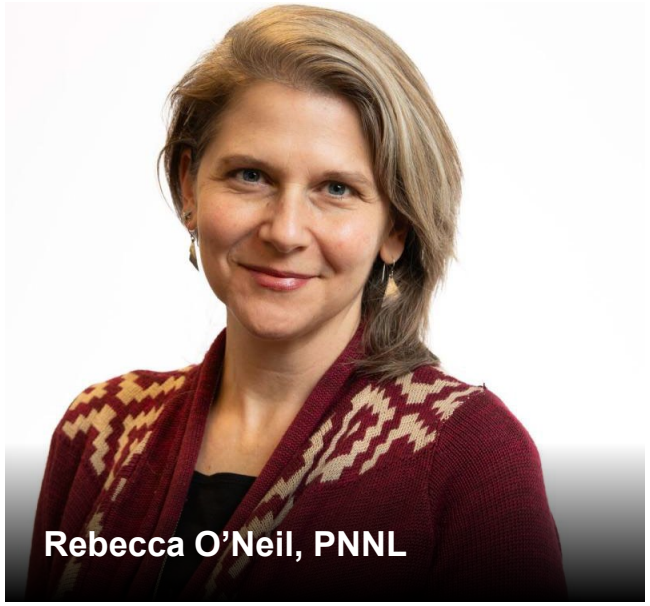
How Wildfire Affects Energy Affordability



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The Burn Rate: How Wildfire Impacts Energy Affordability

WILDFIRE RISK & RESILIENCE @PNNL

https://www.pnnl.gov/projects/wildfire-risk-resilience/changing-utility-business-models

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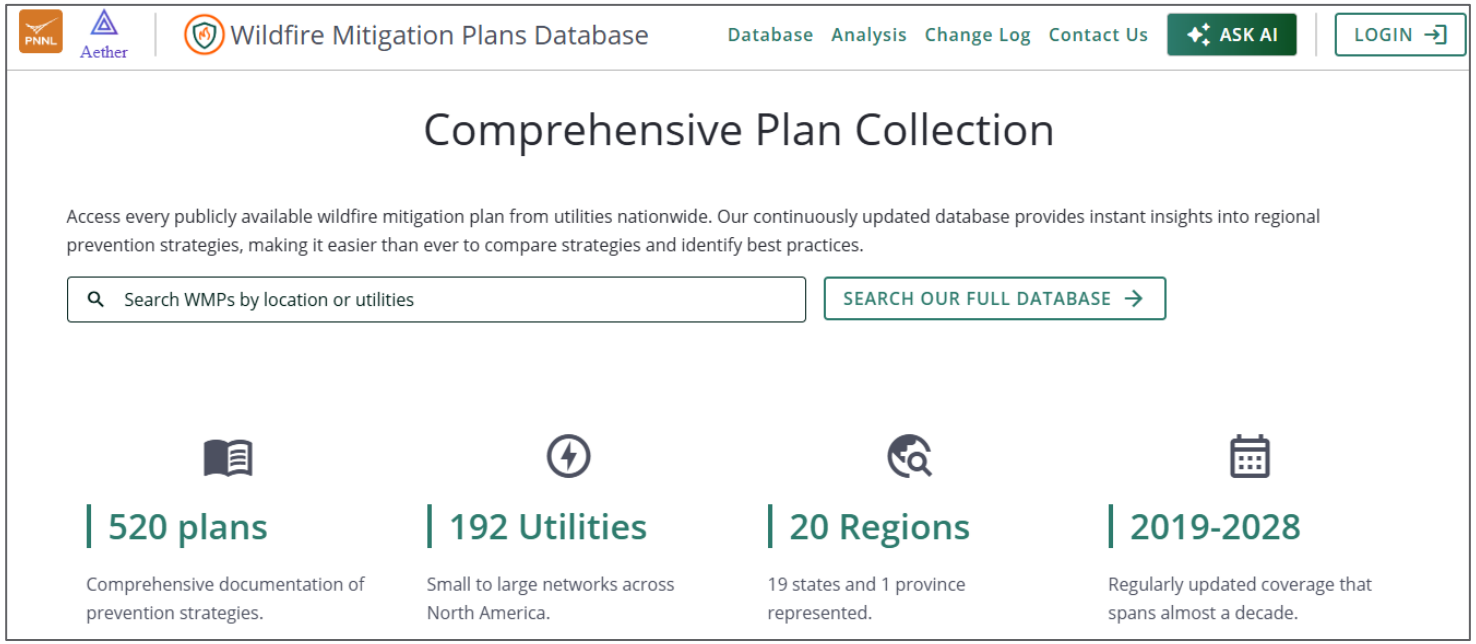
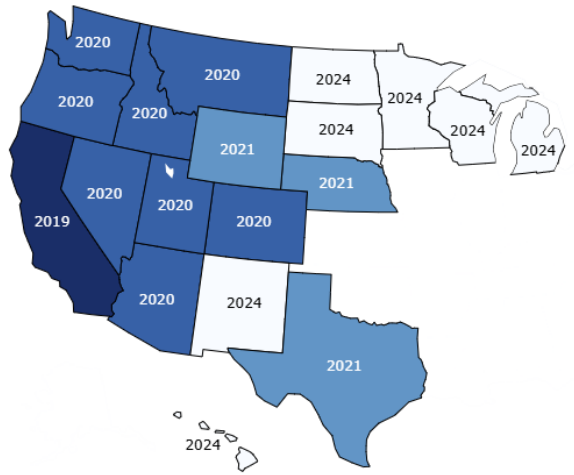
U.S. DEPARTMENT of ENERGY BATTELLE

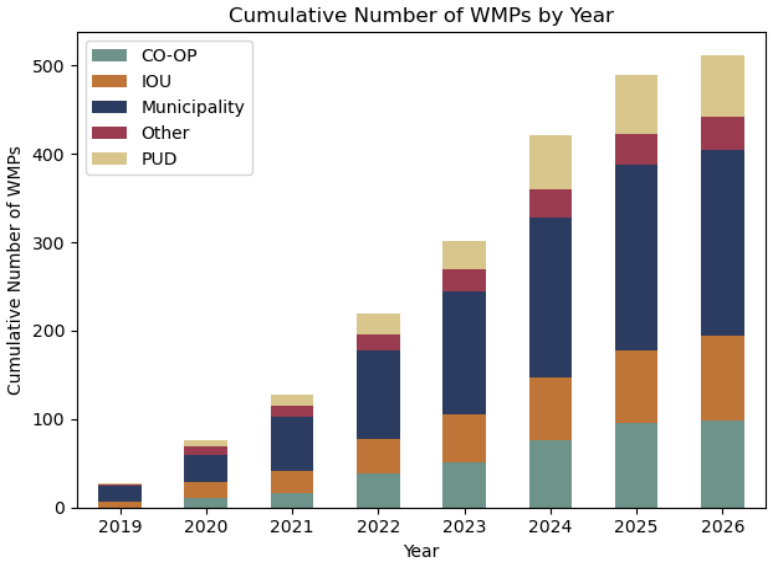
PNNL is operated by Battelle for the U.S. Department of Energy

PNNL-SA-223453

Wildfire Mitigation Plan Database







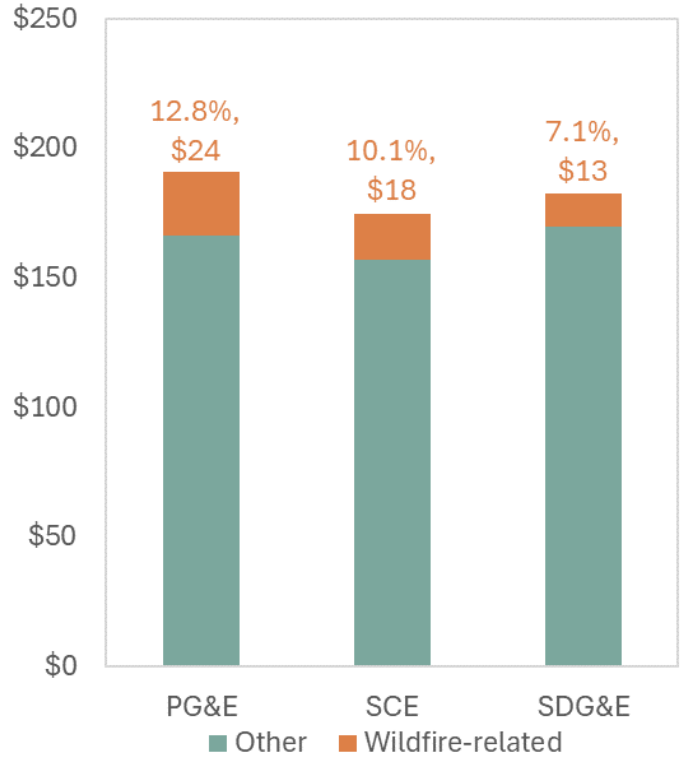
https://wildfire.pnnl.gov/mitigationPlans/

Direct and indirect wildfire costs are increasing electricity customer rates

- **Wildfire risk leads to increased direct and indirect costs for electric utilities and ratepayers:**
  - Utility direct spend on mitigation to protect infrastructure *from* wildfire (heat, wind, smoke).
  - Utility direct spend on mitigation to prevent ignition (grid hardening, vegetation management).
  - Utility direct spend on increased costs for risk coverage instruments (e.g. insurance).
  - Downgraded credit ratings and increased utility cost of capital, which translates to higher ratepayer costs.
- Among utilities with explicit wildfire mitigation charges, impacts vary by customer class, at **~0.11¢–0.60¢/kWh**, with an average near **0.30¢/kWh**.

For detailed information see: PNNL, Cost Recovery Mechanisms for Utility Wildfire Mitigation, 2026.

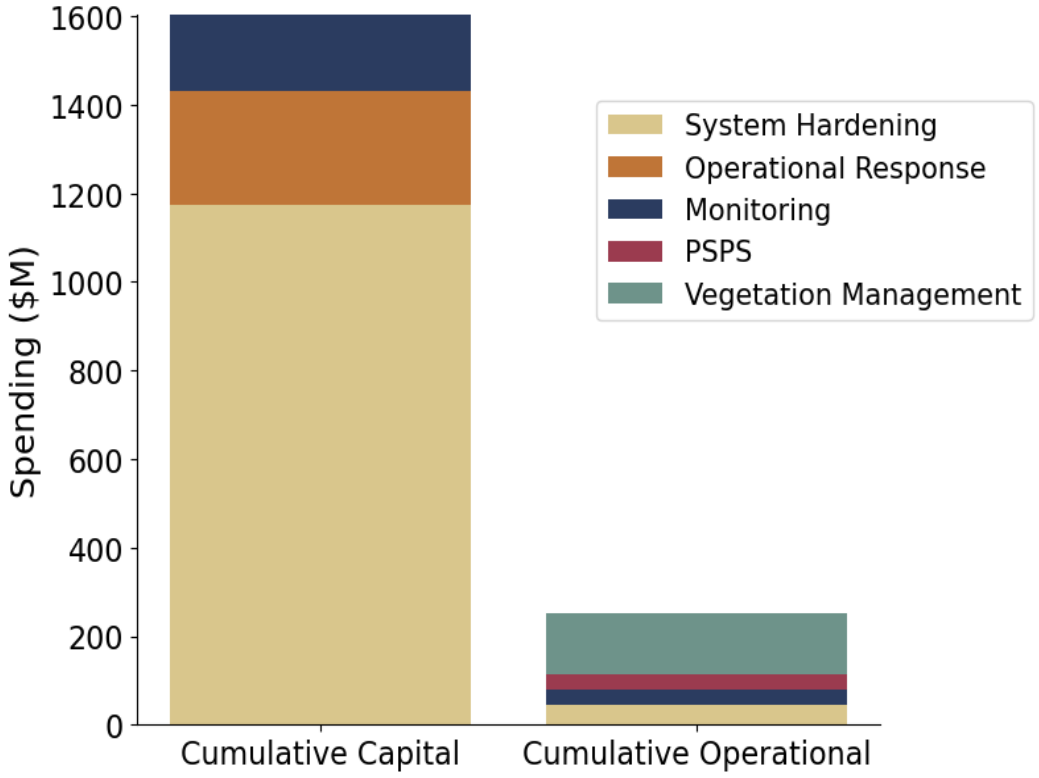
Utility wildfire-related spending (including insurance and mitigation) accounted for ~7-13% of an average residential customer's monthly electricity bill in 2023 across California's investor-owned utilities.



Data from California Public Utilities Commission 2024

Wildfire mitigation spending can take many forms

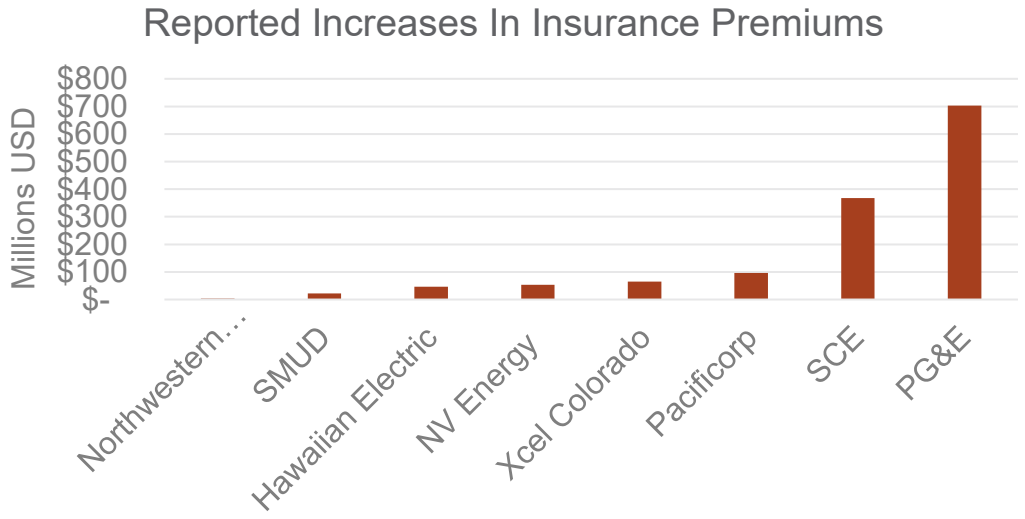
For example, Xcel Energy's 2025-2027 proposed wildfire mitigation plan in Colorado includes $1.6B in capital expenditures and $250M in operations and maintenance.

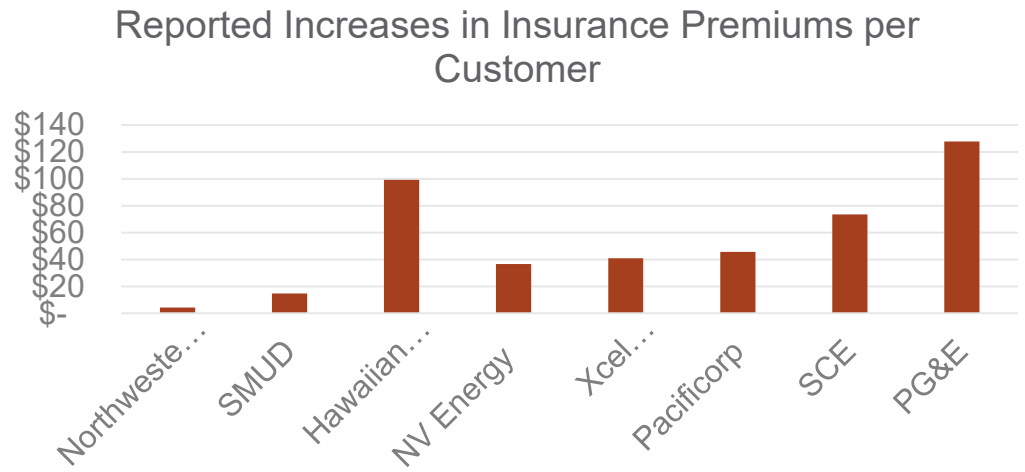


Total proposed spending for 2025-2027: $1.9 billion
Data from Xcel Energy 2024b

- **Grid Design and System Hardening**: Pole replacement and reinforcements, installation of automation equipment and covered conductor installations.
- **Vegetation Management**: Inspection schedules, application of herbicides, pruning, tree removal procedures, and more advanced methods.
- **Wildfire Condition Monitoring**: Situational awareness (aerial surveillance data) and forecasting modeling to predict wildfire conditions.
- **Operational Response**: Tracking wildfires, immediate reactive de-energizing, new technologies.
- **Public Safety Power Shutoff (PSPS) and related enhancements**: Selective de-energization of power lines to avoid igniting wildfire. (Wildfire Mitigation Plans Analysis View *see trackers at link*)

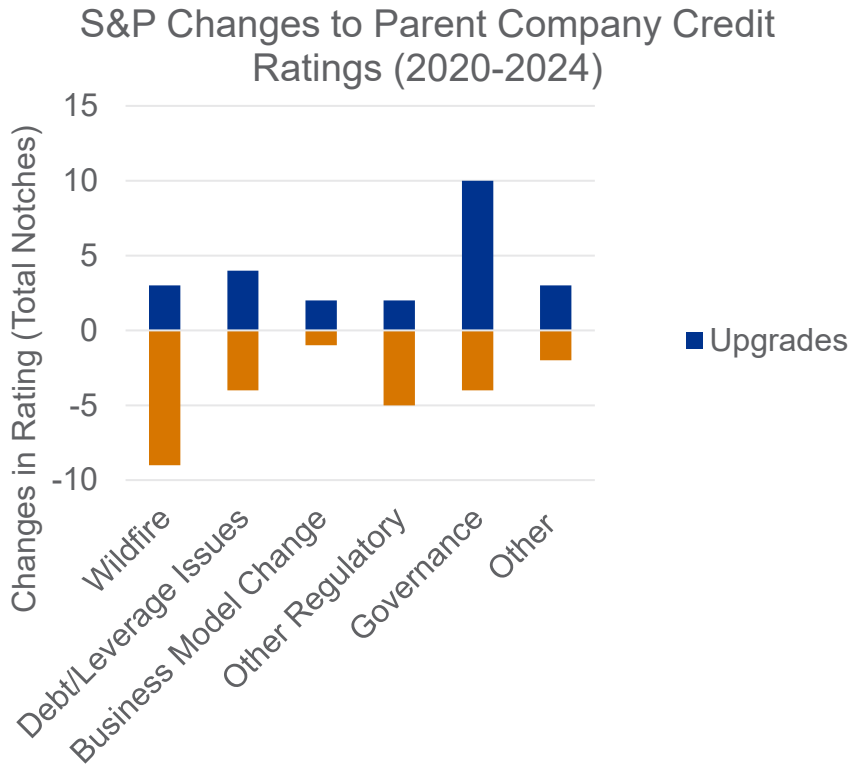
Utility insurance rates are increasing due to wildfire





- Western utilities have reported **dramatic increases in liability insurance premiums** along with lower coverage limits and reduced availability.
  - Some utilities have reported liability premiums increasing nearly 20-fold over a handful of years.
  - Others report an inability to obtain insurance at all.
- On a per customer basis, **these translate to as much as $128 per customer account** (over one to multiple years).
- Even companies in states with more lenient liability standards report increases in cost.
- Policymakers and companies are exploring alternative insurance mechanisms to reduce costs.

Wildfire risks can lead to utility credit rating downgrades

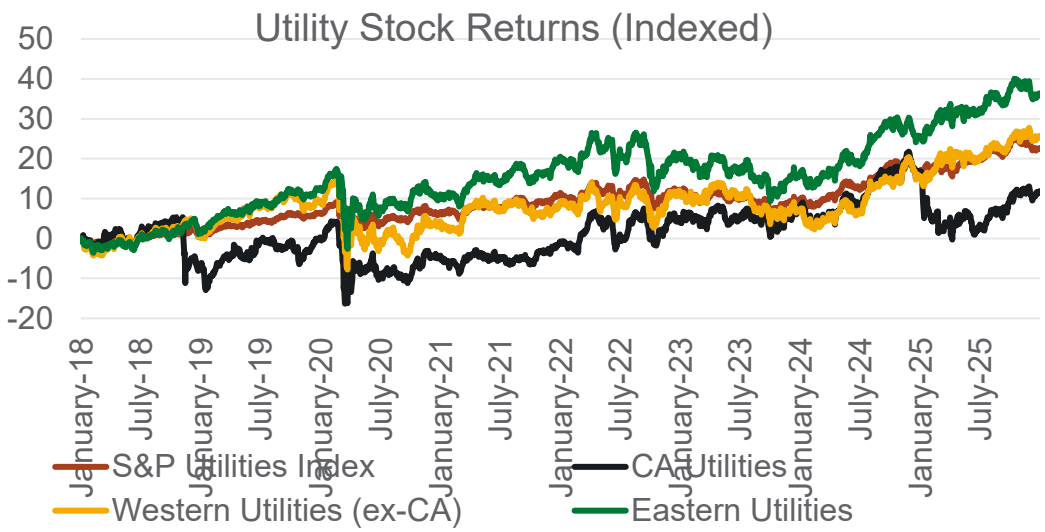


Source: EEI, Credit Ratings Summary (2020-2025)

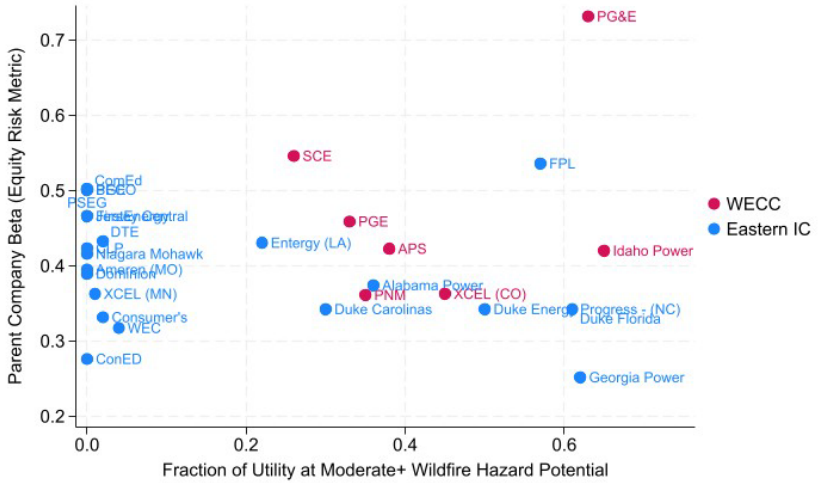
Note: notch refers to a single level change in credit score

- **Credit rating actions can affect investor-owned utilities, municipal utilities, and cooperatives.** The industry average credit rating for investor-owned utilities is BBB+, generally considered to be "investment grade" and corresponding with consistent returns on investment and a relatively low cost of capital (Edison Electric Institute 2024).
- **Wildfire-related losses and liabilities can materially affect a utility's ability to meet financial commitments** and can therefore result in a credit rating downgrade or negative outlook. From 2020 through 2023, credit rating downgrades of North American regulated utilities outpaced upgrades by more than 3-to-1, in part due to increasing physical risk like wildfire (S&P Global 2024).
- A credit rating downgrade due to wildfire risk can **compound a utility's financial stress** by increasing the cost of borrowing and reducing access to capital (Kousky et al. 2019).
- A rating action for a subsidiary can also affect the parent company and other subsidiaries (S&P Global 2023).
- **Credit rating downgrades to utilities can occur relatively quickly after a wildfire, even before determination of liability.**
- **There are also examples of agencies raising utility credit rates by addressing wildfire risk through WMPs, or by settling outstanding wildfire cases.**

Wildfire and equity returns



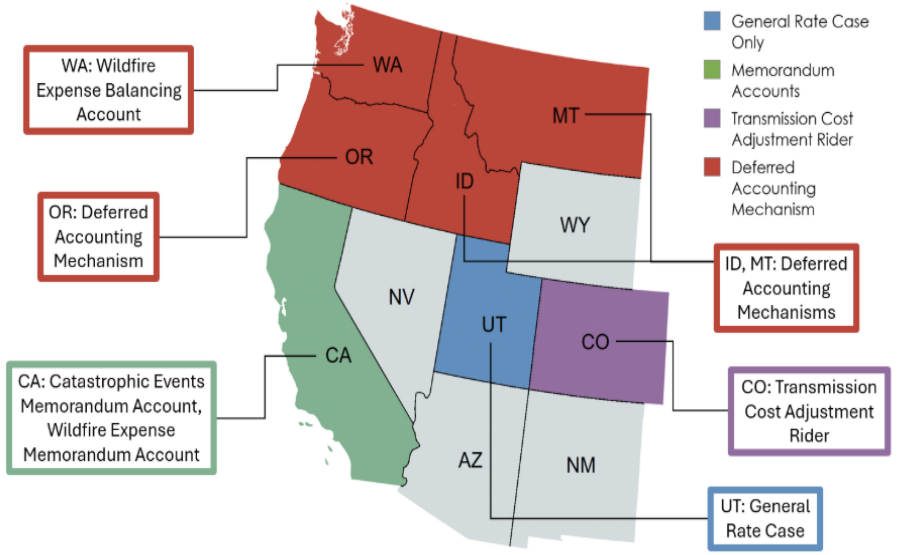
Simple average of company return based on geography. Parent companies with utilities than span WECC and Eastern IC are excluded. Includes component companies of the S&P 500 utilities index.



- **PNNL found statistically significant differences in risk profiles between large electric utilities in the U.S. West and the U.S. East.**
  - Initial analysis shows utilities in the WECC carry 25% risk premium to utilities in the East.
  - Risk premiums for utilities in general rose by ~20% in 2019, 2021, 2022, and 2023.
- Preliminary analysis also finds a statistically significant relationship between increasing number of fires, and investor risk perception of utilities.
- PNNL also examined **how utility equity returns vary in most wildfire prone areas.** We find sharp divergences in returns between eastern and western utilities.
- **Western utilities outside of California had substantially lower returns than eastern utilities from 2020-2024.** California utilities saw sharply negative returns, with considerable volatility. Large dips following the Camp and Palisades fires are visible.
- Other factors like utility business model will also impact returns.

States vary in how they track wildfire costs, making simple cost comparisons impossible

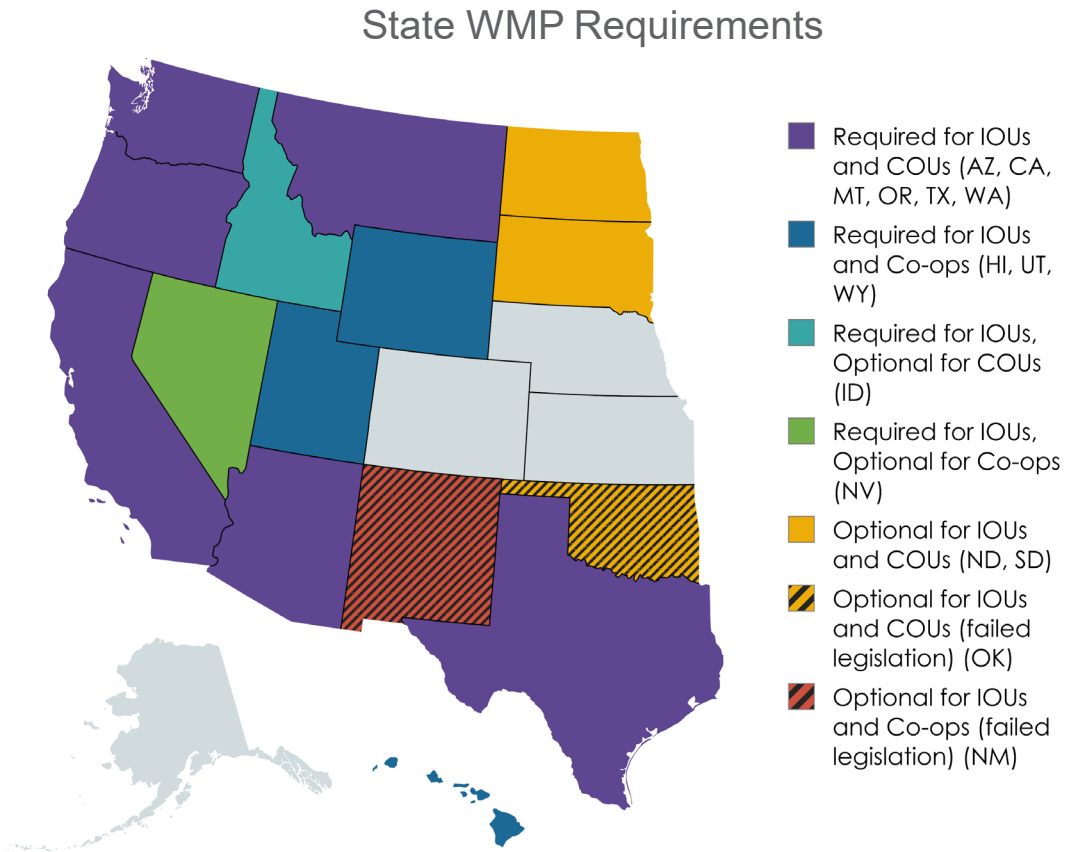
Tracking Type Used by Regulated Utilities by State



For detailed information see: [PNNL, Cost Recovery Mechanisms for Utility Wildfire Mitigation, 2026].

- Mechanisms used to track costs vary and as a result it can be difficult to access and compare costs across states.
- Mechanisms can include:
  - General Rate Case
  - Explicit Tariffs and Schedules
  - Deferred Accounting and Balancing Accounts
  - Memo Accounts
  - Transmission Cost Adjustment Riders

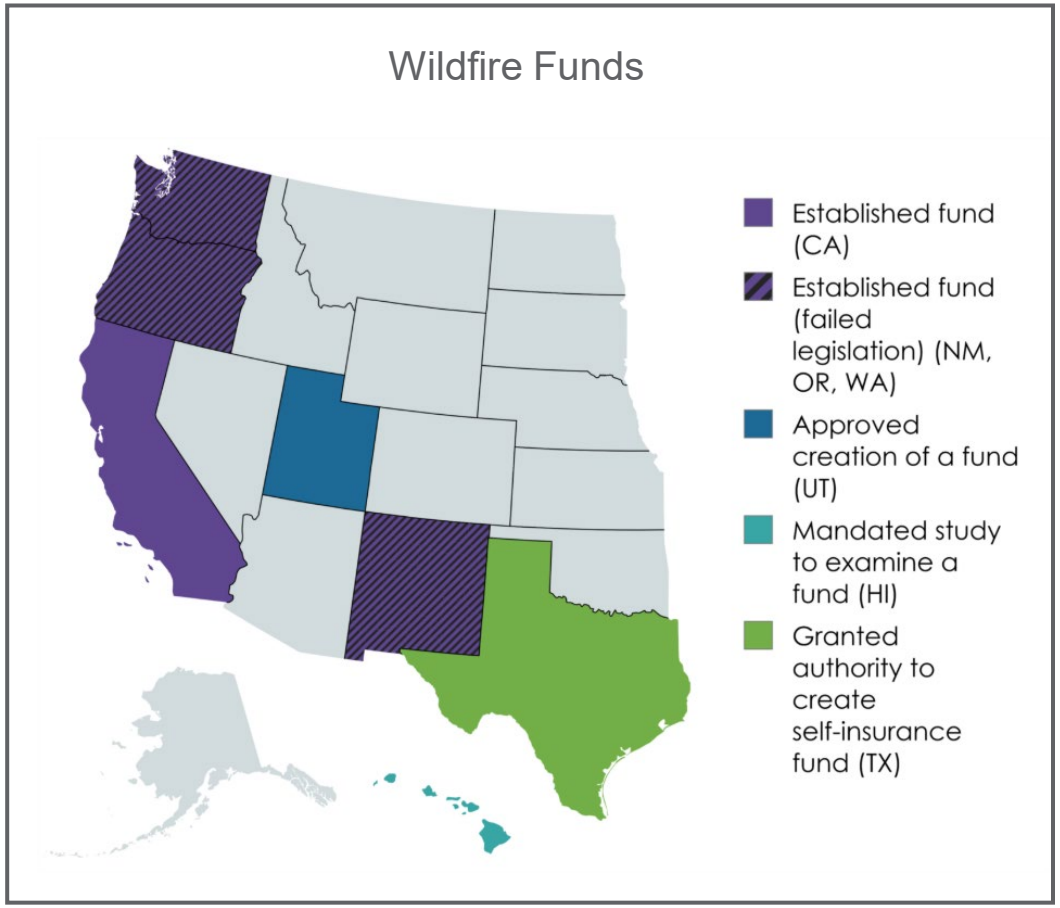
Wildfire Mitigation Plans are Linked to Liability Protection in Some States



States have considered how WMPs can provide protections from liability risks, including:

- Requiring third party approval of WMPs,
- Associating WMP compliance with negligence immunity,
- Associating WMP compliance with damage caps, and
- Associating WMP compliance with payment funds or bonds.

Establishment and exploration of financial backstops for utilities paying claims



The most consequential wildfire legislation involves the creation of wildfire funds.

With the passage of AB 1054 in 2019, California became the first state to establish a financial backstop for utilities that ignite wildfires, and the California Wildfire Fund remains the only fully capitalized and accessible pool for utilities to support litigation claims following a utility-ignited wildfire.

Other funds are in various stages of maturity in Utah, Hawaii, and Texas. Funds can be capitalized through a combination of ratepayer and shareholder contributions, as in California, or exclusively by ratepayers, as in Utah.

Legislation types and costs they mitigate

Each legislative approach seeks to provide cost certainty or constraints for certain damage types including utility infrastructure damage, economic damage from outages, and third-party liability.

Legislative Approaches to Mitigating Wildfire Damages and the Type of Cost it Attempts to Mitigate

Damage or Cost Type	Wildfire Mitigation Plans (WMPs)	Authority to Approve WMPs	Modified Liability	Modified Damages	Wildfire Funds	Self-Insurance Funds
Damage to Utility Infrastructure	X	X				X
Economic Damage from Outages	X	X	X	X		X
Third Party Liability from Fires			X	X	X	X

PNNL Resource Library Including our Utility Wildfire Risk and Liability, Legislation, and Rules Tracker

Purpose and volume of utility securitization

- Securitization is a mechanism to fund extraordinary, one-time costs via utility-issued, ratepayer-backed financing bonds.
  - Past uses have included early power plant retirement, storm recovery, and debt restructuring
  - Current trend to use for wildfire

Over $16 billion

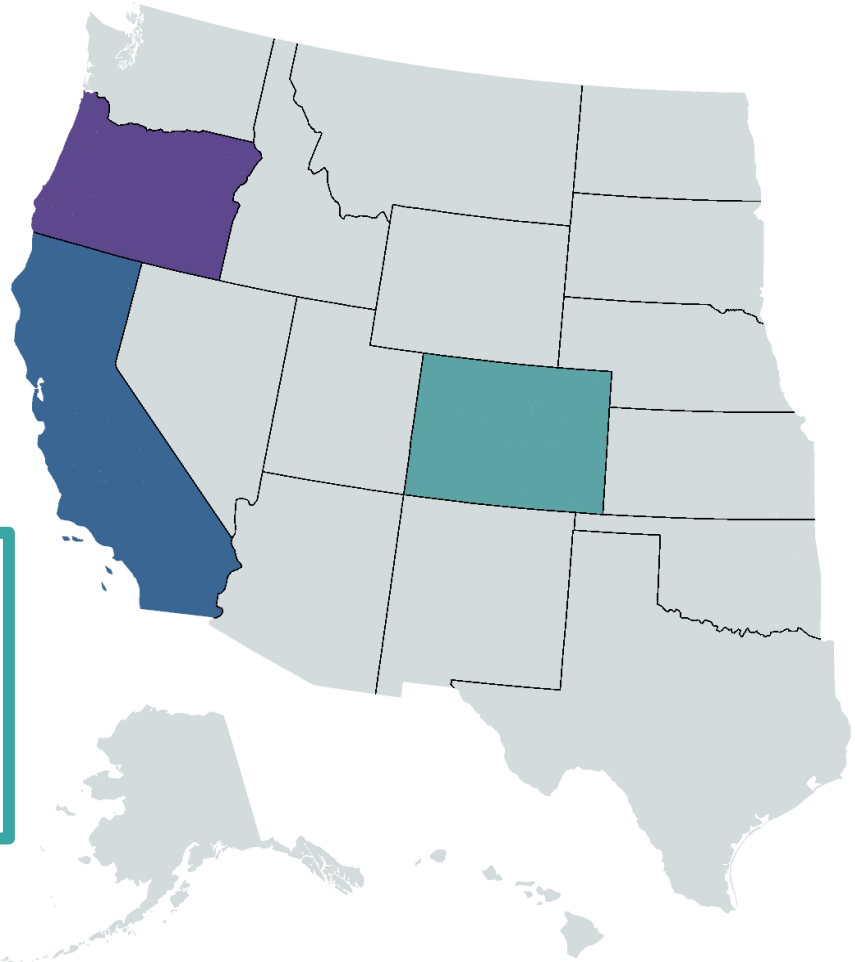
A 2022 spike in amount for all utility-related securitization issuances, in only 13 deals

Source: "Credit FAQ: The Rationale Behind U.S. Utility Securitization And Reasons For Recent Growth." March 2024. *S&P Global 2024*

Self-insurance for liability costs (e.g., Oregon in 2026)

Post-fire recovery (e.g., California)

Proactive wildfire mitigation capital expenditures (e.g., Colorado in 2025)

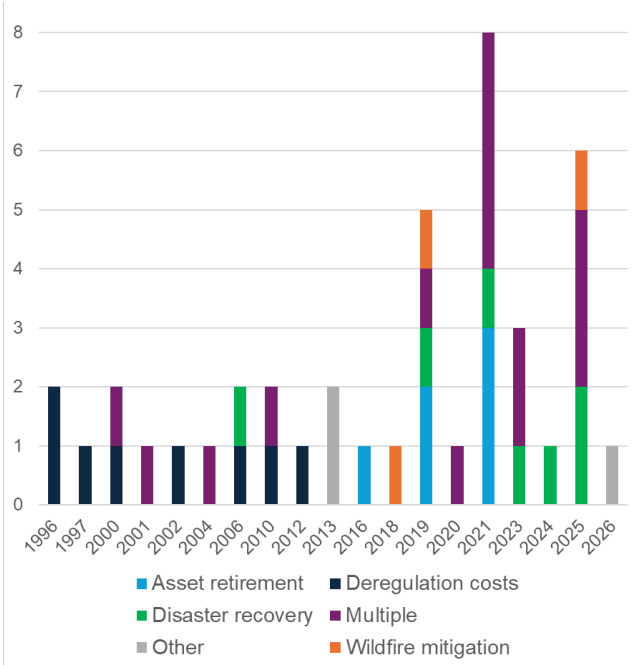


States Authorizing Wildfire-Related Securitization Measures

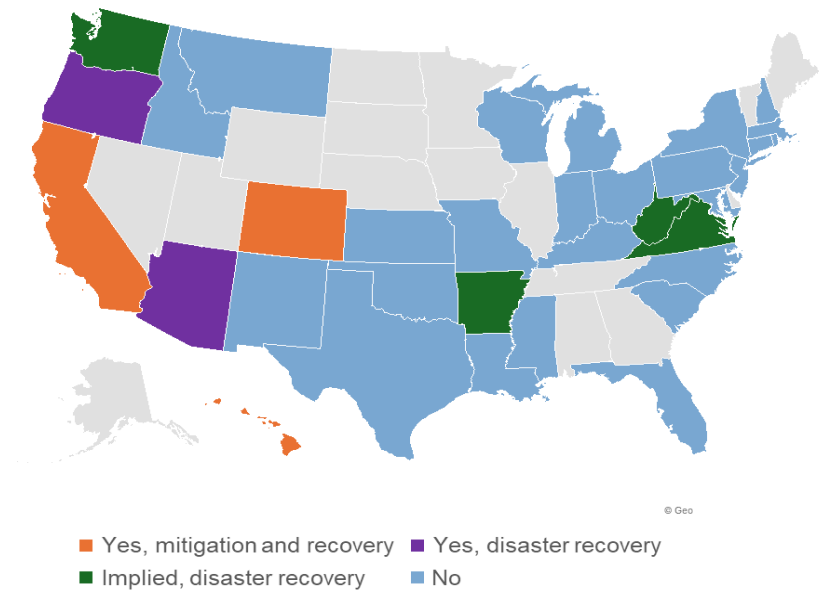
Source for figure: S&P Global 2024

State Authorization of Utility Securitization

Securitization Legislation by Year Enacted and Eligible Costs



Eligibility of Wildfire Costs for Securitization by State



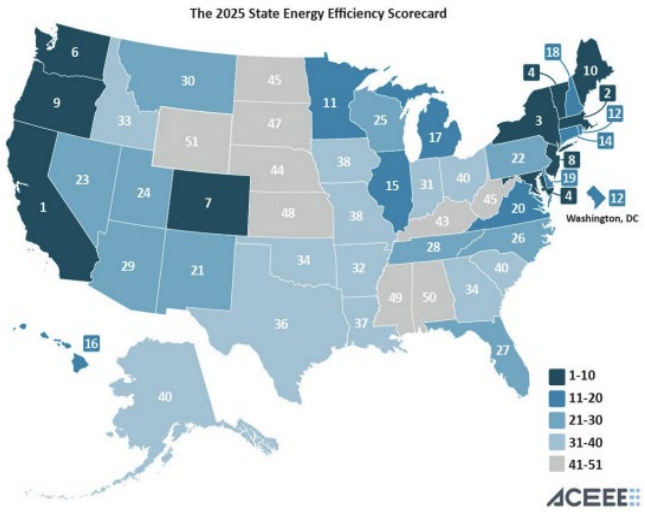
- **9 states allow securitization of different types of wildfire costs.**
- **Recovery:** Explicit or implied (as natural disaster / extreme weather). Utilities can issue bonds for post-event rebuilding costs.
- **Mitigation:** Utilities can issue bonds for proactive investments.
  - California (AB 1054) and Hawaii (SB 897) *require* utilities to securitize initial portion of WMP capital spending.
  - Colorado approved $1.2B securitization for Xcel's 2025-2027 WMP.
- **Liability:** In 2026, Oregon passed law allowing securitization for utility self-insurance, a response to wildfire challenges (HB 4077).

Uses of utility securitization have evolved over time. Disaster recovery and wildfire costs have driven a recent increase in legislative activity.

Potential co-benefits exist between load reduction and wildfire mitigation benefits

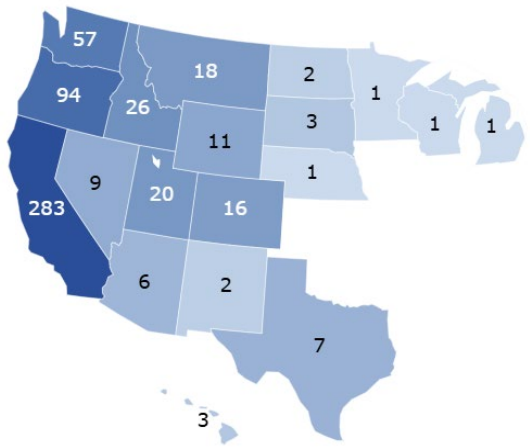
Some utilities and states that have significant investments in load reduction programs (also known as energy efficiency) also have significant risks and investments in wildfire mitigation.

ACEEE 2025 State Ranking for efforts to advance energy efficiency



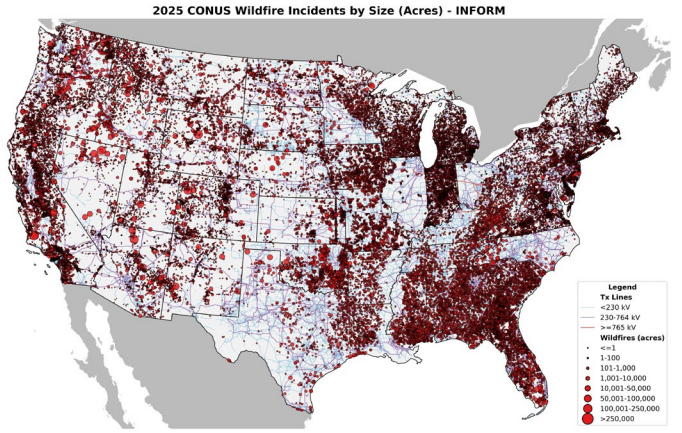
(Kresowik et al. 2025: ACEEE 2025 State Energy Efficiency Scorecard)

Wildfire Mitigation Plans by State



(Statistics on Wildfire Mitigation Plans)

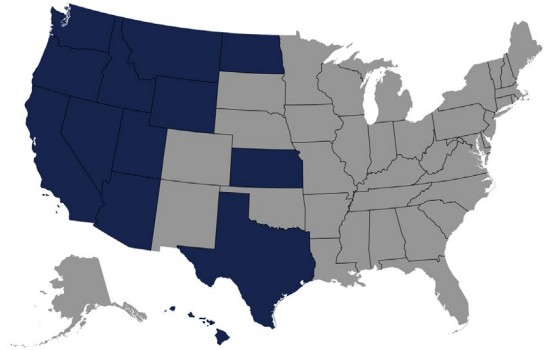
2025 Wildfire Events, by Scale



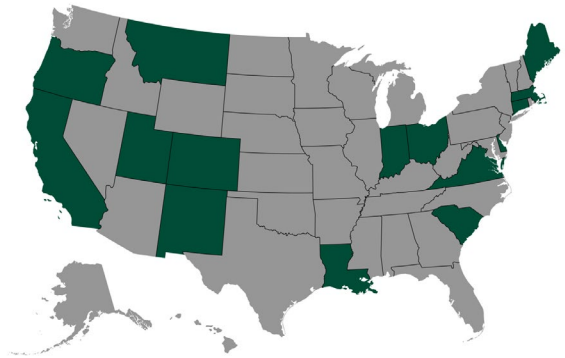
(Source: InFORM, Map Credit: PNNL)

Converging State Policy for Wildfire and Advanced Transmission Technologies (ATTs)

States with Wildfire Legislation



States with ATTs Legislation



In recent years, states have enacted legislation addressing both utility wildfire risk management and the evaluation or deployment of grid enhancing technologies and ATTs, offering an opportunity to advance two policy objectives with one set of investments.

Advanced Transmission Technologies offer:

1. Direct ignition risk reduction through reduced current and/or conductor temperature and reduced line sag, and
2. Indirect wildfire benefits through reduced scale of emergency de-energizations.

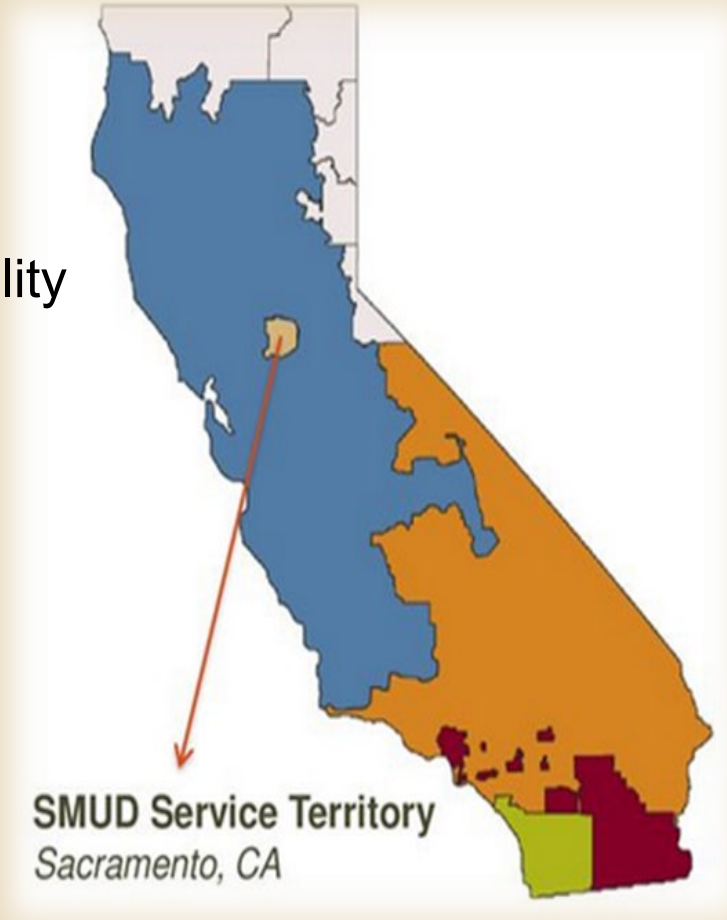
Top Priority:
Safety of Our Employees, Customers, & Community

SMUD is the electric service provider for Sacramento County

- California Central Valley
- Urban & suburban development

- 143 Miles of Right-of-Way containing -
  - 471 T/L circuit miles
  - 10,042 D/L circuit miles
  - 250 Substations

- 6th Largest US Community Owned Utility
- Service Area Population: 1.5 million
- Service Area: 900 square miles
- Accounts Served: 650,000+
- SMUD Employees: 2,200+
- Rates 50%+ lower than nearest IOU



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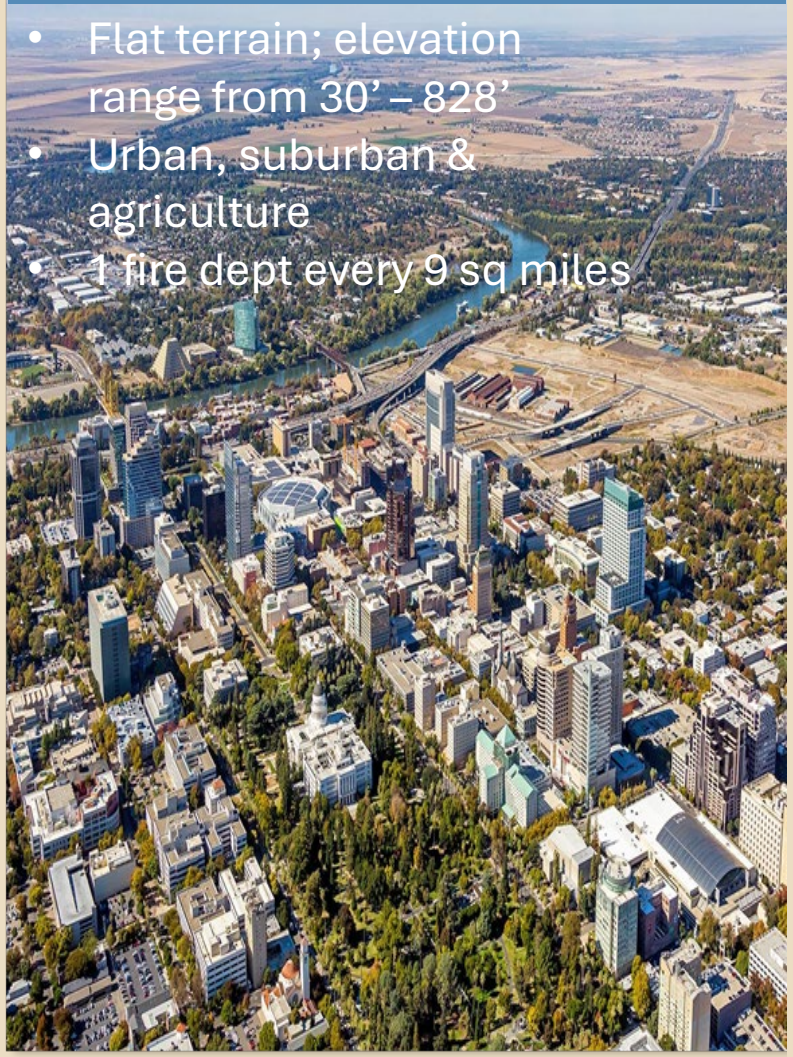
Two Distinct Areas of Operation

Sacramento County: Distribution

- Flat terrain; elevation range from 30’ – 828’
- Urban, suburban & agriculture
- 1 fire dept every 9 sq miles



SMUD’s hydro generation is located on the western slope of the Sierra Nevada primarily within lands of the El Dorado National Forest

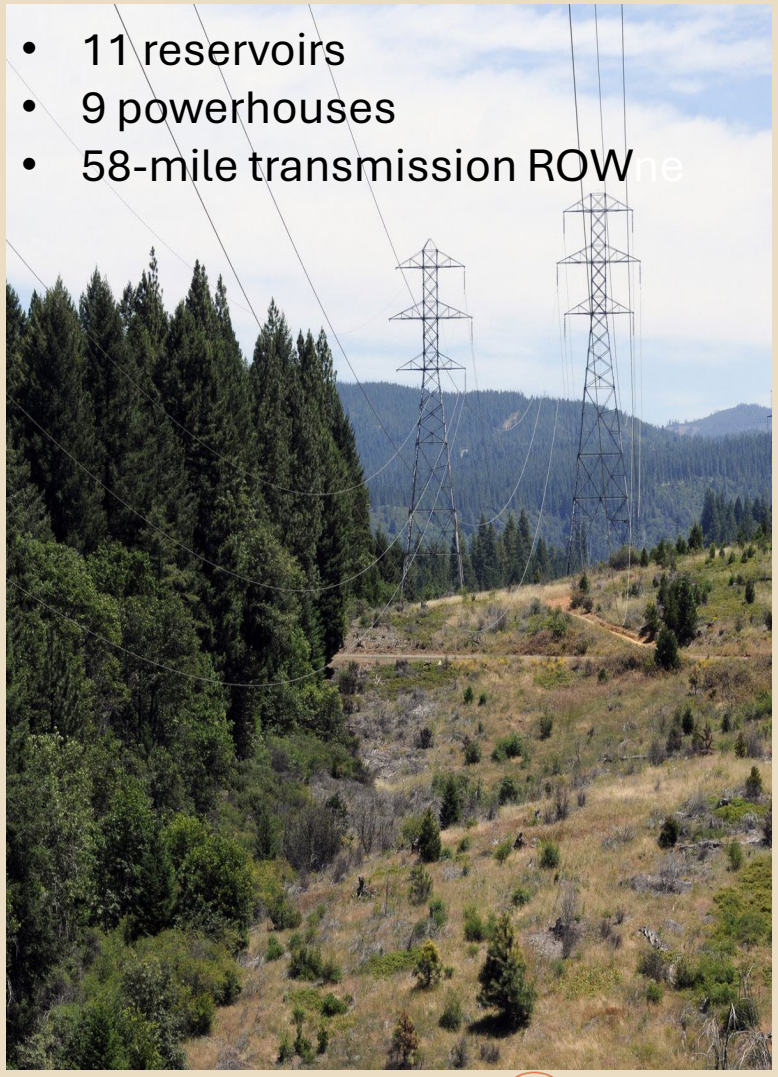
El Dorado County population density: Approx 112 people per square mile, mostly concentrated in the lower-western areas (Placerville)

Tranmission Line –

- 170.6-line miles
  - 12kV & 21kV < 1 mi
  - 69kV – 31.3 mi
  - 230kV – 136.7mi

El Dorado County: Transmission

- 11 reservoirs
- 9 powerhouses
- 58-mile transmission ROW



SMUD Wildfire Mitigation By The Numbers

2,500+ ACRES IN UARP PATROLLED AND MAINTAINED

3,800 MILES OF DISTRIBUTION LINES PATROLLED AND MAINTAINED

90,000+ TREES PRUNED ANNUALLY

SMUD continues to enhance its wildfire prevention efforts with new and improved safety measures in place and make the electric system more resilient.

Vegetation Management

- Regular inspection and vegetation maintenance around SMUD's power lines.
- Digital technology used to identify trees and other vegetative growth around power lines.

Line Inspections

- Helicopter aerial inspections
- Ground patrols
- Infrared inspections
- Wood pole intrusive inspections
- Detailed line inspections
- Annual line patrols
- LiDAR vegetation inspections.
- Splice x-rays

Fire mitigation

- Real time monitoring weather stations.
- Undergrounding of wires
- Replacing fusing & arrestors with non-spark emitting equipment
- Install covered conductors and utilize ductile-iron & steel poles
- Proactive de-energization protocols

Re-Accredited as a "Right of Way Steward" in 2022

- ✓ **1 of only 7 Utilities In North America**

SMUD®

Wildfire Insurance: Key Changes = Massive Budget Impacts

Prior to 2017 Wildfire insurance was an 'add-on' coverage to General Liability Insurance

- An un-rated part of the coverage with low frequency / severity

The Wildfire Insurance market changed dramatically in 2018

From mid-July to August in 2018 a series of large wildfires erupted across California, resulting in the deadliest and most destructive wildfire season California had ever experienced -

[it now ranks third after the 2020 and 2021 wildfire seasons]

- 103 confirmed fatalities
- 24,226 structures damaged or destroyed
- 8,527 fires burning 1.9M+ acres

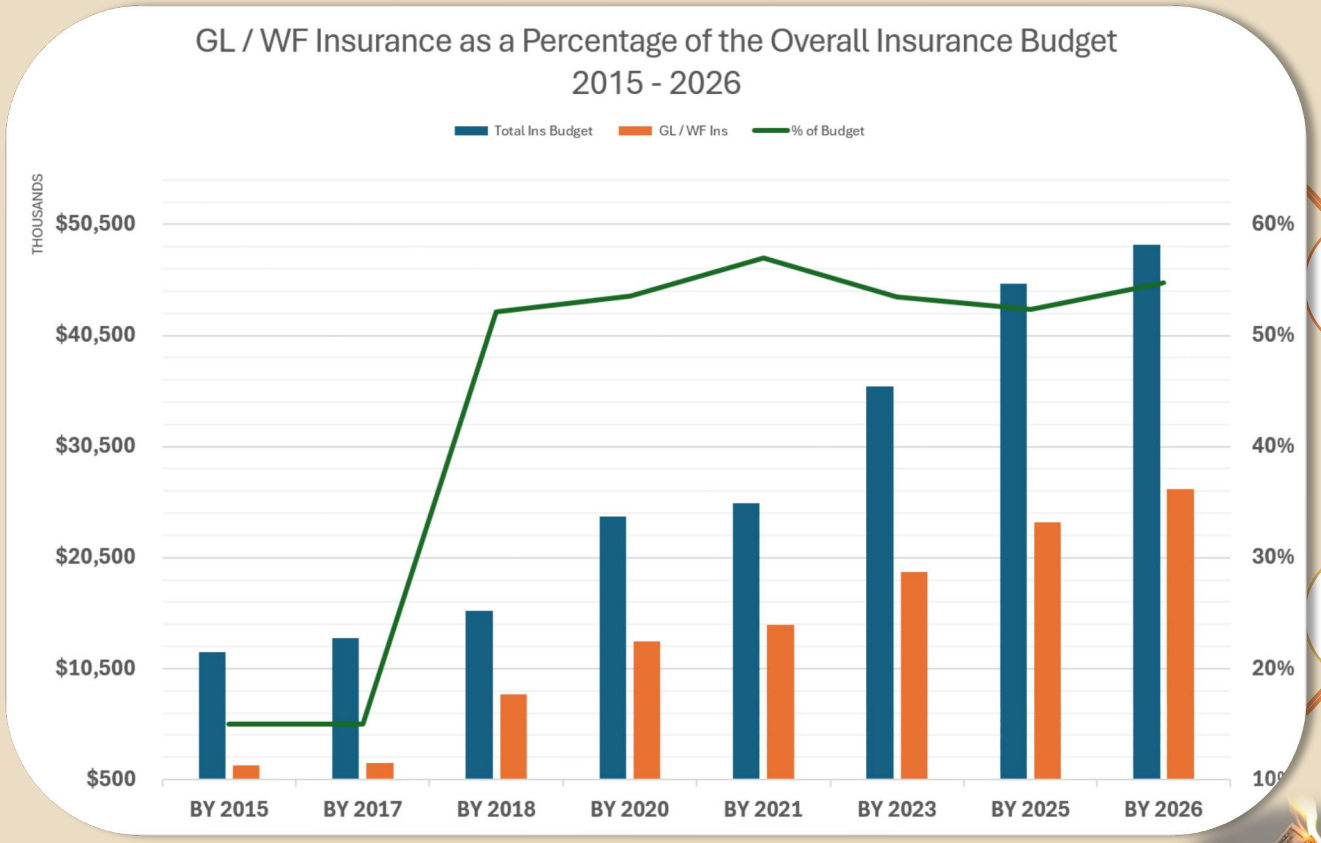
Overall, the 2018 fires resulted in at least $26.4 billion in property damage and firefighting costs

Source: National Forest Foundation

The insurance industry considered forest health and vegetation management practices to be major contributors to the wildfire risk

SMUD

Wildfire Insurance: Unrated Risk to Major Operating Expense



Over the past decade

- WF Limit Increased 150%
- Self Insured Retention Increased 400%
- Premium spend increased 1,205%

GL / WF coverage costs increased to more than 54% of the overall insurance budget

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Fuels Reduction as Tactical Risk Management Strategy for Wildfire Risk Reduction

Multi-year project –

- Conceived, scoped, and approved in 2018
- Project work began in 2019 with the objective of –
  - Quantifying the risk
  - Objectively illustrating the reductions

Fuels Reduction Goals

Reduce Wildfire Risk

Improve Safety & Reliability

Improve Insurance Risk Profile To Obtain -

- **Preferred Insurance Rates**
- **Additional Capacity / Higher Limits**

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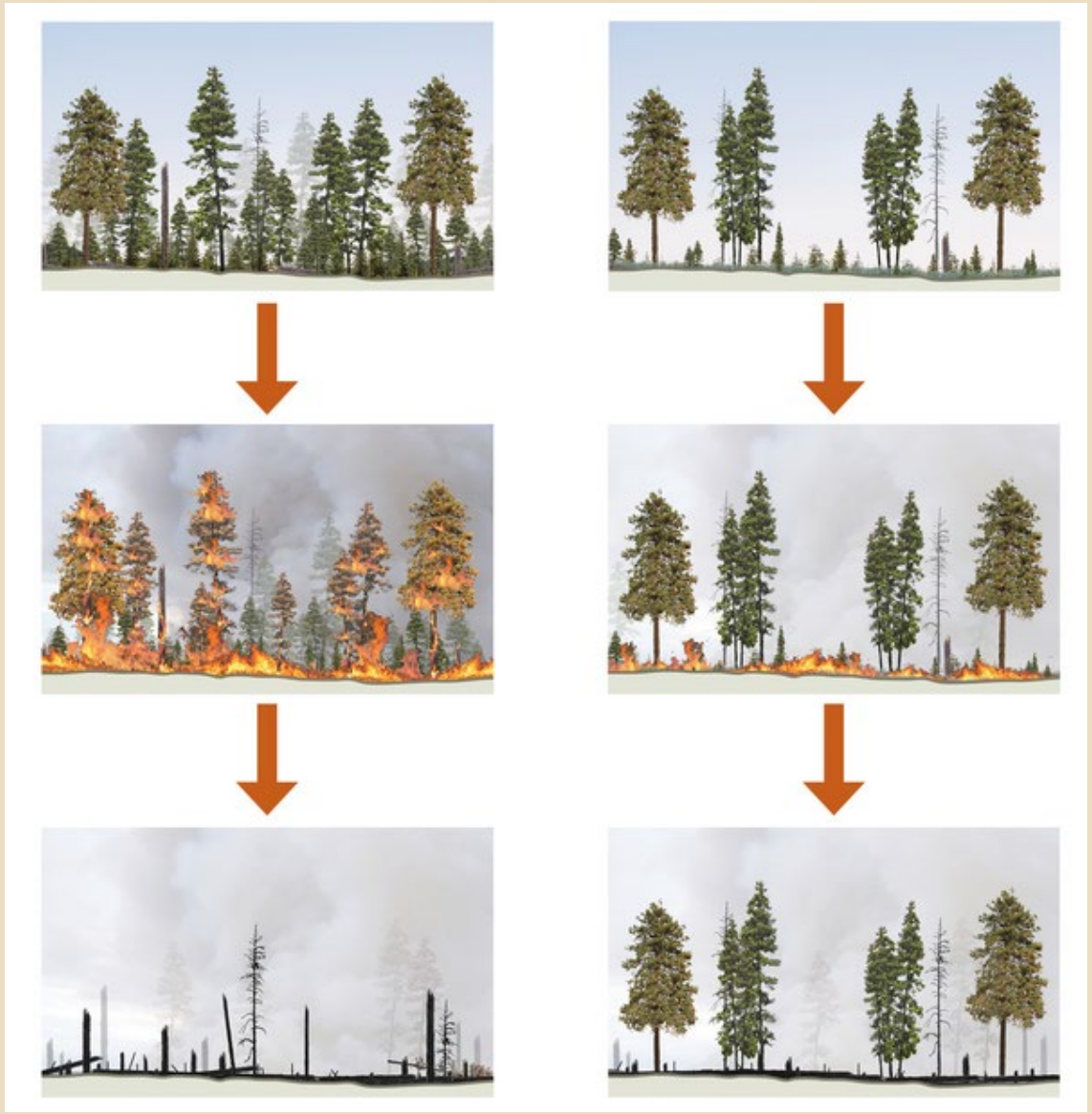
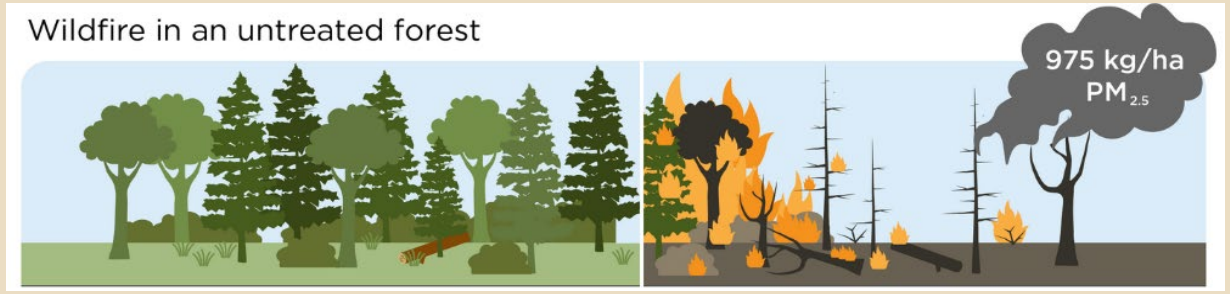
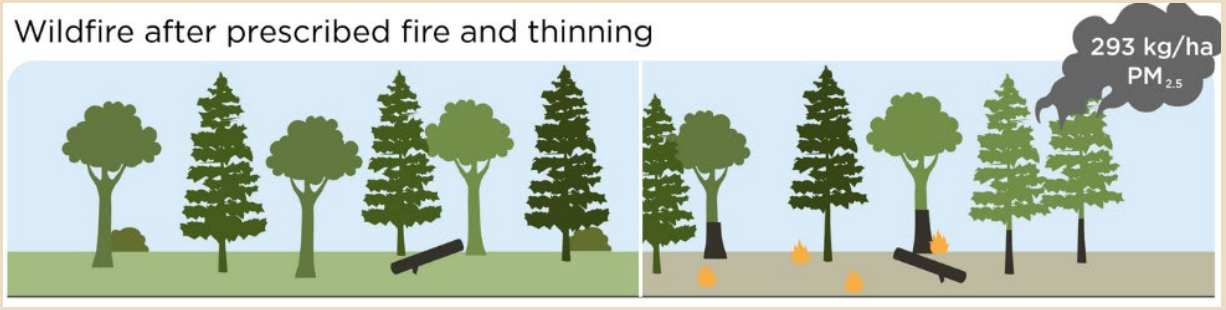
Vegetation Management = Forest Restoration

Unmanaged Growth **Managed Growth**





Forest Restoration (fuels thinning) can significantly reduce the risk of megafires in conifer forests. This practice helps combat the effects of drought and climate change, with significant benefits for air quality, water quality, carbon storage and wildlife habitat.

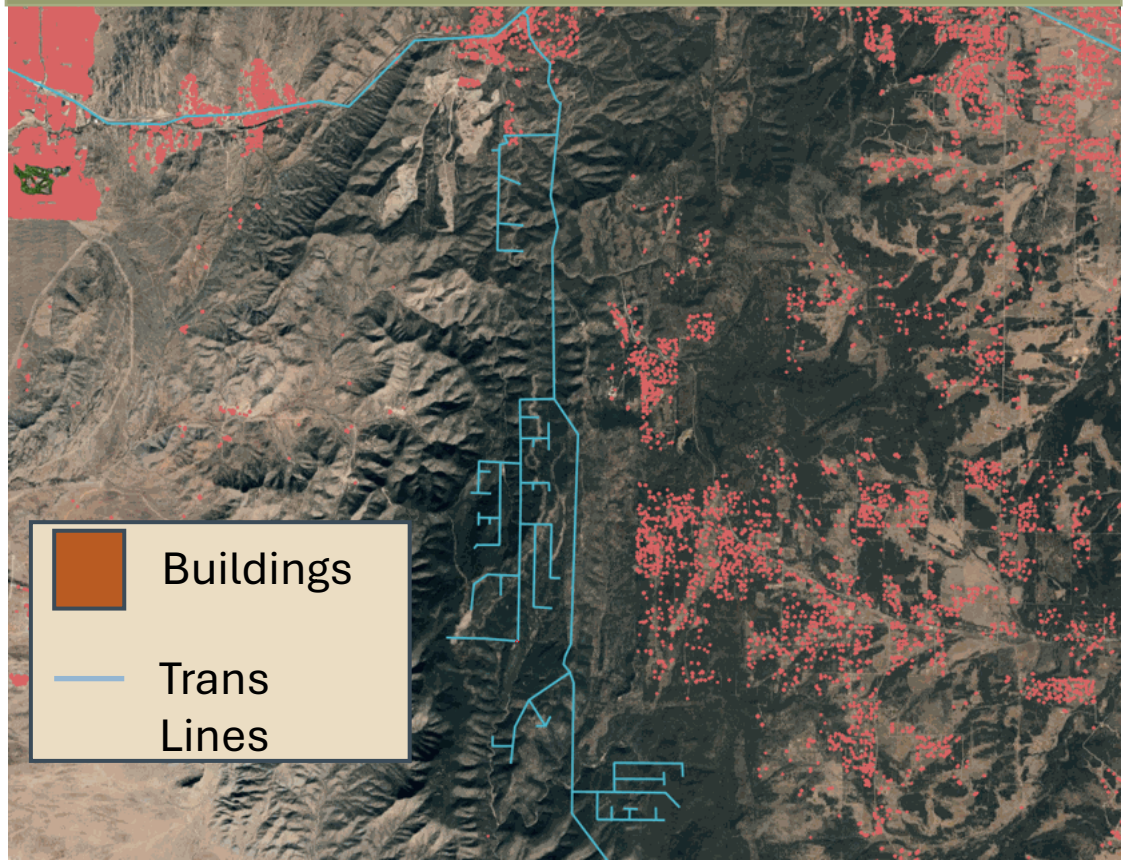


Source: Nature Conservancy (www.nature.org)

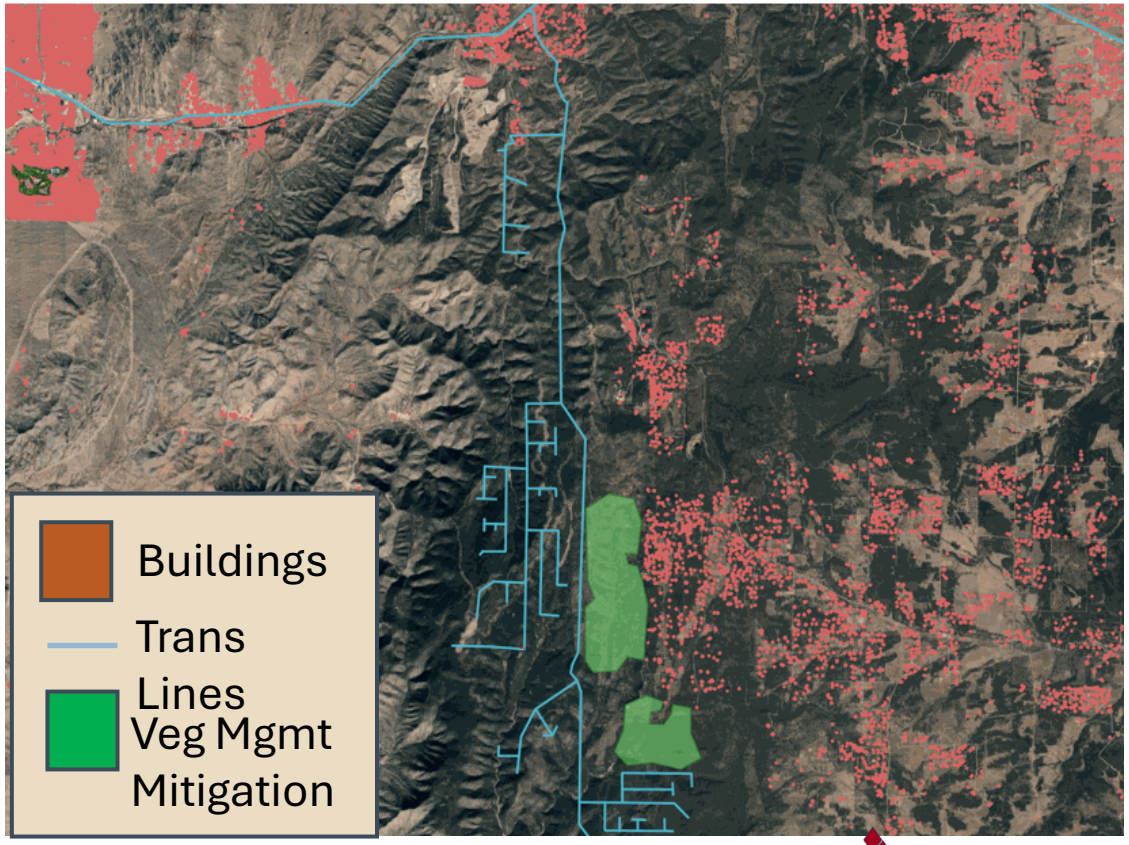
FIRE SPREAD MODELING – WITH & WITHOUT VEGETATION MANAGEMENT

Positive Impact of Vegetation Management on Fire Spread: Reducing Ignitions and Enhancing Suppression Effectiveness

Fire ignition in power line path – No Vegetation Management Mitigation (fuels thinning)



Same ignition point, with Vegetation Management Mitigation (fuels thinning)



Firescape

***Disclaimer*:**

This illustration is a fire spread model and does not reflect actual conditions on SMUD property or service area. It's intended solely for informational purposes and does not represent the full scope of our vegetation management or risk reduction efforts.

Risk Differentiation is Key to Managing Insurance Costs

Manage the relationship with your insurance underwriters

Personal relationships matter in the industry

Be willing to meet on their territory

Highlight the good – and be willing to discuss areas for improvement

Provide access to the subject matter experts when possible

Provide pertinent information before the questions are asked

What is your operating environment?

What makes it better or more challenging?

How does your organization manage these risks?

Make your organizational presentation part of your underwriting submission

Quantify both the risk and the mitigation impact ***(when possible)***

Examples:

Wildfire modeling – update regularly as models and risk mitigations change

Wildfire risk mitigation investment – annual spend, projects, overhead line miles – inspection frequency, types of inspections

Asset hardening efforts – undergrounding, spark arresters, conductor change outs

Vegetation management – practices, schedules, and risk quantification / mitigation

SMUD®

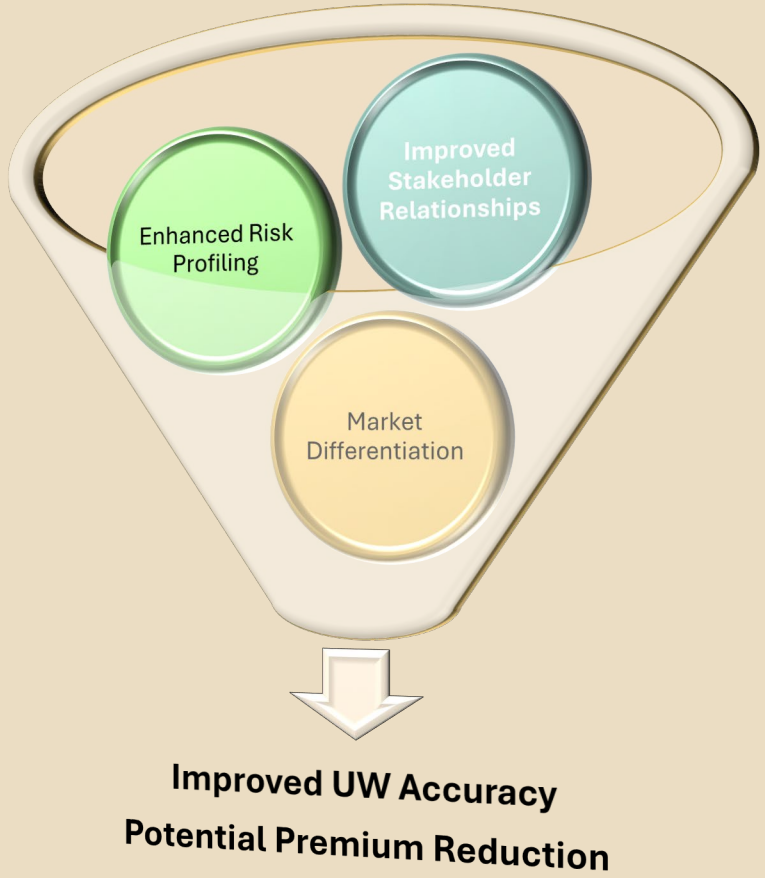
Strategic Collaboration – Risk, Veg Mgmt, & Technology

Integrating the UVM expert into the underwriting process provides a significant opportunity to enhance the organization's risk assessment and positively impact marketing of the exposure

- ✓ **Enhanced Risk Profiling:**
  Vegetation management SMEs provide key insights into the conditions that influence risk, such as proximity and health of trees to power lines, wildfire exposure, and maintenance practices, enabling insurers to create more accurate risk models.

- ✓ **Strengthened Stakeholder Relationships:**
  Mutual engagement builds trust and transparency, fostering strong insurer relationships in this people-driven market.

- ✓ **Improved Underwriting Accuracy:**
  Collaborating with UVM professionals equips underwriters with detailed, current risk data associated with specific geographies and assets.

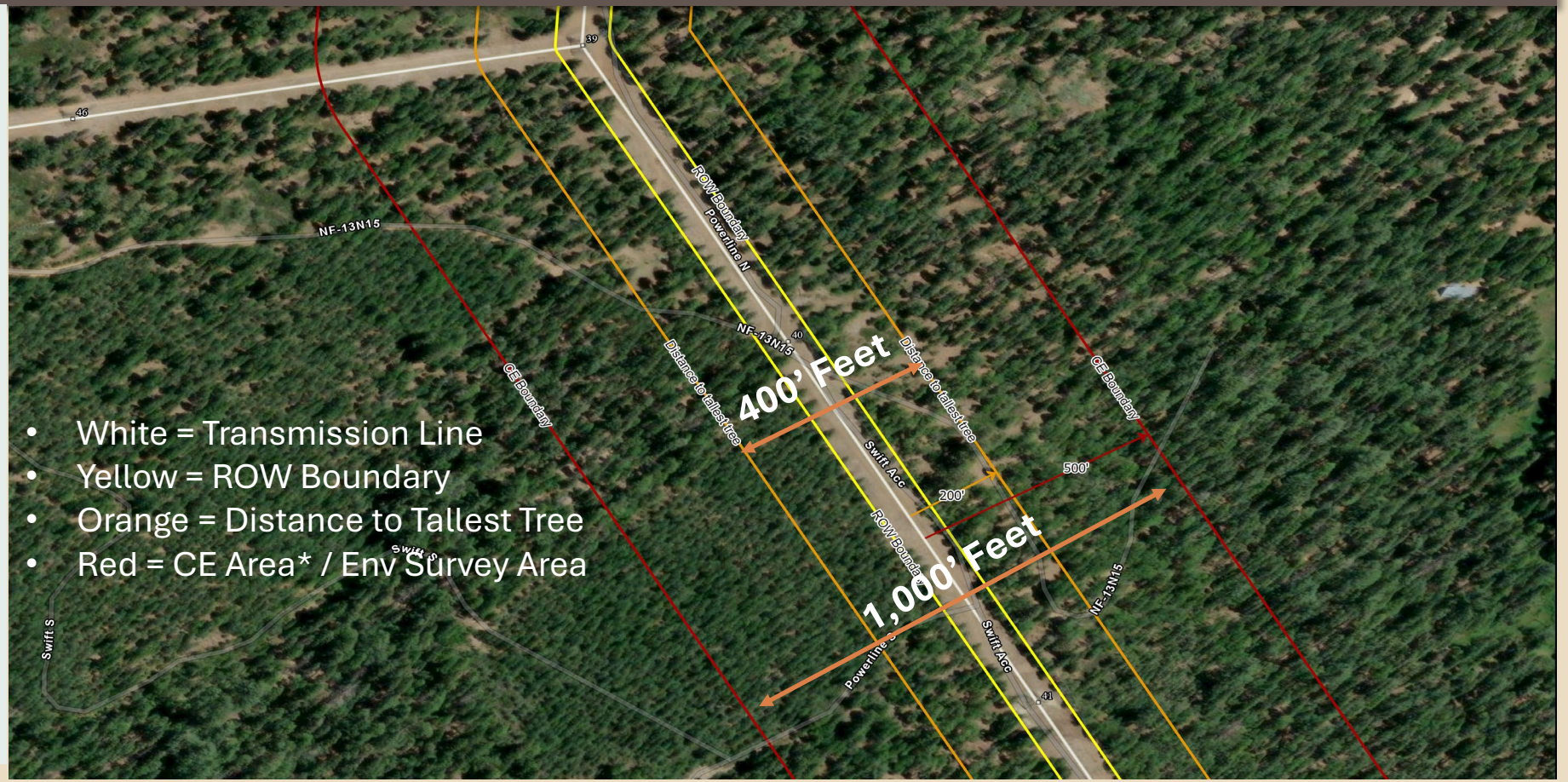


SMUD®

Exceeding industry standards

Enhanced vegetation management for right-of-way transmission.

- Aerial view of SMUD transmission corridor.
- Full clearance within the ROW boundary.
- Veg Mgmt. extends out to 200 ft. on either side, reducing tree height and managing undergrowth.
- Work expanded out an additional 300 feet on either side.



*CE = Categorical Exclusion – no environmental impact or assessment required to carry out work.

SMUD®

Smud Transmission ROW Fuels Reduction

SMUD's Board approved a bold fuels reduction and wildfire mitigation initiative in 2018

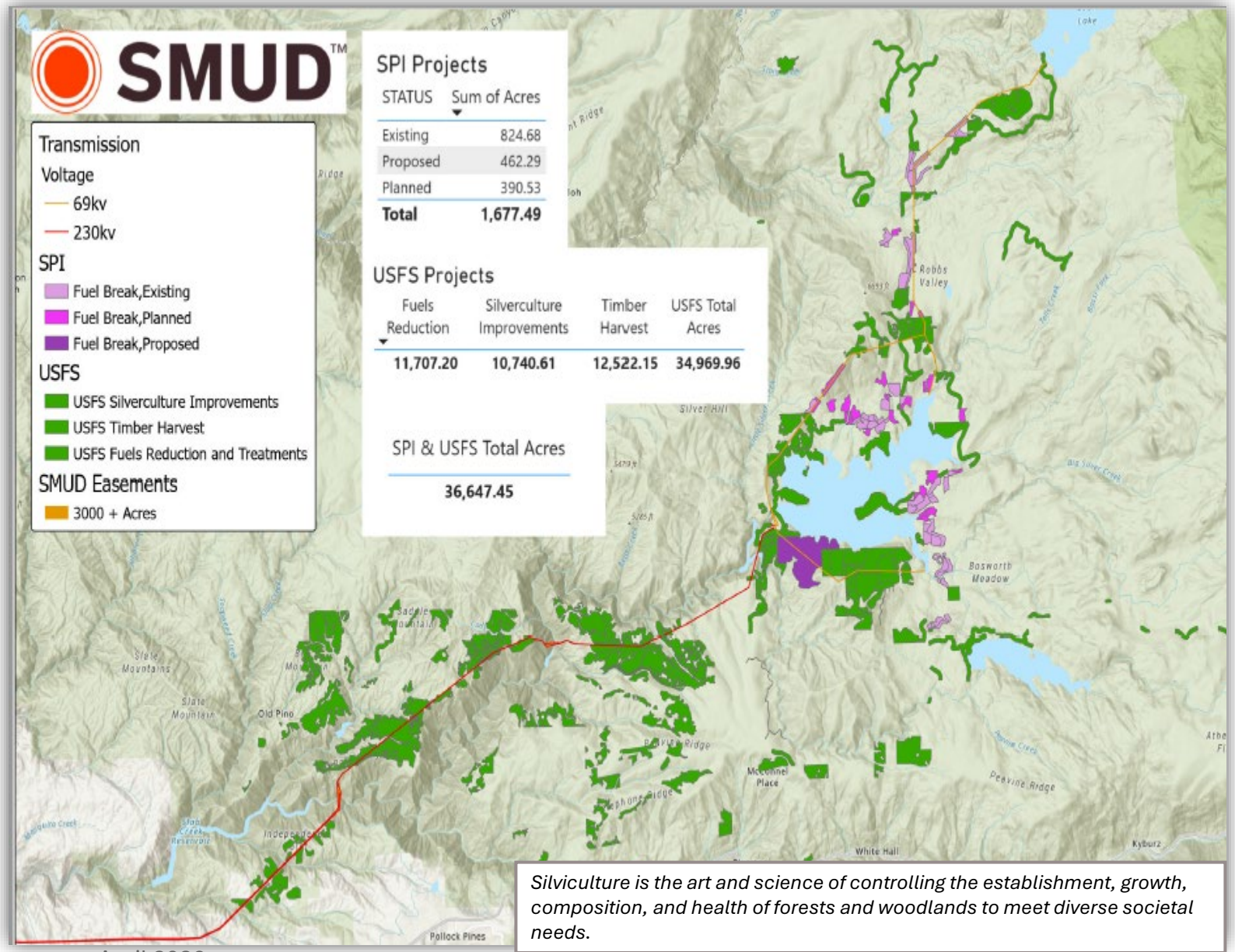
Over the past 7 years, SMUD has:

- Cleared the transmission ROW of any potential strike trees
- Thinned low lying fuels
- Extended clearance beyond the easement
- Maintained verifiable data on risk reduction efforts

Robbs Peak/Loon Lake - Union Valley
Structures 54 – 59

AirBus Satellite Imagery

PARTNERSHIPS ENHANCE MITIGATION EFFORTS



Silviculture is the art and science of controlling the establishment, growth, composition, and health of forests and woodlands to meet diverse societal needs.

Sierra Pacific Industries (SPI) & United States Forest Service (USFS) are the two largest landowners surrounding the UARP transmission line.

SMUD

+

Sierra Pacific Industries

+

National Forest Service

→ **Result = 39k+ total acres of fuels reduction**

SITUATIONAL AWARENESS

Gridscope Sensors

Gridware's technology is designed to detect not just electrical faults, but the environmental factors that cause them, allowing for proactive, rather than reactive, maintenance

Real-time alerts sent to management, & DL/TL leaders for immediate response

SMUD has installed 579 Gridware Sensors along the Transmission ROW and in the service territory

- 176 in El Dorado County – including 8 weather stations
- 403 in Sacramento County – including 3 weather stations

Pole Mounted Sensor (solar + battery) for monitoring:

- Pole Tilt or Sway
- Outage
- Limb(s) on Power or Comms Lines
- Car / Pole Contact
- Animal Activity
- Conductor Movement

The 11 environmental sensors monitor weather factors, including temperature, pressure, wind speed, and humidity.

Sensors operate independent of the grid using solar power to remain online even during power outages

Wood pole inspection & replacement

2025 UARP Transmission Line

- 557 Structures
- 491 Structures are metal or other noncombustible materials
- 66 wood poles

⋆NOTE: 368 of these structures are both "Dist & Trans" structures, meaning the contain both lines on a single structure. 97 are transmission only.

Remaining UARP wood poles will be replaced on a condition-bases as inspected. Additionally, multi-pole structures are rebuilt entirely with ductile iron or steel – even if only a single pole is determined bad.

Approx 20% of the pole inventory is inspected annually, and of those, about 6.32% (~950) are identified for replacement

Poles are inspected by Line Construction Inspection - follows GO165 inspection cycle.

· Visual Inspection

· Sounding

· Internal Inspection (using resistograph).

· Excavation and below ground line evaluation

· Shell Thickness Determination (using resistograph/ shell thickness gauge)

Poles designated for standard (i.e., non-emergency) replacement are replaced within 36 months of identification.

Average replacement cycle has been 24 months or less.

Utility Pole Facts:

- *Samuel Morse developed the concept of utility poles in 1844 for telegraph lines.*
- *Poles for electricity followed thereafter.*
- *The American National Standards Institute established standards for wood utility poles in 1924.*
- *Average pole height is 35-40' – SMUD's tallest pole in the portfolio is 115'.*

ECOLOGICAL MANAGEMENT & ENVIRONMENTAL STEWARDSHIP

SMUD views vegetation management as an opportunity to protect the environment while providing reliable, safe power.

SMUD implements innovative projects, like using goats or partnering in pollinator-supportive landscaping, to advance ecological management.

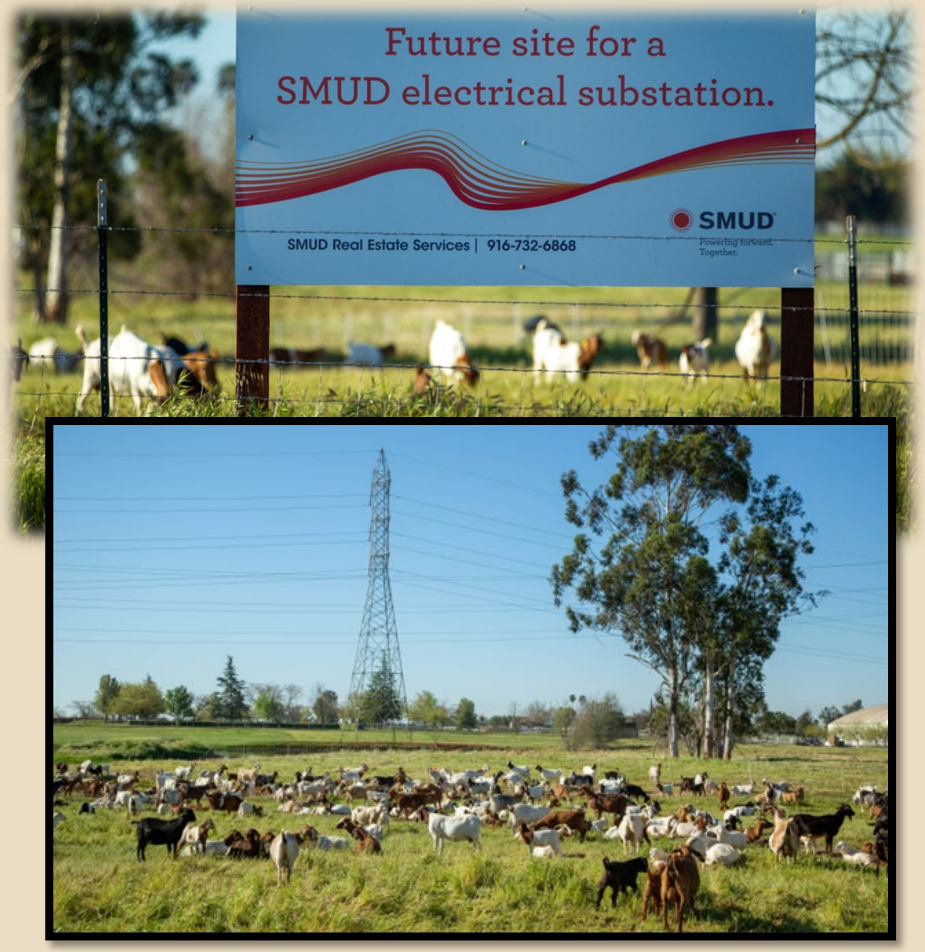
When conducting tree trimming or removal, SMUD crews work to avoid damaging nests, dens, or sensitive habitats. When possible, work is scheduled around sensitive species' breeding seasons. Native plants are often preserved or replanted to maintain or restore local ecosystems.

SMUD Veg Mgmt Nov. 2025

Environmental stewardship is focused on:

- Wildfire risk reduction
- Protecting biodiversity
- Supporting ecosystem health
- Preventing power outages

EPRI honors SMUD with the North American Pollinator Protection Campaign (NAPPC) Award for vegetation management work at Pine Hill Preserve



Growing native plants adds beauty and important habitat for wildlife, especially for pollinators.

Collaborate to Communicate and Educate the Industry

The UVM SME is the expert in the space –
Bring that experience and enthusiasm to the underwriters

- The insurance industry is reactive
- Insurance underwriters are still trying to understand the risk
- Data-driven analysis provides clear evidence to improve insurance ratings
- Executive approval of WF ratings required by most insurers
- UVM SME participation lends credibility, builds trust, and enhances the conversation

Mitigate, Manage, & Manifest

Risk Reduction Rewards Realized

SMUD®

Proven Results:

- Quantifiable WF risk reduction
- Impactful visuals – LiDAR, graphics, and statistics
- Harness technology
- Preferred insurance underwriting risk – more capacity, lower rates

New standards established for ROW Management on landscape level

Safety & Reliability

Veg Mgt & Risk Mitigation –

- **Winter 2021-2022**: Record snowfall and wind events: **No vegetation related outages**
- **Winters 2023-2025:** Record rain events: **No vegetation related outages**
- **No vegetation related wildfire ignitions in territory**
- **No vegetation related outages on the transmission system**

Wildfire Insurance

2026-2027 Program Renewals –

- Affordable capacity offered
- Limits expanded
- Rate reductions extended
- All incumbent carriers remained on the program
- New capacity / carriers joined
- Filled out the program within budget –
  - Limit increased 11%
  - Self-insured portion reduced 29% (lowest in program)
  - Insured coverage increased by 12%

Insurance Market Context: Successful renewals in 2025/26 and 2026/27 following significant challenges in the WF insurance market, particularly following California's 2025 severe wildfires

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