

CALTRANS CLIMATE CHANGE
**VULNERABILITY &
RISK ASSESSMENT**
STATEWIDE SUMMARY
REPORT

2026

ARUP

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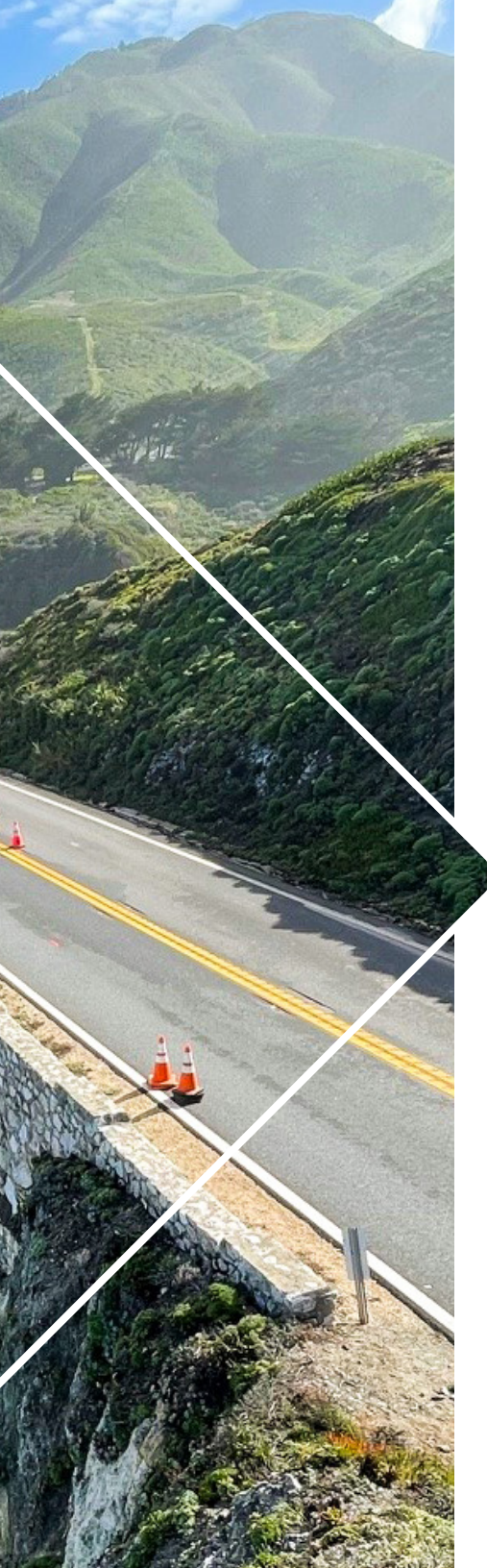
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Caltrans

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with support from:
Pathways Climate Institute
Cambridge Systematics





Key Definitions

Adaptation: Actions, strategies, or measures taken to adjust natural or human systems in response to actual or expected climate change and its impacts, in order to reduce harm, manage risk, or take advantage of potential beneficial opportunities.

Assets: Physical infrastructure that comprises the State Highway System (SHS), including the bridges, tunnels, electrical infrastructures including Transportation Management Systems, and culverts that support its function.

Climate Change: Long-term changes in climate patterns, including temperature, precipitation, sea level, and the frequency and intensity of extreme events, primarily driven by human activities that increase greenhouse gas concentrations in the atmosphere.

Climate Hazard: A climate-related physical event or trend, such as flooding, extreme heat, drought, wildfire, or landslide, that has the potential to cause damage or disruption to assets, services, or communities.

Exposure: The extent to which assets, systems, or communities are located in areas where they may experience climate hazards, considering the geographic overlap between the hazard and the asset.

Representative Concentration Pathways: Greenhouse gas concentration trajectories through 2100 representing possible future climate scenarios. The CCVRA uses RCP4.5 and RCP8.5.

Resilience: The ability of assets, systems, or communities to anticipate, prepare for, withstand, adapt to, and recover from disruptions while maintaining or rapidly restoring essential functions.

Risk: The potential for adverse impacts resulting from the interaction of a climate hazard with the exposure, vulnerability, and criticality of assets or systems, often expressed as a combination of the likelihood of an event and the severity of its consequences.

Sea Level Rise: The increase in the surface elevation of the world's oceans due to increasing global and local temperatures. As sea levels rise, the frequency of coastal hazards such as coastal flooding and coastal erosion increases.

Shared Socioeconomic Pathways: The storylines describing the societal, economic, political changes that lead to the future worlds delivering on the greenhouse emissions described by the RCPs. The CCVRA uses SSP2-4.5 and SSP5-8.5.

Vulnerability: The degree to which an asset, system, or community is susceptible to harm from hazards, based on its sensitivity to impacts and its capacity to cope with, adapt to, or recover from those impacts.



Background

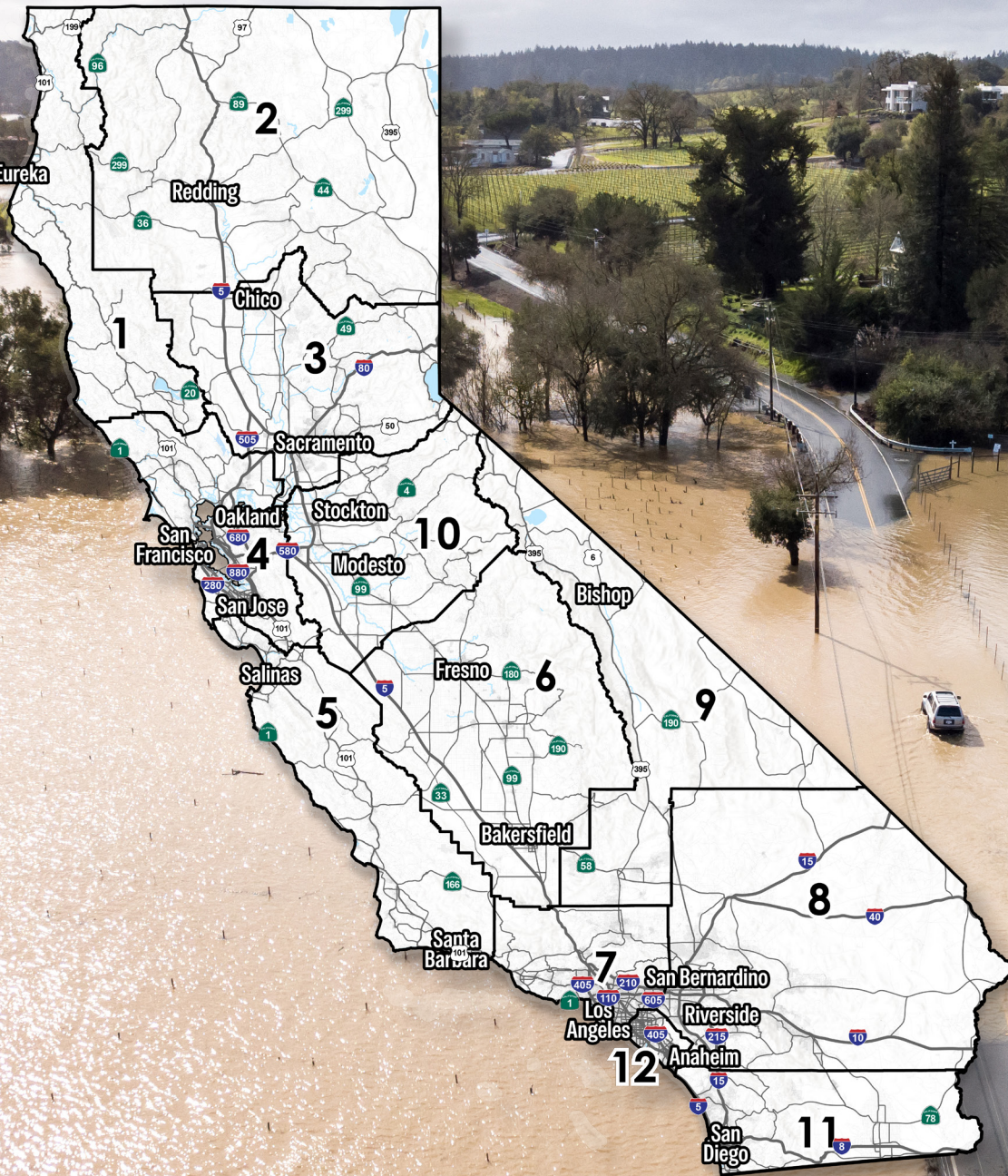
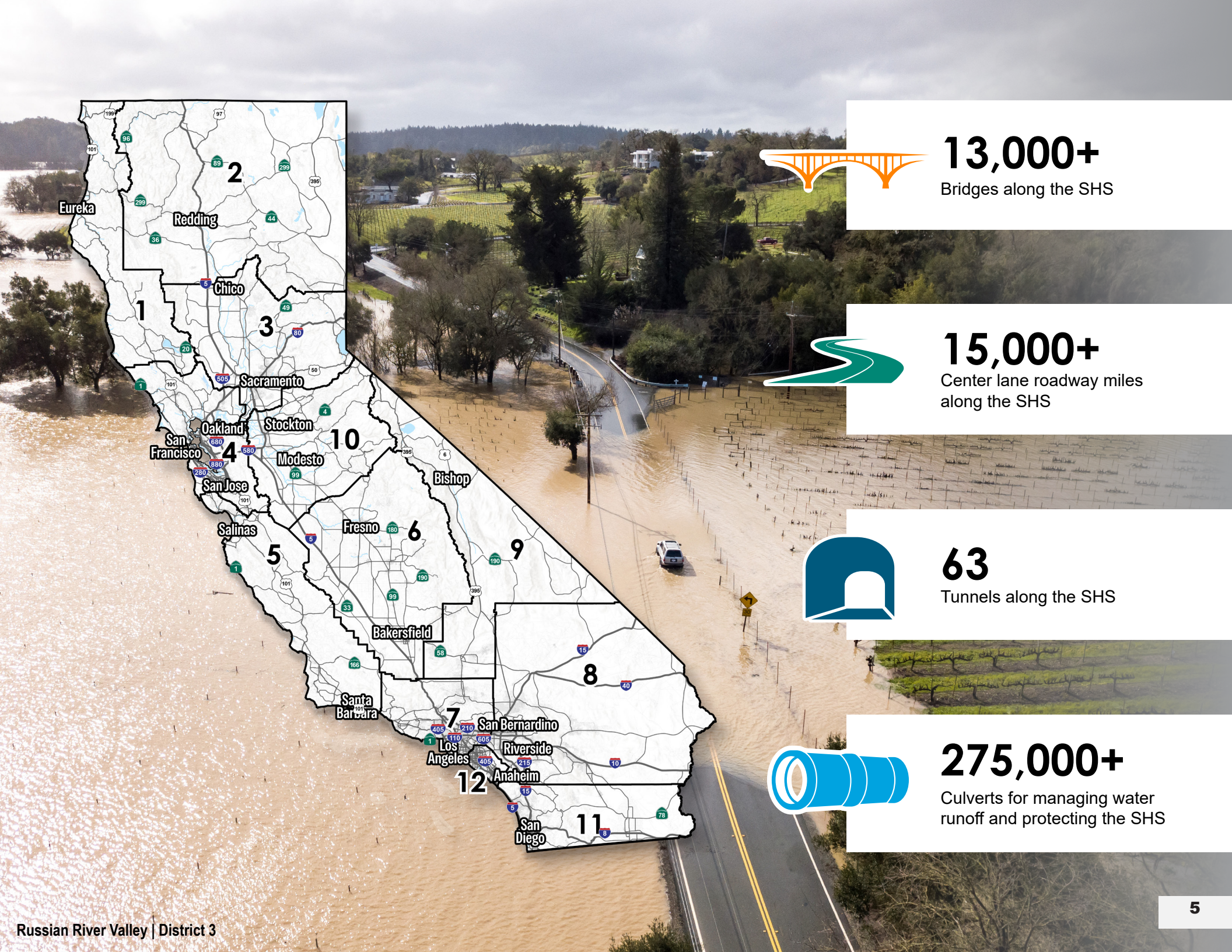
The 2026 Climate Change Vulnerability Risk Assessment (CCVRA) represents Caltrans' effort to safeguard the State Highway System (SHS) against a changing climate. Building on previous efforts, this report marks a strategic transition from identifying hazards to a rigorous, statewide risk-based framework.

By integrating the latest climate science and analytical tools, the CCVRA provides a clear, data-driven roadmap for planning, asset management, and project delivery across all 12 districts.

In addition to this Statewide Summary Report, the CCVRA provides data through an online public map. The Technical Report explains the methodology used to develop the Statewide Summary Report and the online map.

Together, these resources offer a transparent and repeatable framework, allowing Caltrans to seamlessly update climate projects as new asset information or scientific data becomes available. This report presents an overview of the CCVRA methods and findings.

Coronado Bridge | District 11



13,000+
Bridges along the SHS



15,000+
Center lane roadway miles
along the SHS



63
Tunnels along the SHS



275,000+
Culverts for managing water
runoff and protecting the SHS



Purpose

The CCVRA serves as a comprehensive, planning-level analysis of climate change impacts on the SHS. It includes a range of climate hazards, and a robust risk assessment.

This assessment has three objectives:

01

Establish risk assessment approach

Previous Caltrans assessments evaluated climate hazard exposure and identified adaptation priorities. This updated assessment takes a risk approach that incorporates the vulnerability of Caltrans assets to specific hazards and the physical consequences of climate impacts on Caltrans' infrastructure. This strengthens Caltrans' understanding of potential system disruption and damage associated with climate hazards across all 12 districts.

02

Provide actionable resilience and adaptation data

Deliver current data and comprehensive risk ratings for SHS assets for key climate hazards. The methodology established here enables Caltrans to use a statewide risk assessment framework to support risk-informed decision making.

03

Increase transparency and support future updates

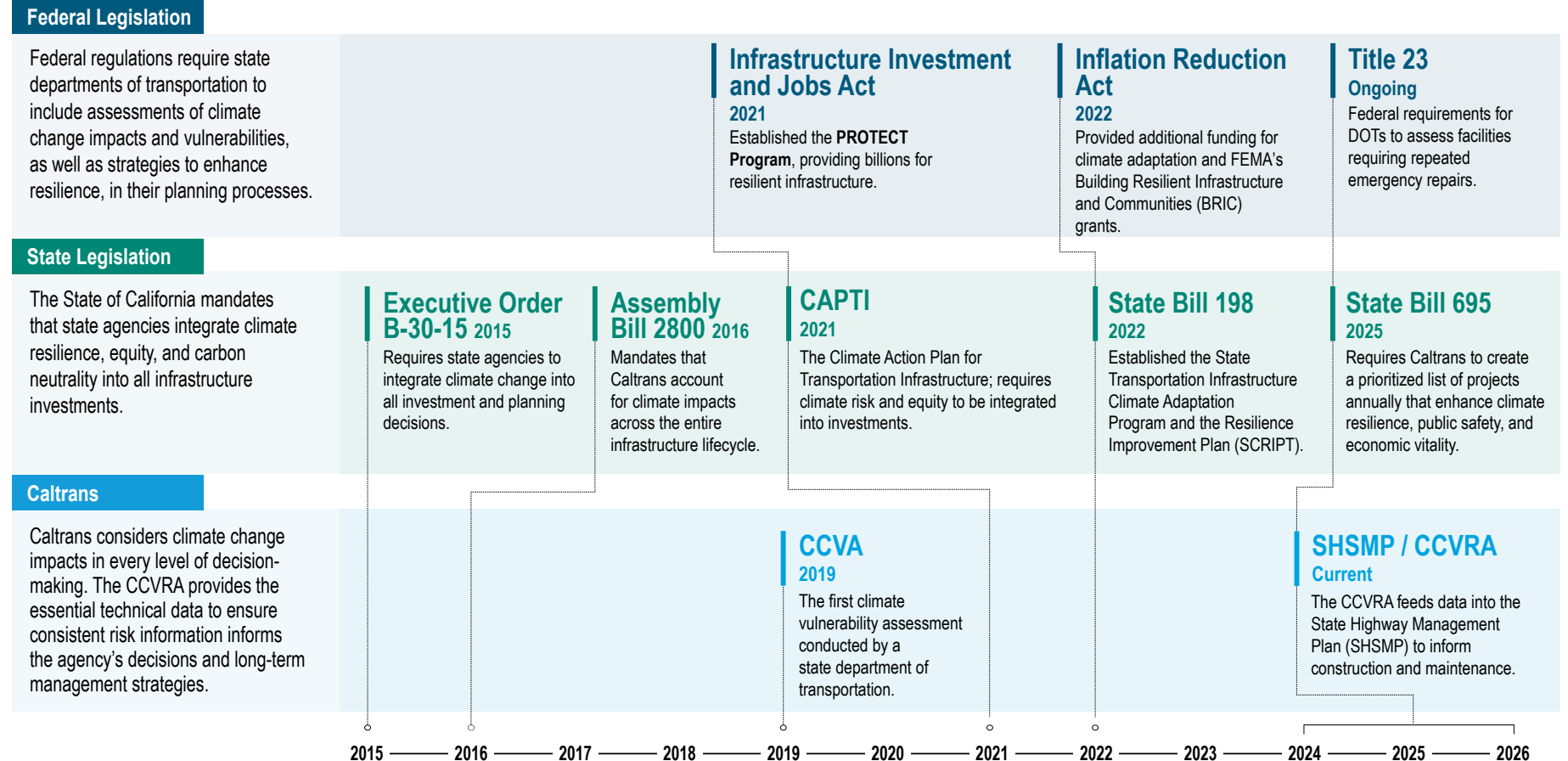
This assessment provides the underlying methods and data necessary for Caltrans to update its findings as new climate data or asset information becomes available.



Policy Context

The CCVRA is a direct response to existing policy and funding opportunities at both the federal and state levels.

The CCVRA adheres to and advances the following policies:





Key Advancements Since 2019

The previous assessment in 2019 identified where climate hazards pose the greatest threat to the SHS. The CCVRA builds on that foundation by integrating the latest climate science and additional climate hazards within a standardized risk assessment framework. These enhancements reflect Caltrans' transition toward a more precise, strategic, and data-driven process for addressing climate risks.

Central to this evolution was a collaborative engagement process designed to incorporate technical knowledge, field expertise, and practical experience from staff directly involved in asset management, planning, and project delivery. This ensured the CCVRA reflects real-world conditions and supports practical application across the agency.

This direction resulted in several areas of focus and advancement:

Higher resolution climate data

This assessment relies on data from California's Fifth Climate Change Assessment, including indicators from the latest downscaled climate models and statewide hazard datasets, providing higher resolution information on the hazards that most impact the transportation network.

Statewide consistency and actionable insights

The assessment includes a standardized framework that evaluates climate risks consistently across all districts and hazards, ensuring comparable risk ratings statewide. This approach provides the granularity needed to capture district-specific and cascading threats, such as wildfire-induced debris flows, to support localized adaptation and strategic implementation.

Advancements in risk and resilience analysis

The 2026 CCVRA transitions from the 2019 exposure-based mapping to a statewide risk assessment framework aligned with Caltrans asset management practices. This approach expands upon hazard exposure to include a deeper assessment of asset vulnerabilities and impacts.

User-friendly, transparent tools

The CCVRA empowers Caltrans staff by providing practical, accessible resources and analytical tools that are straightforward for staff at both Headquarters and the District level to apply during project planning and decision-making.





Methodology

This chapter outlines the standardized approach Caltrans uses to evaluate climate-related risks to the State Highway System (SHS). By integrating hazard, exposure, and vulnerability into a single, comparable framework, this methodology enables consistent assessment across asset types and climate stressors.

How We Assess Risk

Caltrans identifies risks to the SHS by combining three key factors. Together, these help us decide where to invest in repairs and improvements to keep California moving.

Hazard

The likelihood and intensity of a climate-related event

Exposure

Identifies SHS assets located in areas where climate hazards are expected to occur

Vulnerability

How susceptible the exposed assets are to damage



This data-driven approach allows us to prioritize projects that make our transportation system stronger and more resilient for everyone.

The 2026 CCVRA establishes a state-of-the-art approach to evaluate risk across California's highways in two ways:

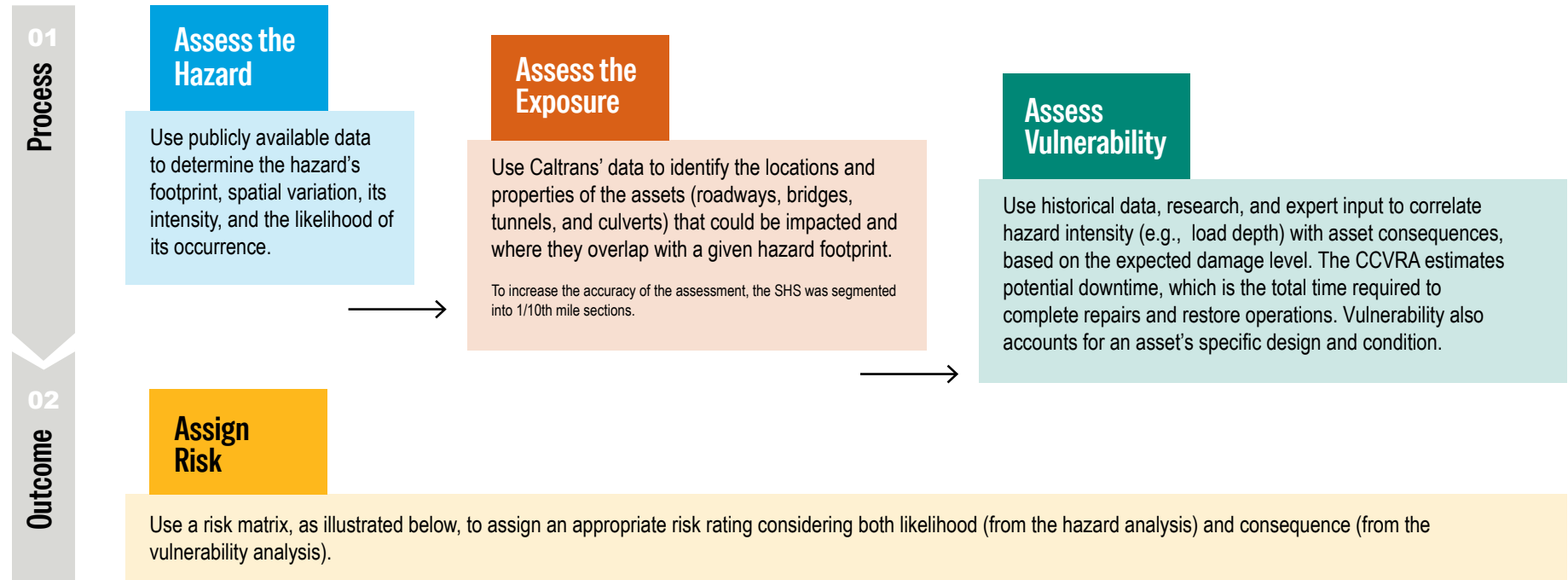
Consistent scoring across hazards

All risks, from wildfires to floods, are measured on the same scale. This ensures a clear, statewide comparison of where investments are needed most.

Severity- and asset-specific consequences

Evaluates different hazard intensities and asset vulnerabilities to determine how damage varies. The result is a more accurate and useful understanding of risks to our roads, bridges, tunnels, and culverts.

The CCVRA follows a structured, sequential process to calculate risk for a specific asset and hazard:



		Consequence (Downtime)				
		Temporary Route Loss	Short-Term Route Loss	Medium-Term Loss	Long-Term Route Loss	Semi-permanent Route Loss
Likelihood	Permanent Exposure	Extremely High	Extremely High	Extremely High	Extremely High	Extremely High
	Exceptionally Likely	Medium	Medium-High	High	Very High	Very High
	Very Likely	Low-Medium	Medium	Medium-High	High	Very High
	Likely	Low	Low-Medium	Medium	Medium-High	High
	Possible	Very Low	Low	Low-Medium	Medium	Medium-High
	Unlikely	Very Low	Very Low	Low	Low-Medium	Medium

This risk matrix used for the CCVRA is adapted from risk tables in the 2022 Transportation Asset Management Plan (TAMP) and the 2025 State Highway System Management Plan (SHSMP).

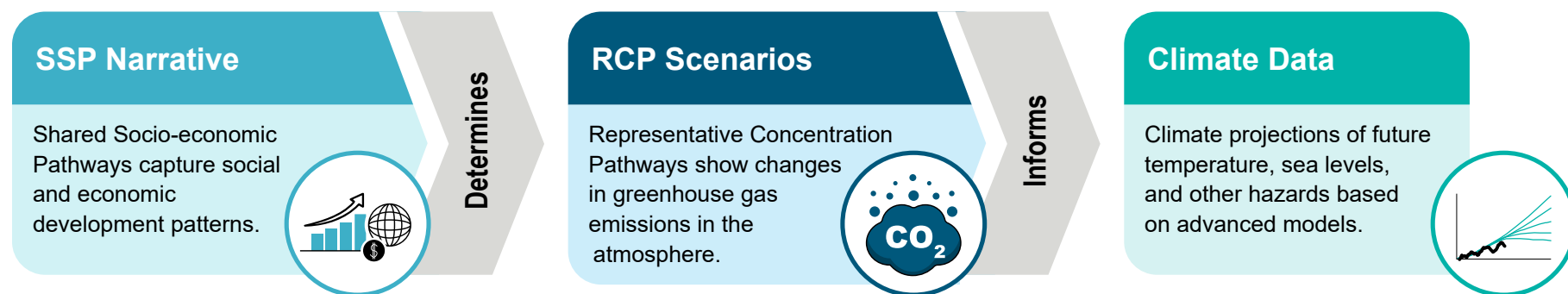


Climate Scenarios

The CCVRA evaluates future risks under two emissions futures, an intermediate and a high scenario, to provide a range of plausible climate outcomes for California's transportation system.

The CCVRA draws on both the Fourth and Fifth California Climate Change Assessments (CCA4 and CCA5), which are based on successive generations of Global Climate Models (GCM) (CMIP5 and CMIP6, respectively). While CCA5 reflects the

latest advances in climate science and introduces updated scenario frameworks that integrate socioeconomic pathways with emissions trajectories, many planning-relevant datasets remain more fully developed and available under the CCA4 framework.



Earlier climate assessments used Representative Concentration Pathways (RCPs) to describe emissions trajectories (e.g., RCP8.5), while newer models adopt Shared Socioeconomic Pathways (SSPs), which link emissions to global societal change. To maintain consistency with CCA4 and CCA5, the CCVRA focuses on two emissions scenarios, intermediate and high.

Caltrans can discuss the SSP1-2.6 scenario and other scenarios as valid options in future CCVRA updates or in other phases of project delivery, including project design. However, the SSP1-2.6 scenario cannot be incorporated into the 2026 CCVRA maps and risk assessments, since staff used downscaled GCM outputs from the Fifth California Climate Assessment as the basis for the GIS maps in the 2026 CCVRA, and these outputs are not available for SSP1-2.6.

Intermediate Emissions Scenario

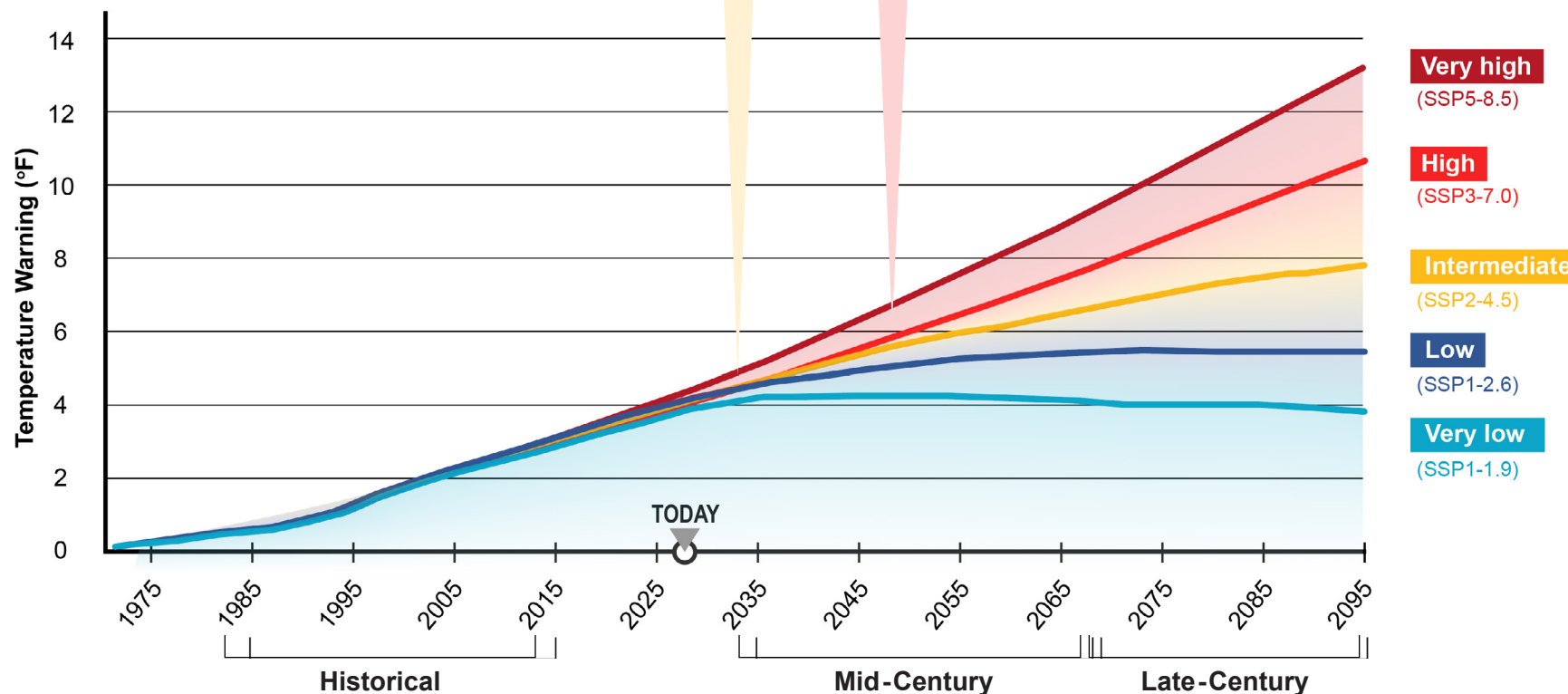
RCP4.5 for data from the CCA4
SSP2-4.5 for data from the CCA5

Assumes emissions follow current trends until mid century, when they start decreasing

High Emissions Scenario

RCP8.5 for data from the CCA,
SSP5-8.5 for data from the CCA5

Assumes a continued reliance on fossil fuels and increase in the associated emissions



The five Shared Socioeconomic Pathways (SSPs) represent distinct global development futures that drive emissions and climate outcomes. The figure shows how projected temperatures diverge

through 2100 across these pathways. Within this framework, the CCVRA focuses on intermediate and high emissions futures, evaluated across historical, mid-century, and late-century conditions.



Key Findings

This section presents the results of the risk assessment of the SHS for the five climate hazards shown on the right. Caltrans selected these hazards by collaborating across divisions, prioritizing those with the highest impacts on Caltrans' assets and the greatest potential to be addressed with strategic adaptation measures.

The specific details for implementing each step of the methodology depend on the format of the datasets available for each hazard. The CCVRA uses the following data sources to assess the current and future characteristics of the hazards included in the risk analysis:

Hazard	Data source for current conditions	Data source for future conditions
 Riverine Flooding	FEMA National Flood Hazard Layer	Maximum Annual Total Runoff, calculated from the LOCAv1 Variable Infiltration Capacity Model (LOCAv1-VIC)
 Coastal Flooding and SLR	Inundation extent and flood depth from the Coastal Storm Modeling System (CoSMoS) for multiple sea level rise scenarios	
 Coastal Erosion	Shoreline change and cliff retreat from CoSMoS for multiple sea level rise scenarios	
 Wildfire	CAL FIRE wildfire threat and tree mortality datasets	Decadal wildfire probability, developed by UC Berkeley and UC Merced and hosted on Cal-Adapt
 Landslides	Deep-seated landslide susceptibility map developed by the California Geological Survey (CGS)	Winter season soil moisture, calculated from the LOCAv1 Variable Infiltration Capacity Model (LOCAv1-VIC)



Riverine Flooding

pages 16-19



Coastal Flooding

pages 20-23



Coastal Erosion

pages 24-27



Wildfire

pages 28-33



Landslides

pages 34-37





Riverine Flooding

When rivers and creeks overflow, the flooding can substantially damage California's transportation system. Damage can involve roadway washouts, eroded bridge foundations, blocked tunnels from water and debris, and culvert failure due to clogging and erosion.

Riverine flooding occurs when rivers or creeks overflow, spilling water and debris onto adjacent land. Across the State Highway System, vulnerabilities vary by asset type but are largely driven by the depth and velocity of floodwaters. Roadways are susceptible to washouts, with the risk escalating in regions prone to unstable slopes or landslides. Bridges face different threats, primarily structural damage caused by the force of high-velocity flood flows and the physical impact of floating debris. Meanwhile, tunnels and culverts are frequently compromised by mud and debris blockages. In extreme cases, severe soil erosion can lead to total culvert failure, necessitating extensive and costly repairs.

Currently, a significant portion of California's SHS is located in a designated flood zone:

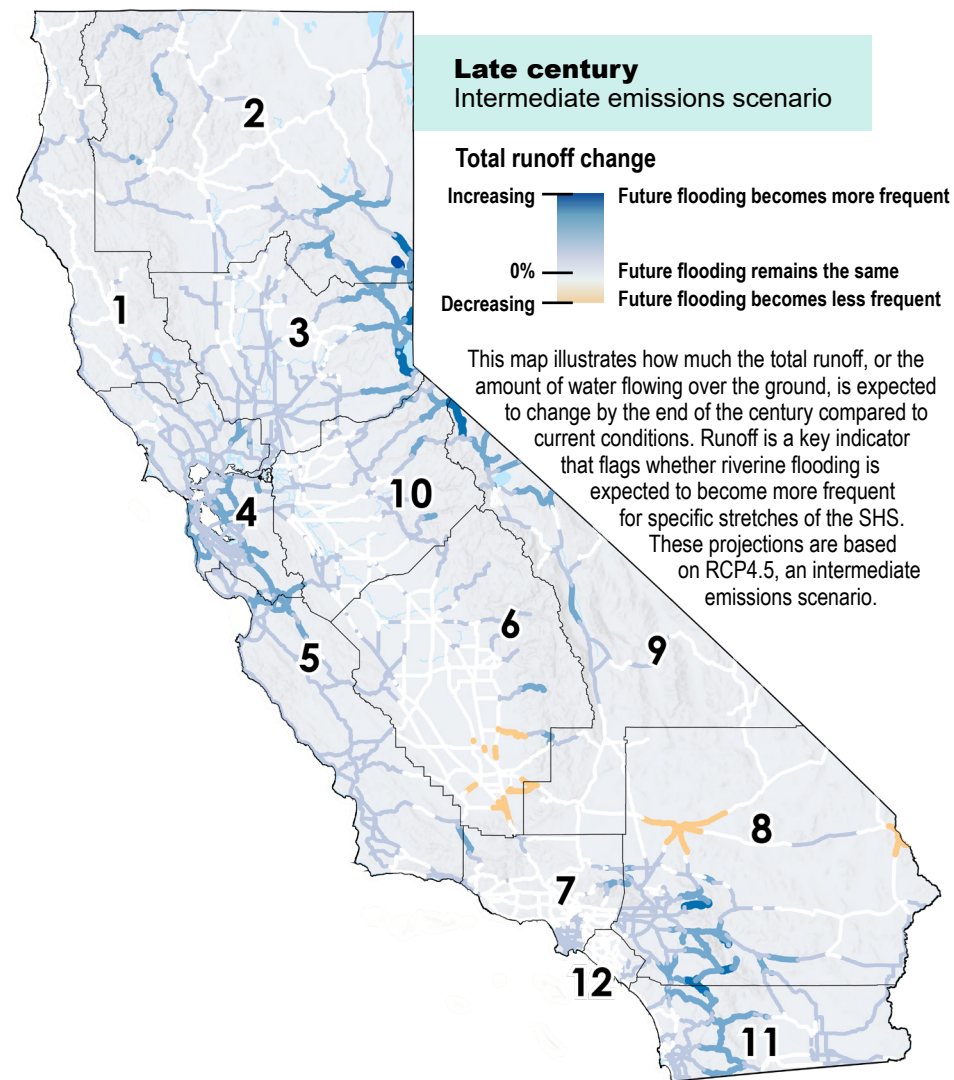
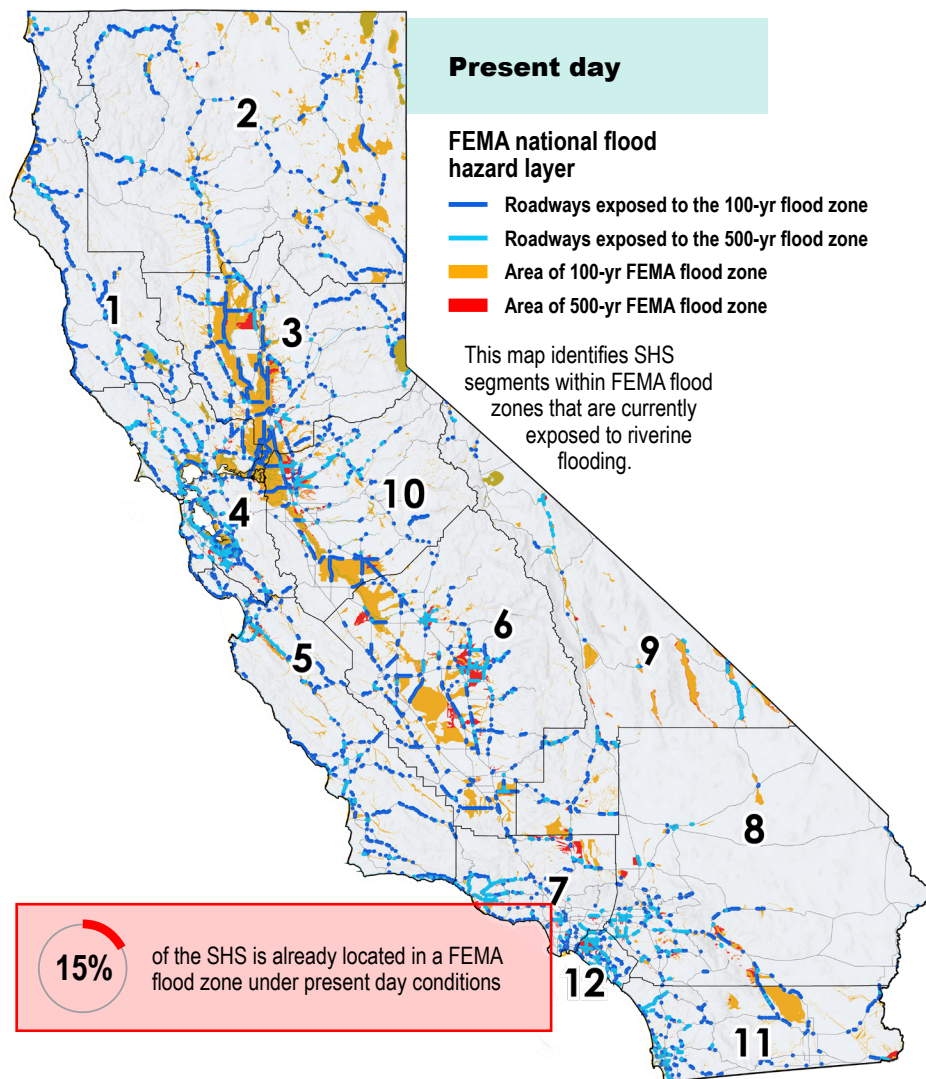
- 11% of the system is in a "100-year" flood zone, meaning there is at least a 1% chance of flooding in any given year.
- An additional 4% is in a "500-year" flood zone, representing a 0.2% annual risk.

Combined, roughly 15% of the statewide network, nearly one in every six miles, faces a measurable risk from riverine flooding under current climate conditions.

While many flood-related road closures are relatively short, the damage can increase significantly when flooding and landslides happen in the same place. For this reason, Northern California and the Central Coast (Districts 1, 2, 3, and 5) have the highest proportion of at-risk road miles due to the "double threat" of both high flood potential and high landslide risk.

Looking ahead, as extreme rainfall and runoff increase, more frequent flooding is expected to raise risk levels across the state. Areas expected to see the greatest increase in future risk include Districts 4, 8, and 11 (the Bay Area, Inland Empire, and San Diego), as well as the entire Sierra Nevada range.

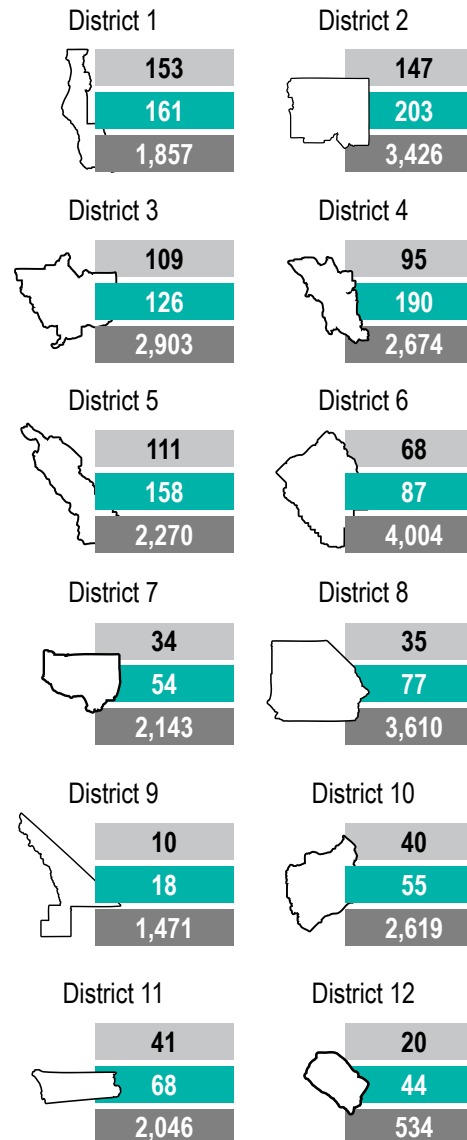
Segments of the SHS exposed to riverine flooding: present day and late century



In the future, riverine flooding is expected to become more frequent across much of California, especially in Districts 4, 8, 11, as well as in the Sierra Nevadas.



Total miles of the SHS facing a medium or higher risk rating



Present day

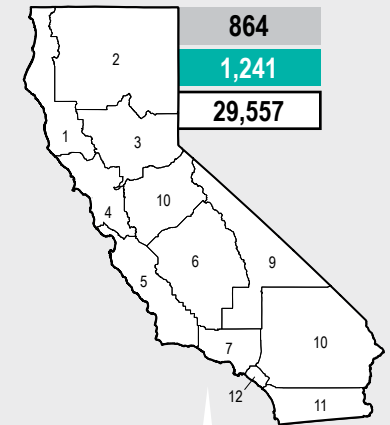
Late century

Intermediate emissions scenario

Total miles

District wide centerline mileage

Statewide

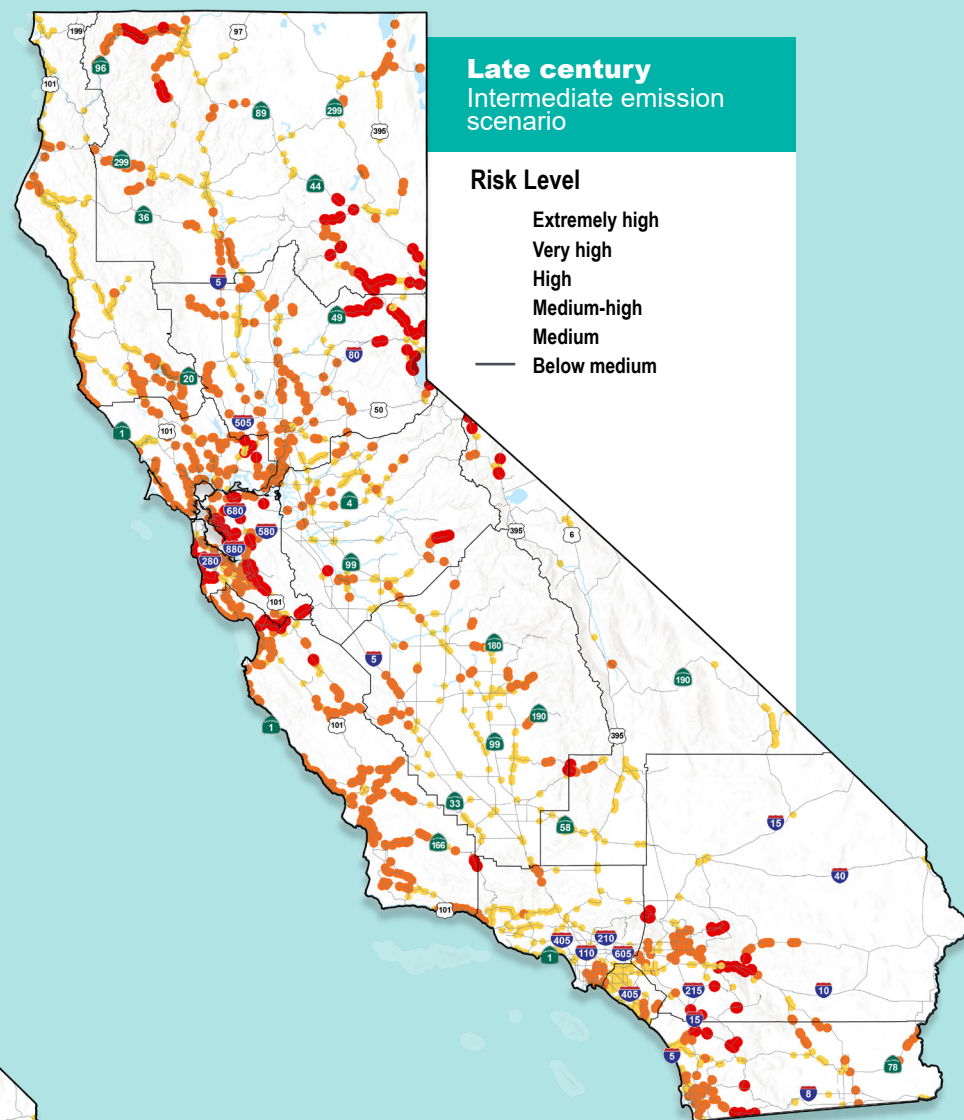
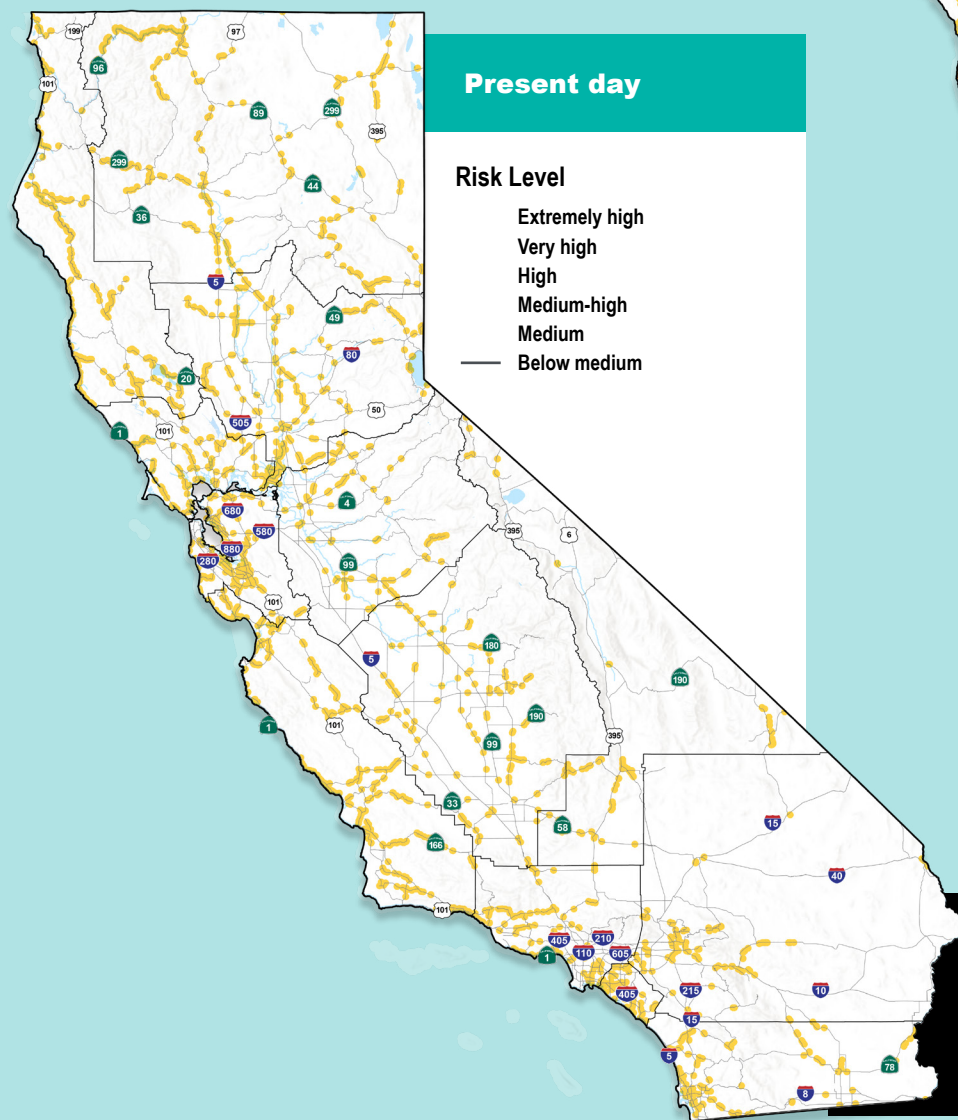


4% of the SHS is projected to be at significant risk to flooding.

While a substantial portion of the SHS is exposed to riverine flooding, most areas have limited risk because the expected damage is manageable. The highest risk occurs where flood-prone segments are also susceptible to landslides, as their combined effect with flooding can significantly damage the road.

Risk ratings for riverine flooding across the SHS

While today's highest riverine flooding risk for roadways is rated as medium, future climate projections indicate this can escalate up to very high as storm intensity and runoff increase.

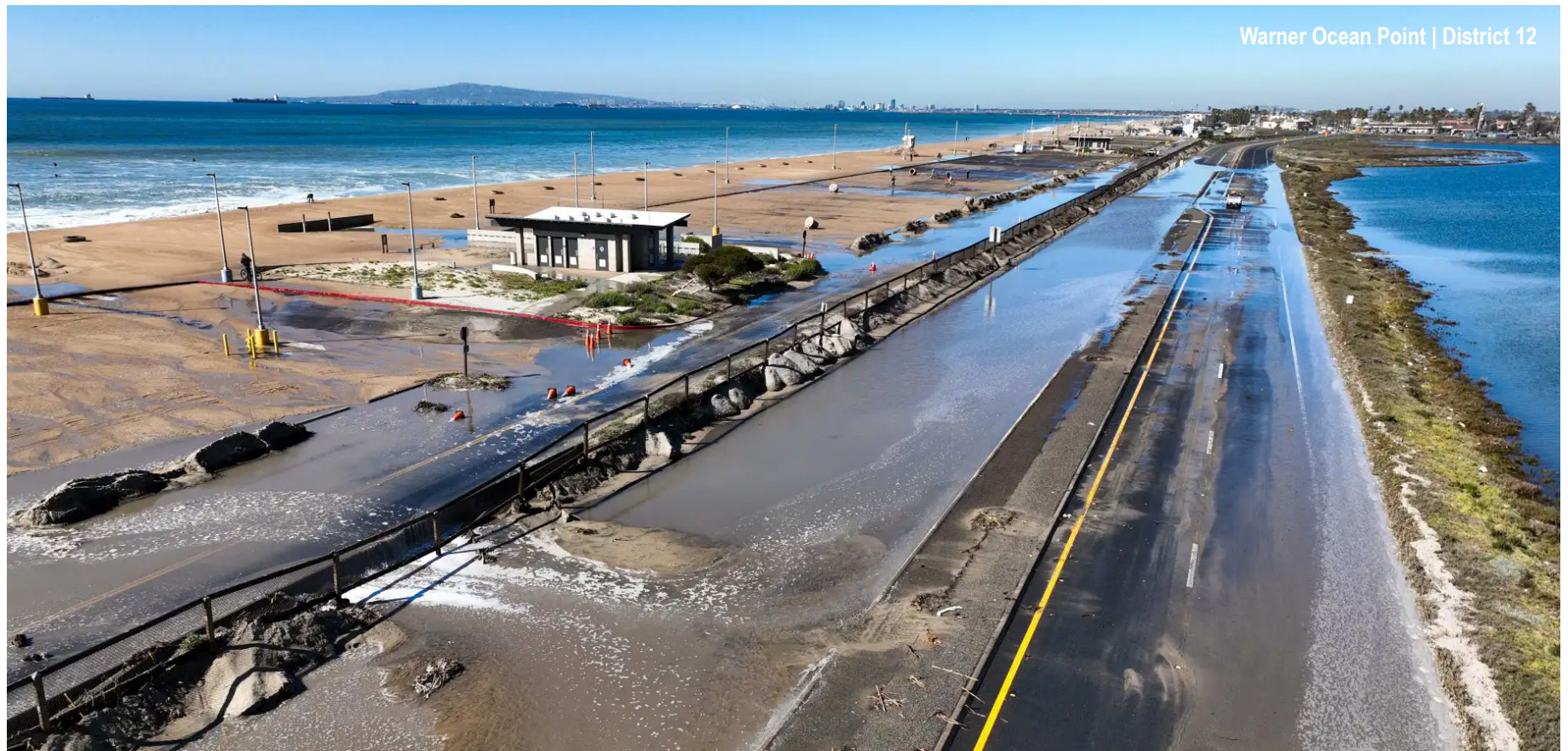


A moderate portion of California's highway network is currently at risk, and future climate conditions will amplify these threats. Increased storm frequency and the combined impact of flooding and landslides will require more resilient infrastructure to prevent major failures.

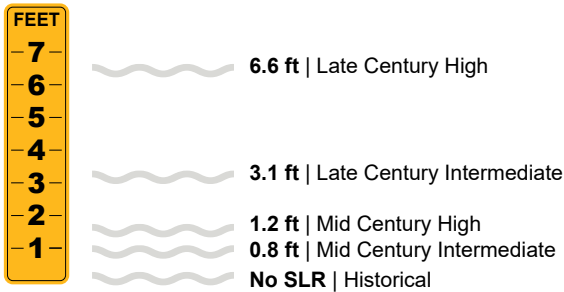


Coastal Flooding and Sea Level Rise

Coastal flooding occurs when seawater moves inland due to high tides, storm surge, and wave-driven processes. Sea level rise (SLR) will intensify the impacts of coastal flooding by raising the baseline sea surface, exposing more land, assets, and people to inundation. Since coastal flooding can lead to the permanent loss of infrastructure, long-term solutions may require realigning, elevating, relocating or strategically decommissioning vulnerable assets.



The SLR scenarios selected for the CCVRA span the range recommended by the latest Ocean Protection Council guidance released in 2024.



Coastal hazards are highly localized within the six coastal districts (1, 4, 5, 7, 11, 12), where approximately 90 miles of roads are currently exposed to coastal flooding during major storms. As climate change progresses and sea levels increase, up to 440 miles of coastal roads could be impacted, with up to 330 miles potentially becoming permanently flooded and lost by the end of the century.

Sea Level Rise + Temporary Flooding

The CCVRA covers two types of coastal flooding, based on source and duration:

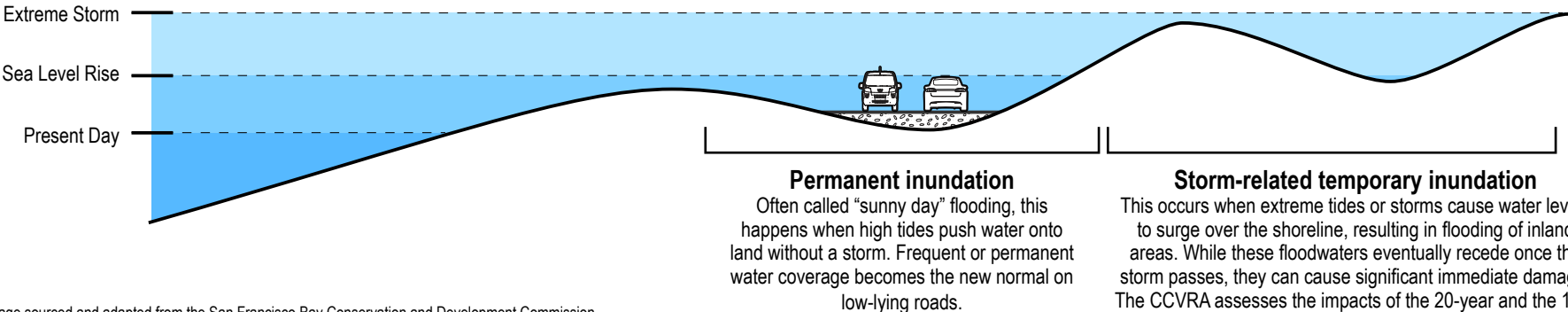


Image sourced and adapted from the San Francisco Bay Conservation and Development Commission

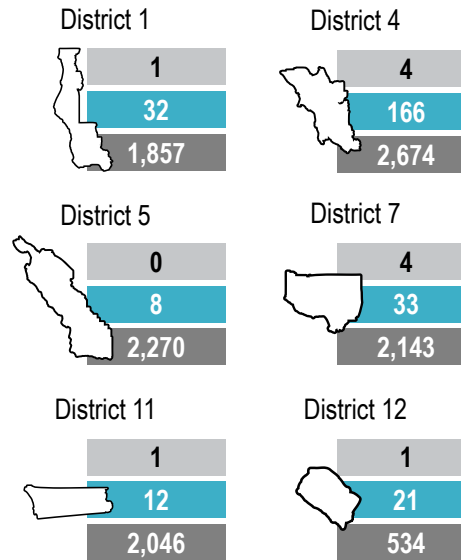
This represents a critical shift from occasional storm disruptions to the chronic loss of infrastructure, forcing Caltrans to decide whether to realign, elevate, relocate, or strategically decommission the affected coastal routes. While the total mileage may seem low compared to the entire SHS, these roads are vital lifelines serving four of California’s most populated districts.

Caltrans assets respond to temporary coastal flooding in ways similar to riverine flooding, with the severity of damage driven by water depth, duration, velocity, and debris. Roadways, bridges, tunnels, and culverts face impacts ranging from temporary closures to major repairs, depending on how floodwaters interact with their foundations, drainage systems, and access points. Landslide susceptibility or poor structural integrity increase the chance of significant damage and, therefore, the risk.

Ultimately, coastal flooding poses the greatest threat of permanent asset loss among all hazards evaluated. This risk increases sharply under higher SLR scenarios, leading to consequences that can be severe or transformational for coastal communities. Due to the highly localized nature of these threats, a detailed review of the district-level findings is essential for understanding the specific impacts on each community.



Total miles of the SHS facing a medium or higher risk rating



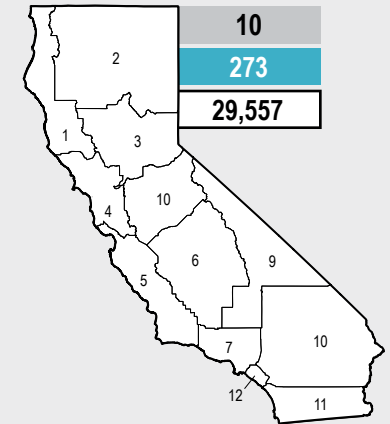
Present day

6.6 ft of SLR

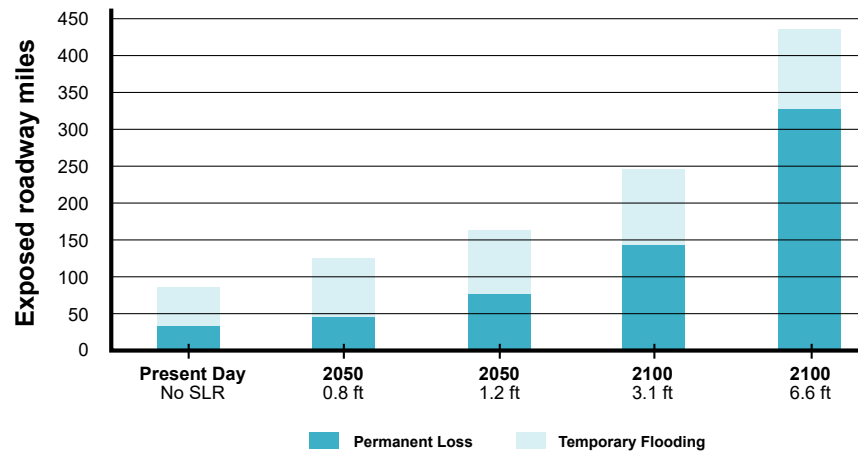
Total miles

District wide centerline mileage

Statewide

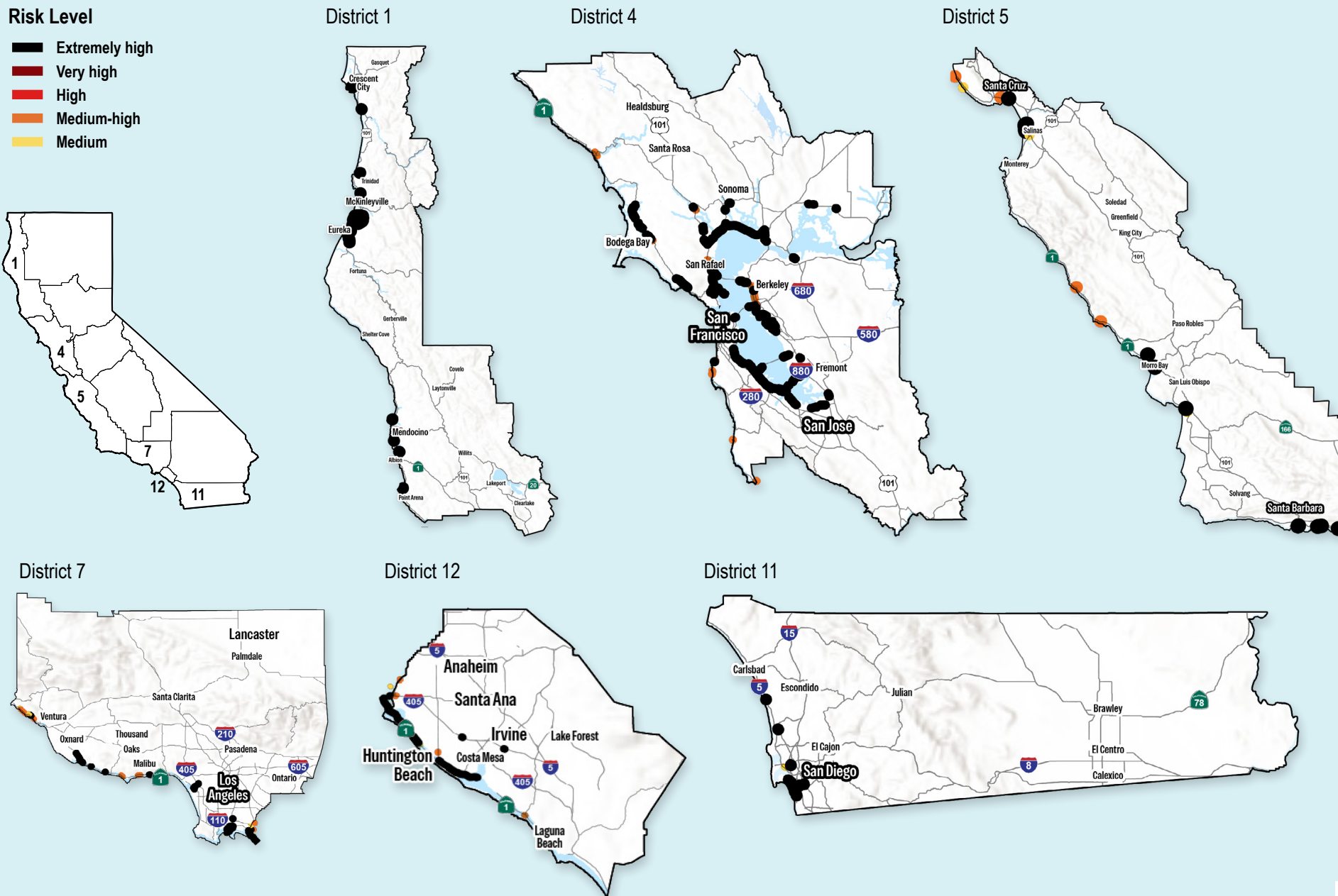


Roadway miles exposed to coastal flooding for each SLR scenario



Coastal flooding impacts a small but highly critical portion of the SHS. The combination of increasing exposure, specific infrastructure vulnerabilities, and rising sea levels create a serious threat. This poses the highest risk of permanent loss for roads that millions of Californians in some of our most populated coastal regions rely on every day.

Risk ratings for coastal flooding across the SHS under 6.6 feet of SLR, representing the most extensive inundation scenario evaluated





Coastal Erosion

Coastal erosion is a progressive loss of land along the coast, driven by the erosive force of seawater and waves. This process is expected to accelerate in the future due to rising sea levels caused by climate change. Coastal erosion is a chronic hazard that causes permanent loss of infrastructure, requiring relocation or redesign rather than simple repair. This poses a significant long-term risk to coastal highways constrained by steep bluffs and narrow shorelines.

The CCVRA considers how both the shoreline and the coastal cliff edges are impacted by the erosive force of the ocean, using the same sea level rise scenarios as the coastal flooding analysis.

Cliff-backed highways are the most vulnerable because fast-moving erosion and narrow inland space leave few options for long-term protection. Coastal erosion threatens Caltrans' assets by progressively diminishing the ground that supports roads, bridges,

tunnels, and culverts. As erosion undermines foundations and approaches, these structures can experience cracking, sinking, or sudden collapse. The severity of this damage depends on how close the asset is to the shoreline, the energy of the waves, and local soil conditions. Because coastal erosion results in irreversible loss of land, any asset exposed to this hazard is assumed to experience permanent loss of function within the CCVRA framework.



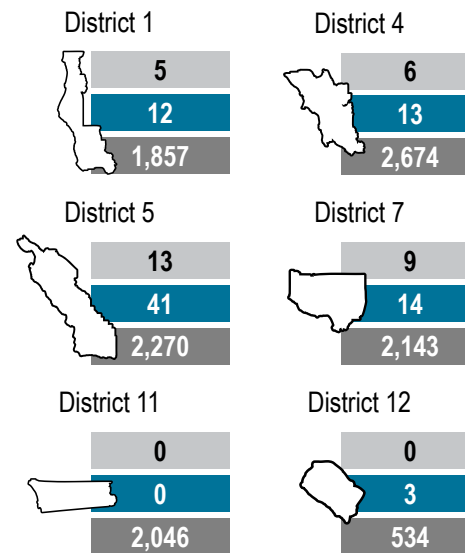


Exposure to coastal erosion is concentrated along cliff-backed highways and narrow shorelines, particularly in Districts 5 and 7, where there is little room to move roads inland. By mid-century, at least 32 miles of roads are expected to be lost to coastal erosion across the state. As sea levels continue to rise, that number could grow to 84 miles by the end of the century, with the heaviest losses concentrated in Monterey, Mendocino, Ventura, San Mateo, San Luis Obispo, and Sonoma counties.

Across all asset types, coastal erosion is classified as a high-consequence hazard because the damage is often irreversible. Unlike other hazards that may allow for simple repairs, erosion typically requires major engineering for stabilization, relocating the highway inland, or full replacement of the asset. Consequently, this hazard is associated with the highest risk rating. As sea levels rise throughout the century, a growing portion of California's coastal roads will face permanent loss rather than temporary disruption.

Because these impacts are heavily localized, understanding specific threats requires detailed district-level mapping. For example, projections for District 5 show that with 6.6 feet of sea level rise, risk is heavily concentrated in the Big Sur region, where the terrain and shoreline conditions make infrastructure particularly vulnerable.

Total miles of the SHS lost to coastal erosion



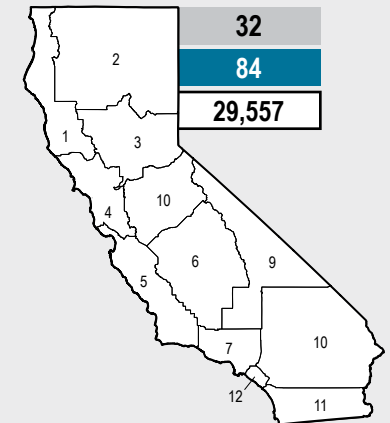
0.8 ft of SLR

6.6 ft of SLR

Total miles

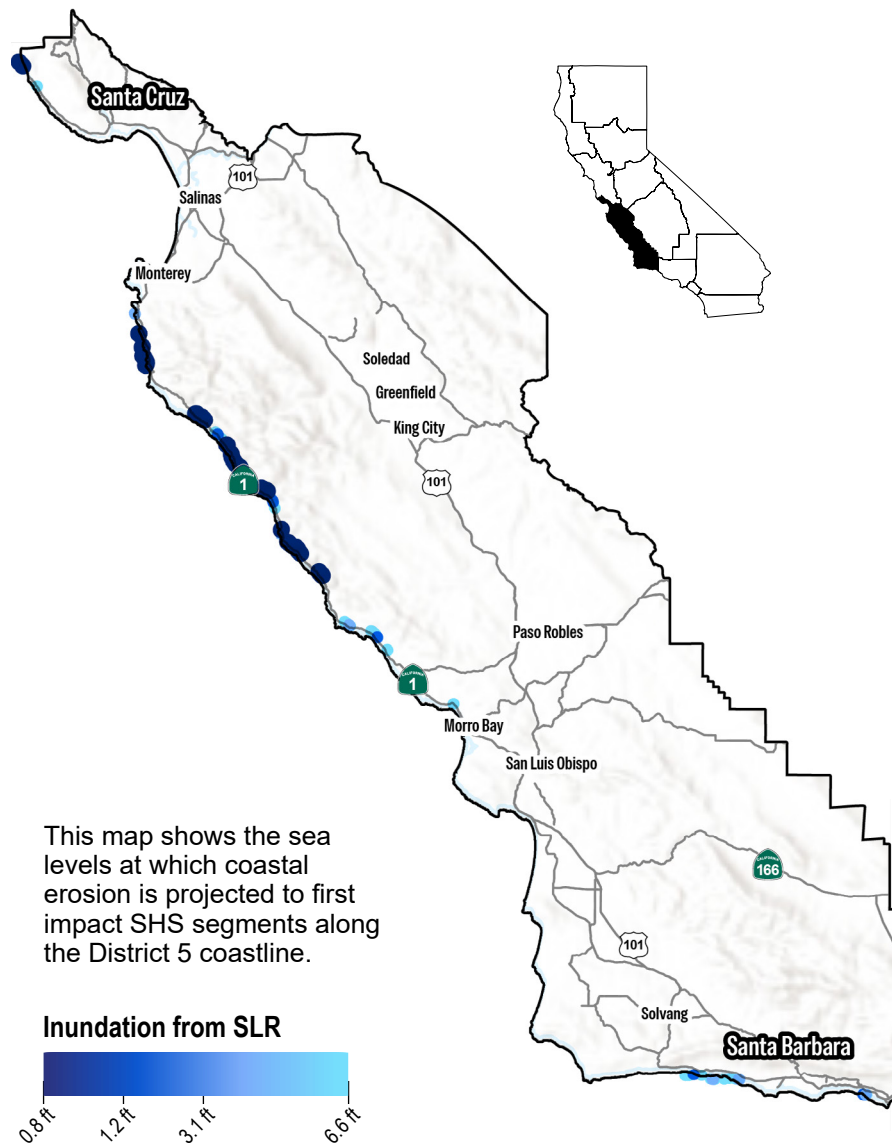
District wide
centerline mileage

Statewide



Coastal erosion poses a permanent and ongoing threat to SHS assets along cliff-backed highways and narrow shorelines within Caltrans' six coastal districts. Adaptation solutions are complex given geographic constraints.

Exposure to coastal erosion in District 5 under 6.6 feet of SLR, representing the most extensive inundation scenario evaluated





Wildfire

The increase in wildfire impacts in California over the past several decades has been driven by three interacting factors: hotter and drier conditions, a legacy of fuel buildup resulting from long-term fire suppression, and continued residential development in fire-prone areas.

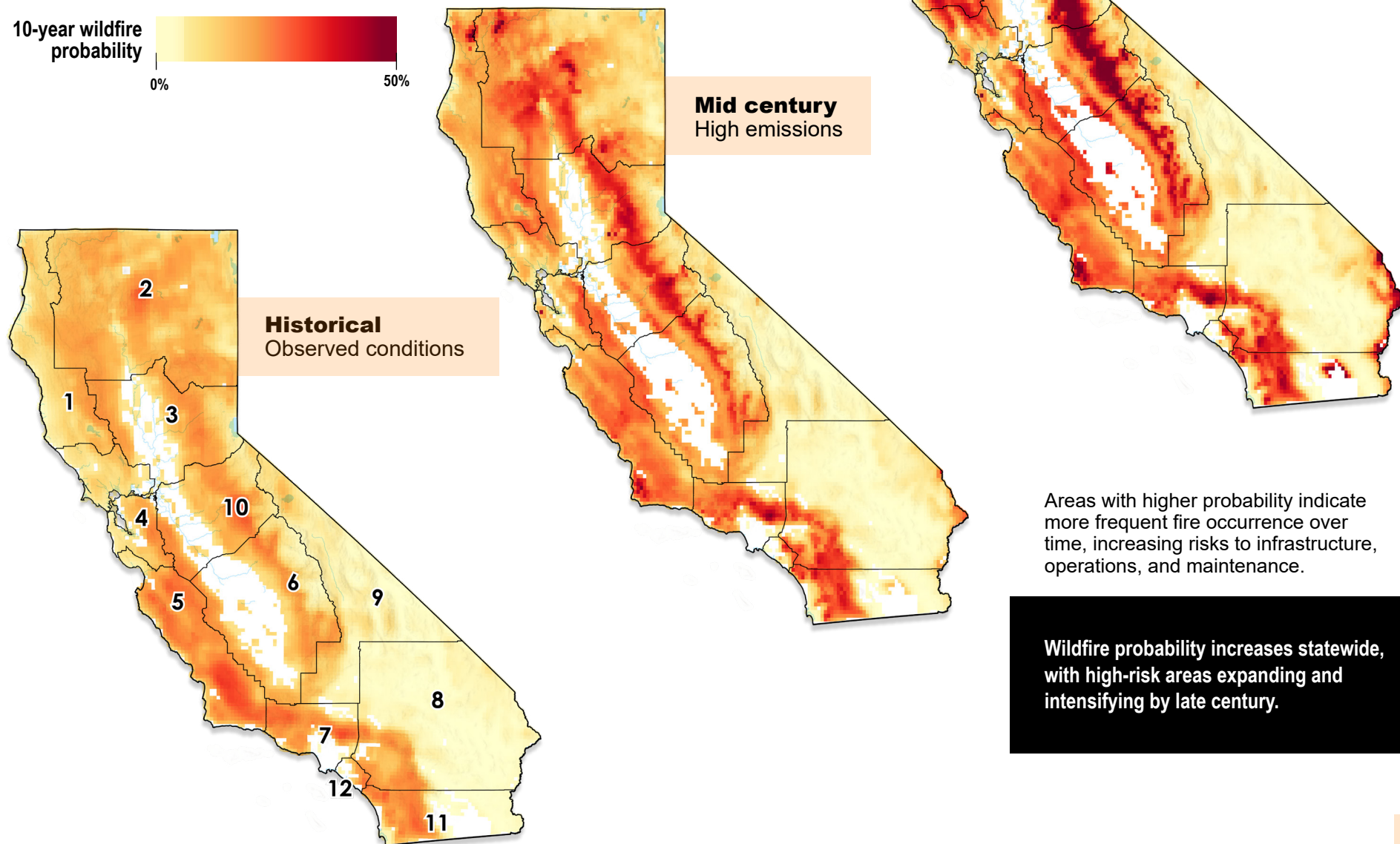
Wildfires increasingly threaten the SHS, causing direct structural damage and exposing infrastructure to extreme heat and smoke. Beyond the flames, secondary hazards such as debris flows, rockfalls, and culvert blockages can further increase maintenance costs and lead to prolonged corridor closures, particularly in vegetated and fire-prone areas.



Projected wildfire probability across California

These maps show the probability of wildfire occurring at a given location over a 10-year period, based on statewide climate and fire modeling.

10-year wildfire probability



Areas with higher probability indicate more frequent fire occurrence over time, increasing risks to infrastructure, operations, and maintenance.

Wildfire probability increases statewide, with high-risk areas expanding and intensifying by late century.

Wildfire risk to roadways is primarily driven by operational disruptions rather than structural failure. While smoke and fallen debris often cause temporary closures, it is rare for a fire to cause permanent road damage. Significant pavement damage typically only occurs in extreme cases when the fire is hot enough to actually weaken the materials that hold the asphalt together.

Similarly, modern concrete bridges are generally resilient against wildfire heat, but steel and wooden bridges can experience catastrophic damage. The main impact of wildfire on tunnels is the overload or damage of the ventilation system, which can lead to safety closures, while plastic culverts can melt when exposed to extreme heat.

Wildfire exposure is widespread across the state, with approximately 75% of roadways statewide located in fire-prone areas. In several districts, this exposure exceeds 90%.

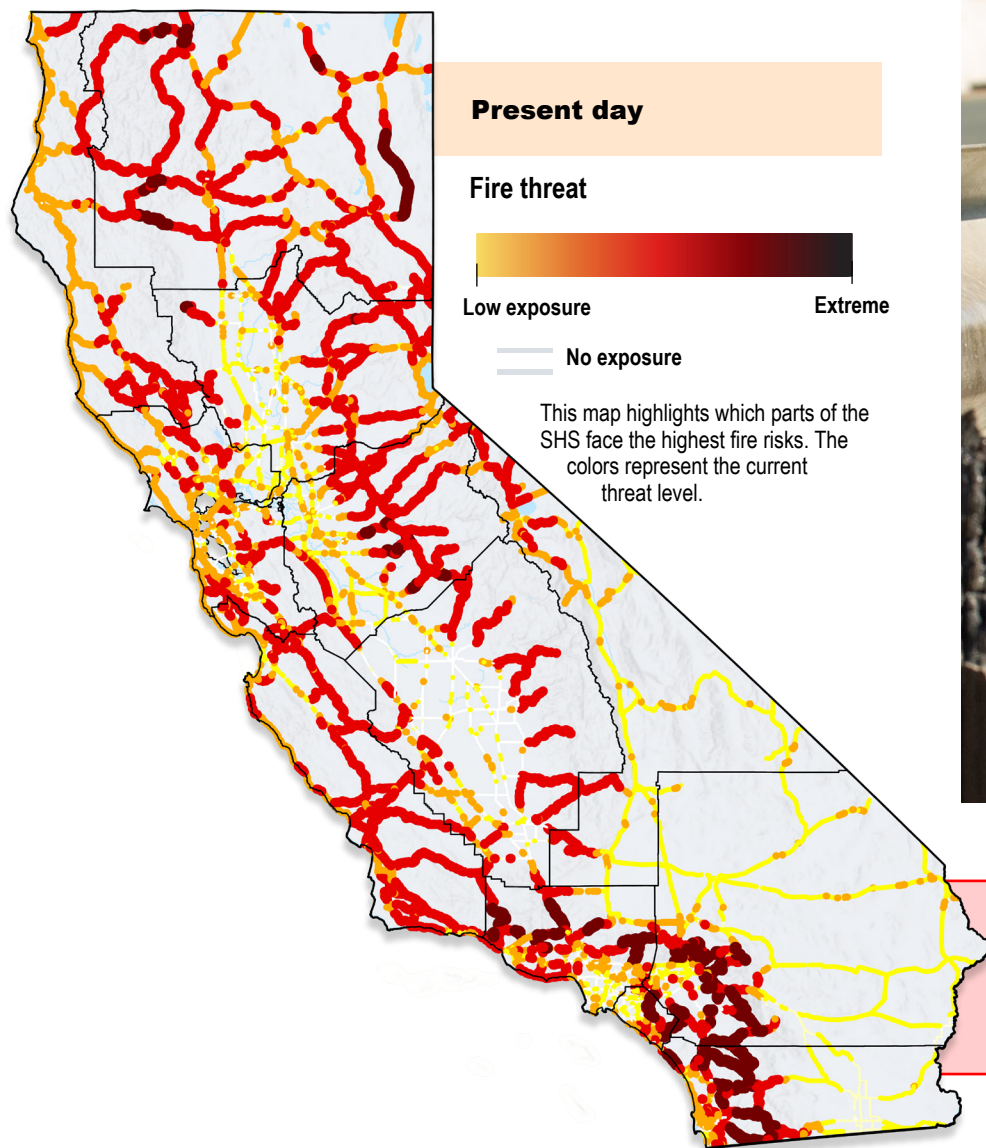
Districts 1 & 2: The North Coast and North Country are heavily exposed due to vast, densely forested terrain with complex topography surrounding mountainous roadway corridors.

District 5: The Central Coast faces wildfire hazard from steep, brush-covered canyons that meet coastal communities and critical travel corridors.

District 9: The Eastern Sierra is vulnerable due to its arid climate and highways that pass through expansive, flammable wildlands.



Segments of the SHS exposed to wildfire



75%

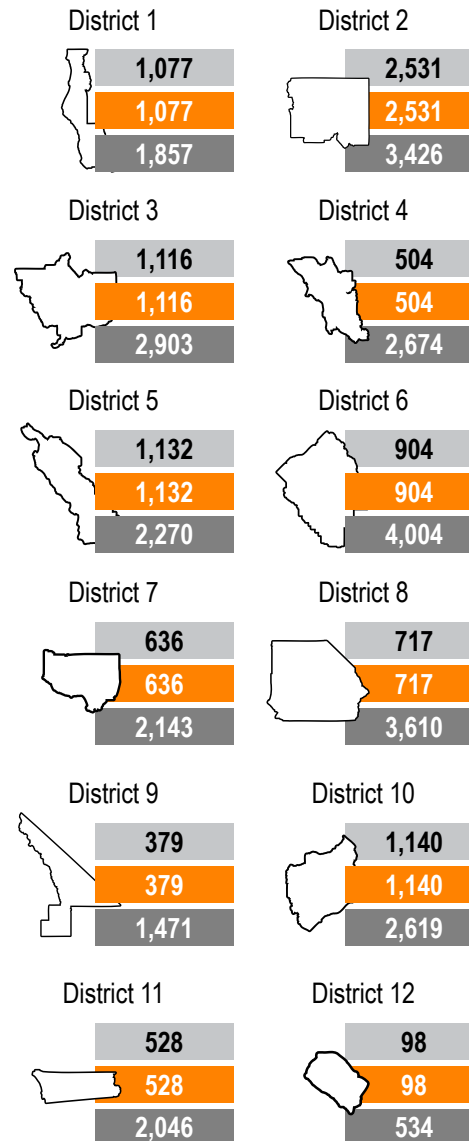
of the SHS is
exposed to some
level of wildfire
hazard

90%

in D1, D2, D5,
and D9 the SHS
exposure increases
to 90% and above



Total miles of the SHS impacted by wildfire



Present day

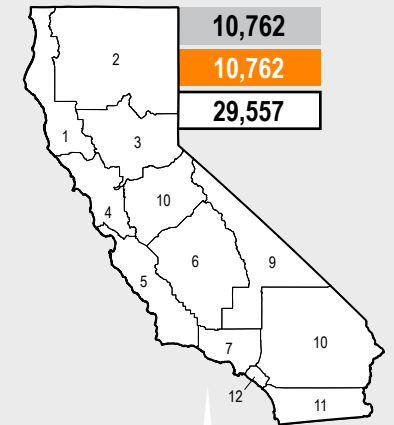
Late century

Intermediate emissions scenario

Total miles

District wide centerline mileage

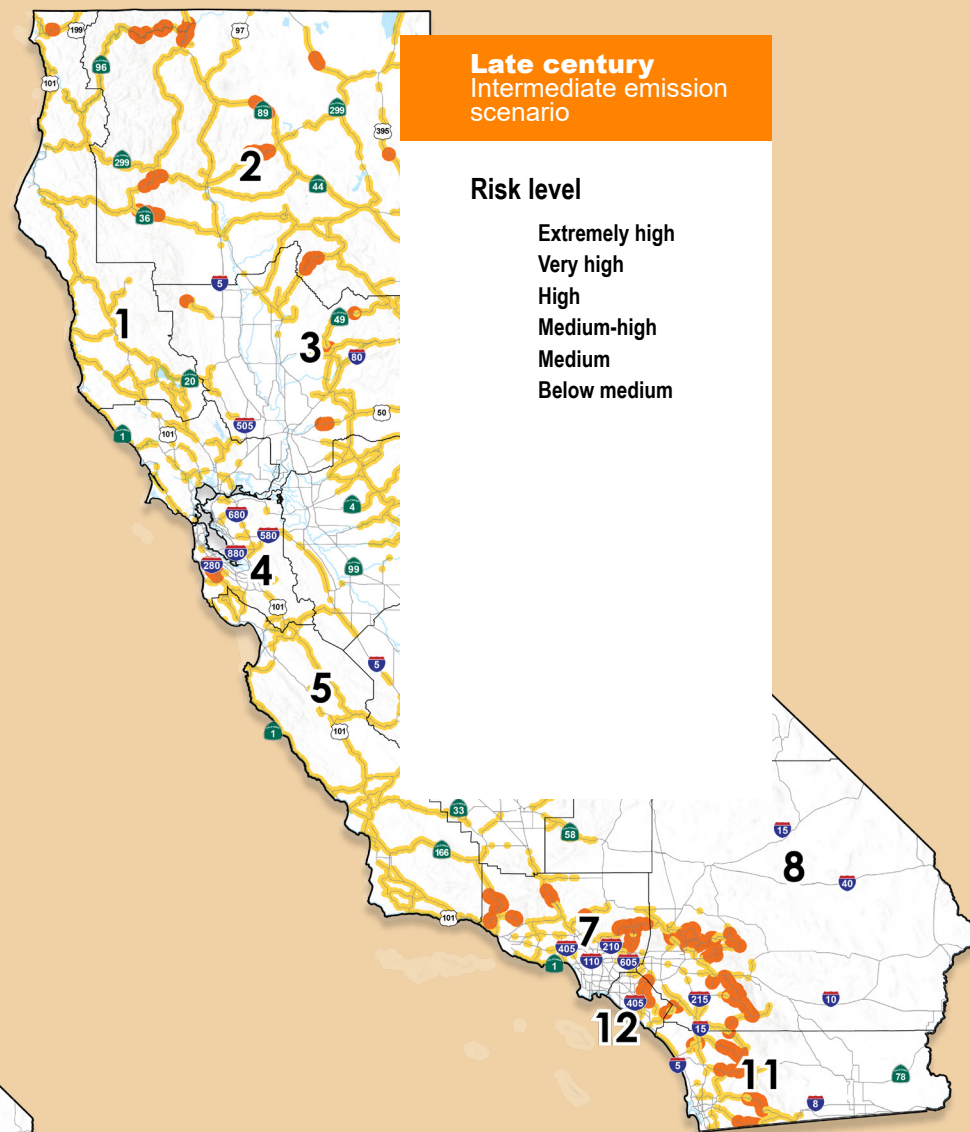
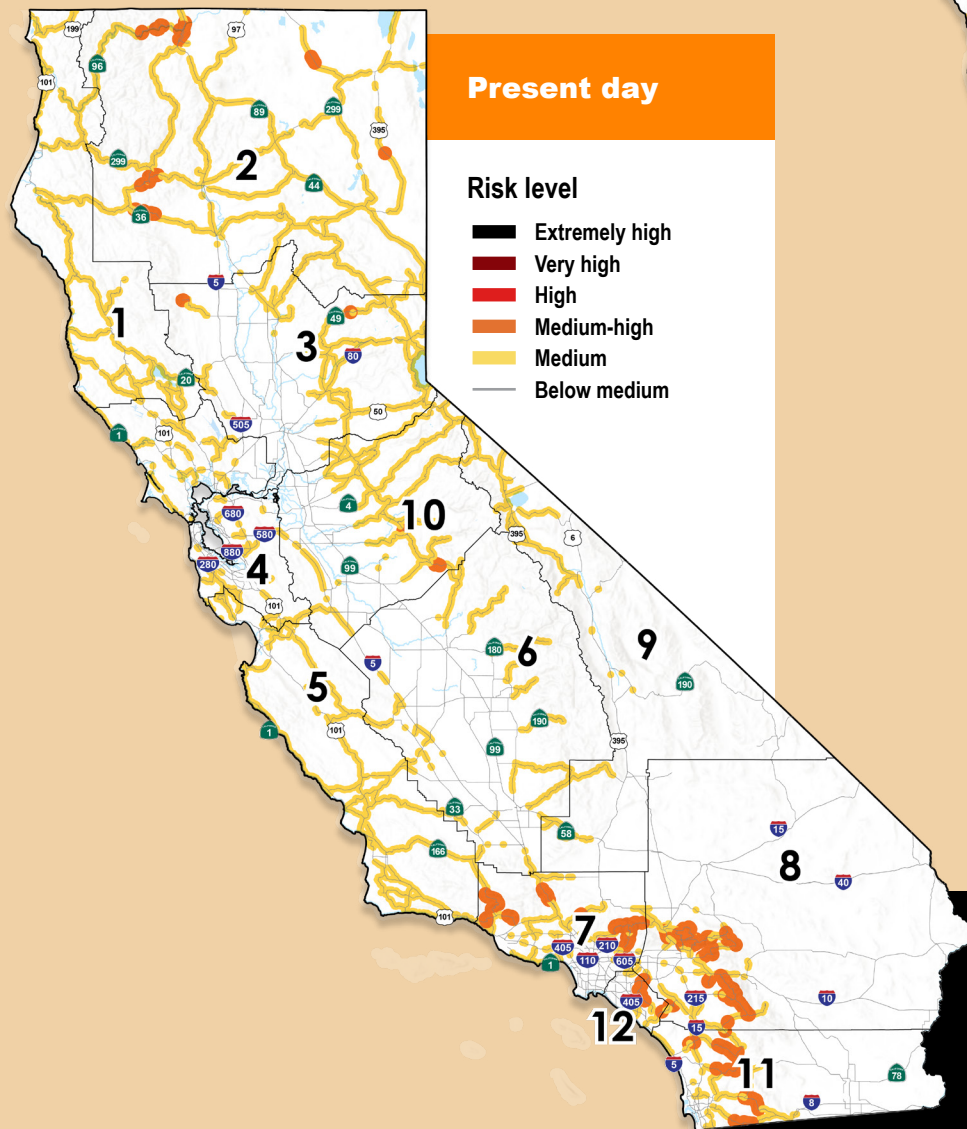
Statewide



More than one third of the SHS has a medium or higher risk rating for wildfire today, highlighting how widespread the hazard is. While wildfire frequency is expected to continue increasing in the future, the associated risk remains moderate, and only a few roadway segments experience increased risk.

Risk ratings for wildfire across the SHS

The maximum risk rating that a roadway segment can achieve today is medium-high, which can increase to high in future scenarios.



While wildfire hazard is extremely widespread in California, extensive roadway damage is not common. Therefore, the overall risk to the SHS remains moderate, with very few assets exceeding a Medium risk rating. For both present-day and future conditions, the highest risk locations are concentrated in heavily vegetated, fire-prone mountainous regions surrounding Los Angeles, San Bernardino, San Diego, and portions of District 2.



Landslides

Landslides occur when the stress on a slope exceeds the strength of its soil, rock, and vegetation. In California, these events are typically triggered by heavy rainfall or erosion. Landslides compromise the SHS by blocking travel lanes, undermining embankments, or taking out entire roadway segments. Particularly in steep coastal and mountainous terrain, landslides can result in prolonged closures and high reconstruction costs.

Landslides are among the costliest climate hazards, often requiring major capital repairs. Based on the characteristics of the landslide, for all asset types, impacts can vary from debris blockage (minimal to severe) to significant structural damage: Part of the roadway can fail and collapse with a downhill slide, bridge substructures can be compromised if the supporting soil fails, tunnel portals can be blocked or damaged by falling debris, and culverts can be blocked, cracked, or displaced.

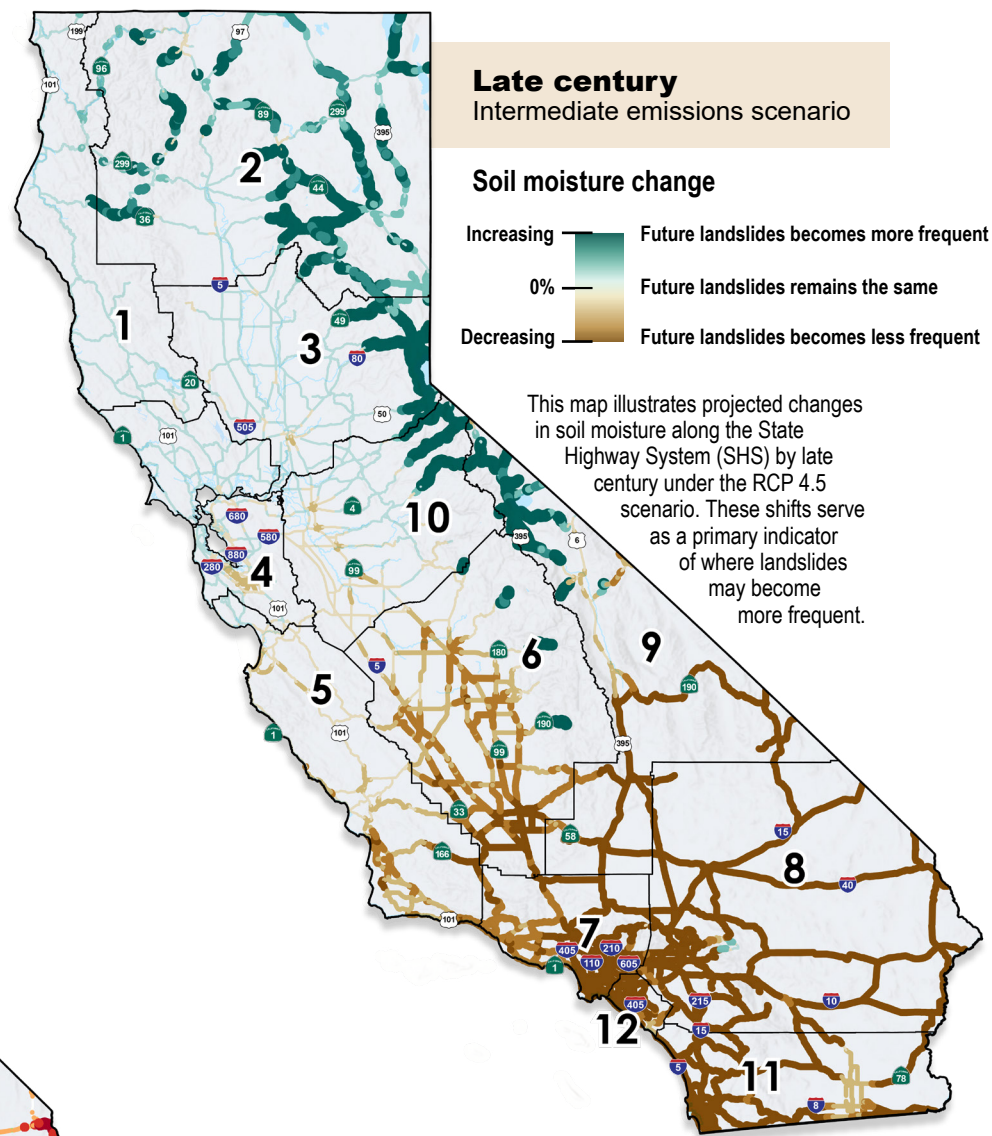
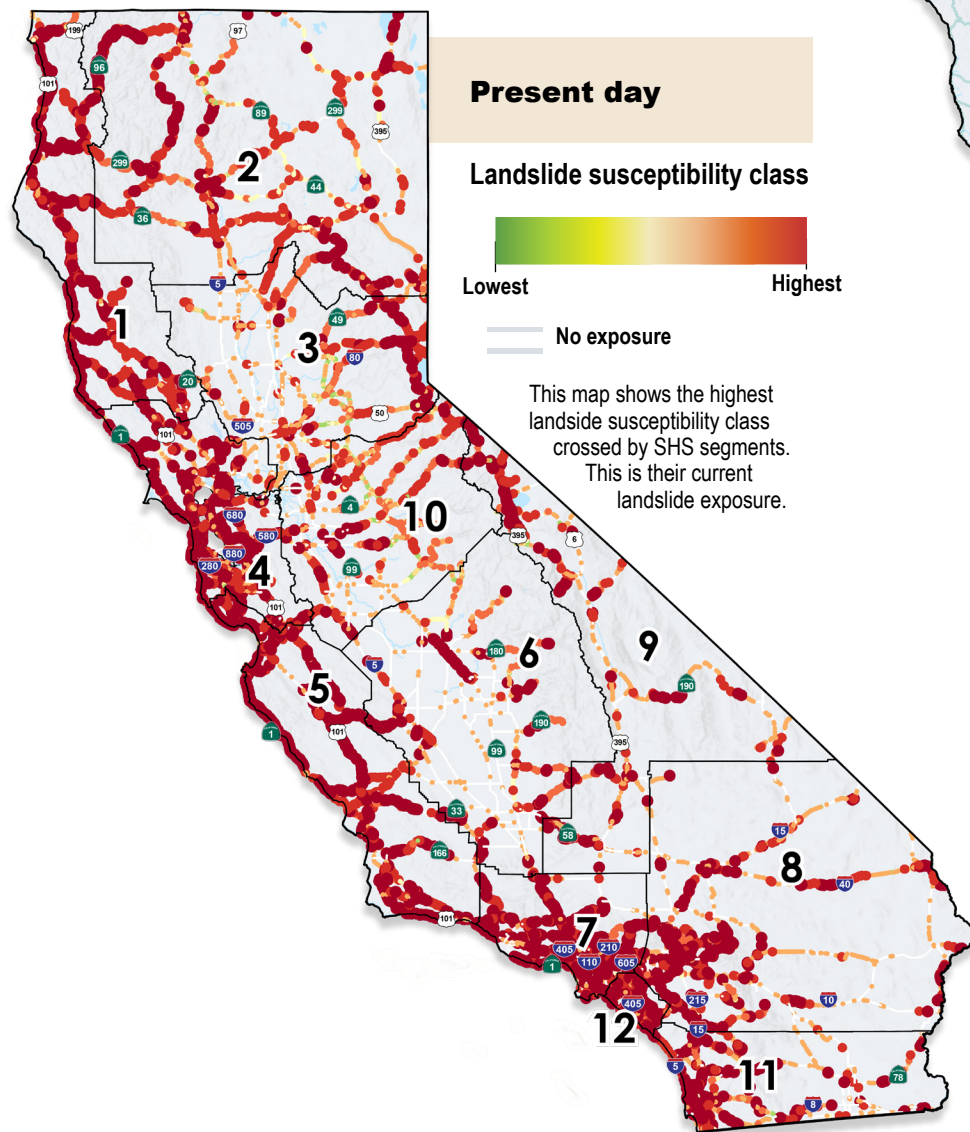
Nearly 50% of the SHS is exposed to some level of landslide hazard today, with the highest exposure in Districts 2, 6, and 8. Climate models predict an increase in average annual precipitation and the frequency of dry-to-wet extremes in California to increase landslide

activity across the state. Future soil moisture is expected to increase in the northern portion of the state, especially in the Sierra Nevada, and decrease elsewhere, indicating that future landslides are expected to become more frequent in these areas.

The severe structural damage and long repair times associated with landslides, combined with the high landslide susceptibility of large portions of California, make landslide risk higher compared to many other climate hazards. The highest risk areas are mostly concentrated along steep coastal corridors and mountainous terrain, such as portions of the North Coast and Sierra Nevada where slope gradients and weaker geology coincide.

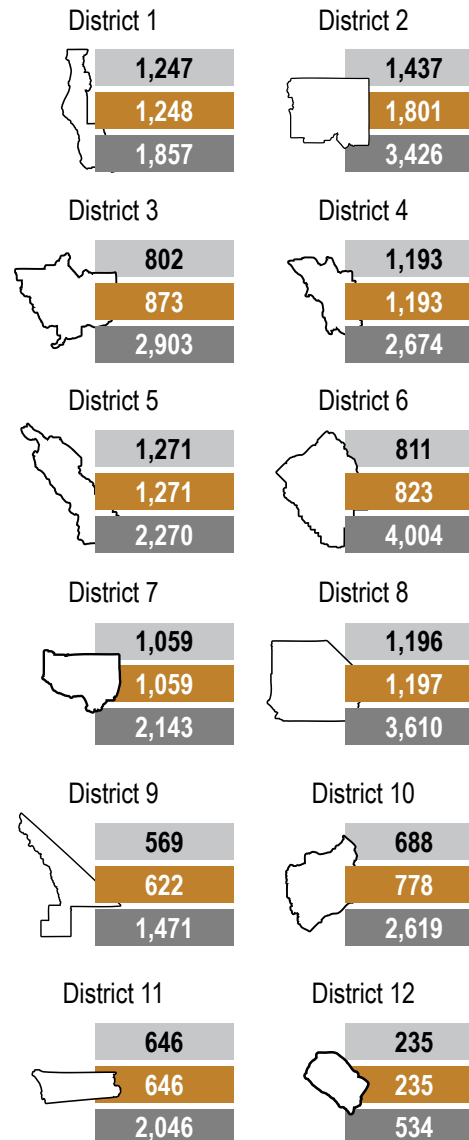
Segments of the SHS exposed to landslides

Nearly 50% of the SHS is exposed to some level of landslide hazard today, with the highest exposure in Districts 2, 6, and 8.





Total miles of the SHS facing a medium or higher risk rating



Present day

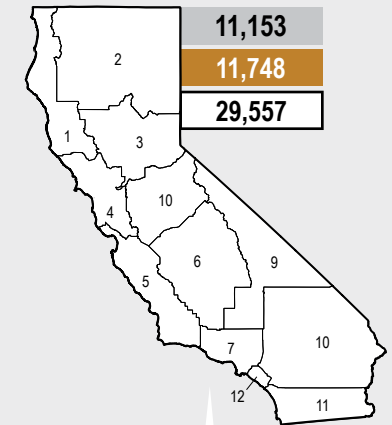
Late century

Intermediate emissions scenario

Total miles

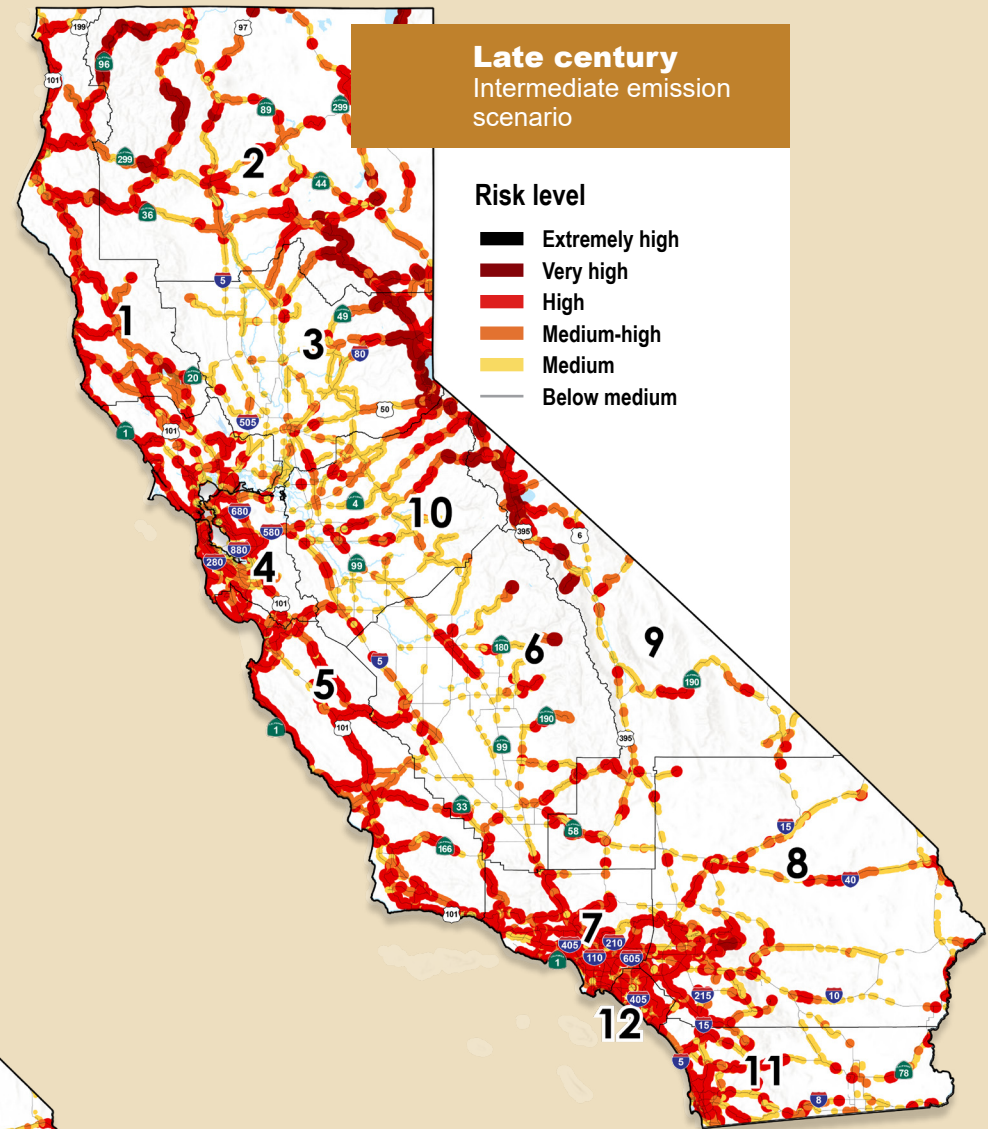
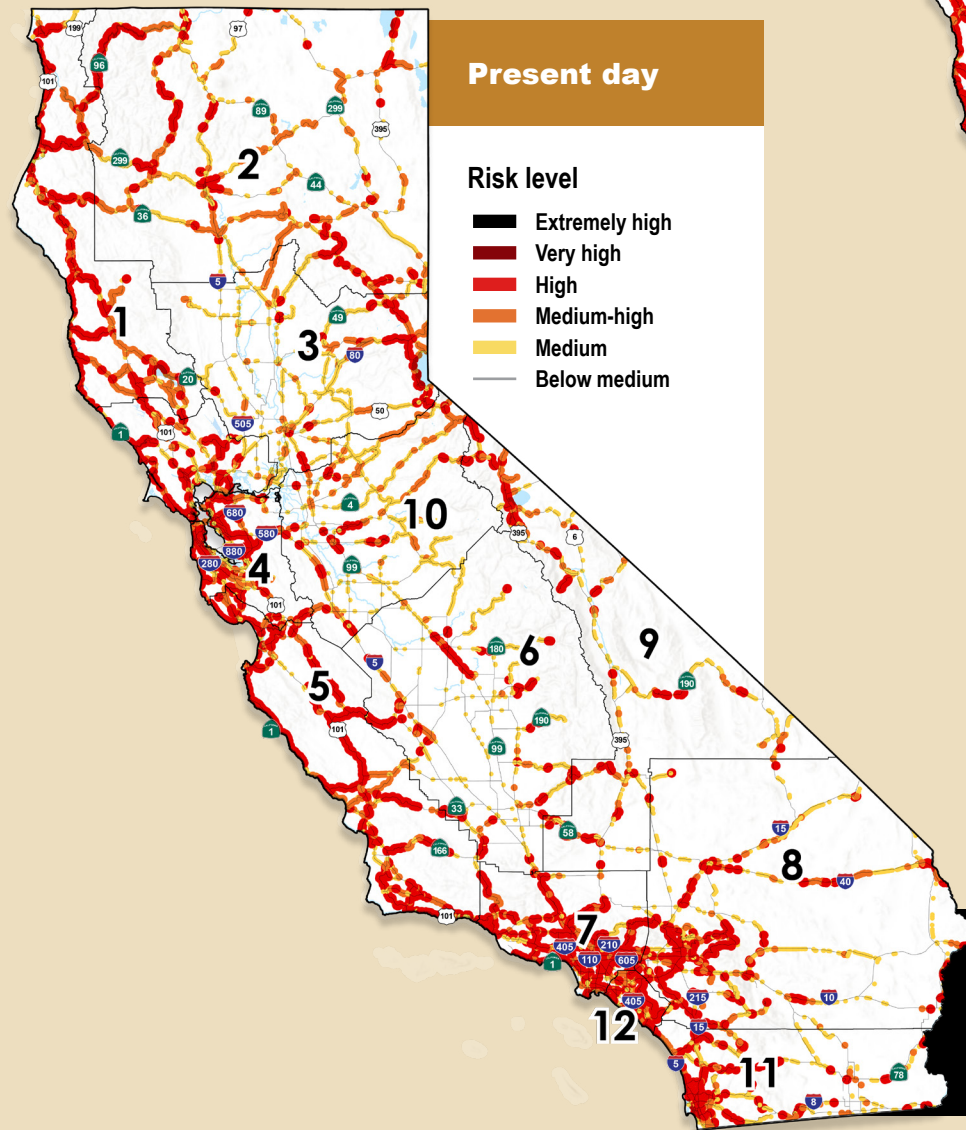
District wide centerline mileage

Statewide

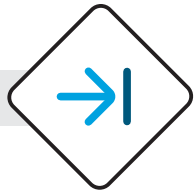


More than one third of the SHS has a medium or higher risk rating for landslides today. Increases in precipitation and dry-to-wet extremes will cause landslides to become more frequent in the future, further increasing the risk, especially in D2 and along the Sierra Nevada.

Risk ratings for landslide across the SHS



A large portion of the SHS reaches High risk ratings for landslides, especially along the coast and the Sierra Nevada. The higher risk associated with landslides compared to other hazards is evidence of the severe damage and long repair time landslides can cause to roadways.



Next Steps

The CCVRA provides a roadmap for adapting critical infrastructure to a changing climate, and empowers Caltrans to make proactive, risk-informed decisions for long-term capital and maintenance planning.

Building Climate Fluency and Sustaining Impact

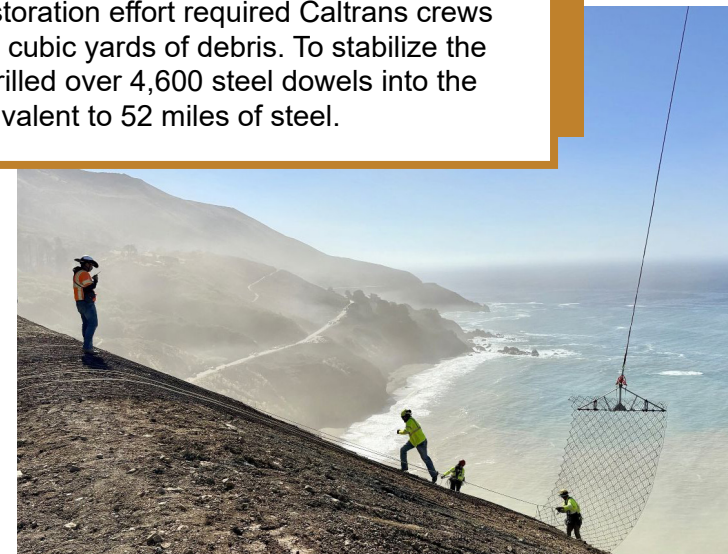
The 2026 CCVRA provides a way to assign a climate impact related risk level to Caltrans projects. Information from the CCVRA may be included in the Caltrans Transportation Asset Management Plan (TAMP) and will be used to inform project planning and delivery of adaptation projects.

The information supports risk-informed decision making and improves Caltrans' ability to prioritize climate adaptation projects.

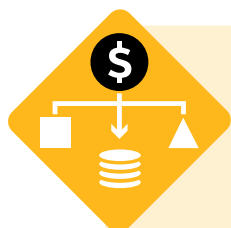
In February 2024, a major storm triggered a massive landslide that covered the Pacific Coast Highway 1 in Big Sur. Following a two-year closure, the route reopened in January 2026.

The \$83 million restoration effort required Caltrans crews to remove 300,000 cubic yards of debris. To stabilize the slope, engineers drilled over 4,600 steel dowels into the mountainside, equivalent to 52 miles of steel.

Big Sur | District 5



There are multiple opportunities to embed the CCVRA results into Caltrans' planning and policies:



Prioritization / Criticality Enhancements

Enhance asset criticality assessments by incorporating a consequence-based perspective that considers how disruptions affect network connectivity, emergency response, economic activity, and access to essential destinations.



Long Range Planning & Programming

The State Highway System Management Plan (SHSMP)

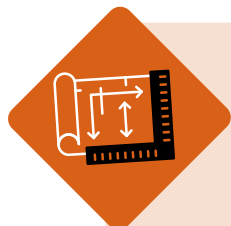
Link specific climate risks to core asset management decisions, corridor planning, and investment strategies, ensuring resilience is built into the system's preservation and growth.

State Highway Operation and Protection Program (SHOPP)

Incorporate high-risk locations and adaptation costs from CCVRA into long-term priorities.

State Transportation Improvement Program (STIP)

Guide updates by identifying where climate exposure and risk may affect project viability, lifecycle costs, and long-term performance, helping prioritize investments that improve system resilience.



Project Development & Design Standards (PA&ED, PS&E)

Project Development Screening Tool

Use the CCVRA database as a screening tool during the Planning and Environmental (PA&ED) phase for all new projects and major rehabilitations.

Climate-Informed Design

Update Caltrans Design Standards when needed (e.g., storm drain capacity, road elevation, material specifications) to account for future climate conditions.



Maintenance & Operations

Targeted Maintenance

Where feasible, reallocate resources to increase inspection frequency and pre-emptive maintenance in high-criticality, high-risk locations.

Emergency Response

Use hazard maps to pre-position resources and optimize closure/detour routes during extreme weather events.



Funding & Partnerships

Leverage Data

Use available data sources to strengthen applications for federal grants (e.g. FEMA/USDOT).

Interagency Collaboration

Establish partnerships with local, regional, and federal agencies to coordinate adaptation efforts.



Monitoring & Evaluation

Performance Tracking

Develop Key Performance Indicators (KPIs) to measure the effectiveness of adaptation investments. Create a formal process for Maintenance and District personnel to provide feedback on the accuracy of the risk scores and the efficacy of implemented solutions.

CALTRANS CLIMATE CHANGE
**VULNERABILITY &
RISK ASSESSMENT**
STATEWIDE SUMMARY
REPORT

2026