Upper Pajaro River Watershed Reassessment 2025:

10-Year Reassessment of the Ecological Condition of Streams Based on the California Rapid Assessment Method

SANTA CLARA COUNTY, CALIFORNIA

Technical Report prepared for the Santa Clara Valley Water District (Valley Water)
Safe, Clean Water and Natural Flood Protection Program,
Priority D, Project D5: Ecological Data Collection and Analysis

SFEI | AQUATIC SCIENCE CENTER

Valley Water
Clean Water • Healthy Environment • Flood Protection

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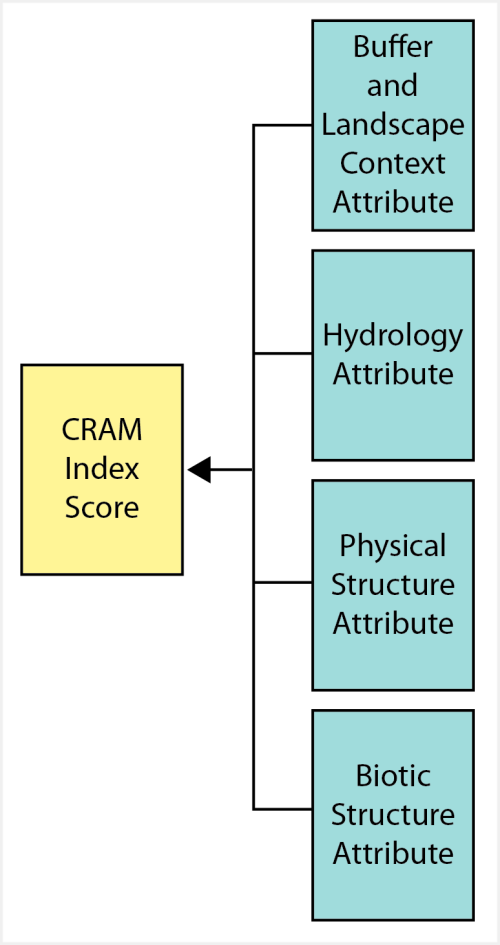
Executive Summary

What is the Upper Pajaro River Watershed Stream Condition Reassessment?

The Santa Clara Valley Water District (Valley Water) collects data on the health, or overall ecological condition, of streams across its five watersheds as a part of its voter-approved Safe, Clean Water and Natural Flood Protection Program. That program identified six priorities including Priority D to Restore Wildlife Habitat and Provide Open Space. Valley Water has seven projects under Priority D including Project D5: Ecological Data Collection and Analysis. The data collected, analyzed, and shared by Project D5 supports Valley Water's *Watershed Master Planning* process, which engages the community and uses equitable metrics to identify flood protection and stream stewardship priority actions for a sustainable future.

Uvas Creek at CRAM site Uva_318

Since 2010, Project D5 has taken a watershed approach to monitor and assess the overall ecological condition of streams in Santa Clara County's five major watersheds using a spatially balanced statistical survey design and the state's recommended California Rapid Assessment Method (CRAM). CRAM is a cost-effective, observational field method that results in a numerical Index Score that characterizes the overall ecological condition of the sampled stream reaches (or Assessment Areas), as well as the whole watershed (with a known level of certainty). As illustrated at the right, underlying the Index Scores are four component Attribute Scores, each of which focuses on a core aspect of a stream's condition: Buffer and Landscape Context, Hydrology, Physical Structure (physical complexity), and Biotic Structure (vegetation). The four Attribute Scores are averaged to roll up to the Overall Index Score. Scores can also be placed into one of three condition classes of Good, Fair, or Poor condition to further summarize stream conditions at the watershed and sub-watershed scales.



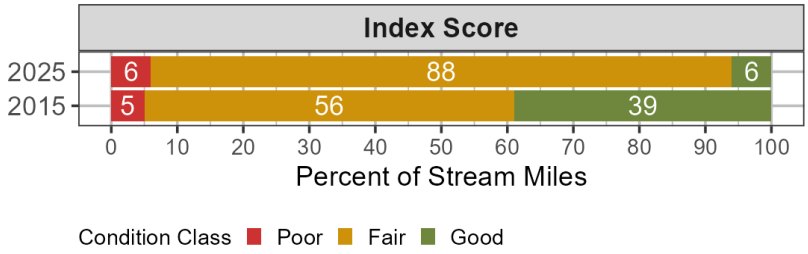
A baseline survey of the ecological condition of streams within the Upper Pajaro River watershed was completed by Project D5 in 2015, and this 10-year reassessment survey was completed in 2025. The survey focuses on characterizing stream conditions in the watershed as a whole, and within four primary areas of interest (PAIs): Uvas Creek, Llagas Creek and Pacheco Creek sub-watersheds, and the Valley floor (Valley) region.

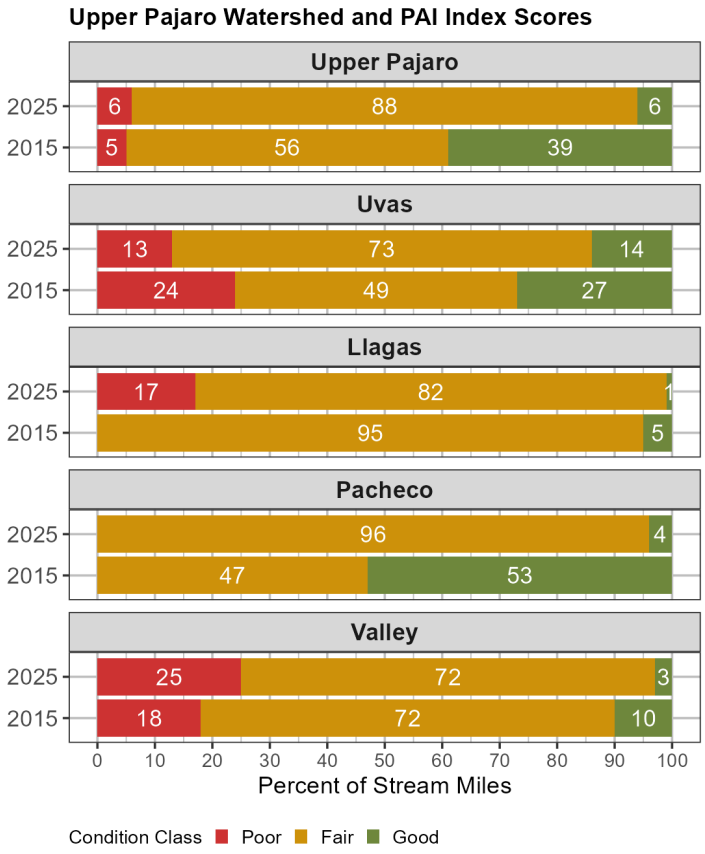
The Project D5 watershed surveys are designed to answer two questions:

- What is the overall ecological condition of streams in the Upper Pajaro River watershed, its sub-watersheds and the valley floor?
- How has stream condition changed over the past 10 years

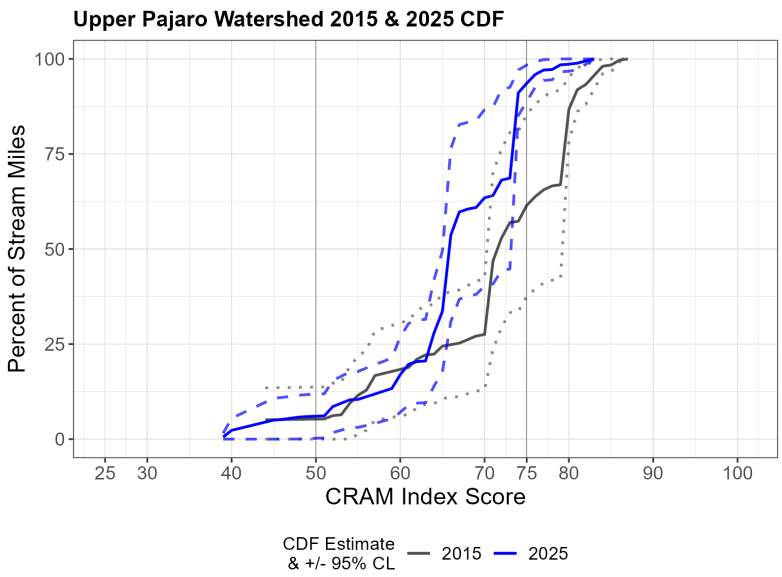
What did the stream condition reassessment find?

The majority (88%) of stream length (miles) in the Upper Pajaro River watershed is currently in Fair condition, with 6% in Good and 6% in Poor condition. There was a statistically significant increase in the percent of stream miles in Fair condition, and a corresponding decrease in the percent of stream miles in Good condition between surveys





The overall ecological conditions of streams was measured for the full Upper Pajaro River watershed and its four PAIs. Currently the Uvas Creek PAI has the highest proportion of stream length in Good condition, while the Llagas Creek and Valley PAIs have the highest proportion in Poor condition. The Pacheco Creek PAI had the greatest amount of change in condition between survey periods.

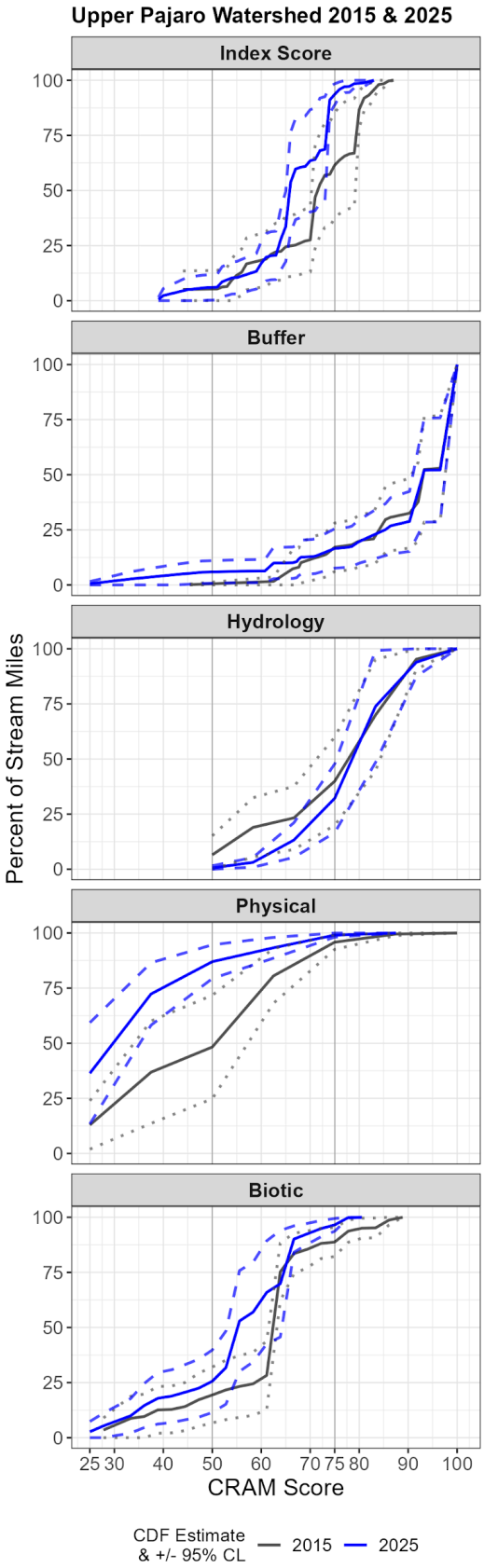


The decline in overall ecological conditions at the watershed scale can be visualized by comparing the 2015 and 2025 cumulative distribution function (CDF) curves and their 95% confidence limits (CL). Observe that the blue curve for the 2025 survey is shifted to the left (towards lower Index Scores) as compared to the 2015 survey. A statistical test confirms that the observed decline in condition is significant.

Mainstem Upper Pajaro River at CRAM site Oth_398

At the CRAM Attribute Score level, the largest amount of change between the two surveys occurred within the Physical Structure Attribute. As shown on the right, the CDF curves and their 95% CLs for Buffer and Landscape Context and Hydrology largely overlap, indicating that conditions have not changed at the full watershed scale for these two Attributes between survey periods. However, the Physical Structure Attribute CDF for the 2025 survey has shifted to the left, indicating a decrease in condition that is statistically significant. The Biotic Structure Attribute conditions also declined, primarily driven by changes observed in the Pacheco Creek PAI's mean CDF estimate.

A number of factors likely contributed to the observed decline in stream conditions between survey periods: (1) some revisit sites clearly showed a decline in Buffer conditions with encroachment of new housing or agriculture into the evaluated buffer zones; (2) improved CRAM practitioner training over the past decade contributed to the downward shift in Physical Structure Scores with more careful field evaluations (thus inflating differences between surveys); and (3) improved representation of sites in the more anthropogenically influenced Valley PAI, along with increasing the total number of sites assessed in 2025 likely resulted in a more representative sample of streams in the watershed compared to 2015. Nonetheless, both surveys are statistically valid, spatially balanced random samples of stream conditions. We make several recommendations in the report on how to further standardize reassessment monitoring for future surveys.



Why do these watershed-wide stream condition surveys matter and how will they be used?

The Project D5 stream condition surveys employing CRAM provide cost effective, watershed-scale summaries about the overall ecological condition of stream resources that Valley Water and other decision makers and resource managers can use in a number of ways.

Project Planning and Design

The results support restoration, mitigation, enhancement or preservation projects by providing ecological context at sub-watershed and watershed scales to inform project planning, implementation and support consistent monitoring for comparisons.

Specifically, the results support Valley Water's *Watershed Master Plans* by identifying opportunity areas for ecological restoration and preservation actions, and by providing data to help measure success towards ecological performance metrics and goals.

The CRAM surveys can help guide the selection of where ecological enhancement might be planned. For example, the decline in the overall ecological conditions of stream resources over the last 10 years is partly a result of current stream and land use management practices at the watershed scale (e.g. allowing for little or no riparian vegetation adjacent to stream channels in agricultural settings, or allowing new urban development in the Valley to encroach on adjacent stream buffer zones, both of which degrades the protective quality of adjacent riparian habitat). Buffer areas adjacent to streams should be enhanced and protected to improve ecological diversity and support contiguous riparian habitat. The majority of stream reaches in the Upper Pajaro River watershed are in Fair condition indicating that there are plenty of opportunities for targeted improvement in the future. In addition, reaches in good ecological condition can be targets for preservation.

Reviewing the CRAM Metric level results identifies the the kinds of enhancement actions that are likely to have the largest positive impact on site-scale and watershed scale conditions, and can directly inform project designs that aim to improve stream habitat conditions and resiliency for future climate conditions (such as increased periods of drought, warmer air temperatures, more intense precipitation events, flashier flows, increased wildfire risk, and sea level rise, among others). For example, the Hydrologic Connectivity Metric measures the ability for channel flows to access a floodplain; sites with low scores could be evaluated for the potential to setback berms or levees, or layback channel banks create space for high water to spread, slow and sink (infiltrate), providing the ecological and hydraulic benefits associated with floodplains.

Stream Condition Tracking and Project Monitoring

The results satisfy the objectives of the Safe, Clean Water and Natural Flood Protection Program's Project D5, namely collecting watershed scale monitoring data to track stream ecosystem health. The data from the Upper Pajaro Watershed reassessment allow for tracking stream conditions across the watershed through time, as well as comparing it to other watersheds in Santa Clara County and across the state. Using CRAM to monitor projects after they have been completed, allows Valley Water and others to evaluate project performance through time and compare their project conditions to overall watershed conditions, and compare the performance of projects using a standardized and relatively inexpensive monitoring method.

Data Sharing

The CRAM field data and the resulting summary cumulative distribution function (CDF plots) from these surveys are publicly shared on EcoAtlas to widely disseminate the information and support a watershed approach to planning and decision making. Because Valley Water owns only a small portion of streams in the watershed, and most of their stream management work occurs only in reaches that they own (or have easement access to), these surveys provide important landscape and ecological context for site- or project-specific management decisions and share detailed ecological information about streams necessary for partners across the watershed to work collaboratively.

List of Abbreviations

AA	Assessment Area
BAARI	Bay Area Aquatic Resources Inventory
CARI	California Aquatic Resources Inventory
CDF	Cumulative Distribution Function estimate
CL	Confidence Limit
CRAM	California Rapid Assessment Method for wetlands
CWMW	California Wetland Monitoring Workgroup
DEM	Digital Elevation Model
GIS	Geographic Information System
GRTS	Generalized Random Tessellation Stratified
KPI	Key Performance Indicator
NHD	National Hydrography Database
NWI	National Wetlands Inventory
PAI	Valley Water's Primary Area of Interest
RipZET	Riparian Zone Estimation Tool
SFEI	San Francisco Estuary Institute
SMP	Valley Water's Stream Maintenance Program
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
Valley Water	Santa Clara Valley Water District
WRAMP	Wetland and Riparian Area Monitoring Plan

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1.0 Introduction

The Santa Clara Valley Water District (Valley Water) is a California Special District water resources agency in Santa Clara County providing safe, clean water for a healthy life, environment and economy, flood protection, and stewardship of streams on behalf of the county's residents. Valley Water's 1,300-square mile service area (Figure 1) includes 15 cities and five watersheds or groupings of watersheds: Coyote Creek, Guadalupe River, West Valley, Lower Peninsula, and Upper Pajaro River (Valley Water's service area does not include the Alameda Creek watershed in Santa Clara County, nor any of the Pajaro River watershed outside of Santa Clara County).

In 2012 and 2020, Santa Clara County voters approved the Safe, Clean Water and Natural Flood Protection Program that identified a number of local priorities. The ecology focused *Priority D* aims to restore and protect wildlife habitat. Project D5 focuses on ecological data collection and analysis to track stream ecosystem health.

The 2025 Upper Pajaro River Watershed stream condition survey reported here was completed by Valley Water's Project D5 with science and field monitoring support from the San Francisco Estuary Institute (SFEI) and SWCA Environmental Consultants employing the California Rapid Assessment Method (CRAM). The goal of the survey was to reassess the overall ecological condition of streams across the watershed to begin to track potential ecological changes since the first baseline condition survey in 2015.

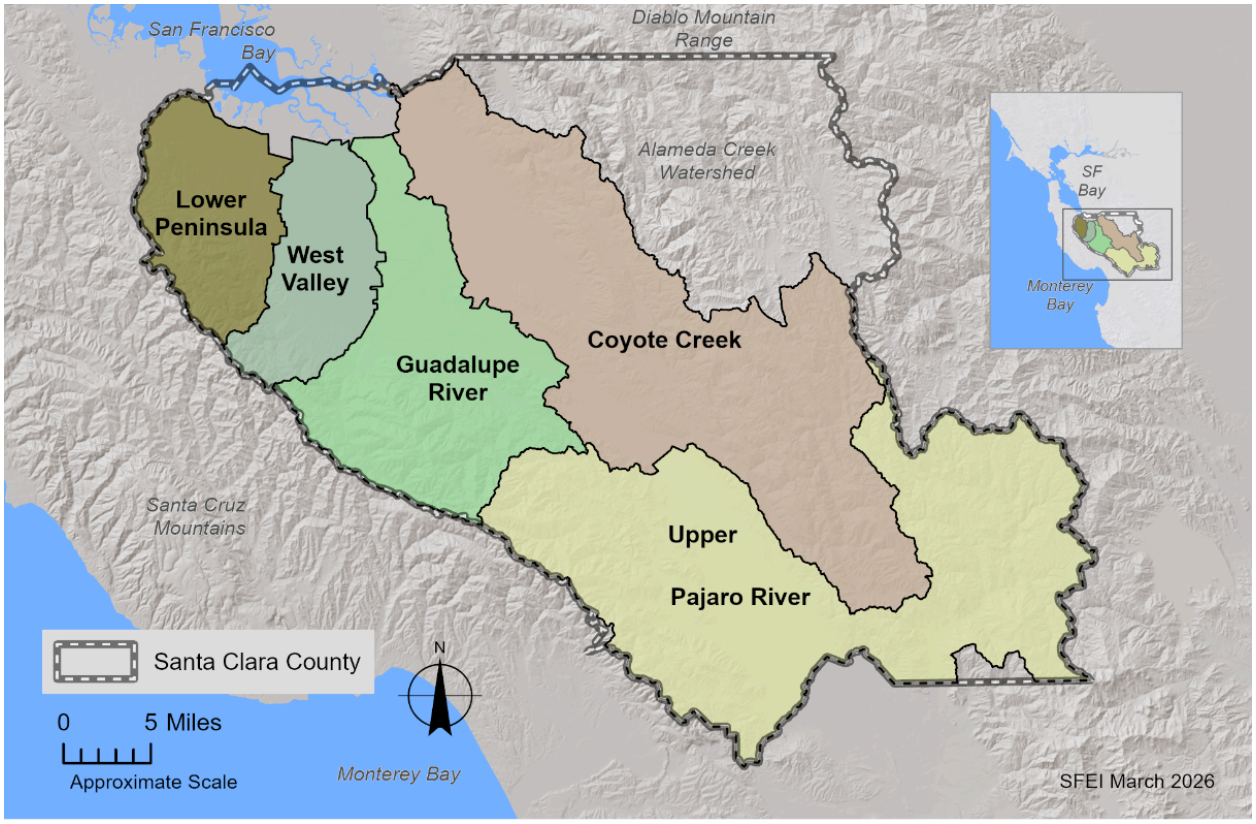

Figure 1. Map of Santa Clara County's five major watersheds. Alameda Creek drains north to Alameda County and is not part of Valley Water's service area.

1.1 Project D5 History

Since 2010, Valley Water has employed a watershed approach to monitoring steam resources across its five major watersheds guided by monitoring and data management protocols outlined in the *Tenets of the State Wetland and Riparian Monitoring Program* (WRAMP; CWMW, 2010) of the California Wetland Monitoring Workgroup (CWMW) of the State Water Quality Control Board's Water Quality Monitoring Council. The WRAMP recommended that, when establishing a stream or wetland monitoring program, managers organize environmental monitoring data collection using the United States Environmental Protection Agency's (USEPA) 3-level wetland monitoring and assessment framework (see side bar), use scientifically vetted and standardized monitoring methods, and share data publicly (see https://www.sfei.org/programs/ei/ecoatlas-toolset for more information) to support state and federal wetland protection policies, resource management planning, and stream and wetland restoration performance tracking using a watershed (or regional) approach.

Upon voter approval of the Safe, Clean Water and Natural Flood Protection Program in 2012, Valley Water's environmental monitoring program officially became Project D5 under Priority D to Restore Wildlife Habitat and Provide Open Space. Project D5 was tasked to assess stream ecosystem conditions in Valley Water's five major watersheds, to reassess those conditions

every 10 years (in 2020 this was changed to every 15 years), and to share the information with the public to help make informed watershed and asset management decisions. Project D5 completed the first baseline watershed surveys of ecological condition in its five watersheds between 2010 and 2018 (*Santa Clara County Five Watersheds Assessment: A synthesis of Ecological Data Collection and Analysis conducted by Valley Water* (called the Five Watershed Synthesis Report in this report; Lowe et al., 2020). The Coyote Creek, Guadalupe River, and Upper Pajaro River watersheds were planned, funded, and reassessed in accordance with the original 10-year reassessment schedule (2020, 2022, and 2025 respectively). Future watershed reassessments, including the second stream condition surveys for the Lower Peninsula and West Valley watersheds, will occur on a 15-year cycle following the 2020 renewed Safe, Clean Water and Natural Flood Protection Program's schedule.

The **USEPA's 3-Level monitoring and assessment framework** provides a logical and economical structure for organizing and implementing a large regional or statewide wetlands monitoring program.

Level 1 data consist of geospatial datasets used to generate tables, imagery, or maps to determine the distribution, abundance, and diversity of aquatic resources, or other relevant ecological information. This data is essentially any geospatially referenced information that supports environmental monitoring and assessment. The data may be collected by remote sensing or ground surveys, and can always be represented by dots, polygons, or lines in a geographical information system (GIS). The California Aquatic Resource Inventory (CARI v1.1, SFEI, 2022), Bay Area Aquatic Resources Inventory (BAARI v2.1, SFEI ASC, 2017), Valley Water's "Creeks" GIS-layer, and Project Tracker's Habitat Projects are all examples of Level 1 data.

Level 2 data consist of rapid field assessments, cost-effective evaluations of conditions based on visible ecological indicators that do not require the collection or processing of materials from the field, but instead are field measures. These methods output numerical scores of conditions. The California Rapid Assessment Method (CRAM) is a standardized, statewide Level 2 methodology that assesses the overall ecological condition of streams and wetlands and their adjacent riparian habitat (CWMW, 2013a).

Level 3 data are 'intensive site assessments' providing detailed information on how well the stream or wetland is functioning, or to address specific regulatory monitoring requirements. Quantitative flow measures, water quality testing, hydrogeomorphic assessments, and number of species observed per unit area are examples of Level 3 data.

1.2 Monitoring Parameters

Project D5 employs six monitoring parameters to characterize the amount, distribution and diversity (or types) of aquatic resources and the overall ecological conditions of stream resources (Table 1).

Table 1. Project D5's six monitoring parameters to evaluate the amount, distribution and diversity (or types) of aquatic resources and the overall ecological conditions of stream resources at a watershed scale.

	Parameters	***USEPA Monitoring Framework Level***	***Data or Method***
A	Stream abundance (miles of stream channels)	1	California Aquatic Resources Inventory (CARI v2.1, SFEI ASC 2017) and Valley Water's "Creeks" GIS-layers
B	Stream distribution (miles of stream channel by stream order)	1	
C	Non-stream wetland diversity	1	
D	Non-stream wetland abundance by type	1	
E	Stream riparian abundance (miles of streams by functional riparian width class)	1	CALVEG, DEM & RipZET
F	Stream condition Index and Attribute Scores	2	CRAM stream condition surveys for the whole watershed

The Level 1 geospatial assessments (parameters A-E) were previously reported for the Upper Pajaro River watershed using the best available digital maps of surface waters and riparian areas at the time and are summarized in the *Upper Pajaro River Watershed Condition Assessment 2015* (Lowe et al., 2016) and the *Five Watershed Synthesis Report* (Lowe et al., 2020). Since there has been no new Level 1 geospatial data produced since that time, with the exception of a new Santa Clara County-wide CalVeg dataset produced by Santa Cruz Mountains Stewardship Network (SCMSN, 2023), there are no updates to those parameters to report. A reassessment of the Level 1 parameters, including the new riparian area extent, will be evaluated at the County-wide scale once all five watersheds have been reassessed.

Project D5's Level 2 stream condition surveys employ CRAM (parameter F), the reassessment of which is the focus of this report. CRAM was selected because (1) it provides standardized scientific information that can be applied to site, stream, or watershed scales, (2) it supports on-the-ground stewardship planning and actions, such as protecting and restoring riparian areas and floodplains, managing invasive plants, improving fish passage and spawning habitat, and stabilizing stream channels, (3) it is repeatable and can be used to evaluate change over time or in response to implemented actions, and (4) it is accepted by the USEPA, United States Army Corps of Engineers, and California's State Water Resources Control Board (CWMW, 2019). The CRAM procedures are described in detail in Chapter 3.

2.0 Upper Pajaro River Watershed Setting

Valley Water's Watershed Master Plan for the Upper Pajaro River watershed (2024a, 2024b) provides more detail on the topics in this chapter as well as a vision for future ecological conditions of the watershed, and helps to guide implementation of projects to address water resource management in cooperation with the multiple agencies, jurisdictions, and partners in the watershed.

2.1 Geography, Geology, and Climate

The Pajaro River watershed drains to the Monterey Bay, is 3,370 km^2 (1,300 mi^2) in size, and covers portions of San Benito, Santa Cruz, Monterey, and Santa Clara Counties (see Valley Water's Upper Pajaro Watershed Setting Report for more detail; Valley Water, 2024a). The northernmost portion of the Pajaro River watershed, specifically the portion within Santa Clara County, is known as the Upper Pajaro River watershed. At 930 km^2 (360 mi^2) in size, it comprises approximately one-third of the total area of Valley Water's five major watersheds. The Upper Pajaro River watershed is bound on the east by the Diablo Range, and to the west by the Santa Cruz Mountains, with the large, low gradient Santa Clara Valley floor in the middle. The underlying geology is complexly folded and faulted, with the San Andreas Fault running along the Santa Cruz mountains, which are made up of primarily sedimentary bedrock, with volcanic intrusions at fault lines. The Diablo Range is also sedimentary in lithology, while the Valley consists of Quaternary alluvial deposits. The orographic effect of the two mountain ranges drive the watershed's precipitation patterns, with the west side of the watershed receiving significantly more precipitation than the east. Average annual precipitation in the watershed's Santa Cruz mountains headwaters is as high as 55 inches, while the Valley gets as little as 15 inches, and the the Diablo Range headwaters receive a similarly low 20 inches (PRISM, 2021). Much of the headwaters in both mountain ranges are undeveloped, with either open space or grazing land uses, while the Valley floor is heavily developed, with row-crop agriculture and orchards, rural residential properties, and the cities of Morgan Hill, San Martin, and Gilroy (Figure 2).

The Upper Pajaro River watershed contains three primary tributary sub-watersheds - Uvas Creek, Llagas Creek, and Pacheco Creek - as well as the mainstem Pajaro River and various small tributaries that drain directly into the mainstem, which is referred in this study as the "Other" sub-watershed (Figure 3). These are discussed in more detail in Section 2.4.

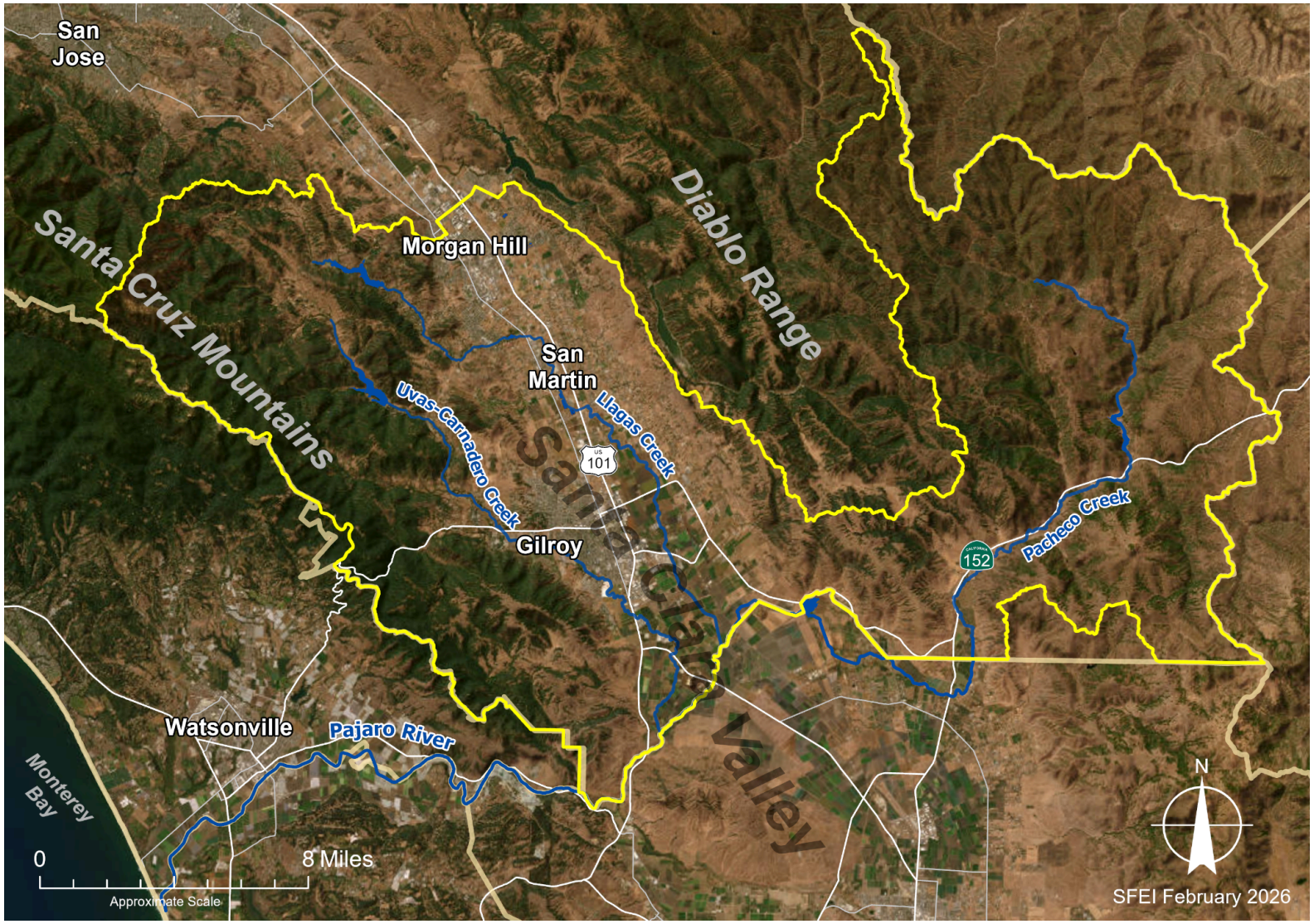

Figure 2. Map of the Upper Pajaro River watershed boundary (yellow line) showing the largely undeveloped headwater areas in the Santa Cruz Mountains and the Diablo Range, and the agricultural and developed Santa Clara Valley floor. The Upper Pajaro River watershed is defined by the Santa Clara County boundary; the mainstem Pajaro River continues to flow west to Monterey Bay.

2.2 Land Uses and Habitats

Historically the watershed was inhabited by the Amah Mutsun and Awaswas people (part of the Ohlone peoples), with 20-30 contiguous villages throughout the Pajaro River Basin. These indigenous peoples used the watershed for fishing, hunting and gathering, along with substantial land management, particularly using fire management to control plant communities. The watershed supported a diverse array of habitats, from dense valley oak woodlands in the north to wetland mosaics in the south (Grossinger et al., 2008). Many of the channels in the watershed were discontinuous, as their waters sank into ground, and their sediment deposited, continuing to build their alluvial fans. Uvas, Llagas and Pacheco Creeks had defined channels, but with intermittent seasonal flows. The region near the Santa Clara-San Benito county line hosted a large wetland complex (known as the Bolsa), with a variety of habitats, including areas of high salinity, which is now known as the Soap Lake floodplain.

European contact in the late 1700s initiated a number of land ownership and land use changes, including: settling and ranching by Spanish explorers and missionaries, transfer of land to Mexican-owned ranchos, transition to American settlers and gold seekers, introduction of the railroad, transition to agriculture (orchards, vegetable crops), and finally transition to urban development and growth of the cities (Valley Water, 2024a).

These land uses have significantly modified the channel network, with stream reaches on the Valley floor displaying the most change. The creeks have been lengthened and connected, relocated, channelized, simplified, leveed and hardened to increase their efficiency. The result has been incision, disrupted sediment transport, disconnection from floodplains, reduced complexity and ecological condition, and ultimately, reduced ability to provide high quality habitat for aquatic and wildlife species. Other major drainage changes have occurred, such as the draining and clearing of the Soap Lake floodplain for agriculture and grazing. In addition, reservoirs, stock ponds and percolation ponds have modified flows in the watershed.

Despite these changes, the Upper Pajaro River watershed provides many natural resources utilized by humans and wildlife. The current channel network conveys stormwater runoff, recharges groundwater, and provides aesthetic, recreational, and educational resources to the local communities. Its landscape contains ranches and farms dating back to Spanish occupation, growing cities and towns, highly productive agricultural areas, important timber resources, critical transportation and wildlife migration corridors, open space areas for recreation including County Parks and Henry Coe State Park, and rich natural habitats. The Soap Lake floodplain, while currently mostly developed for agriculture, continues to attenuate flood flows and improve water quality, while also providing seasonal wetland habitat for foraging, refuge, and spawning. The variety of streams in the watershed provide spawning and rearing grounds for anadromous and resident fish, including Pacific lamprey (*Entosphenus tridentatus*) and the federally threatened steelhead/rainbow trout (*Onchorynchys mykiss*).

Constructed reservoirs, stock ponds, and groundwater wells provide water supply to local residents, farms and businesses.

2.3 Ecological Condition Opportunities and Constraints

Land and resource managers face many challenges when managing for ecosystem service and function improvements. For example, the watershed has experienced (1) serious riparian resource loss due to development and food safety regulations, (2) reductions in water quality due to urban and agricultural land uses, and (3) stream habitat loss, degradation, or fragmentation due to increases in stream alterations and fish passage barriers. Other threats to ecological condition include groundwater extraction, surface water diversions, storage of surface runoff in a number of reservoirs, simplification of stream channels for flood control purposes, and degradation of water quality due to certain agricultural practices. All of these impacts will likely be amplified given continued climate change; for example, patterns and intensity of precipitation are expected to change, impacting sediment transport and downstream delivery.

While facing these threats, resource managers also have opportunities to improve current and future management and support shared goals. For instance, there is a renewed and intense push for conservation in the watershed, as county agencies and natural resource organizations have recently purchased multiple significant properties to enhance ecological connectivity. In addition, restoration projects focused on Sycamore Alluvial Woodland in the Pacheco Creek sub-watershed, floodplain enhancement in the Soap Lake area, fish passage barrier removals in the Uvas Creek sub-watershed, Valley Water's mitigation project at Lake Silveira, and water quality improvement from agricultural areas all represent actions that are currently underway in the watershed.

2.4 Sub-watersheds and Project D5 Primary Areas of Interest (PAIs)

Project D5's primary areas of interest (or PAIs) for data analysis are the three primary sub-watersheds and the Valley floor (or Valley PAI), which is a mix of sub-watersheds with urban and residential development and agricultural land uses (Figure 3). The Valley PAI is the same as the Lowland Valley region that was used in the Five Watershed Synthesis Report (Lowe et al., 2020), and matches the geographic terminology used in Valley Water's Upper Pajaro Watershed Management Plan (2024a, 2024b). The whole watershed PAI (also called Upper Pajaro River watershed or Upper Pajaro PAI in this report) includes the three main sub-watersheds, the mainstem of the Pajaro River along the southern border of the County, and other small tributaries (shown in purple in Figure 3).

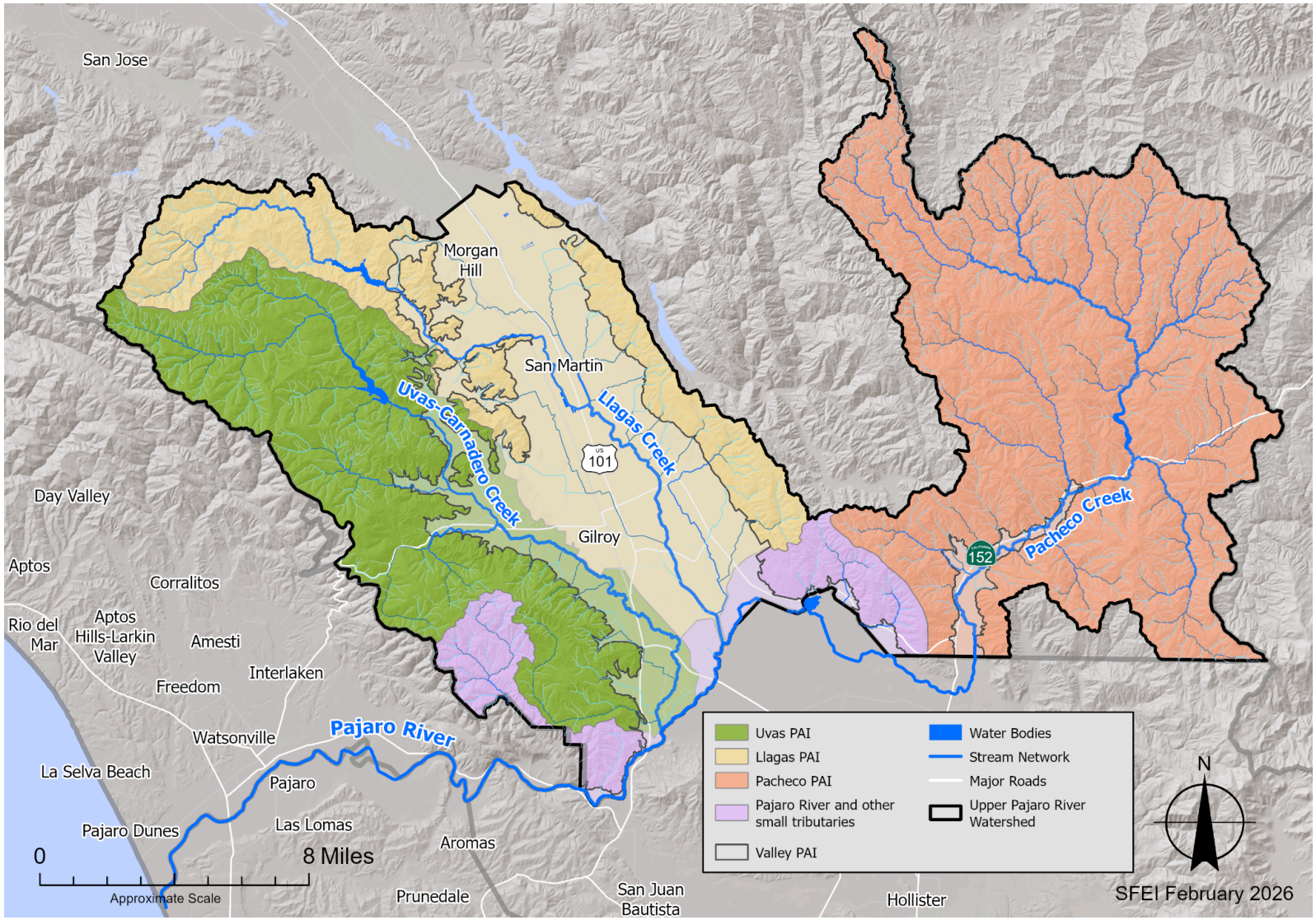

Figure 3. Map of the Upper Pajaro River watershed in Santa Clara County and its four PAIs: Uvas (green), Llagas (yellow), and Pacheco (orange) Creek sub-watersheds and Valley (light grey highlight). Portions of the Pajaro River and other small sub-watersheds in the county (purple) are included in the full study area extent.

The Uvas Creek sub-watershed PAI has 21% of the stream length in the watershed, and drains the western-most portion of the watershed, including the mostly undeveloped slopes of the Santa Cruz Mountains. The upper watershed channels are typically very steep, relatively simple, and ephemeral, draining open space forested watershed areas. The middle and lower watershed channels are typically larger, fairly complex, and intermittent or perennial, draining rural residential and grazing properties. These channels feed the Valley Water-owned and -operated Uvas Reservoir, which has a capacity of 9,688 acre-feet of water, and is operated primarily for water supply. Below Uvas Reservoir, mainstem Uvas Creek channel flows first through the rural residential and vineyard properties in the outskirts of the City of Gilroy, and then through the city proper in the Debel Uvas Creek Preserve and the City's Christmas Hill Park. The channel has its first set-back levee as it enters the City, in the reach downstream of Highway 152. This channel reach flows through a functionally-wide undeveloped corridor, and remains relatively natural, despite some historic incision and placement of riprap at the toe of the banks in some reaches. South of the city, the low gradient, and very incised mainstem flows under a handful of road and railroad crossings, and through agricultural fields, until it joins the mainstem Pajaro River at the southern end of the sub-watershed. This lowest reach has a very narrow, but continuous riparian corridor, while the channel overall lacks complexity, and is marked by long, deep pools and glides.

The Llagas Creek sub-watershed PAI has 17% of the stream length in the watershed, and primarily drains the low elevation Santa Clara Valley portion of the watershed. There is a small portion of higher elevation headwaters, although not as high as Uvas Creek, that drain the eastern slope of the Santa Cruz Mountains. This area has forested north-facing slopes and grassy south-facing slopes, and a mix of open space and grazing lands. Numerous small ephemeral tributaries feed the mainstem Llagas Creek in this reach, which is characterized by a relatively complex and coarse-grained channel, with a continuous riparian corridor. Llagas Creek flows into the Valley Water owned and operated Chesbro Reservoir, which has a capacity of 7,967 acre-feet of water, and is operated for water supply. Below Chesbro Reservoir, Llagas Creek flows through the outskirts of the City of Morgan Hill, turning east toward the middle of the Valley floor. Here the creek passes through Lake Silveira, a successful creek-lake separation project that is providing mitigation for the Llagas Creek Flood Protection Project. The Llagas Creek sub-watershed also drains the northern and eastern portion of the Santa Clara Valley, which is heavily developed by the City of Morgan Hill, but also with remaining areas of rural residential housing and agricultural fields. As Llagas Creek flows south through the Valley floor, it is joined by tributaries such as West Little Llagas Creek, Little Llagas Creek, San Martin Creek, and Miller Slough, channels which were historically lengthened and connected, that now bring drainage from the suburban and rural residential areas. Llagas Creek enters the Llagas Creek Flood Protection Project near the crossing at Monterey Road; this on-going project began in 2019 and is scheduled to be completed by 2027, with the goal of providing 100-year flood protection to the residents and businesses in the Valley floor. Continuing to flow south, the

mainstem becomes intermittent as it crosses under Highway 101, south of San Martin. This channel reach is inset into the Valley floor, with maintenance roads along both banks, and constructed so that the channel is simplified and able to convey greater amounts of flood flows. The banks in the project have been re-vegetated with a mix of native trees and shrubs, to supplement the ribbon of riparian trees that exist on both channel banks. The lowest reach of Llagas Creek, downstream of Highway 152, is bounded by levees as it flows through agricultural fields. Vegetation becomes dense both in and along the channel in this reach, as the groundwater level grows more shallow, and channel complexity decreases. Here it joins the mainstem Pajaro River, which continues to flow southwest through the heart of this agricultural area.

The Pacheco Creek sub-watershed PAI has 55% of the stream length in the watershed, and drains the Diablo Range on the eastern side of the watershed. The upper sub-watershed is characterized by rugged and remote areas of open space and grazing land owned by Henry Coe State Park, California Department of Fish and Wildlife, and a number of large private ranches, a few of which were recently purchased by conservation organizations. The channels in the upper watershed vary from small, relatively simple channels to large channels with beds consisting of coarse grain sizes and more complexity. Channels here likely retain much of their historical character, and are naturally less complex due to their limited flow regime. This sub-watershed is much drier than the Uvas Creek sub-watershed, and thus most of the stream reaches are either ephemeral or intermittent, with only mainstem Pacheco Creek remaining perennial. Pacheco Reservoir impounds North Fork Pacheco Creek, which has a capacity of 5,500 acre-feet of water, and is owned and operated by the Pacheco Pass Water District. Downstream of the reservoir, the North and South Forks converge, creating mainstem Pacheco Creek, which parallels Highway 152. This channel reach has one of the largest and highest quality stands of remaining sycamore alluvial woodland in the state. This reach also marks a transition to agricultural land uses, including grazing and orchards. Pacheco Creek then flows into San Felipe Lake, which is a small portion of the larger historical Soap Lake floodplain.

The Valley PAI includes portions of the Llagas, Uvas and Pacheco Creek PAIs into a unique, overlapping fourth PAI that allows for analysis of ecological condition in the most developed and managed area of the Upper Pajaro River watershed and where Valley Water has more land ownership and influence on stream condition. The Valley PAI has 14% of the stream length in the watershed. The PAI is characterized by the relatively flat, low gradient Valley floor that slopes from the north (at the watershed divide with Coyote Creek) to the south towards the Pajaro River mainstem and includes the municipal boundaries for the cities of Morgan Hill, San Martin, and Gilroy. Outside municipal boundaries, much of the Valley PAI consists of rural residential property, agricultural fields, small industrial properties, and small areas of undeveloped open space. The majority of the PAI is privately owned. The Valley PAI includes portions of mainstem Uvas, Llagas, and Pacheco Creeks, as well as a number of tributaries to Llagas Creek. Significant portions of the channel network consist of engineered flood control

channels. Other portions of the network include ditches and other modified channels that drain agricultural areas, modified tributary channels that drain the eastern side of the Llagas Creek sub-watershed, and stormdrained portions of Morgan Hill, San Martin, and Gilroy, in addition to the more natural reaches of Uvas and Pacheco Creeks.

3.0 Stream Condition Assessment Methods

The 2015 baseline watershed stream condition survey employing CRAM served as the basis for the 2025 reassessment. The watershed extents, PAIs and other aspects of the survey design (Lowe and Solomon, 2015) and original sample draw (Lowe, 2015) were decided at that time and described in detail in separate reports and summarized in the final Upper Pajaro River Watershed Condition Assessment 2015 report (Lowe et al., 2016).

In this section a brief review of CRAM provides context for how CRAM results are used to characterize the overall ecological condition of streams in the Upper Pajaro River watershed in this report, and an overview of the original 2015 survey design, sampling plans, and sampling outcomes provides context for the 2025 watershed reassessment sampling plans. More information about the original survey design and analysis can be found in Lowe (2015).

3.1 CRAM Overview

CRAM is a standardized, statewide Level 2 field based method used to characterize the overall ecological conditions of streams and other wetland types. CRAM provides numerical Index Scores that estimate the overall potential of a stream or wetland and its adjacent riparian area to provide levels of the ecological services expected of the area given its type, condition, and environmental setting. CRAM scores are based on visible indicators of physical and biological form and structure relative to statewide reference conditions.

CRAM field assessments involve scoring a number of individual Metrics, which are organized into four Attributes of condition: 1) Buffer and Landscape Context, 2) Hydrology, 3) Physical Structure, and 4) Biotic Structure. Each Attribute characterizes unique aspects of a stream's health or condition.

To aid summarizing results at a site specific, or even a watershed or other landscape scale, CRAM scores can be grouped into three standard ecological health classes (also called condition classes) to characterize the overall condition of a stream reach (or streams in a watershed) as being in Poor, Fair or Good condition (CRAM Technical Bulletin, CWMW, 2019). The condition classes are defined as tertiles of the maximum range of possible CRAM Index or Attribute Scores, with Poor condition scores ranging from 25 to 50, Fair condition scores from 51 to 75, and Good condition scores from 76 to 100. Analyses of CRAM scores can use these

categorical condition classes as a way to characterize the relative proportions of stream miles in Poor, Fair or Good condition to facilitate comparisons at the watershed and/or PAI scales.

3.2 CRAM Survey Design and Sampling Plan

Project D5 employs the Generalized Random-Tessellation Stratified (GRTS) survey design and analysis methods developed by the USEPA's National Environmental Monitoring and Assessment Program (EMAP 1990 - 2008; Messer et al., 1991; Stevens and Olsen, 2003; Stevens and Olsen, 2004). Since Project D5 surveys began in 2010, EPA's EMAP evolved into the National Aquatic Resource Surveys (NARS) and is now run by the EPA's Office of Water (Nahlik et al., 2025). GRTS is EPA's recommended method for monitoring programs to assess and track the ecological conditions of streams or wetlands at a watershed, regional, or even national scale with a known level of confidence and with relatively few sampling sites. The EPA's *'spsurvey' Design and Analysis* package in R (an open source programming language) was used to develop the stream condition survey designs for all five Valley Water watersheds and to analyze the sampled CRAM field data. *Spsurvey* is maintained and updated by the EPA (Dumelle et al., 2023) and SFEI continues to seek advice and review from EPA's *spsurvey* developer and code manager (Michael Dumelle) to ensure that the GRTS methods are applied appropriately.

The 2025 reassessment survey used the same survey design and sample draw as was developed for the 2015 survey with the goal of revisiting the 2015 sites and improving the spatial distribution by adding new sites (see below). A sample draw is the final list of randomly selected sites (CRAM Assessment Areas or AAs) that are the output of *spsurvey's* GRTS function.

3.2.1 Sample Frame

The 2015 survey design used a version of Valley Water's 'Creeks' geospatial dataset clipped to the Upper Pajaro River watershed boundary and updated to include Strahler stream orders 1-7 (Strahler, 1952 and 1957). Strahler stream order is a classification system used in hydrology to rank the hierarchy and branching complexity of streams within a watershed. It helps scientists categorize channels from tiny, unbranched headwaters to large river systems located in the Valley floor. The dataset was further attributed with PAIs and served as the sample frame for the GRTS sample draw in *spsurvey*. This digital dataset, representing the population of stream resources to be sampled, is a required input for *spsurvey*.

3.2.2 2015 Survey Design and Sample Draw

The survey design aimed to stratify the sample to include more sites in the Uvas, Llagas, and Valley PAIs than would have been proportionally assigned without any stratification. These adjustments were made to increase the number of sites in areas of special interest to Valley Water while preserving the ability to evaluate the conditions in the watershed as a whole. Confidence limits can vary widely depending on how homogenous or diverse the sample population is within each PAI and by stream order.

The 2015 sample draw targeted 88 sites and included all stream orders (as defined by a Valley Water 'Creeks' dataset, modified to add Strahler stream orders 1-7). 352 additional oversample sites were included in the sample draw to replace target sites that were dropped due to lack of access, dangerous terrain, inaccurate mapping.

3.2.3 2015 Survey Outcomes and 2025 Reassessment Sampling Plans

A number of factors were considered in planning for field sampling for the 2025 reassessment: (1) the 2015 sample draw's targeted sites, (2) the final outcome of the 2015 survey (both the number of sites and the distribution of sites across PAIs), and (3) the uncertainty in the final cumulative distribution function (CDF) results from the 2015 survey for each PAI. The original 2015 survey design and sample draw targeted 88 sites across the watershed using a stratified sample. The final 2015 sampling outcome resulted in 81 site assessments distributed across the watershed. The resulting CDF estimates of condition showed considerable variability within some PAIs (as indicated by wide 95% confidence limits), especially in the Uvas Creek PAI at the Index Score and Attribute Score levels (see the final Upper Pajaro River Watershed Condition Assessment 2015 report (Lowe et al., 2016)).

The 2025 sampling plan aimed to (1) revisit all the 2015 sampled sites, (2) visit any of the remaining original 88 target sites that were not sampled in 2015, and (3) increase the total number of sites from the original 88 to 101, adding 13 new sites to try to reduce the overall uncertainty in the final results, and to improve the characterization of PAIs with high variability (Uvas Creek and the Valley).

Table 2 summarizes the distribution of sites by PAI and by Valley and upper watershed (Upper WS) regions for the original sample draw, the 2015 outcome and the 2025 planned sampling effort. The same process of outreach to landowners for permission to access properties was undertaken for the 2025 sampling effort.

Table 2. Sample Draw Targets by Primary Areas of Interest (PAIs) for 2015 and 2025.

Primary Area of Interest (PAI)	2015 Target			2015 Outcome			2025 Target		
	Valley	Upper WS	Total	Valley	Upper WS	Total	Valley	Upper WS	Total
Uvas	11	13	**24**	11	12	**23**	11	22	**33**
Llagas	18	6	**24**	20	3	**23**	23	7	**30**
Pacheco	2	28	**30**		23	**23**	1	23	**24**
Other	5	5	**10**	11	1	**12**	12	2	**14**
Whole Watershed	36	52	**88**	42	39	**81**	47	54	**101**

Figure 4 shows the final distribution of sampled sites for the 2015 survey. A total of 151 candidate sites were evaluated in 2015 and these included the targeted 88 sites and replacement sites (also called oversample sites). Landowners were contacted to ask for

permission to access their properties for CRAM assessments, and ultimately 81 sites were sampled and 70 sites were dropped for a number of reasons: the landowners denied access, a site was too remote for reasonable access, or a site failed to meet the CRAM definition of a riverine wetland (e.g., a site on a mapped stream line was in a reservoir and not in an actual stream reach).

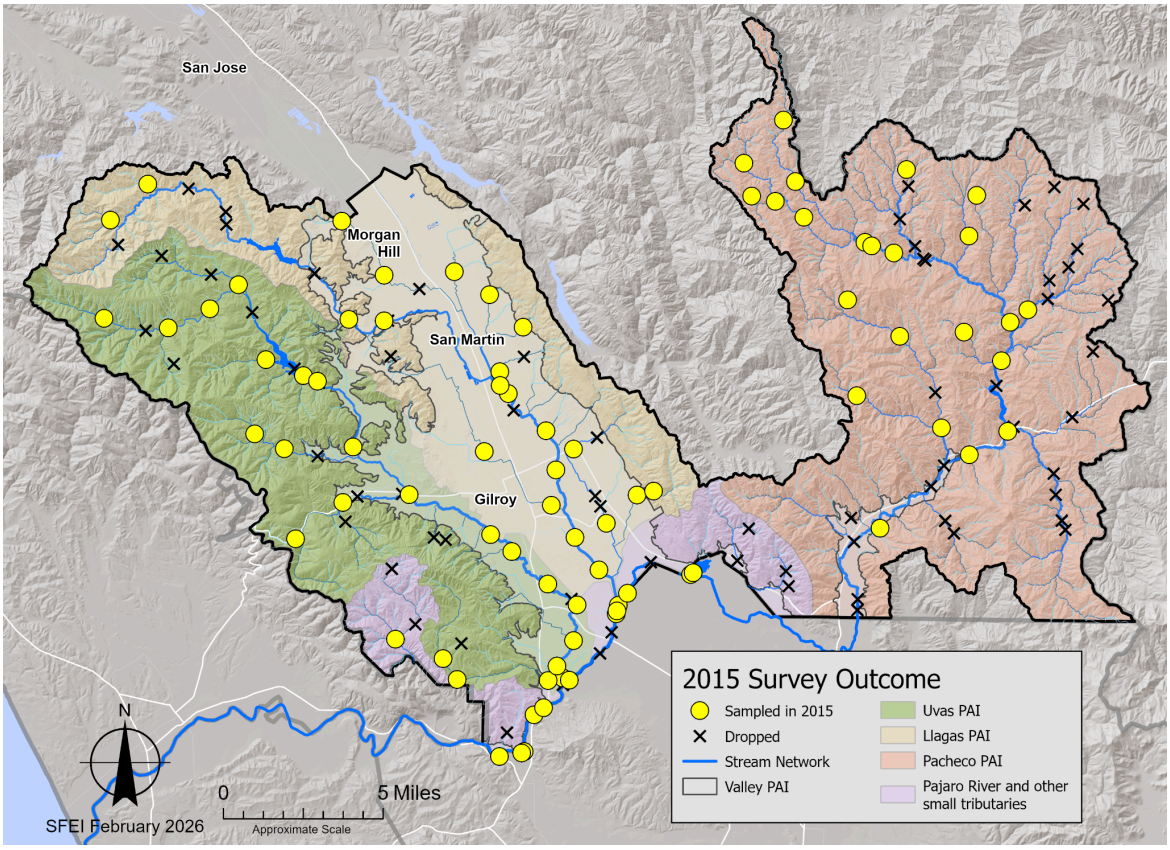

Figure 4. Map of the final 2015 survey outcome. A total of 151 candidate sites were evaluated, 81 sites were sampled (circles) and 70 sites were evaluated but dropped (X's) because field teams were denied permission to access or for other reasons.

Building upon the 2015 outcome, Figure 5 shows the planned 2025 sampling sites (n=101) that aimed to improve the distribution of sites across the watershed and fill spatial gaps in the 2015 outcome and reduce the uncertainty in the final CDF results. Of the added 13 sites, 11 were located in the Valley PAI to better characterize that area of interest, and two were located in the uppermost reaches of the upper watershed of Uvas Creek PAI to try to reduce uncertainty in that PAI's CDF results.

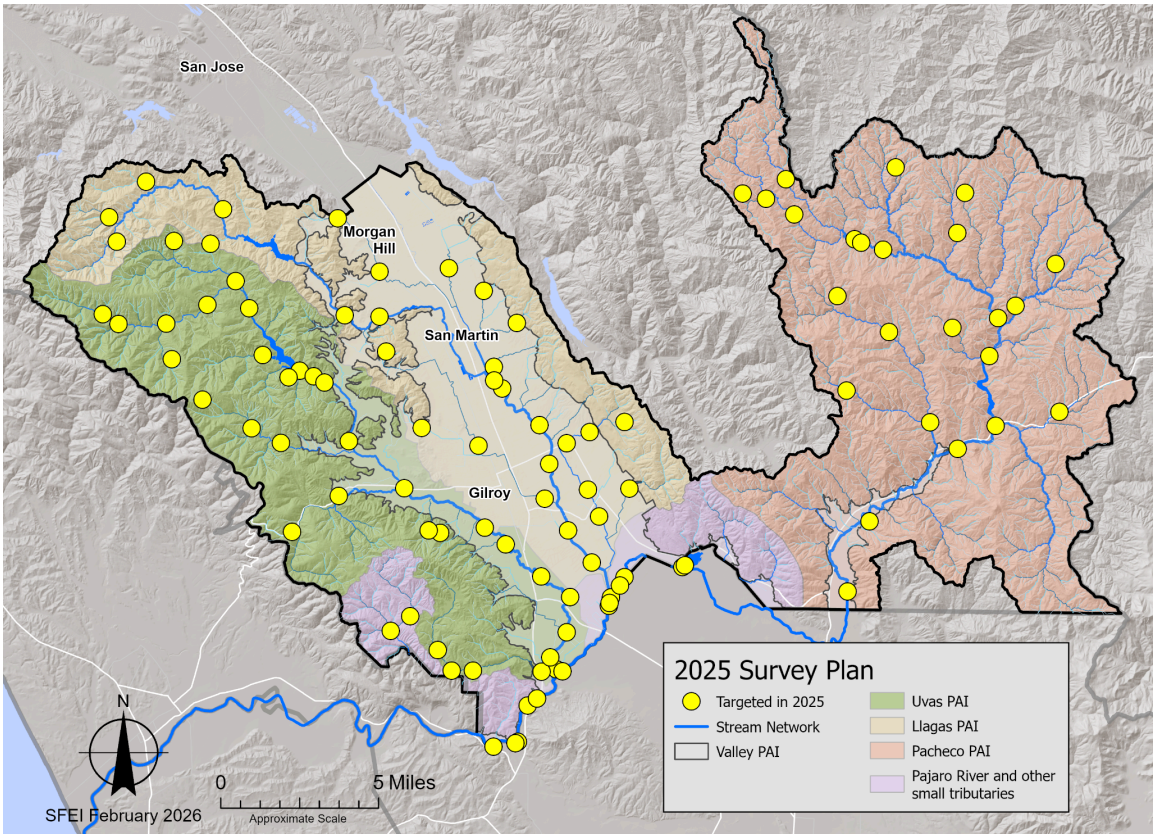

Figure 5. Map of the 2025 planned sampling sites (n=101) that aimed to improve the distribution of sites compared to the 2015 survey outcome.

3.2.4 CRAM Field Surveys and Data Management

Fieldwork for the 2025 survey was completed between June 23 and August 26, 2025. A total of 94 CRAM sites were assessed by combinations of 27 field practitioners.

As a part of this survey, intercalibration exercises were completed at the beginning, middle, and end of the field season. Nine sites were assessed in total, by multiple field teams during the three exercises, with an Assessment Area (AA) established for each assessment: five AAs were assessed during the beginning exercise, two AAs during the middle exercise, and two AAs during the end exercise. Intercalibration exercises are an important quality assurance (QA) step for any large monitoring and assessment project that utilizes the California Rapid Assessment Method (CRAM), especially when many field practitioners are employed (CWMW, 2018; CWMW, 2019). These exercises have two primary goals: (1) documenting and evaluating how closely aligned the field teams were compared to the senior practitioner team (composed of the most experienced practitioners), and (2) providing an opportunity for additional CRAM instruction, specific to the Upper Pajaro River watershed, to improve the consistent application of CRAM. For information about the results of the intercalibration exercises please refer to the team's intercalibration report (Pearce and Lowe, 2026).

Field teams were composed of two to three practitioners per site. On average two sites were completed per day by each team. Teams used the *California Rapid Assessment Method - Riverine Wetlands Field Book. V.6.1* (CWMW, 2013b) to complete the survey. Most teams collected data digitally using the CRAM application created by Wildnote, while a few teams used paper data sheets. Regardless of the data collection method, the field lead from each team reviewed the fieldsheets at the end of each day for completeness.

Data for all 94 AAs were uploaded to eCRAM, the on-line statewide CRAM data management system (accessed at www.cramwetlands.org), with a final completeness check occurring when the data were downloaded, checked, and corrected as necessary prior to data analyses and reporting. All field datasheets were scanned (or downloaded from Wildnote) and electronically archived by both SFEI and Valley Water. All publicly available CRAM data that has been uploaded to eCRAM is accessible online through EcoAtlas (www.ecoatlas.org). Project D5 CDF results have been published through EcoAtlas's Landscape Profile Tool.

3.2.5 Data Analyses

Statistical analyses for the 2025 survey evaluated the CRAM Index and Attribute Scores, based on the survey design and adjusted sample weights, to estimate the overall condition of streams in the watershed and within each of its PAIs. Each CRAM assessment is weighted to represent a portion of the total stream miles within the sample frame. Because the final distribution and number of surveyed sites is different from the sites targeted in the original stratified design (because of dropped and replaced sites), the sample weights must be adjusted before the final analysis. The analysis output consists of cumulative distribution function (CDF) estimates that include plots and tables of the CDF estimates, mean CDF estimates, and summary percentiles.

CDF plots enable a user to visually evaluate and compare the percent of stream miles within the Upper Pajaro River watershed equal to or less than any given CRAM Score with a known level of confidence (95% confidence limits). The median CRAM Scores, where half of the stream resources in the watershed are below that score, are easily identified and can be used to compare subsets of data, such as among the PAIs.

The confidence limits of a CDF are generally wider when there is a lot of variation in condition scores within a surveyed area or when the sample size is small. A curve that is shifted to the right indicates better overall stream conditions (higher CRAM Scores) than a curve that is shifted left.

An example of a CRAM Index Score CDF plot, shown in Figure 6, shows how to interpret the curve. Reading the blue arrows (across and down), it indicates that 50% of all the streams in the watershed have a CRAM Index Score of 74 or less with a 95% confidence that the 50th percentile score (or median score) is between 70 and 80 (or less) as indicated by the red confidence limit lines. The plot is also divided into three equal-interval subsets of the full range of possible CRAM Scores (25-100), called health or condition classes: Poor ecological condition

has a CRAM Score of 25 to 50, Fair 51 to 75, and Good 76 to 100. Figure 7 shows a bar chart that represents the proportion of streams (or percent of stream miles) in Poor, Fair, and Good condition based on the results of the same watershed survey.

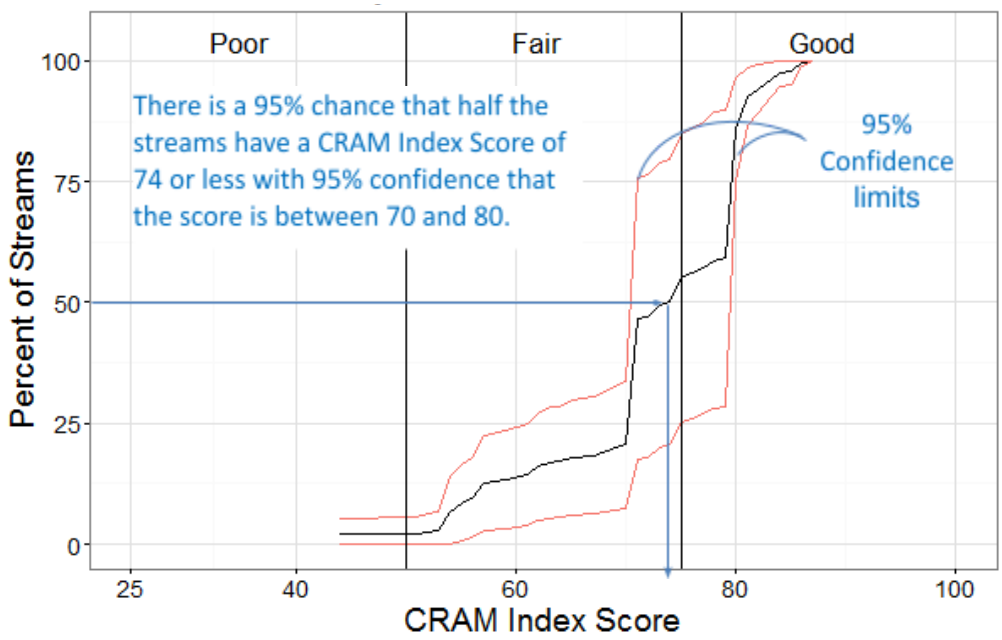

Figure 6. Example CDF plot of CRAM Index Scores showing how to interpret the 50th percentile Index Score on the curve.

Figure 7. Example bar chart of the proportion of streams in Poor, Fair, and Good condition based on CRAM condition classes.

Decisions about scores that delimit condition classes do not alter the underlying CDF, but they do affect its interpretation. For this report, the classes are defined as three equal-interval subsets of the full range of possible CRAM Scores because it is the most neutral approach and it affords direct comparisons between different watersheds based on the distribution of scores and stream miles among uniform condition classes.

To evaluate if the observed shifts in condition between survey periods were statistically significant, *spsurvey's change_analysis* function was used. The change analysis test was applied to both the continuous data (the mean CDF estimates of condition) and the categorical data

(the Good, Fair, Poor condition class data) at a 95% confidence level. The test takes into account survey sample weights and stratification to ensure the *change* estimates reflect the population, which is different from a standard t-test that assumes a simple random sample.

4.0 Survey Results and Discussion

4.1 Distribution and Abundance of Aquatic Resources

As described in Section 1.1.1 above, the Level 1 geospatial assessments (Parameters A-E) that assess the abundance and distribution of stream and wetland aquatic resources were not analyzed during this reassessment because no new detailed mapping has been developed as of the time of reporting. Additionally, there has not been any large-scale changes in stream or wetland abundance or diversity in the watershed during the time period between surveys. The analysis results can be found in the two previous reports: *Upper Pajaro River Watershed Condition Assessment 2015* (Lowe et al., 2016) and the *Five Watershed Synthesis Report* (Lowe et al., 2020).

4.2 CRAM Survey Results

4.2.1 Overview of Results

The 2025 Upper Pajaro River watershed reassessment survey found:

(1) The reassessment survey, comprising 94 AAs, found that the majority of stream length in the watershed is currently in Fair condition (88%), with 6% in Good and 6% in Poor condition.
(2) The CDF curve of the Index Score for the entire watershed shifted to the left from the 2015 to 2025 surveys, indicating a decline in condition. This decline was statistically significant and was mostly due to a reduction in the proportion of stream miles in Good condition.
(3) However, many of the 95% confidence limits of other CDF curves for individual Attributes at the PAI scales overlap, indicating that no statistically significant changes have occurred between surveys for those Attributes and/or areas.
(4) The most significant changes between surveys occurred a) in the Pacheco Creek PAI, and b) in the Physical Structure Attribute. The change in the Pacheco Creek PAI is likely (in part) due to redistribution of AAs between surveys. The change in the Physical Structure Attribute is likely due to actual on-the-ground changes in Structural Patch Richness and more consistent practitioner scoring of Topographic Complexity.
(5) Three main reasons account for the changes in scores between the 2015 and 2025 surveys. First, while the 2025 survey better quantifies stream condition in the watershed by adding new sites, particularly in PAIs that had large confidence limits, the

different distribution of sites from 2015 (including 32 replacement or added sites) appears to have affected the results. Second, some locations had actual on-the-ground changes, such as changes in understory plant species or new development adjacent to the creek. Finally, variability in how specific CRAM Metrics were scored by practitioners contributed to some of the change between surveys.

4.2.2 2025 Survey Site Outcomes

The 2025 survey, which targeted 101 sites, ultimately yielded CRAM assessments at 94 sites, largely due to landowner access limitations. This was an increase compared to the 2015 survey, from 81 to 94 sites. In 2025, 62 of the 94 sites were revisits of 2015 survey sites, while 32 were newly sampled sites (Table 3). The 32 new sites include 19 where access was denied in 2015, as well as the 13 planned additions. Of the 13 planned new sites, eight were in the Uvas Creek PAI, seven were in the Llagas Creek PAI, and two were lost in the Pacheco Creek PAI (because access was not granted). Four of the new sites were in upper watershed areas of the Uvas Creek PAI, and nine were added in the Valley floor PAI. Figure 8 compares the spatial distributions of the 2015 and the 2025 sampled sites. The 2025 survey had better spatial coverage within the Llagas and Uvas Creek PAIs, while the Pacheco Creek PAI had nearly the same number of sites, but with a different distribution of sites in upper watershed versus Valley areas.

Table 3. Number of sites sampled for the 2015 and 2025 Upper Pajaro River watershed stream condition surveys.

Primary Area of Interest (PAI)	2015			2025			Sites Added or Dropped		
	Valley	Upper WS	Total Sites	Valley	Upper WS	Total Sites (2015 Revisits)	Valley	Upper WS	Total Sites
Uvas	11	12	**23**	15	16	**31 (18)**	4	4	8
Llagas	20	3	**23**	23	7	**30 (21)**	3	4	7
Pacheco	0	23	**23**	3	18	**21 (16)**	3	-5	-2
Other	11	1	**12**	10	2	**12 (7)**	-1	1	0
Whole Watershed	42	39	**81**	51	43	**94 (62)**	**9**	**4**	**13**

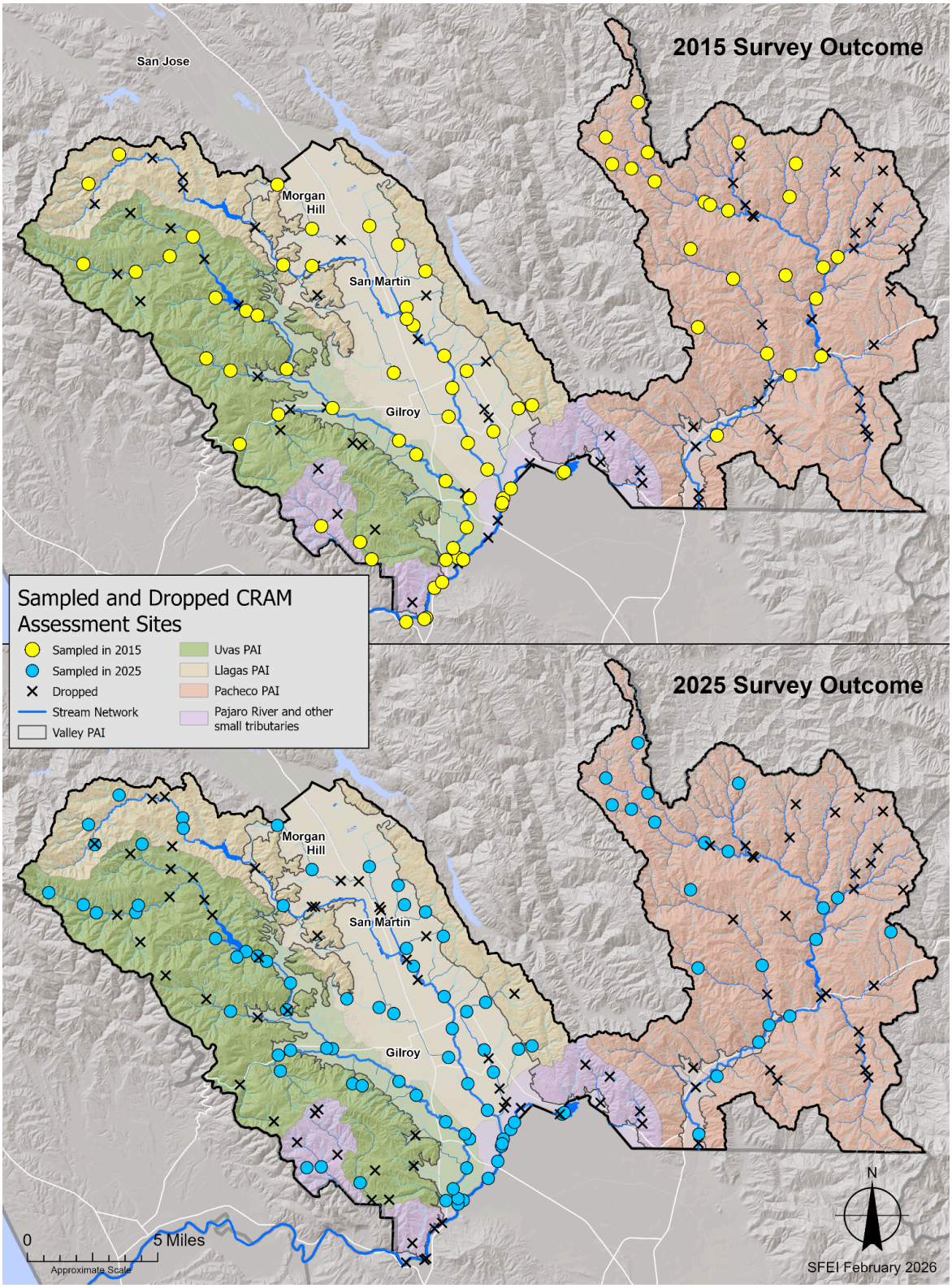

Figure 8. Maps of 2015 and 2025 Upper Pajaro River watershed stream condition survey sites. Dropped sites (X's) are primarily where permission to access was not granted.

4.2.3 Stream Conditions at the CRAM Index Score Level at the Watershed Scale

The 2025 survey found that 88% of the stream miles in the watershed are in Fair ecological condition based on the CRAM Index Score, 6% are in Good condition, and 6% are in Poor condition. For context, Figure 9 presents four field photos from the 2025 survey that show a range of stream conditions from Poor to Good ecological condition as measured at the CRAM Index Score level.

Figure 9. Examples of different ecological conditions within the Upper Pajaro River watershed based on 2025 CRAM surveys. Upper left: Jones Creek site Lla-171 (Index Score = 45, Poor condition). Upper right: San Ysidro Creek site Lla-155 (2025 Index Score = 57, Fair condition). Lower left: Llagas Creek site Lla-158 (2025 Index Score = 73, Fair condition). Lower right: Uvas Creek site Uva-330 (2025 Index Score = 83, Good condition).

There was a decline in the proportion of stream resources in Good condition from the 2015 survey as measured at the Index Score level (Figures 10 and 11). The 2015 and 2025 CDFs of CRAM Index Scores in the entire watershed are compared in Figure 10. The proportions of stream miles with Index Scores less than 64 largely remained the same (the curves overlap),

suggesting that the proportion of streams in lower condition has not changed much between survey periods. In comparison, the proportions of stream reaches with Index Scores between 64 and 83 showed a decline from Good to Fair condition between the two survey periods. A separate change analysis (Appendix B.2) confirmed that the decline in condition at the watershed scale was statistically significant.

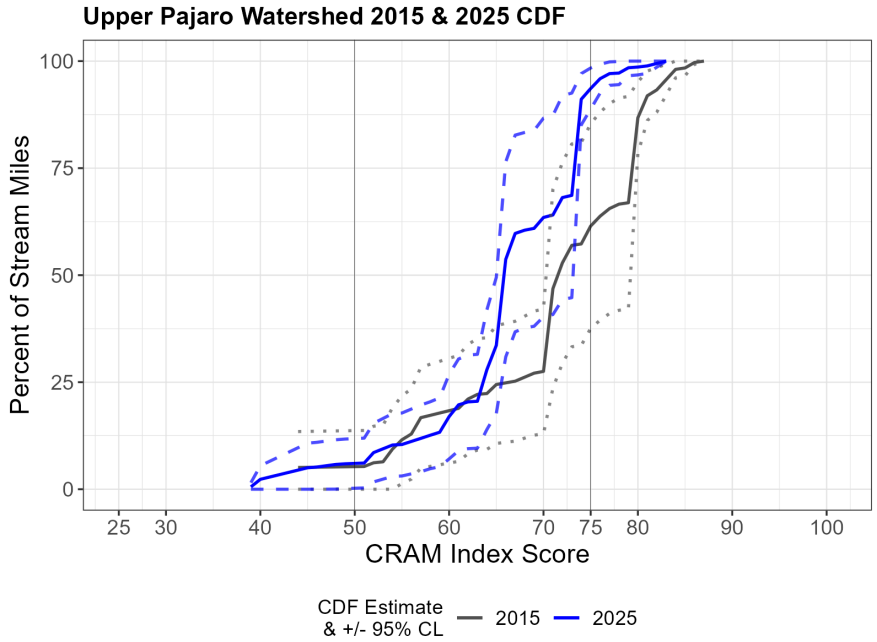

Figure 10. Cumulative distribution function (CDF) plots from the 2015 (grey) and 2025 (blue) CRAM Index Scores at the watershed level.

Figure 11 uses information from the CDF curves to compare the ecological condition class (Good, Fair, and Poor) of streams in 2015 and 2025. It also illustrates that when assessed by the CRAM Index Score, the proportions of watershed stream miles in Poor condition remained essentially unchanged between 2015 and 2025, while the proportions of stream miles in Good condition decreased and the proportions in Fair condition increased.

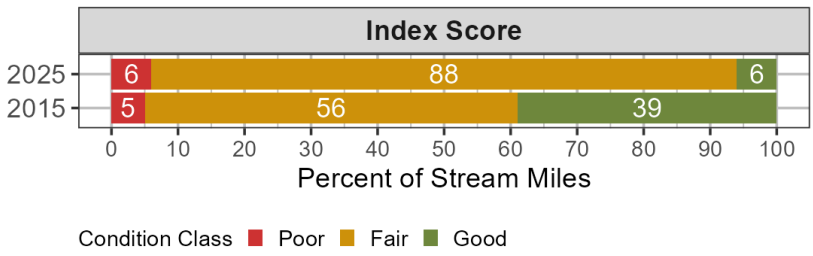

Figure 11. Bar charts summarizing the estimated percent of watershed stream miles in Poor, Fair, and Good ecological condition based on CRAM Index Score.

This finding of reduced stream resources in Good condition raises the questions of: 1) where is the change most pronounced? 2) what aspects of the stream resources are impacted? and 3), what are the potential causes of change? To best interpret these results and explain the observed shift in condition, a closer look is warranted at the following three factors:

1. The PAI level data (Section 4.2.4),
2. The CRAM Attribute level data (Sections 4.2.4 and 4.2.5),
3. The potential causes of observed change in condition between surveys (Section 4.2.6).

4.2.4 Stream Conditions at the PAI scale and CRAM Attribute Level

The condition class summary of Index Scores at the whole watershed and PAI scale (Figure 12) highlights where change between surveys is most pronounced and which subregions are likely contributing the most to the observed changes. All four PAIs show a decrease in the proportion of stream length in Good condition, however the Pacheco Creek PAI shows the largest, and statistically significant, decrease (Figure 12.A). The categorical summary of the four CRAM Attributes underlying the Index Scores at the watershed scale indicates that Physical Structure had the most pronounced change (Figure 12.B). Across the Upper Pajaro River watershed, the proportion of stream miles with Physical Structure in Poor condition increased from 48% to 87% between surveys.

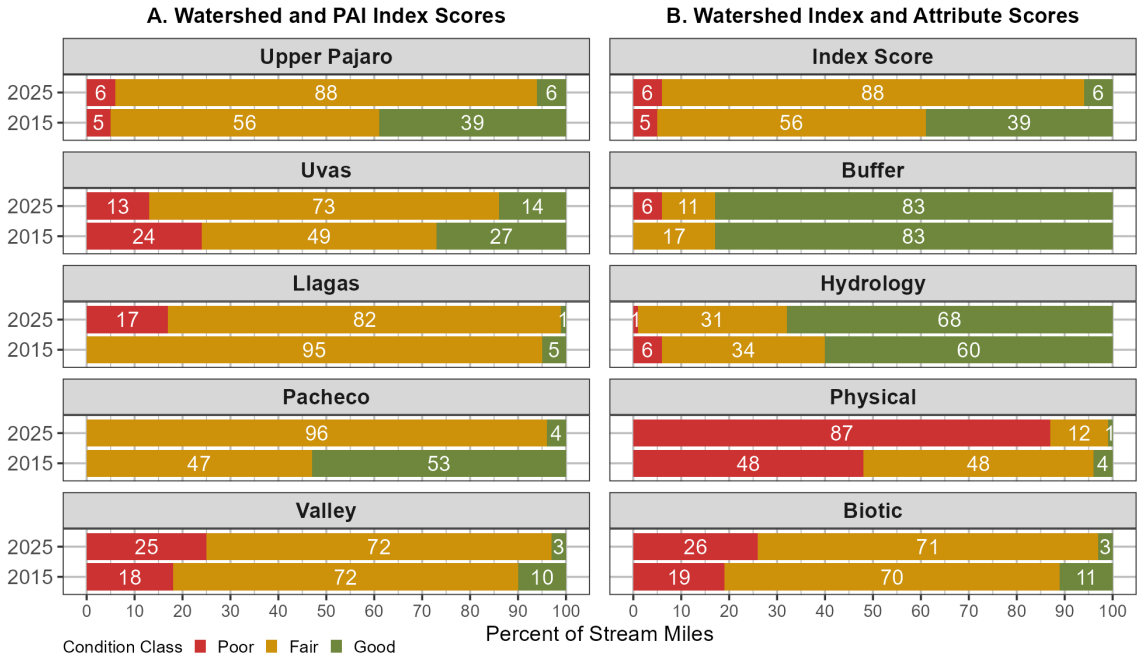

Figure 12. Estimated percent of stream miles in Poor, Fair, and Good ecological condition between the 2015 and 2025 survey periods. A) Conditions at the Index Score level for the whole Upper Pajaro River watershed and each of the PAIs. B) Conditions at the Index and Attribute Score levels for the whole Upper Pajaro River watershed.

Another way of viewing the reassessment survey results is through maps of the individual AAs and their Index Score condition class from the 2015 and 2025 surveys (Figure 13). These maps are not directly related to the CDF outputs and plots, but nonetheless provide a simple visual comparison of the differences in site distribution and condition between survey periods. The Uvas Creek PAI shows the least amount of change in condition, as compared to the readily observable site level change in the Llagas and Pacheco Creek PAIs.

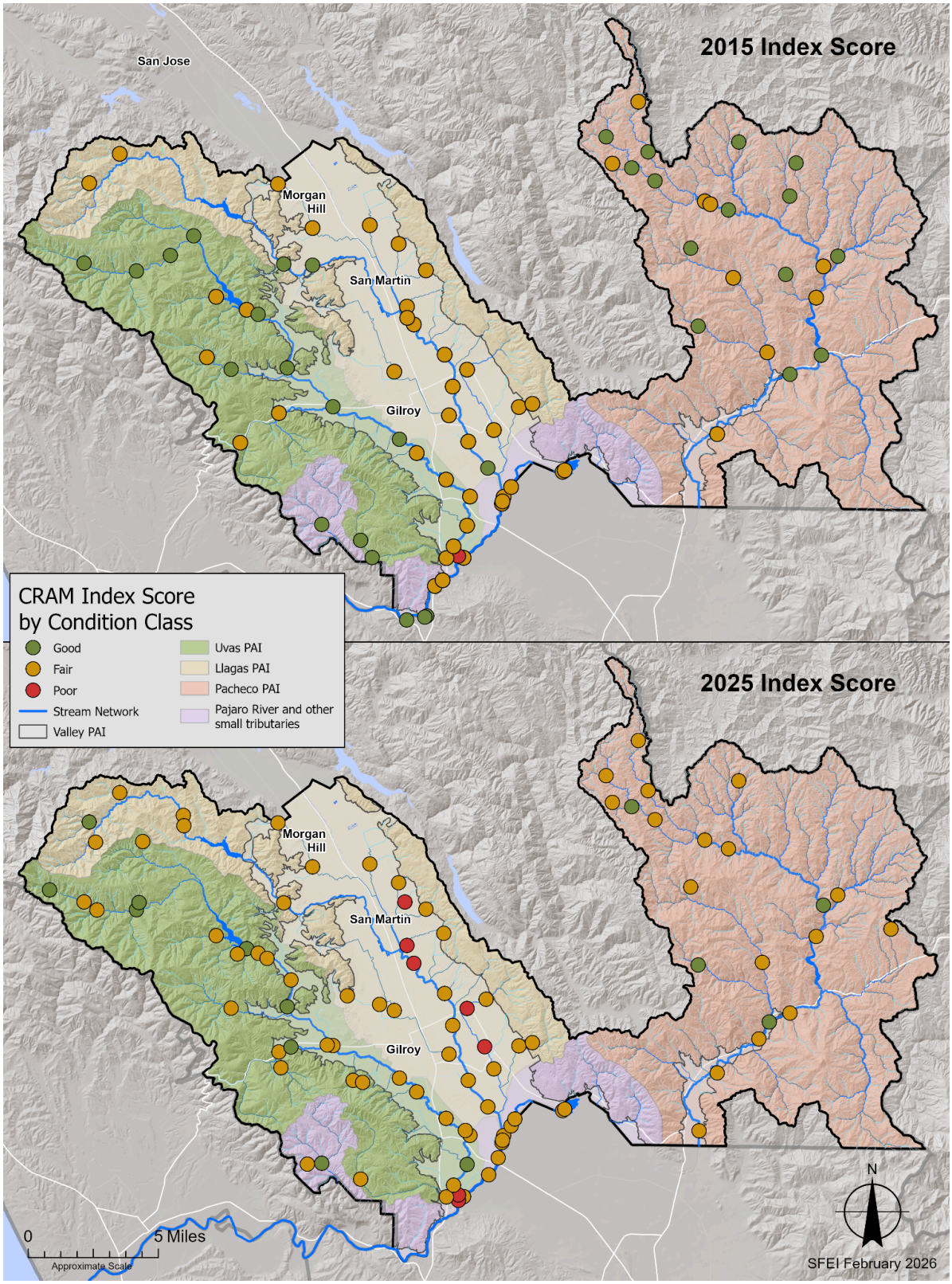

Figure 13. CRAM sites, colored by their Index Score condition class (Good, Fair, Poor), from the 2015 and 2025 surveys.

The Attribute Scores that underlie the Index Scores and that contribute the most to changes in the proportions of streams in Poor, Fair, and Good condition in specific PAIs are visualized in Figures 14 and 15. The CDFs in Figure 14 and the bar charts in Figure 15 indicate that:

- Many of the PAI- and Attribute-level curves largely overlap, or overlap within the confidence limits, indicating that no significant change has occurred between surveys for those measures.
- Within the Uvas Creek PAI, there is no significant statistical change in stream conditions between the two survey periods at the Index or Attribute Score levels (possibly because the condition in 2015 was more variable than in other PAIs).
- Within the Llagas Creek PAI, a statistically significant decline in stream conditions between the two survey periods is observed at the CRAM Index Score, as well as for the Buffer and Landscape Context and the Physical Structure Attributes.
- Within the Pacheco Creek PAI, a statistically significant decline in stream conditions between the two survey periods is observed at the CRAM Index Score; this leftward shift is the most obvious of the PAIs. In addition, leftward shifts are observed for the Physical Structure and the Biotic Structure Attributes.
- Overall, the Buffer and Landscape Context Attribute has the highest proportion of stream miles in Good condition, however the Llagas Creek and Valley PAIs have the smallest proportion of stream miles in Good condition amongst the four PAIs.
- Within the Valley PAI, a statistically significant decline in stream conditions is observed for the Buffer and Landscape Context Attribute.
- The Hydrology Attribute curves are all S-shaped and are similar for all PAIs. There is very little change between surveys, with the exception of improvement in the lowest condition scores, for example in the Uvas Creek PAI.
- The Physical Structure Attribute curves show a consistent shift to the left (i.e., decline in condition), with the least amount of change in the Llagas Creek and Valley PAIs.
- Biotic Structure Attribute curves largely overlap, but with a slight shift to the left, especially in the higher condition Scores. The shift in the mid-range Scores in the Pacheco Creek PAI is mimicked in the shape of the full watershed curve.

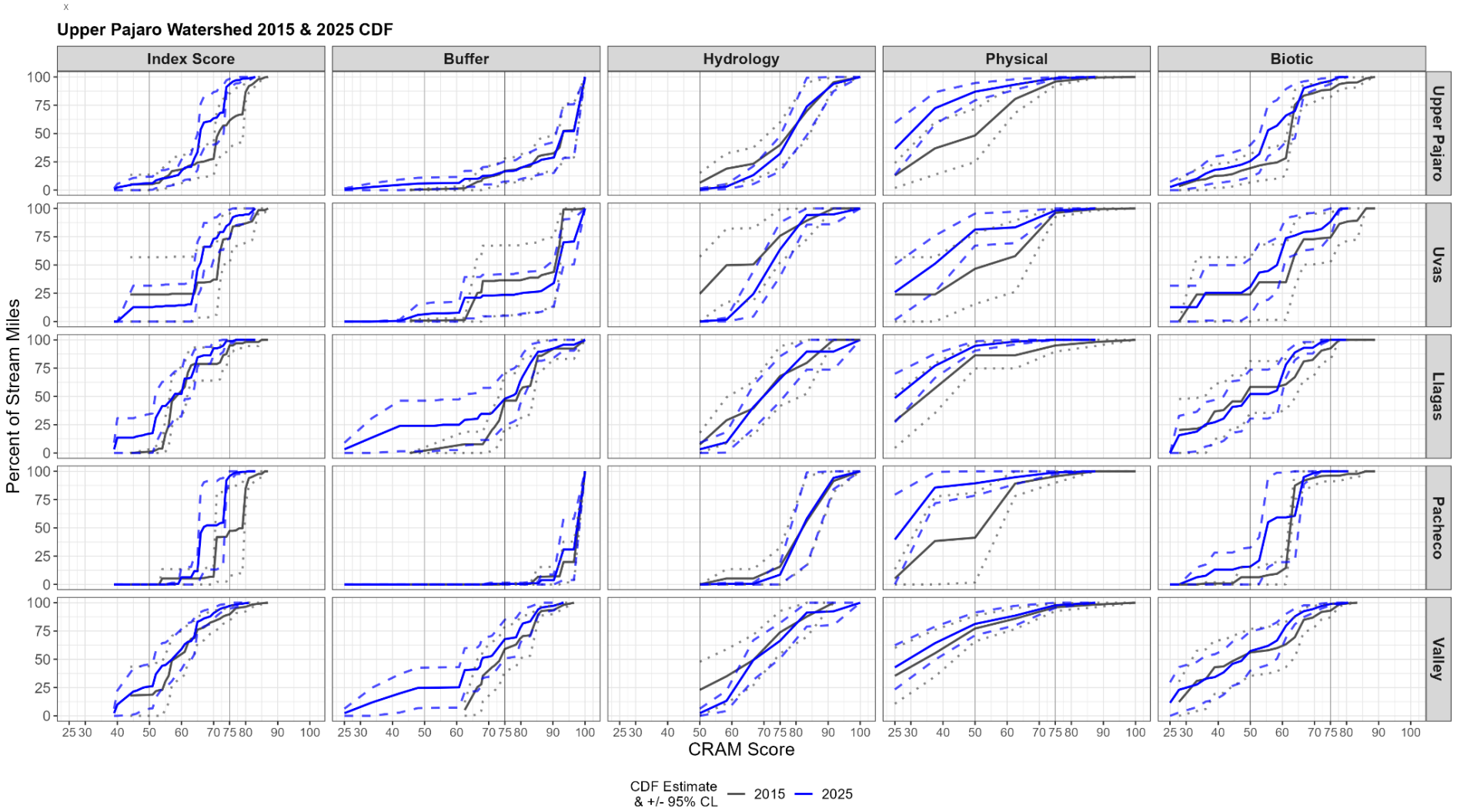

Figure 14. Cumulative Distribution Function (CDF) plots (and 95% Confidence Limits) of the CRAM Index and Attribute Scores for the Upper Pajaro River watershed and PAIs from 2015 and 2025, illustrating the differences and changes in relative conditions of streams across both PAIs and Attributes.

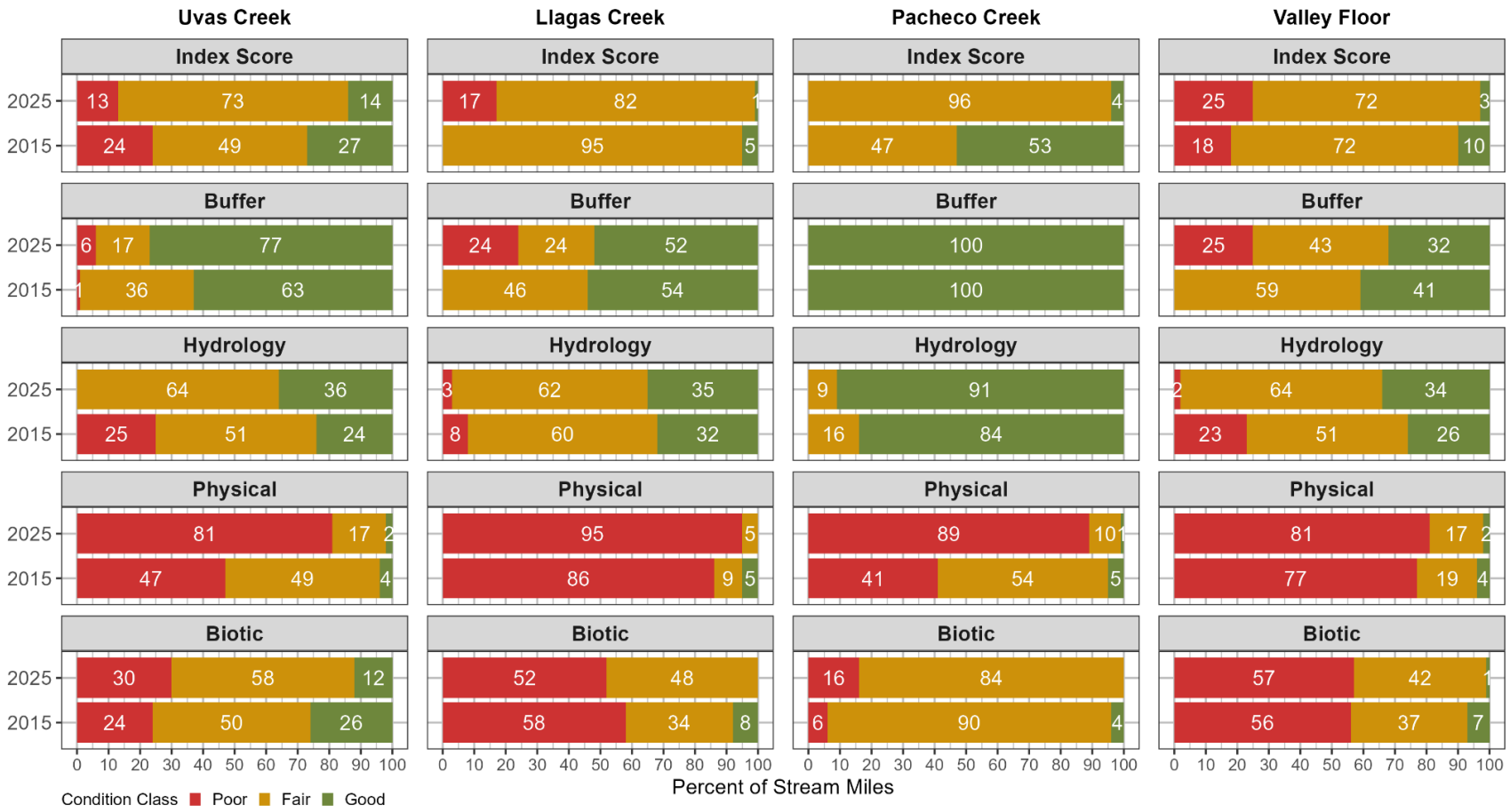

Figure 15. Percent of stream miles in Poor, Fair, and Good ecological condition at the Index and Attribute Score levels for each of the four PAIs from 2015 and 2025 surveys.

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4.2.5 Stream Conditions at the CRAM Attribute and Metric Score Level

Each CRAM Attribute - Buffer and Landscape Context, Hydrology, Physical Structure, and Biotic Structure - evaluates a unique component of a stream's health or condition.

For the Upper Pajaro River watershed, the majority of streams are in Good condition at the Buffer and Landscape Context and Hydrology Attribute Score levels (Figure 12.B), but are in Poor or Fair condition at the Physical and Biotic Structure Attribute Score levels. A statistically significant decline in stream conditions between the 2015 and 2025 surveys is observed at the Physical Structure and the Biotic Structure Attribute Score levels. Examining the Metric Scores that underlie these Attribute Scores reveals more about stream condition drivers and helps resource managers identify specific restoration or management actions that could improve stream conditions.

Buffer and Landscape Context

A buffer is a transitional area between a stream and its surrounding environment that protects the stream from anthropogenic stress, by providing services such as runoff filtration, wildlife refuge, and barriers for humans, non-native wildlife and invasive plants (CWMW, 2013b). CRAM includes two Metrics to assess the Buffer and Landscape Context Attribute: the Stream Corridor Continuity Metric and the Buffer Metric. The Stream Corridor Continuity Metric considers the land cover (e.g. land cover serving as riparian habitat) upstream and downstream of the AA. The Buffer Metric is composed of three sub-metrics: (1) percentage of the AA perimeter that has a buffer; (2) the average buffer width; and (3) the condition or quality of the buffer.

More stream miles had a Poor Buffer and Landscape Context Attribute Score in 2025 than in 2015 at the watershed scale, with variability among the PAIs (Figures 12.B & 15). In the Llagas Creek and Valley PAIs, there is an increase in the proportion of stream miles in Poor condition that is statistically significant. It should be acknowledged that there is a strong correlation between those two PAIs because the majority of Valley streams are located within the Llagas Creek PAI. The increase in the proportion of streams with Buffer in Good condition in the Uvas Creek PAI is not statistically significant, and there was no change in the Pacheco Creek PAI (100 percent of stream resources had Good Buffer conditions).

Figure 16 shows the distribution of CRAM sites sampled during the 2015 and the 2025 stream condition surveys, color coded by their Buffer and Landscape condition classes of Poor, Fair and Good. Review of all of the revisited sites indicated that on-the-ground changes such as new development, newly cultivated lands (e.g. vineyards), and changes in agricultural practices (e.g. cultivating a formerly fallow field or installing new fencing) resulted in lower scores at some sites. Other contributions to lower Buffer and Landscape Context scores include: (1) the addition of nine sites in the Valley PAI, which tends to have much less buffer than the upper watershed, (2) changes in how the revisited AA extents were defined - resulting in

recharacterization of buffer conditions[1], (3) differences in how practitioners interpreted grasslands within the Buffer Condition Metric, and (4) 10 individual Metric or Sub-metric scores with practitioner errors between the original 2015 and 2025 surveys.

[1] Each 2025 practitioner team reviewed the 2015 AA boundary before beginning their assessment. Sometimes the lateral extent of the boundary was too narrow or too wide in 2015 (based upon decisions about active floodplain) causing a change in adjacent buffer, but most often the AA boundary differences were related to property access constraints, and thus a 2025 AA could be slightly shifted in space as compared to the 2015 AA boundaries.

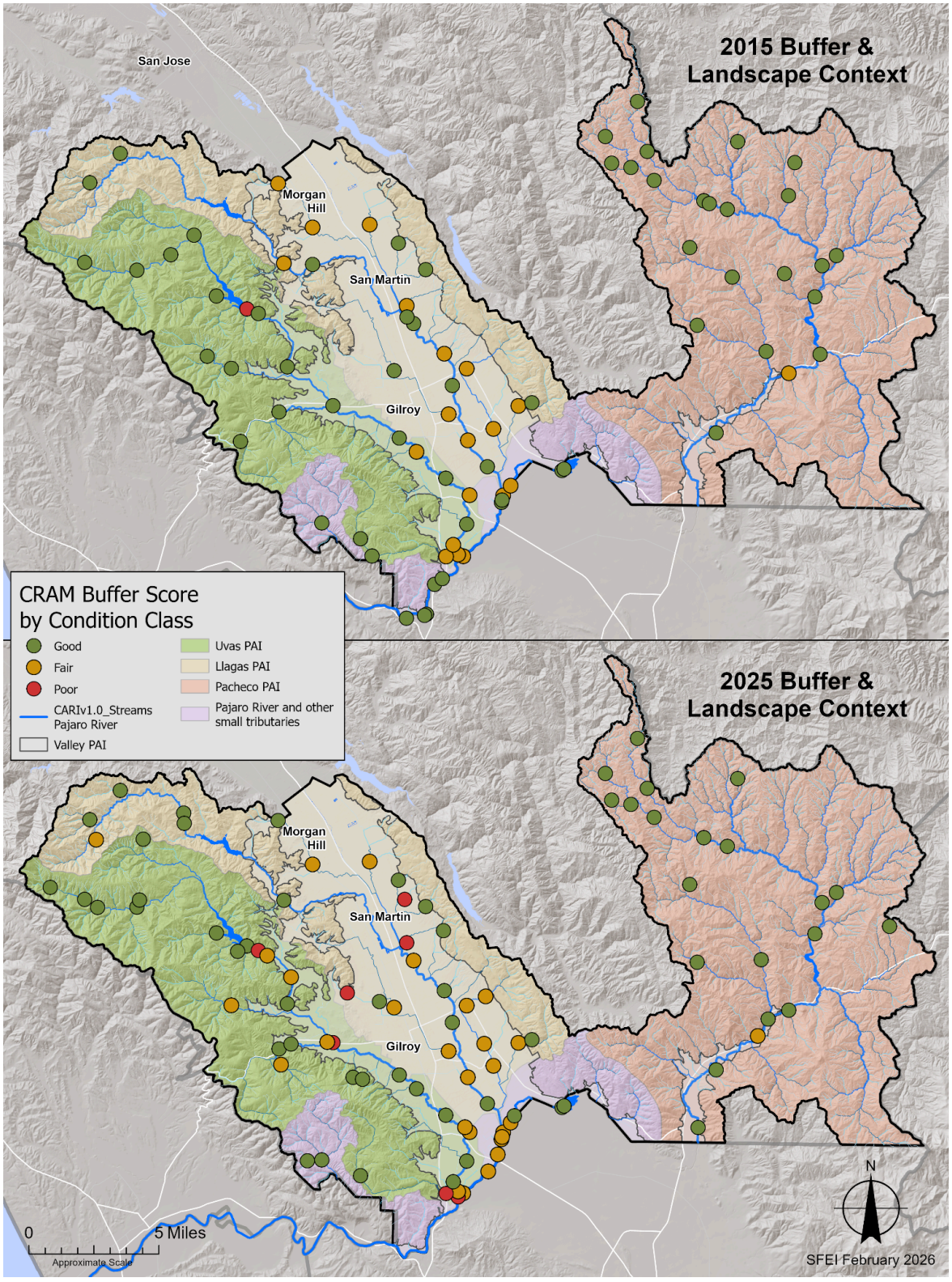

Figure 16. CRAM Buffer and Landscape Context Attribute Scores colored by condition class (Good, Fair, Poor) for the 2015 and 2025 surveys.

Hydrology

Hydrology is the most important factor impacting a stream's overall ecological condition because its physical structure is determined by the magnitude, duration, and intensity of water movement (CWMW, 2013b). CRAM includes three Metrics to assess the hydrologic condition of streams: Water Source, Channel Stability, and Hydrologic Connectivity.

The Hydrology Attribute Scores did not show significant differences in the percent of stream miles in Poor, Fair, or Good condition between survey periods. Nonetheless, the bar charts show slightly improved conditions across all four PAIs (again not statistically significant), with the most improvement occurring in the Uvas Creek PAI. The change is also visible at the site level in the maps in Figure 17, with a decrease in the number of red (Poor condition) AAs and increase in the number of green (Good condition) AAs in 2025 compared to 2015. The lack of statistically significant change is not surprising, as aspects of Hydrology are difficult to change over just 10 years. For instance, a change in Water Source requires significant change in land use within the watershed, Channel Stability requires significant aggradation or degradation, and Hydrologic Connectivity requires a significant change in channel geometry (such as caused by large flood events). None of these factors occurred in the watershed at a scale large enough to affect the PAI-scale scores. However, a comparison of Hydrology Metric scores between survey periods showed some differences in the ways field teams scored the different Metrics. In general, the 2015 teams tended to score Channel Stability and Hydrologic Connectivity lower than the 2025 teams. In part these differences are a result of improved CRAM guidance over the past decade in an effort to further standardize the method. Despite Metric level scoring differences, proportions of streams in Good, Fair, and Poor condition at the Attribute level did not significantly change between surveys.

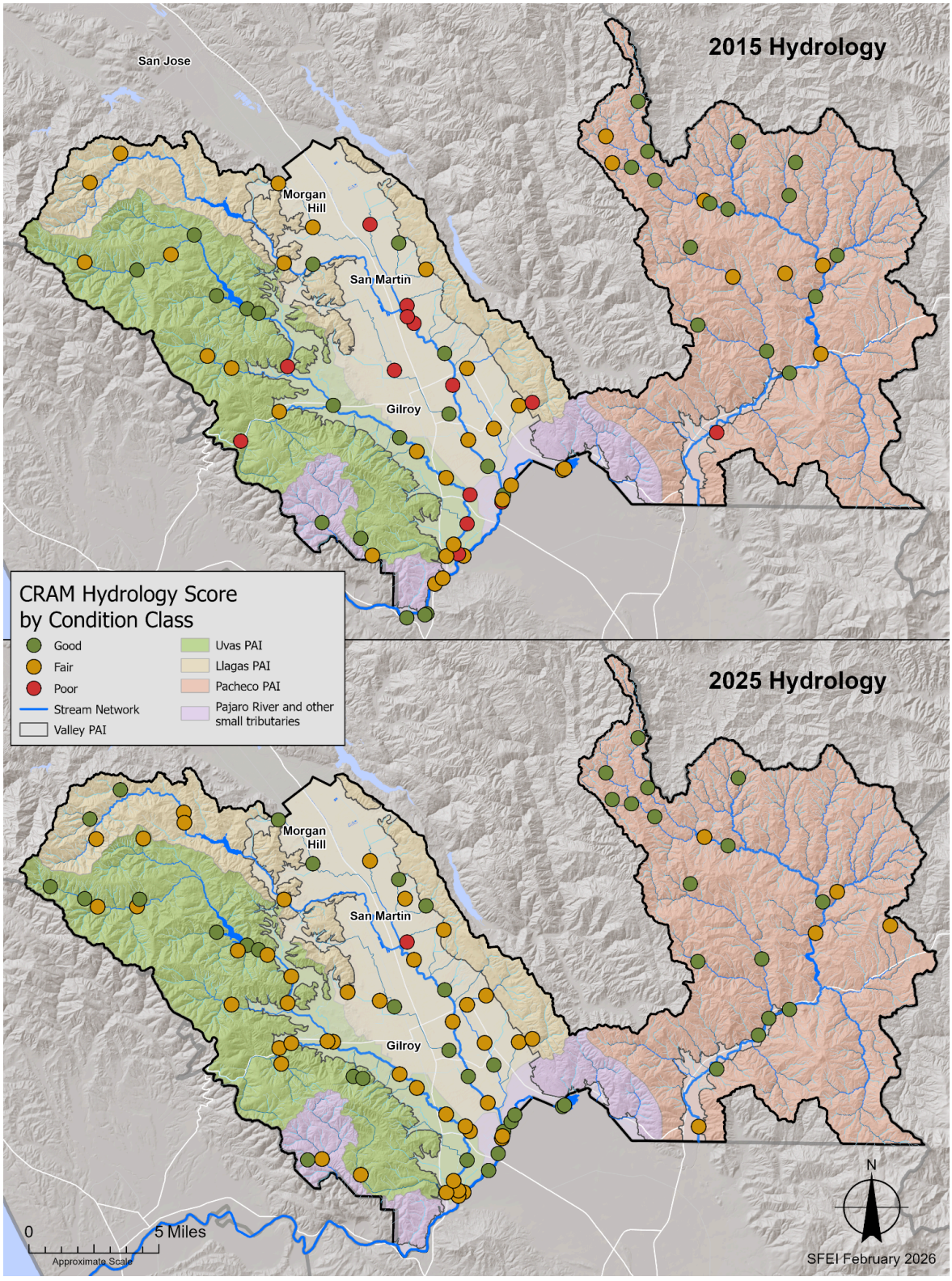

Figure 17. CRAM Hydrology Attribute Scores colored by condition class (Good, Fair, Poor) for the 2015 and 2025 surveys.

Physical Structure

Physical Structure describes the spatial organization of living and non-living surfaces within a stream that support flora and fauna, and which are created and controlled by physical processes occurring within the stream (CWMW, 2013b). CRAM includes two Metrics to assess the Physical Structure of streams: Structural Patch Richness and Topographic Complexity.

The change analysis indicated a significant decline in Physical Structure, based on the CDF, at the watershed scale between 2015 and 2025, likely due to a significant decline in the Pacheco Creek PAI and to a lesser extent the Llagas Creek PAI, the Pajaro River mainstem, and other small watersheds. The change analysis in the Uvas Creek PAI was not significant, possibly because the 2015 95% confidence limits were wider than for the other PAIs making it more difficult to detect change through time. For the categorical change analysis, the increase in the proportions of stream resources in Poor condition (and complementary decrease in the proportions of stream resources in Fair condition) was statistically significant at the watershed scale and in the Pacheco Creek PAI, suggesting that the decline in Physical Structure was most pronounced in that sub-watershed. At the site scale, the maps in Figure 18 show more AAs in Poor Physical Structure (red) in 2025 than in 2015. Although Physical Structure decline was not statistically significant in the Uvas Creek PAI, the bar charts (Figure 15) show a much larger proportion of stream miles in Poor condition in 2025 as well (47% in Poor condition in 2015 as compared to 81% in 2025). Again, the wide 95% confidence limits for this PAI in 2015 were likely the reason that the change analysis was not statistically significant

Of all four CRAM Attributes, the Physical Structure Attribute has the greatest proportion of stream miles in Poor condition, and the most statistically significant change between surveys. Similar to the Buffer and Landscape Context Attribute, a review and comparison of the revisited sites helped to identify possible reasons for the changes observed at the watershed and PAI scales. These were most likely a mix of actual on-the-ground change, change in the distribution and number of sites, and differences in the application of CRAM methods. For the Structural Patch Richness Metric, the change in scores likely reflects a slight simplification of the stream channels between surveys, along with practitioners that were more discerning in identifying individual patches in 2025. Similarly, about a third of the Topographic Complexity Metric scores indicated less complexity at revisit sites compared to 2015, likely due to differences in scoring, with very few revisit AAs actually experiencing a real change. These differences include practitioners that are more discerning in identifying a bench and micro topographic complexity across the entire cross section, more careful consideration of the length of existing benches, possible misidentification of benches in 2015 due to the drought, and changes in the placement or width of the AA between surveys.

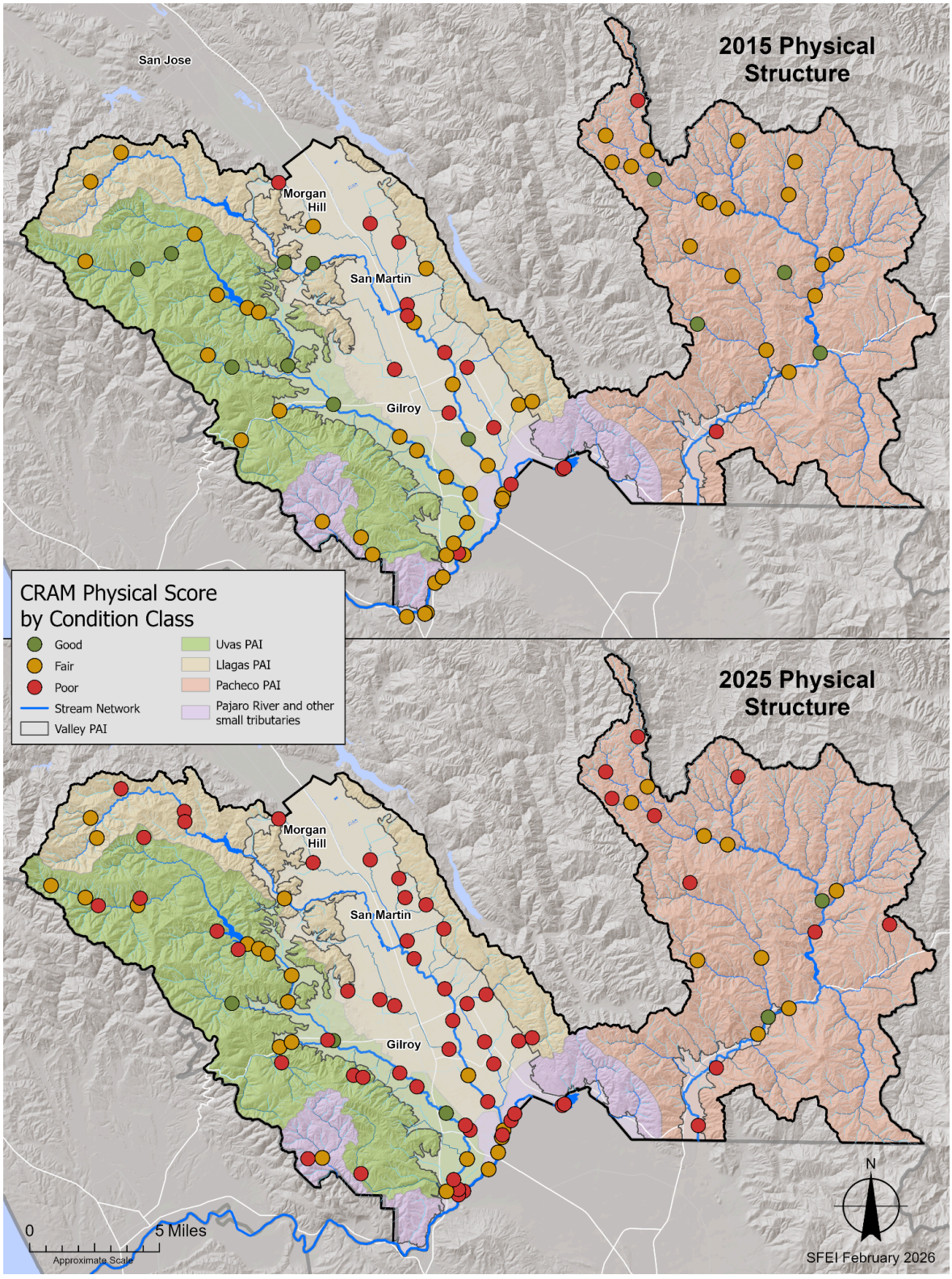

Figure 18. CRAM Physical Structure Attribute Scores colored by condition class (Good, Fair, Poor) for the 2015 and 2025 surveys.

Biotic Structure

Biotic Structure includes all of the living vegetation and coarse detritus that creates material structure and architecture within a stream corridor (CWMW, 2013b). CRAM includes three Metrics to assess the Biotic Structure of streams: Plant Community Composition, which includes three Sub-metrics (Number of Plant Layers, Number of Co-dominant Species, and Percent Invasion), Horizontal Interspersion, and Vertical Biotic Structure.

Biotic Structure Attribute scores showed a statistically significant decline, based on the CDF, at the watershed scale, in the Pacheco Creek PAI, and the Pajaro River mainstem and other small watersheds. The categorical change analysis indicated that the decline in the proportion of stream miles in Good condition was statistically significant at the watershed scale and the Valley PAI. Changes in the proportions of streams in Fair and Poor condition were not significant even though Figure 15 bar charts show a visible change. Changes in the proportions of streams in Poor, Fair, and Good condition in the Uvas Creek PAI are visibly pronounced, yet were not statistically significant likely due to the wide 95% confidence limits in 2015, making it difficult to determine if significant change actually occurred.

The Biotic Structure Attribute Scores are often more variable than other Attribute Scores between site revisits, reflecting annual and seasonal changes in plant community conditions. Interestingly, the Figure 15 bar charts show that the relative proportions of change among the Biotic Structure condition classes was not as large as some of the other Attributes. Nonetheless, all four PAIs showed a slight decline in the proportions of stream miles in Good Biotic Structure condition as compared to 2015. These small changes likely reflect the change in the distribution of, and the addition of nine sites for the 2025 survey, as well as expected annual variability in the plant community. At the site scale, the maps in Figure 19 show roughly similar distributions of sites by Biotic Structure condition classes, with fewer sites in Good condition and a few more sites in Poor condition in the Pacheco Creek PAI.

Of the 62 AAs that were revisited, approximately half had a change in score for one or more of the Biotic Structure Metrics. Interestingly, only one revisit site had the exact same Metric scores for both surveys, and two revisit sites had a different score for all three Metrics. More commonly, only one or two of the Metrics or Sub-metrics had different scores, with no single Metric defining the differences. In general, a larger number of scores decreased as opposed to increased between surveys based on a lower number of plant layers present, a lower number of co-dominant species, a greater proportion of invasive species, and more simple plant communities in planform and in the third dimension. These differences likely reflect actual on-the-ground change in the slight simplification of the plant community, as well as improved CRAM guidance over the past decade in an effort to further standardize the method.

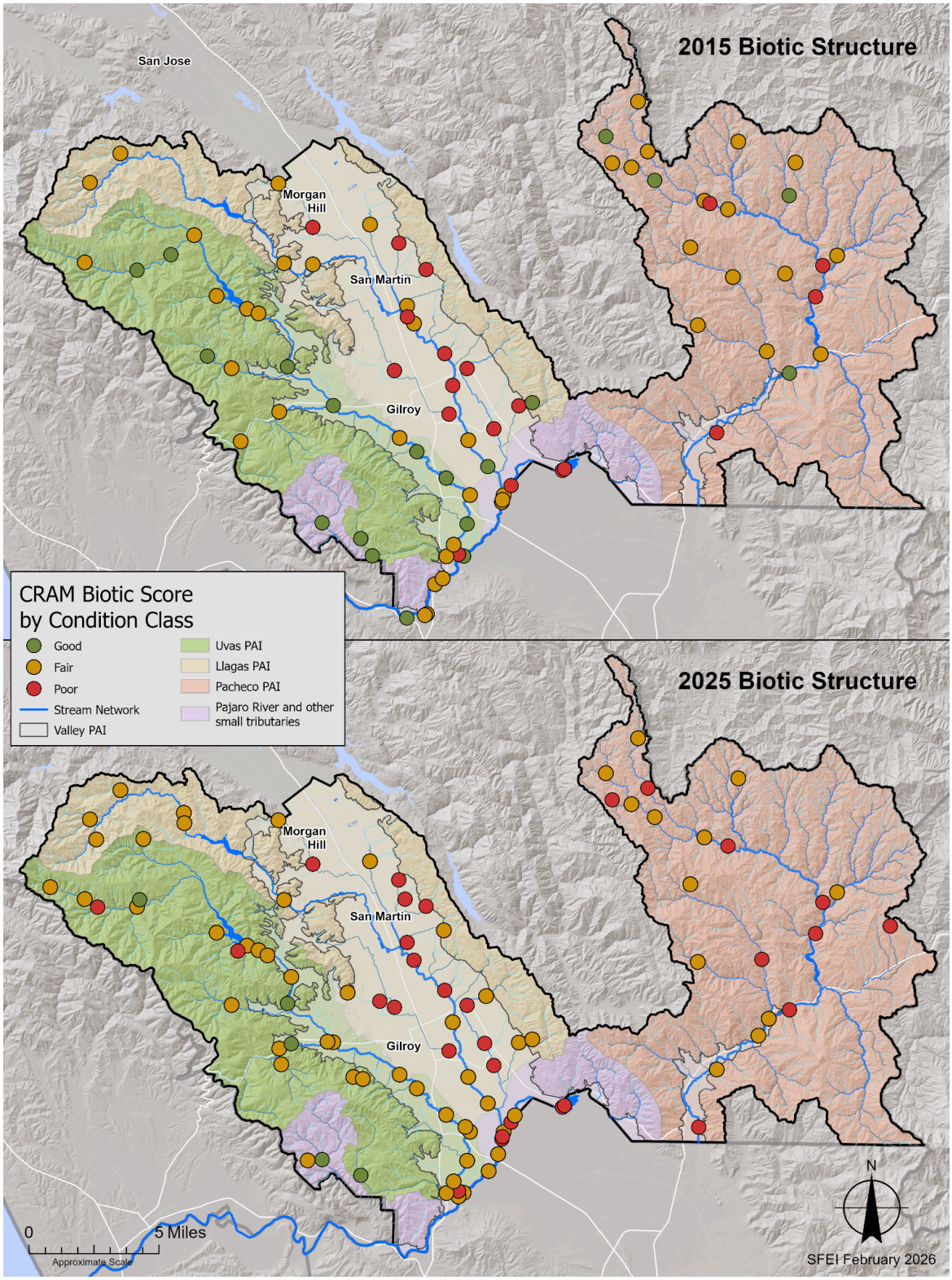

Figure 19. CRAM Biotic Structure Attribute Scores colored by condition class (Good, Fair, Poor) for the 2015 and 2025 surveys.

4.2.6 Causes of Change in Condition

As discussed in the previous sections, there are three primary causes for the observed changes between the 2015 and 2025 surveys:

- Changes in access to the 2015 revisit assessment sites and the addition of 13 new sites across the watershed in 2025. It was expected that changing the distribution and number of sites for the 2025 survey would affect the results, with only 62 of the 81 originally sampled sites successfully revisited and 32 replacement and additional sites added (totaling 94 sites). It was determined, however, that the benefits of improving representation of sites across the watershed (including within specific PAIs) was more important for the 10-year reassessment survey.
- Actual changes on the ground between 2015 and 2025. The CRAM surveys did detect changes in ecological conditions at survey sites. For example, assessment site Lla-179 had undeveloped parcels adjacent to a flood control channel in 2015. By 2025, new housing and a school had been built and the flood control channel was fully fenced. This change causes the width of the buffer to be smaller, thus resulting in a lower Buffer and Landscape Attribute score. At Uva-283, two plant species were co-dominants in the short plant layer (*Cynodon dactylon* and *Vinca major*) in 2015. In 2025, however, these species were not present. The reduction in the total number of species present resulted in a lower Biotic Structure Score.
- Differences in the application of CRAM between 2015 and 2025. Variability in how some Metrics were scored by CRAM field practitioners contributed to some of the change between survey periods. This is most evident within the Physical Structure Attribute, particularly in the Topographic Complexity Metric. A thorough comparison of the CRAM Metric scores for all of the revisited sites indicated that most sites likely did not change much between survey periods and that differences in scores reflected: a) practitioner errors in the identification of bench surfaces, b) variability in how practitioners interpreted the presence/absence of micro-topographic relief within the AA, c) difficulty in correctly identifying benches in 2015 due to previous years of drought conditions, and d) improving guidance since 2015 about how practitioners should be viewing and interpreting the Metric narrative.

Due to the rigor of the spatially balanced statistical survey design, it was known in advance that changes in the number or location of sites within the reassessment survey could result in changes in condition between years at the sub-watershed and watershed scales. However, the increase in the total number of sites in the survey, along with the better spatial distribution of those sites, actually improves the overall understanding of stream condition within the watershed. The addition and redistribution of sites in 2025 illustrates that the condition of streams in the watershed is not as good as the 2015 results suggested. Additionally, the influence of CRAM practitioner training and bias has long been recognized as a source of

change in reassessment surveys. However, the intensity of the CRAM training and intercalibration process controls this influence far better than other alternative methods.

4.2.7 Stressors Impacting Stream Conditions

CRAM includes a checklist of 47 different stressors that practitioners evaluate at each AA as either (1) visibly present or (2) visibly present AND having a significant adverse effect upon condition. A CRAM stressor is defined as an anthropogenic perturbation within the AA or its immediate environmental setting that is likely to negatively influence condition and function of the wetland or stream (CWMW, 2013a). Stressors for Hydrology, Physical Structure, and Biotic Structure must be evident within 50 meters of the AA, while Buffer and Landscape Context stressors must be present within 500 meters of the AA in order for the field team to record them. Practitioners are taught that stressors should be considered significant if they are directly affecting the score of any given CRAM Metric within the AA, or if the activity is clearly affecting morphology, function, or other natural processes within the stream.

For the 2025 survey, the number of stressors varied between zero and 19 for individual AAs. Most AAs listed many stressors as present, while 10 of the 94 AAs recorded no stressors (these AAs were all located in undeveloped areas of the watershed). The following seven individual stressors (in no specific order) were flagged as having a "significant effect" at more than 10% of the sites: (1) Intensive row crop agriculture, (2) Transportation corridor, (3) Urban residential, (4) Non-point source discharge, (5) Grading or compaction, (6) Plowing or discing, (7) Lack of treatment of invasive plants.

In general, the stressor checklist is used to help investigate possible reasons for low CRAM scores. Some stressors, like those described above, are fairly common throughout the Upper Pajaro River watershed and generally occur outside the AA boundary making it difficult to remediate or eliminate these stressors given land ownership and current land use. However, for other stressors, managers may be able to take actions to reduce the stressor and improve stream condition. For instance, within the Hydrology Attribute, the most common stressors included: (1) Dikes or levees, (2) Engineered channel, (3) Flow obstructions, and (4) Weir or drop structures. Typically these features are elements added by and under the jurisdiction of the resource managers, meaning that they may have the ability to address the negative impacts of these constructed elements.

The stressor checklist can also be used to evaluate changes that might have occurred between surveys. There were 10 revisit sites that had greater than 10% change in "significant effect" stressors, with seven having a larger percentage of "significant effect" stressors in 2025 than in 2015. Looking more closely at these sites, only two of the 10 actually experienced real change on the ground that should result in different stressors being identified. The other eight were instances where the field teams viewed the stressors differently, and either overestimated or underestimated their "significant effect" stressors as compared to the previous survey. The

most common differences were within the water quality stressors (e.g., Nutrient impaired and Pesticides or trace organics impaired) or in the landscape-level land use stressors (e.g., Industrial/Commercial or Orchards/nurseries). Upon review, these stressors did exist, but likely should not have been flagged as "significant effect" stressors because they did not directly cause a decline in any individual metric score.

5.0 Summary and Recommendations

5.1 Summary

The CDF results of Project D5's 2025 CRAM stream condition reassessment survey in the Upper Pajaro River watershed showed a decline in the overall ecological conditions of streams at the watershed scale, within some PAIs at the Index Score level, and for some Attributes when compared to the 2015 survey. The biggest shifts were observed in the Physical Structure Attribute CDF, and in the Pacheco Creek PAI Index and Physical Structure Score levels. The Llagas Creek and Valley PAIs, whose areal extents cover much of the same stream reaches, showed a decline in the Buffer and Landscape Context Attribute. A number of factors contributed to the changes, including (1) changes in the distribution and number of sites that resulted in about a third of the sites being new locations, (2) on-the-ground changes in adjacent land use and stream conditions at revisit sites, and (3) differences in how field teams applied CRAM between 2015 and 2025.

5.2 Management Applications for CRAM

The Project D5 CRAM reassessment surveys reevaluate channel condition in context of current stream management practices, flood control or other capital projects, and restoration/mitigation project implementation. The survey results provide accessible, science-based information about the overall ecological condition of watershed resources that managers can use in their long-term resource planning processes (including for climate change), to help build partner relationships and opportunities for collaboration, in urban planning (by protecting adjacent stream buffers), and in ecological enhancement project designs. In addition:

- CDFs can be used to set watershed restoration goals: Managers can use the CDFs to consider the scale of action that will be necessary to affect change within a PAI or at the watershed scale. For example, Valley Water's Upper Pajaro Master Watershed Plan has a quantitative metric to increase the miles of (or proportion of) streams that are in good to excellent ecological condition based on the CRAM Index Score at the watershed scale using Project D5's stream condition survey's Index Score CDF.

- CRAM and CDFs can be used to provide local watershed context to support management decisions by allowing site-specific CRAM scores to be compared to watershed or PAI conditions.
- CRAM can help track the progress of restoration/mitigation projects. For example, Valley Water's Lake Silveira Mitigation project for the Upper Llagas Creek Flood Control Project is using CRAM to characterize the change in stream and pond conditions from pre-project conditions. The surveys are able to track project performance and compare conditions to the Llagas Creek PAI CDFs to put the project's condition into its local watershed context.

5.3 Recommendations

5.3.1 Upper Pajaro River watershed recommendations

The Project D5 CRAM survey results indicate that the following actions could directly improve the ecological condition of stream resources in the Upper Pajaro River watershed and contribute to the improvement of watershed and PAI-scale conditions.

- Compared to Valley Water's other more urban watersheds, the Upper Pajaro River has a real opportunity to preserve, enhance, and maintain riparian corridors, particularly in the Valley PAI. Resource managers should actively preserve, maintain and enhance riparian corridors along stream channels to preserve and connect long stretches of stream buffer. Intact riparian corridors provide habitat, refuge for native flora and fauna, and reduces water quality and other human impacts on streams. Preserving and improving the connectivity of riparian corridors is one of the most important actions that can be taken to maintain or improve stream condition within this watershed. Given the recent scale and rapid pace of urbanization, this action becomes more urgent.
- Resource managers should actively manage for and promote channel stability and provide more space for flood waters by expanding floodplains and buffers.
- Valley Water should plan for and implement the following actions in the channels they own and manage:
    - When existing trapezoidal or engineered flood control channels are due for maintenance, prioritize the inclusion of inset floodplain bench surfaces and add significant in-channel complexity elements (such as boulder clusters, anchored large wood, or coarse bars), and plant native vegetation on the bank slopes and top of banks.
    - In incised reaches, lay back channel banks, widen the channel corridor, create a floodplain bench, and install in-channel complexity elements (such as boulder clusters, anchored large wood, or coarse bars).
    - Channel maintenance should aim to maintain or increase the number of structural patch types (e.g. more significant areas of cobble/boulders, anchored large woody debris, bars, hard elements to encourage pool formation, swales,

and variegated channel banks) to improve channel complexity, and thus habitat value.

- Continue invasive vegetation removal, especially arundo and eucalyptus, but also Himalayan blackberry (*Rubus armeniacus*), Peruvian peppertree (*Schinus molle*), and English ivy (*Hedera helix*).
- Promote or plant as much native vegetation as possible along channels (e.g., adjacent to agricultural lands and along ditches within urban areas) to stabilize banks and slopes, slow and absorb runoff, increase biodiversity, increase ecological resilience to climate change, as well as benefit local communities.
- CRAM assessments found degraded and/or narrow stream riparian habitat (buffers) along many of the streams in the agricultural areas of the Valley PAI. CRAM's descriptive Metric scoring can be used to educate the agricultural community about the impacts of riparian management activities, including the effects of complying with more recent food safety requirements (e.g. removal of riparian vegetation, installation of food safety fencing). The results of this survey could be used as part of an education and incentive program, perhaps led by the Resource Conservation District, to help agricultural land managers implement multi-benefit farm-adjacent riparian buffer management actions, such as controlling erosion from agricultural fields and channel banks, and strategic grazing practices in sensitive aquatic and riparian areas.

5.3.2 CRAM Survey Recommendations

The 2025 10-year reassessment survey also sheds light on how data collection processes and survey outcomes can be improved. Future Project D5 watershed surveys should consider the following:

- Continue to focus upon revisiting as many previously assessed sites as possible, as the revisit sites provide the most direct comparison of change between survey periods. This requires a fairly extensive effort to obtain Permission-To-Enter from landowners relatively far in advance.
- CRAM practitioners should be experienced, particularly in streams, and especially in Bay Area streams. They should have been actively practicing CRAM leading up to the survey (conducting assessments earlier in the season, as well as in the year prior to the survey).
- Require each field team to fully review the previous assessment datasheet and scores in detail *before* leaving a revisit field site, and to make formal notes about any Metrics that have different scores. Field teams must have access to all the information from a previous assessment: the datasheets must include all field sketches and the original aerial photographs. Review of previous scores by the field teams will help ensure that practitioners: (1) carefully think through their decisions and make sure that no errors were made, (2) review any Metrics where scores were different from previous scores

and carefully evaluate and justify the reasons for score changes, and (3) convey information to the data analysis team through their notes on the reasons why a site's scores are different. Examples of differences might be: a restoration project occurred that changes specific Metric scores, a new house was constructed that now encroaches on the adjacent buffer, the previous practitioners mis-identified bankfull possibly because of excessive vegetation growth then compared to now, or an invasive vegetation removal project has recently occurred.

6.0 References

California Wetland Monitoring Workgroup (CWMW), 2010. Tenets of the State Wetland and Riparian Monitoring Program. Coordinated strategy to assess the extent and health of California's wetland resources. Available at: https://www.cramwetlands.org/sites/default/files/2025-03/CWMW_WRAMPTenets.pdf

California Wetland Monitoring Workgroup (CWMW), April 2013a. California Rapid Assessment Method for Wetlands and Riparian Areas: User's Manual, Version 6.1. pp. 77. Available at: http://www.cramwetlands.org/documents#field+books+and+sops

California Wetland Monitoring Workgroup (CWMW). 2013b. California Rapid Assessment Method for Wetlands: Riverine Wetland Field Book, Version 6.1. January 2013. pp. 46. https://www.cramwetlands.org/documents

California Wetland Monitoring Workgroup (CWMW). 2018. Data Quality Assurance Plan, Version 7. October 2018. Pp 52. https://www.cramwetlands.org/cramdocs/data-quality-assurance-plan-cram

California Wetland Monitoring Workgroup (CWMW). 2019. Using the California Rapid Assessment Method (CRAM) for Project Assessment as an Element of Regulatory, Grant, and other Management Programs. Technical Bulletin – Version 2.0, pp 85. https://www.cramwetlands.org/documents

Dewitz, J., 2019. National Land Cover Database (NLCD) 2016. Land Cover Science Product: U.S. Geological Survey data release, https://doi.org/10.5066/P96HHBIE

Dumelle, M., Kincaid T., Olsen, A.R., Weber, M., 2023. *spsurvey*: Spatial Sampling Design and Analysis in R. Journal of Statistical Software, 105(3), 1-29. https://doi.org/10.18637/jss.v105.i03

Grossinger, RM, EE Beller, MN Salomon, AA Whipple, RA Askevold, CJ Striplen, E Brewster, and RA Leidy, 2008. South Santa Clara Valley Historical Ecology Study, including Soap Lake, the Upper Pajaro River, and Llagas, Uvas-Carnadero, and Pacheco Creeks. Prepared for the Santa Clara Valley Water District and The Nature Conservancy. A Report of SFEI's Historical Ecology Program, SFEI Publication #558, San Francisco Estuary Institute, Oakland, CA.

Lowe, S., 2015. Project: Statistical Design, Analysis and Guidance on the Pajaro and Lower Peninsula Watershed Assessments. TASK 3: GRTS Survey Designs and Sample Draws Memorandum – Pajaro and Lower Peninsula Watersheds. SFEI Contribution No. 763. https://www.sfei.org/documents/project-statistical-design-analysis-and-guidance-pajaro-and-lower-peninsula-watershed-0

Lowe, S, and Salomon, M., 2015. *Statistical Design, Analysis and Guidance on the Pajaro and Lower Peninsula Watershed Assessments: TASK 2: Basis of Assessment Memorandum Review Existing GIS Data & Develop Stream Assessment Study Designs for the Pajaro and Lower Peninsula Watersheds*. SFEI Contribution No. 762. https://www.sfei.org/documents/statistical-design-analysis-and-guidance-pajaro-and-lower-peninsula-watershed-assessments

Lowe S., Salomon M., Pearce S., Collins JN., and Titus, D., 2016. Upper Pajaro River Watershed Condition Assessment 2015. Technical memorandum prepared for the Santa Clara Valley Water District - Priority D5 Project. Agreement #A3765F-Task5. San Francisco Estuary Institute, Richmond, CA. SFEI Contribution # 810.

Lowe, S., S. Pearce, M. Salomon, J. Collins, D. Titus. March, 2020. Santa Clara County Five Watersheds Assessment: A synthesis of Ecological Data Collection and Analysis conducted by Valley Water. Report prepared for the Santa Clara Valley Water District (Valley Water) by the San Francisco Estuary Institute-Aquatic Science Center. Project #4097, Valley Water Agreement #A4077F (CAS# 4802). SFEI Contribution #963.

Messer, J.J., R.A. Linthurst, and W.S. Overton, 1991. An EPA program for monitoring ecological status and trends. Environmental Monitoring Assessment, 17:67-78.

Nahlik AM, Paulsen SG, Dumelle M, Holdsworth S, Lehmann S, Tulve NS, Paul SJ, Frey HC. National Aquatic Resource Surveys (NARS): the foundation for long-term aquatic monitoring data across the United States. Environ Monit Assess. 2025 Nov 3;197(12):1291. doi: 10.1007/s10661-025-14629-8. PMID: 41182426; PMCID: PMC12583327. https://pmc.ncbi.nlm.nih.gov/articles/PMC12583327/

Pearce, S., and Lowe, S., 2026. CRAM Intercalibration Memorandum: Results of the CRAM Intercalibration Exercises for the Upper Pajaro River Watershed Stream Condition Reassessment 2025. Report prepared by San Francisco Estuary Institute, for Valley Water Project D5. 24 pp.

PRISM, 2021. 1991-2020 30-yr normal precipitation 800mM4_annual_bil. Accessed from https://www.prism.oregonstate.edu/recent/ using the prism R package (Edmund and Bell, 2015). Data accessed December 2021.

Santa Cruz Mountains Stewardship Network (SCMSN), 2023. 2020 Santa Cruz and Santa Clara county fine scale vegetation map. Scale 1:5,000. Data downloaded from: https://tukmangeospatial.egnyte.com/dl/DvNTI67dWG

San Francisco Estuary Institute (SFEI). 2015. Santa Clara Valley Historical Ecology GIS Data version 2. Accessed July 1 2023. http://www.sfei.org/content/santa-clara-valley-historical-ecology-gis-data

SFEI ASC, 2017. Bay Area Aquatic Resources Inventory (BAARI v2.1). GIS datasets of streams and wetlands within the greater San Francisco Bay Area. San Francisco Estuary Institute, Richmond, CA. https://www.sfei.org/data/bay-area-aquatic-resource-inventory-baari-version-21-gis-data#sthash.iBPVKPQr.dpbs

San Francisco Estuary Institute (SFEI). 2022. California Aquatic Resources Inventory (CARI v.1.1). GIS dataset of stream and wetlands in California standardized to a consistent wetland classification system. San Francisco Estuary Institute. Richmond, CA. https://www.sfei.org/data/california-aquatic-resource-inventory-cari-version-11-gis-data#sthash.Iz1Iu949.dpbs

Stevens, D.L., and Olsen, A.R., 2003. Variance estimation for spatially balanced samples of environmental resources. EnvironMetrics 2003;14: 593-610.

Stevens, D. L., and Olsen, A.R., 2004. Spatially balanced sampling of natural resources. Journal of the American Statistical Association, 99: 262-278.

Strahler, A. N., 1952. Hypsometric (area-altitude) analysis of erosional topology. Geological Society of America Bulletin 63 (11): 1117–1142.

Strahler, A. N., 1957. Quantitative analysis of watershed geomorphology. Transactions of the American Geophysical Union 8 (6): 913–920.

Valley Water, 2024a. Upper Pajaro Watershed Setting Report. Prepared for the Upper Pajaro Watershed Plan. December 2024. 119 pp. https://s3.us-west-1.amazonaws.com/valleywater.org.us-west-1/s3fs-public/Watershed%20Setting%20Report_Upper%20Pajaro.pdf

Valley Water, 2024b. One Water Upper Pajaro Watershed Plan. Version 1.0. 80 pp. https://s3.us-west-1.amazonaws.com/valleywater.org.us-west-1/s3fs-public/FINAL%20Upper%20Pajaro%20Watershed%20Report%20%28high%20resolution%29_0.pdf

Appendix A: 2025 CRAM Scores and SiteID Map

The following table lists the publicly available 2025 Upper Pajaro River Watershed stream condition survey CRAM results. Only 52 out of the 94 completed assessments are public (and listed below) because many landowners requested that their data remain private; however, all of the data were included in the overall watershed assessment for this report. Figure A.1 shows a map of all 94 CRAM sites along with their SiteID. The publicly shared CRAM results can also be viewed and downloaded directly from EcoAtlas (www.ecoatlas.org) by going to website, clicking into the Bay/Delta region in the map, and selecting the 'ShowTools" button at the top right. Once there, under the *Visualize/ Download Data* section select "*Wetland Condition (CRAM)"* and use the filter tool to select the Project named "*SCVWD D5 Project_Upper Pajaro River 2025 Ambient 10-year Resurvey*". Once the project data is selected you explore the CRAM results directly in the map or you can use the "*Download CRAM Data*" button to select a format and download a copy of the data.

Site ID	Revisit	AA RowID	Visit Date	Longitude	Latitude	AA Size (hectare)	Index	Buffer	Hydrology	Physical	Biotic
Lla_151	revisit	10677	25-Jun-25	-121.547	37.008	0.20	57	75.00	83.33	37.50	33.33
Lla_152	revisit	10409	24-Jun-25	-121.573	37.059	0.17	49	75.00	58.33	25.00	38.89
Lla_156	revisit	10421	17-Jul-25	-121.534	37.034	0.12	48	62.50	58.33	25.00	47.22
Lla_158	revisit	10669	11-Jul-25	-121.664	37.091	0.35	73	78.50	66.67	75.00	72.22
Lla_159	x	10422	10-Jul-25	-121.523	37.013	0.10	46	66.46	66.67	25.00	27.78
Lla_161	revisit	10424	07-Jul-25	-121.604	37.113	0.10	52	62.50	58.33	25.00	63.89
Lla_163	revisit	10398	27-Jun-25	-121.550	37.042	0.21	63	80.63	83.33	50.00	38.89
Lla_164	revisit	10397	16-Jul-25	-121.520	36.980	1.03	66	82.92	66.67	37.50	75.00
Lla_167	revisit	10606	26-Aug-25	-121.545	37.025	0.21	67	80.63	66.67	50.00	72.22
Lla_171	revisit	10585	07-Jul-25	-121.515	37.000	0.09	51	67.67	83.33	25.00	27.78
Lla_176	revisit	10401	16-Jul-25	-121.508	36.964	0.54	72	75.00	83.33	62.50	66.67
Lla_179	revisit	10411	23-Jun-25	-121.586	37.033	0.09	58	75.00	83.33	37.50	36.11
Lla_183	revisit	10564	24-Jul-25	-121.534	36.995	0.46	74	75.00	83.33	62.50	75.00
Lla_217	x	10566	10-Jul-25	-121.580	37.093	0.07	40	33.54	75.00	25.00	27.78
Lla_252	x	10428	21-Jul-25	-121.553	37.075	0.22	61	82.92	75.00	25.00	61.11
Oth_391	revisit	10568	24-Jul-25	-121.634	36.947	0.23	80	100.00	75.00	62.50	80.56
Oth_398	revisit	10569	22-Jul-25	-121.535	36.931	0.61	61	67.67	58.33	50.00	69.44
Oth_406	x	10432	21-Jul-25	-121.518	36.942	0.66	69	75.00	83.33	62.50	55.56
Oth_407	x	10433	21-Jul-25	-121.512	36.952	0.53	71	75.00	83.33	62.50	63.89
Oth_408	x	10434	23-Jul-25	-121.538	36.928	0.98	49	33.54	58.33	37.50	66.67
Oth_424	x	10470	23-Jul-25	-121.500	36.973	0.11	62	85.38	83.33	25.00	52.78
Oth_431	x	10572	15-Sep-25	-121.645	36.946	0.23	73	100.00	83.33	50.00	58.33
Pac_001	revisit	10435	08-Jul-25	-121.361	37.001	0.09	64	93.29	83.33	25.00	52.78

Site ID	Revisit	AA RowID	Visit Date	Longitude	Latitude	AA Size (hectare)	Index	Buffer	Hydrology	Physical	Biotic
Pac_005	x	10644	22-Jul-25	-121.373	36.969	0.79	60	82.92	58.33	50.00	50.00
Pac_009	revisit	10396	16-Jul-25	-121.412	37.157	0.12	75	93.29	91.67	75.00	38.89
Pac_010	revisit	10645	07-Jul-25	-121.423	37.148	0.10	76	86.42	83.33	75.00	58.33
Pac_014	revisit	10573	26-Jun-25	-121.381	37.104	0.16	74	100.00	91.67	37.50	66.67
Pac_018	x	10471	23-Jul-25	-121.331	37.020	1.75	72	70.42	83.33	75.00	61.11
Pac_021	revisit	10374	26-Jun-25	-121.436	37.150	0.10	67	93.29	100.00	37.50	38.89
Pac_023	revisit	10437	10-Jul-25	-121.292	37.077	0.86	57	93.29	75.00	25.00	33.33
Pac_026	revisit	10392	15-Jul-25	-121.372	37.130	0.54	74	93.29	75.00	62.50	66.67
Pac_030	revisit	10394	16-Jul-25	-121.355	37.125	0.26	74	93.29	91.67	62.50	47.22
Pac_031	revisit	10438	23-Jul-25	-121.375	37.061	0.23	77	100.00	83.33	62.50	63.89
Pac_034	x	10574	17-Sep-25	-121.325	37.030	0.84	81	86.42	91.67	87.50	58.33
Pac_037	revisit	10646	07-Jul-25	-121.441	37.165	0.13	68	93.29	83.33	37.50	58.33
Pac_041	revisit	10440	26-Jul-25	-121.349	37.163	0.10	75	93.29	83.33	50.00	72.22
Pac_053	revisit	10578	27-Aug-25	-121.419	37.185	0.06	66	100.00	83.33	25.00	55.56
Uva_273	revisit	10442	27-Jul-25	-121.660	37.034	0.27	76	85.38	66.67	75.00	77.78
Uva_275	revisit	10587	12-Aug-25	-121.532	36.964	0.43	59	62.50	58.33	50.00	66.67
Uva_277	revisit	10609	24-Sep-25	-121.666	37.008	0.29	75	90.29	66.67	75.00	66.67
Uva_278	revisit	10443	27-Jun-25	-121.767	37.086	0.26	80	96.54	75.00	75.00	72.22
Uva_279	x	10611	27-Aug-25	-121.535	36.966	0.23	55	60.75	58.33	37.50	63.89
Uva_281	revisit	10444	21-Jul-25	-121.687	37.064	0.74	77	82.92	83.33	75.00	66.67
Uva_284	revisit	10445	11-Jul-25	-121.628	37.013	0.87	70	42.25	75.00	87.50	75.00
Uva_287	revisit	10579	27-Jun-25	-121.546	36.929	0.25	65	47.88	75.00	75.00	61.11
Uva_291	revisit	10402	16-Jul-25	-121.533	36.947	0.41	77	90.29	83.33	75.00	61.11
Uva_293	x	10613	25-Aug-25	-121.658	37.011	0.48	78	90.29	66.67	75.00	80.56
Uva_299	revisit	10413	24-Jun-25	-121.582	36.995	0.38	66	86.42	66.67	37.50	72.22
Uva_306	revisit	10580	27-Jun-25	-121.712	37.072	0.45	72	93.29	100.00	37.50	58.33
Uva_310	x	10448	23-Jul-25	-121.764	37.089	0.14	76	93.29	83.33	50.00	77.78
Uva_324	x	10617	25-Aug-25	-121.658	37.049	0.27	67	68.13	66.67	62.50	72.22
Uva_325	x	10451	21-Jul-25	-121.695	37.063	0.09	64	93.29	75.00	50.00	36.11

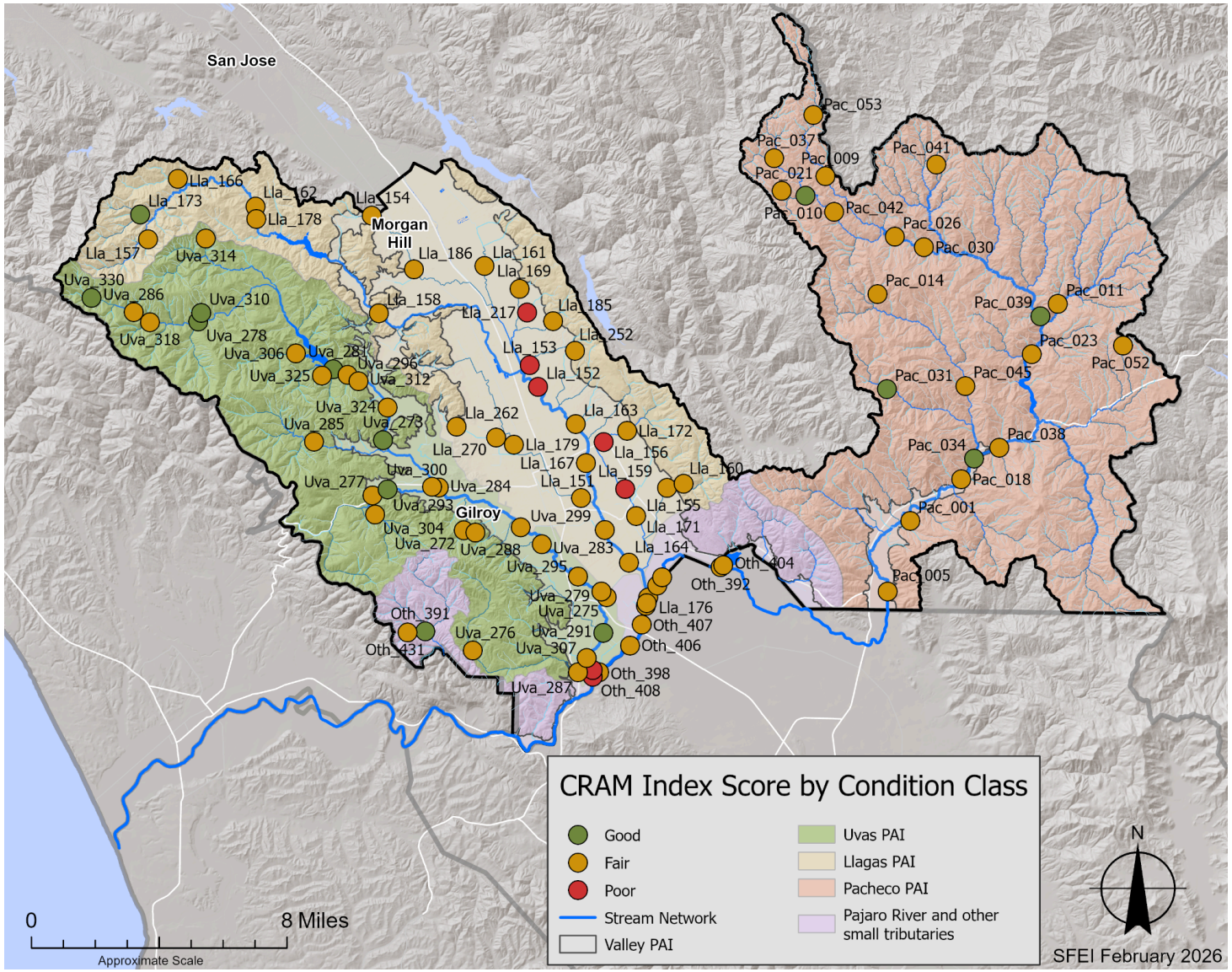

Figure A1. Map of the 94 Upper Pajaro River watershed CRAM AAs surveyed in 2025 colored by their Index Score condition class (Good, Fair, Poor) and labeled with unique Site IDs.

Appendix B: Spsurvey Statistical Analysis Results

B.1 Cumulative Distribution Function (CDF) Estimate Tables

The *spsurvey* cumulative distribution function (CDF) analysis results tables were provided to Valley Water's Project D5's science lead (Zooey Diggory) as separate Excel files. Because of the many hundreds of rows of information are cumbersome to list in a report, Excel files can be accessed and downloaded from SFEI's Data Access webpage (here).

B.2 Change Analysis Test Results

Change analysis test results, from the spsurvey's analysis package in R. The test takes into account the paired revisit sites and was run on the continuous data employing the *mean CDF* results from the CRAM Index and Attribute Scores, and the categorical CRAM condition class results of the estimated proportions of stream miles in Good, Fair, and Poor condition (Table B.2.2). The tests were run for the watershed as a whole, and its PAIs (including the other small tributaries). The *change analysis* test compares the 2025 reassessment survey (survey2) to the 2015 baseline assessment (survey1). A negative *Diff. Est* (difference estimate) indicates a decline in condition, while a positive number indicates an increase in condition with consideration of the error estimates. The full change analysis outputs can be accessed and downloaded from SFEI's Data Access webpage (here).

Tables B.2.1 and B.2.2 (below) list a subset of the change analysis outputs that indicated a significant change between survey periods at a 95% confidence level based on the CRAM mean CDF estimates and the categorical CRAM condition classes of Poor, Fair, and Good condition as described in the main report.

Table B.2.1. List of the mean CDF *change analysis* results that were significant at 95% confidence level. The first two columns identify the two survey periods (Survey_1 = 2015, Survey_2 = 2025). The next two columns identified the subpopulation or primary area of interest (PAI) and the response variable (CRAM Indicator). The next five columns list the Percent Difference results: estimated percent difference (Diff. Est) and standard error (StdError) in the proportions of stream miles that changed between survey periods, the margin of error, and the lower and upper 95% confidence limits (LCB95Pct and UCB95Pct). The next two sets of Survey 1 and Survey 2 columns (six columns each) provide mean CDF estimates for from each survey: the first column is the number of AAs (nResp; or number of responses); the next five columns contain the survey *mean CDF estimates*, margin of error, standard error, and lower and upper confidence bounds (LCB95Pct and UCB95Pct).

Survey_1	Survey_2	Subpopulation	CRAM Indicator	Diff. Est	Std Error	Margin of Error	LCB 95Pct	UCB 95Pct	nResp_1	Estimate_1	StdError_1	MarginofError_1	LCB95Pct_1	UCB95Pct_1	nResp_2	Estimate_2	StdError_2	MarginofError_2	LCB95Pct_2	UCB95Pct_2
2015	2025	Llagas	Index Score	-4	2	4	-9	0	23	62	1	3	59	64	30	58	2	4	53	62
2015	2025	Other	Index Score	-6	2	4	-10	-2	12	73	2	4	68	77	12	67	2	5	63	72
2015	2025	Pacheco	Index Score	-6	2	4	-10	-2	23	75	2	4	71	79	21	70	2	3	66	73
2015	2025	Whole watershed	Index Score	-5	2	4	-8	-1	81	71	2	4	67	75	94	67	1	3	64	69
2015	2025	Llagas	Buffer	-10	5	10	-20	0	23	80	2	4	75	84	30	70	5	10	59	80
2015	2025	Valley	Buffer	-10	3	7	-17	-3	42	76	2	4	72	79	51	66	4	7	59	73
2015	2025	Llagas	Physical	-8	3	6	-14	-3	23	44	4	7	36	51	30	35	2	4	31	39
2015	2025	Other	Physical	-12	3	7	-19	-6	12	63	3	5	58	68	12	51	3	5	46	57
2015	2025	Pacheco	Physical	-17	5	10	-27	-7	23	54	5	10	43	64	21	36	3	7	30	43
2015	2025	Whole watershed	Physical	-14	3	6	-21	-8	81	53	3	7	47	60	94	39	2	5	34	44
2015	2025	Other	Biotic	-10	3	6	-16	-4	12	67	4	8	59	76	12	57	3	6	51	63
2015	2025	Pacheco	Biotic	-6	3	6	-12	-1	23	64	1	2	62	65	21	57	3	6	51	63
2015	2025	Whole watershed	Biotic	-5	2	4	-9	-2	81	61	2	3	58	65	94	56	2	4	51	60

Table B.2.2. *Change analysis* test results that were significant from the categorical CRAM condition class data for 2015 and 2025 surveys. The first two columns identify the two survey periods (Survey_1 = 2015, Survey_2 = 2025). The next three columns identify the subpopulation or primary area of interest (PAI) and the response variable (CRAM Indicator - in this case the CRAM Index or Attribute and Condition Class Category). The next five columns list the Percent Difference results: estimated percent difference (Diff. Est) and standard error (StdError) in the proportions of stream miles that changed between survey periods by Condition Class Category, the margin of error, and the lower and upper 95% confidence limits (LCB95Pct and UCB95Pct). The next two sets of Survey 1 and Survey 2 columns (six columns each) provide the categorical Condition Class estimates for from each survey: the first column is the number of AAs (nResp; or number of responses); the next five columns contain the survey Condition Class estimates, margin of error, standard error, and lower and upper confidence bounds (LCB95Pct and UCB95Pct). Ecological condition classes are based on the full range of possible CRAM Scores (25-100) divided into three equal-intervals of Poor (25-50), Fair (51-75), and Good (76-100) conditions.

Survey_1	Survey_2	Subpopulation	CRAM Indicator	Condition Class Category	Diff. Est	Std Error	Margin of Error	LCB 95Pct	UCB 95Pct	nResp_1	Estimate_1	StdError_1	MarginofError_1	LCB95Pct_1	UCB95Pct_1	nResp_2	Estimate_2	StdError_2	MarginofError_2	LCB95Pct_2	UCB95Pct_2
2015	2025	Pacheco	Index Condition	Good	-48	20	40	-88	-9	14	53	20	40	13	92	4	4	3	6	0	10
2015	2025	Pacheco	Index Condition	Fair	48	20	40	9	88	9	47	20	40	8	87	17	96	3	6	90	100
2015	2025	Valley	Index Condition	Good	-8	3	6	-14	-1	9	10	3	6	5	16	4	3	1	3	0	5
2015	2025	Whole watershed	Index Condition	Good	-32	12	24	-56	-8	32	39	12	24	15	62	13	6	2	5	2	11
2015	2025	Whole watershed	Index Condition	Fair	31	13	25	7	56	48	56	12	24	33	80	74	88	4	8	79	96
2015	2025	Llagas	Buffer Condition	Poor	24	11	22	2	46	0	0	0	0	0	0	3	24	11	22	2	46
2015	2025	Pacheco	Buffer Condition	Poor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2015	2025	Valley	Buffer Condition	Poor	25	9	18	7	43	0	0	0	0	0	0	6	25	9	18	7	43
2015	2025	Whole watershed	Buffer Condition	Poor	6	3	5	1	11	1	0	0	0	0	0	7	6	3	5	1	11
2015	2025	Pacheco	Physical Condition	Fair	-45	21	40	-85	-4	13	54	20	40	14	94	9	10	5	10	0	20
2015	2025	Pacheco	Physical Condition	Poor	48	20	40	8	88	6	41	20	40	2	81	10	89	6	11	79	100
2015	2025	Whole watershed	Physical Condition	Fair	-36	13	25	-60	-11	36	48	12	24	24	71	30	12	4	7	5	19
2015	2025	Whole watershed	Physical Condition	Poor	39	12	23	15	62	33	48	12	23	25	72	59	87	4	8	79	95
2015	2025	Valley	Biotic Condition	Good	-6	3	6	-12	0	8	7	3	6	1	13	2	1	1	1	0	2
2015	2025	Whole watershed	Biotic Condition	Good	-8	3	7	-14	-1	19	11	3	7	5	18	5	3	1	3	1	6