# 9. Chapter 9: Standley Creek Action Plan

## 9.1 Sub-Watershed Overview

The Standley Creek sub-watershed is located near the town of Piercy in northern Mendocino County (Figure 9-1). In addition to Standley Creek, the SHaRP planning process included the nearby South Fork Eel River (SFER) tributaries including Piercy Creek, Bear Pen Creek, and McCoy Creek into this sub-watershed due to their inclusion within the Hydrologic Unit Code (HUC) 12 delineations used during regional prioritization. For simplicity, only the two largest tributaries, Standley Creek, representing the western portion of the sub-watershed, and McCoy Creek, representing the eastern portion of the sub-watershed, are described in detail in this overview.

Standley Creek is a first order stream with approximately 4.7 miles of perennial waterways draining a sub-watershed of approximately 7.3 square miles (CDFG 2009d). Elevations range from approximately 500 feet at the mouth of the creek to 1,200 feet in the headwaters and the landscape is dominated by mixed conifer (predominantly redwood and Douglas fir) with areas of mixed hardwood forest (CDFG 2009d, CDFG 2009e, CDFW 2014). The sub-watershed is entirely privately owned and is managed for timber production. Despite a history of poorly regulated timber harvest and poor management of aquatic resources, Standley Creek supports a persistent population of Coho Salmon, Chinook Salmon, and steelhead.

The shale and sandstone bedrock of the Coastal Belt geology that underlies the Standley Creek sub-watershed forms the steep, rugged characteristic of the western slope of the SFER watershed (CDFW 2014). This underlying geology tends to form steep ridges and canyons in the landscape. Despite the high gradient upland slopes surrounding the watershed, much of the Standley Creek is moderate gradient (2-4% gradient) but are relatively narrow, deep, and tend to erode during winter when the banks fill and the channel migrates (CDFG 2009d). Long-term geologic processes within the western half of the SFER sub-basin have resulted in a major knickzone or area of locally steepened stream channel. This knickzone manifests in multiple knickpoints which propagate up Standley Creek, likely resulting in the end of anadromy at a 5.5 foot bedrock waterfall (CDFW 2014, CDFG 2009e). Soils in the landscape include Wohly-Holohan-Casabonne series and Zeni-Yellohound-Ornbaun-Kibesillah series which are composed of deep to very deep, well-drained gravely to sandy loams formed from weathered sandstone, shale, and/or mudstone (NRCS 2020). According to the 2009 California Department of Fish and Wildlife[9] (CDFW) Standley Creek Stream Inventory Reports, stream banks consist of 63% sand/silt/clay, 17% bedrock, 17% cobble/gravel and 2% boulder (CDFG 2009d, CDFG 2009e). The resulting substrates in Standley Creek pool tailouts are dominated by either gravel (52-60%) or small cobble (23-35%), and 77-

[9] Formerly known as the California Department of Fish and Game (CDFG)

85% of all pool tailouts had gravel embeddedness suitable for salmonid spawning with the upper reaches exhibiting more suitable spawning substrate than the lower mainstem Standley Creek (Figure 9-2).

The weathered shale and sandstone bedrock also support productive timberlands, primarily redwood and Douglas-fir as well as hardwoods, which have spurred several generations of timber harvest in the area (Hahm et al. 2019). The exact timing of initial timber harvest activities in Standley Creek is not readily accessible, but the general pattern for the SFER was that late 19th century logging was restricted to redwoods in accessible areas around creek mouths (CDFW 2014). In late 1890s, the development of a railroad line connected the adjacent Indian Creek sub-watershed and a mill site in Andersonia to Bear Harbor, a small port on the Northern Mendocino coast, allowing timber to be harvested and extracted via rail and ship (Hough 2010). This operation was abruptly halted in 1906 due to damage caused by the historic 1906 earthquake (Hough 2010). Logging resumed in the decades following World War II after a new mill was constructed in 1947 and timber could be hauled via the newly constructed highway 101 (CDFW 2014, Hough 2010). Prior to the Forest Practices Act in 1974, lands in the Standley Creek sub-watershed were tractor logged intensively by the previous owners, primarily Pacific Coast Lumber Company, with rapid and repeated extraction of timber which was taxed if left standing (URFC 2016). By the mid 1960's, most of the merchantable timber had been extracted from the watershed.

McCoy Creek is a fourth order stream in the Western SFER sub-basin and differs from the other tributaries in the Standley Creek sub-watershed primarily in its land use. McCoy Creek has approximately 11.1 miles of perennial stream draining approximately 6.8 square miles of land (CDFG 2007a). Elevations range from approximately 525 feet at the confluence with the SFER to approximately 1,600 feet in the headwaters. Like its Western counterparts, the underlying geology of McCoy Creek is composed primarily of Coastal Belt rock which forms a landscape familiar to Western SFER sub-basin tributaries (CDFW 2014). Similarly, McCoy Creek has a mixed coniferous and hardwood forest although a significant portion of the basin also supports grasslands with approximately 31% of habitat units surveyed in 2007 containing grasses as the dominant vegetation (CDFG 2007a). Although the history of logging in McCoy Creek is not precisely known, it likely followed a similar pattern as described above. Currently, only the upper portions of the mainstem are owned by timber companies and/or managed for timber harvest with current timber harvest plans in the headwaters (CalFire 2019). The lower portions of the stream and portions of the South Fork are now primarily owned in small parcels and used for residential purposes.


**Figure 9-1. Standley Creek's position in the South Fork Eel River sub-basin.**

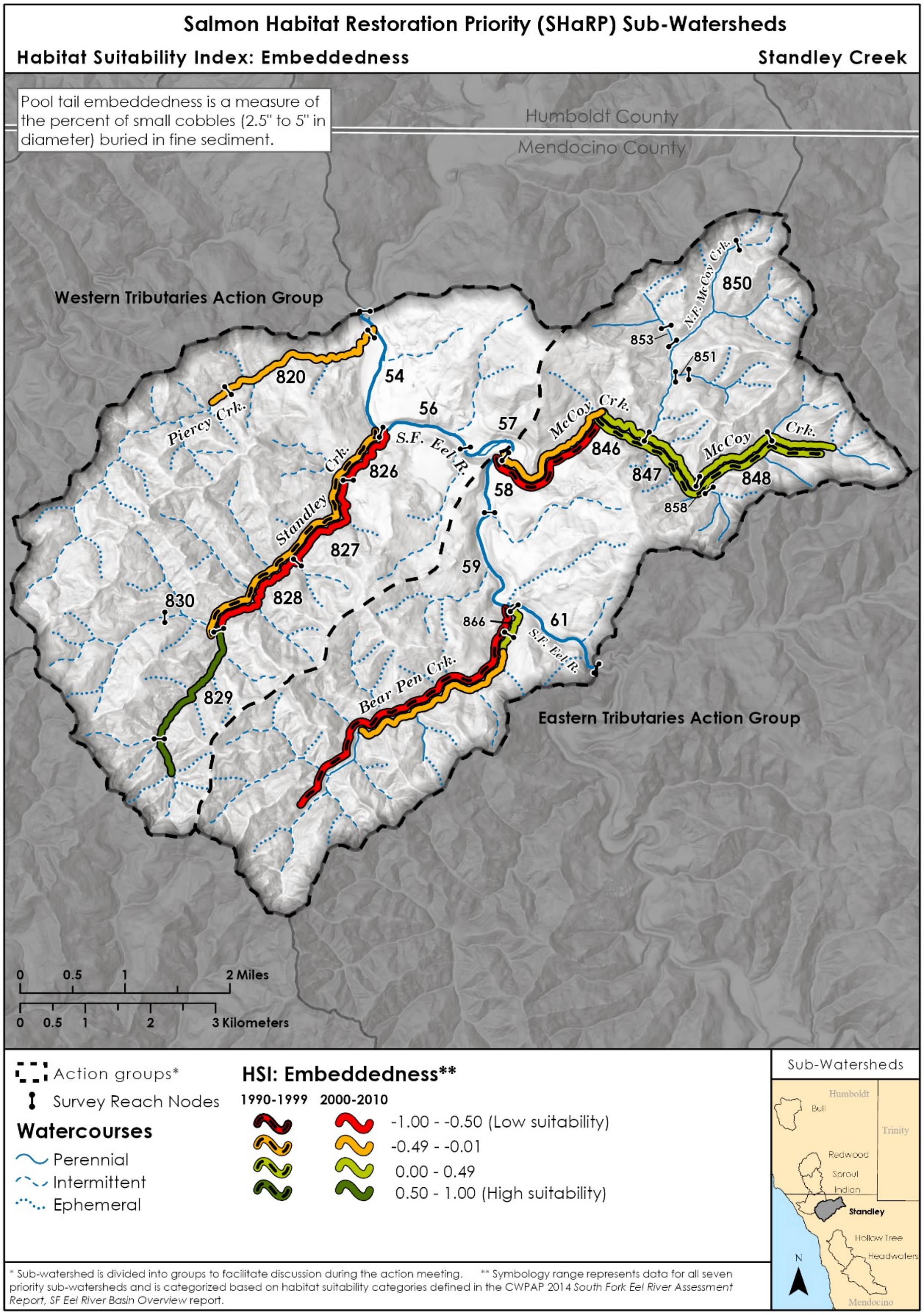


**Figure 9-2. Habitat suitability indices of gravel embeddedness in the Standley Creek sub-watershed derived from CDFW stream habitat inventories completed in the time periods of 1990-1999 and 2000-2010. Surveyed reaches varied per time period based on funding and crew availability.**

## 9.2 History of Land Use and Fish Habitat

The legacy effects of the logging history, a series of devastating floods, and poor management of instream and riparian habitat dramatically altered Standley Creek waterways. The land disturbances due to logging activities exacerbated the slide-prone landscape and left the sub-watershed more vulnerable to erosion. When the watershed was struck by two devastating floods in 1955 and 1964, massive debris and sediment yields were delivered to the Eel River in far greater quantities than observed in the geologic record of the watershed (Sommerfield et al. 2002). Landslides and erosion during these events led to destruction of riparian vegetation and rapid aggradation of SFER tributaries, leaving many tributaries perched above the SFER atop large deposits of sediment (Sloan et al. 2001). Based on aerial photography, this scenario unfolded in the destabilized Standley Creek watershed; widened channels with large gravel and sediment deposits are apparent through the stream (CDF 1965). Channel aggradation was followed by channel incision whereby downcutting would propagate from the mouths of tributaries upstream, reworking tributary valleys (Sloan et al. 2001). Numerous landslides were noted throughout Standley Creek during CDFW stream inventories carried out after these floods and surveyors have since observed logging roads contributing fill directly to waterways and an abundance of deep-seated slides through the lower reaches of Standley Creek (CDFG 1968, CDFW 1976, Kor 1976, PWA 2007, RFFI 2019). Numerous slides were also documented along the length of McCoy Creek in a 2007 CDFW Stream Inventory (CDFG 2007a). These processes have likely contributed to the occurrence of embedded gravels in the lower reaches of Standley and McCoy creeks, where approximately 23%, and 56%, respectively, of pool tailouts surveyed had substrate poorly suited to spawning (CDFG 2009d, CDFG 2007a). This is a high rate relative to the other watersheds considered in the SHaRP process. Additionally, abundant debris associated with timber extraction led to instream debris and sediment accumulations that created potential fish passage barriers (CDFG 1968, CDFG 1976). Several of these debris accumulations were cleared to allow fish passage (Melo 1976, CDFG 1982a). Clearing of instream wood combined with the depletion of new wood recruitment opportunities through flood damage and logging activities likely contributed to the long-term lack of instream cover and large wood[10] in Standley and McCoy creeks (CDFW 2014, Figure 9-3).

[10] Formally referred to as large wood debris (LWD) in the California Salmonid Stream Habitat Restoration Manual (Flosi et al. 1998). LWD may appear in figures and citations made prior to the adoption of the updated terminology, but it is synonymous with large wood.

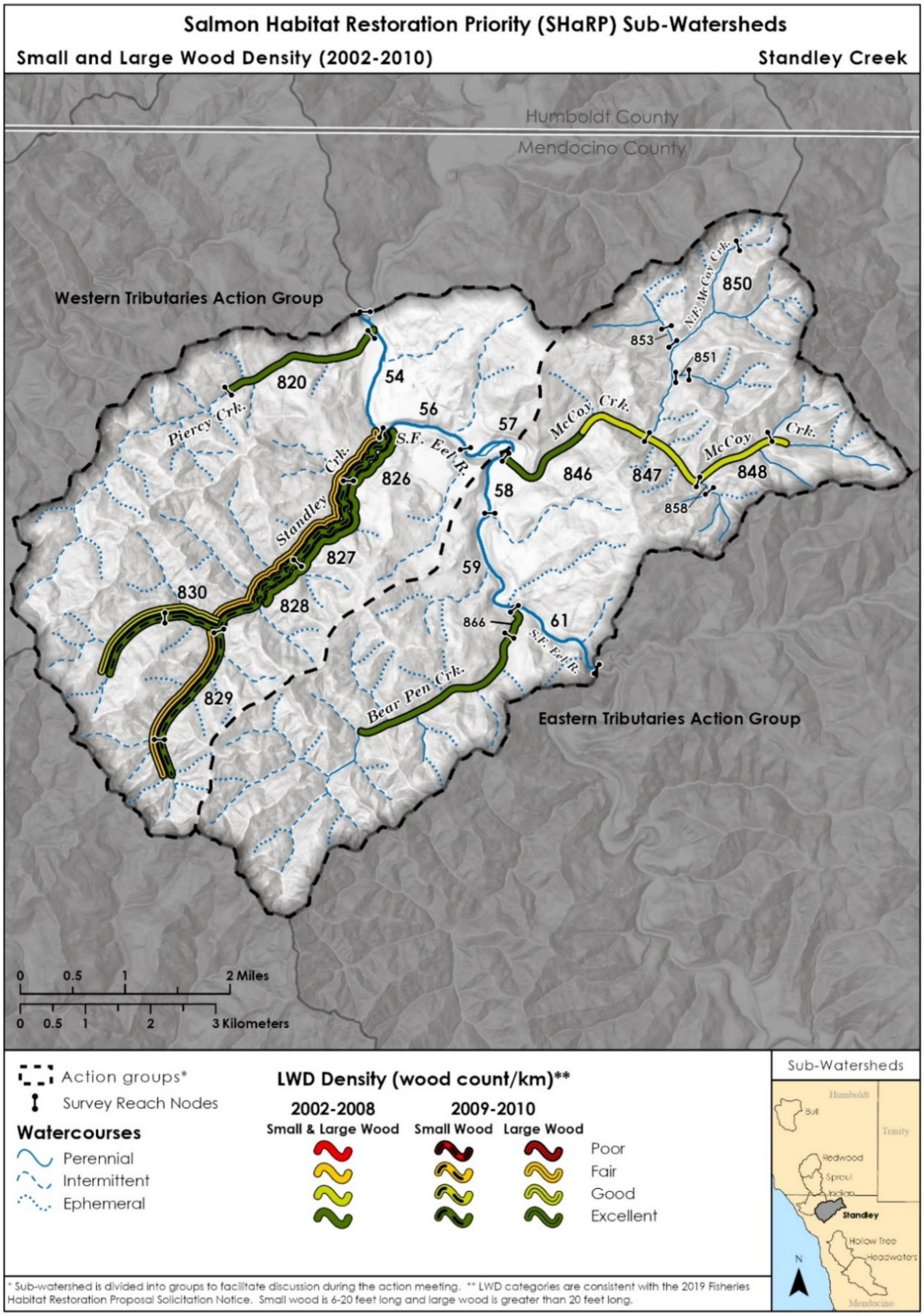


**Figure 9-3. Habitat suitability indices of large wood densities in the Standley Creek sub-watershed derived from CDFW stream habitat inventories completed in the time periods of 1990-1999 and 2000-2010. Surveyed reaches varied per time period based on funding and crew availability.**

Once large wood was removed, there was little channel complexity to slow water velocities or capture and retain gravels, allowing stream energy to rapidly down-cut through the large sediment deposits left by the floods. In many stream reaches, this altered process resulted in severely incised channels which were largely disconnected from their floodplains. The current sediment input-storage imbalance has transformed areas typically used for spawning to exhibit simplified and coarsened substrate or bedrock channels that do not offer a mosaic of sorted sediment deposits necessary for productive salmon spawning (SHaRP unpublished data). The lack of large wood has also reduced hydraulic scouring resulting in shallower pool depths, reduced stream complexity, and vastly diminished connectivity to floodplains (Kaufman 1988) and a lack of critical refugia during winter flows (Bair 2016).

After the 1974 prohibition on logging in riparian zones, the plant communities have been undergoing disturbance succession. In the Pacific Northwest coastal zones, this succession moves relatively quickly from colonizing herbaceous vegetation to a community dominated by hardwoods including maple and alder species and, in the later stages, mature conifers dominate the forest (Naiman et al. 2000). This trend can be seen in the changes in canopy density measured in CDFG stream inventories from 1992 to 2009 (Figure 9-4). In 1992, average canopy cover was 63% and only 34% of the riparian forest was coniferous. By 2009 canopy cover had risen to 94% and conifer represented 56% of the riparian forest. While broad leafed hardwoods trees such as alder species provide canopy cover and other essential ecosystem services within a mature riparian forest, they generally do not grow large enough, nor remain in streams for long (once recruited) relative to large conifers (Naiman et al. 2000). The continued succession from a hardwood dominated riparian to a mature conifer riparian forest that can contribute substantial large wood available to alter channel form will likely take many tens to hundreds of years (Gregory et al. 1991).

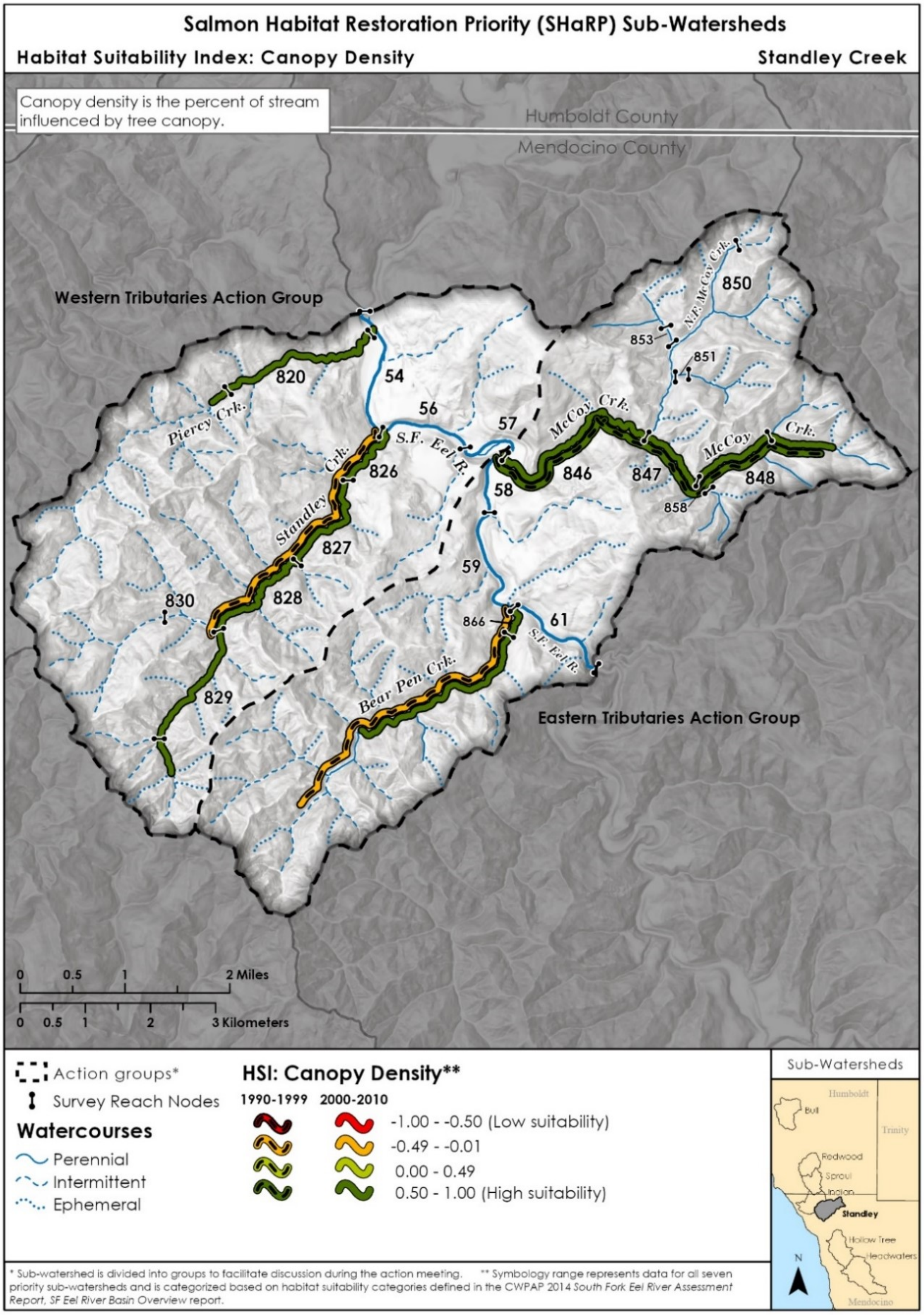


**Figure 9-4. Habitat suitability indices of canopy density in the Standley Creek sub-watershed derived from CDFW stream habitat inventories completed in the time periods of 1990-1999 and 2000-2010. Surveyed reaches varied per time period based on funding and crew availability.**

Despite the history of anthropogenic impacts to the Standley Creek sub-watershed, conditions have remained suitable for salmonids and other anadromous fish. Standley Creek scored relatively high in the SHaRP ranking process: it had the fifth highest overall priority score among sub-watersheds. This high ranking entailed the fifth highest score for Biological Importance, the fourth highest scores in Habitat Conditions and Integrity and Risk, and tied for third in Optimism and Potential. Measured and modeled water temperatures indicate temperatures are optimal for salmonids throughout most of the tributaries in the sub-watershed based on guidelines developed by the Coastal Watershed Planning and Assessment Program (CDFW 2014, Figure 9-5). Pool quality has increased over the last two decades; pools in the middle reaches have deepened, though pool cover is still lacking throughout the sub-watershed (CDFW 2014). Pool tail-outs had a high occurrence of spawning gravels suitable for salmonids and approximately 85% of the upper 1.9 miles of stream had embeddedness values highly suitable to spawning. However, approximately 64% of tailouts in the lower 3 miles of stream had embedded gravels poorly suited to spawning (Figure 9-2). Spawner surveys indicate that most of the surveyed reaches of the Standley Creek sub-watershed are utilized by adult Coho Salmon, Chinook Salmon and steelhead at a relatively low spawning density (Figure 9-6). Steelhead have the broadest distribution of the three salmonid species within the sub-watershed closely followed by Coho Salmon (Figure 9-7).

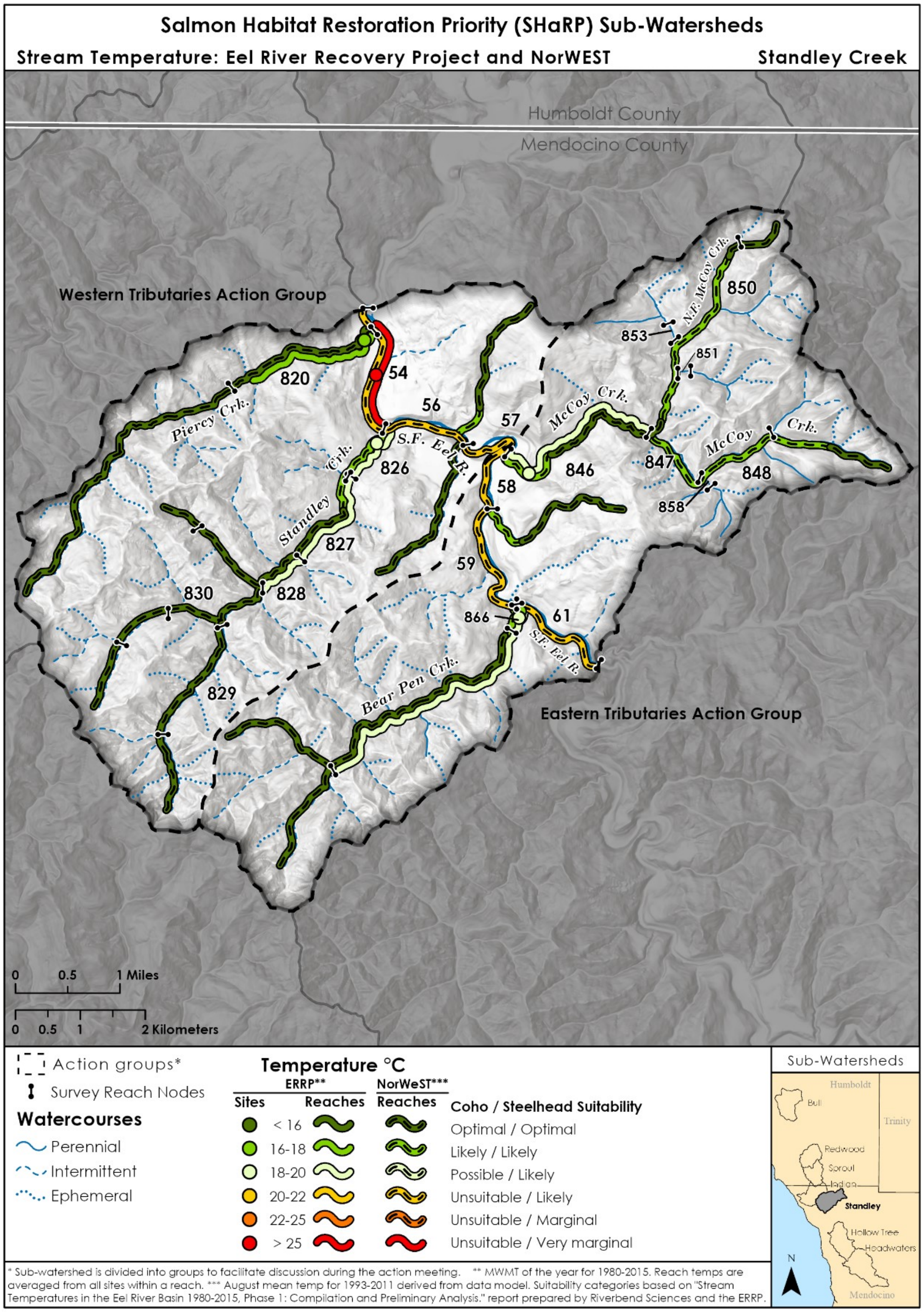


**Figure 9-5. Observed and modeled stream temperatures and associated suitability for Coho Salmon and steelhead rearing in the Standley Creek sub-watershed.**

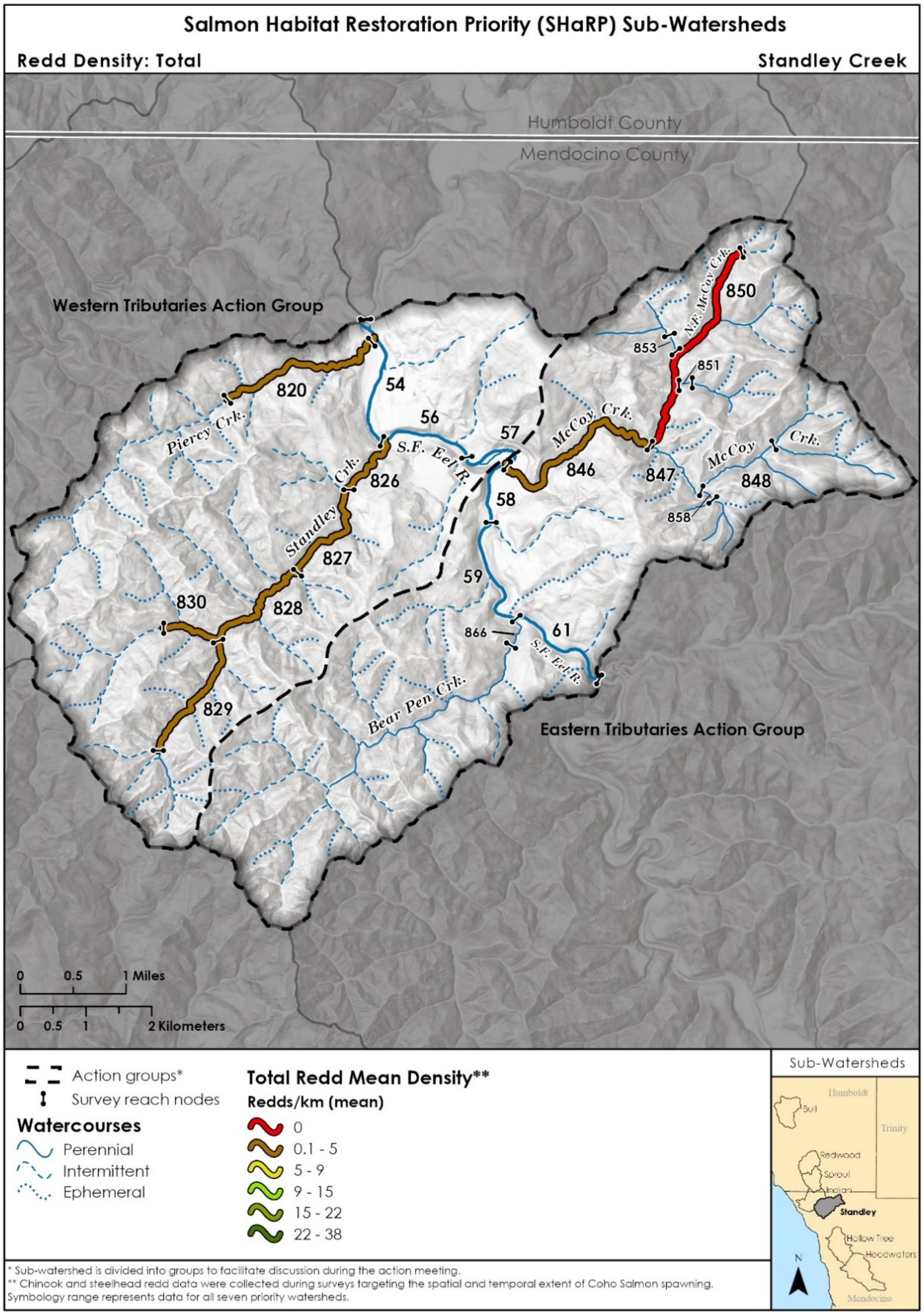


**Figure 9-6. Total density of Coho Salmon, Chinook Salmon, and steelhead redds in the Standley Creek sub-watershed, all years combined (2010-2019), based on CDFW spawner surveys (Guczek et al. 2019). The redd survey was designed for Coho Salmon, so the duration and extent of the survey do not encompass the full spatial or temporal expression of the Chinook Salmon or steelhead run.**

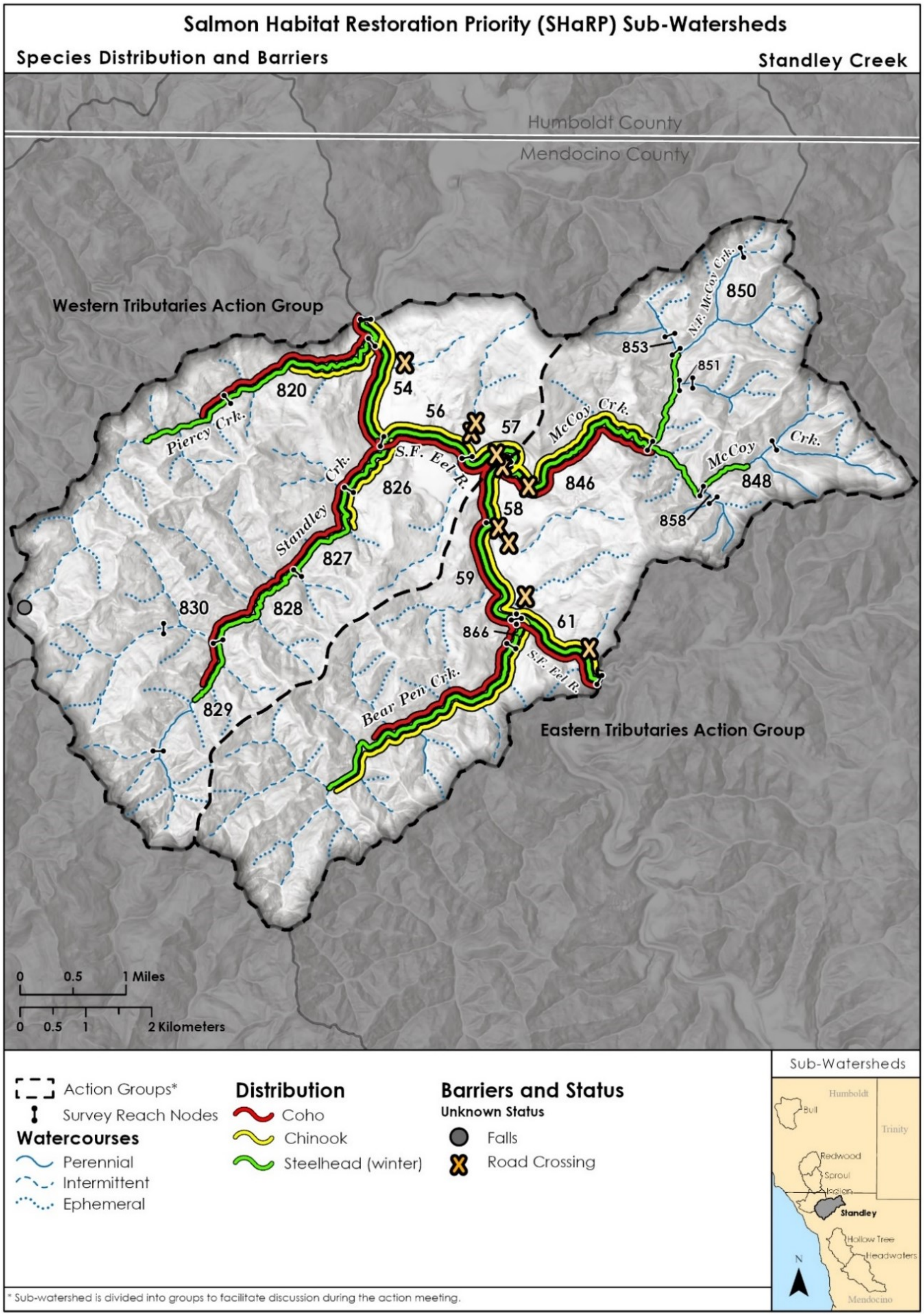


**Figure 9-7. Observed distribution of Coho Salmon, Chinook Salmon, and steelhead in the Standley Creek sub-watershed. Source: compiled observations maintained by CDFW.**

Currently, most of Standley Creek and the other western tributaries are owned by the Usal Redwood Forest Company. Since acquiring lands surrounding Standley Creek, Usal Redwood Forest Company's parent organization, Redwood Forest Foundation Inc. have partnered with Trout Unlimited (TU), Pacific Watersheds Associates (PWA), and the Eel River Watershed Improvement Group (ERWIG) and conferred with experts from UC Berkeley, National Oceanic and Atmospheric Administration (NOAA) Fisheries, Humboldt State University, and Cal Fire to develop and implement restoration projects aimed at decommissioning roads and improving instream conditions through the placement of large wood and riparian planting (RFFI 2019). The Usal Redwood Forest Company continues to be an active participant in the SHaRP process. Unlike the other tributaries, McCoy Creek has many private residences along the lower river and several landowners have historically denied access to the stream, thus making surveying and restoration planning difficult.

## 9.3 Historic and Current Restoration Efforts in Standley Creek

Restoration efforts have occurred in the Standley Creek sub-watershed since the mid-1980s to improve salmon and steelhead populations (Figure 9-8). The desire to improve the streams in this area has permeated landowners, non-profits, agencies, and interested stakeholders, but efforts have been partially hindered by the limited access to remote areas within the watersheds. Standley Creek has long stretches of stream that are confined by moderately steep canyons with little to no road access. Some of the other tributaries in the sub-watershed, such as Bear Pen Creek, also lack an active, developed road network. Despite these obstacles, a variety of restoration work has occurred in this sub-watershed, particularly in Standley Creek and a few of its tributaries.

Early restoration efforts focused on woody debris log jam modifications with intentions to improve fish passage through areas littered with remnants of previous logging activities. Long stretches of streams contained enormous amounts of slash from historic logging operations, which was believed to have prevented or hindered fish passage. In the late 1980s and early 1990s Standley and Piercy creeks had funded log jam modification projects, but additional log jam modifications most likely occurred in other streams in this sub-watershed during this time period.

In the following decades, restoration practiced shifted towards improving stream complexity. In 1992, the California Conservation Corps (CCC) installed 25 instream structures in the lower 8,300 feet of Piercy Creek. McCoy Creek appears to have had limited restoration work; however, one major project occurred in 2001 and 2002. The project involved redirecting a portion of lower McCoy Creek into its natural channel and moving the creek channel away from the toe of a significant slide to decrease the chance of a major slide causing sediment input and blocking the channel.

Beginning in 2007 TU, in partnership with PWA, received FRGP funding to conduct an analysis and subsequent restoration of road networks within the Standley Creek sub-watershed (PWA 2007). With the results of that analysis, TU and PWA collaborated with the Redwood Forest

Foundation Inc. (RFFI), who manages much of the property in the Standley Creek watershed, completed six phases of sediment reduction and habitat improvement projects. By 2018, the projects collectively treated and decommissioned approximately 19.49 miles of road in the Standley Creek sub-watershed (Table 9-1), treated problematic upslope areas (landslides), and planted over one thousand coniferous trees species to reduce/prevent sediment delivery to waterways and improve fish passage at road crossings (Novelli and Leroy 2019). These projects prevented an estimated 101,149 cubic yards of sediment from entering waterways in the sub-watershed (Table 9-1) (Novelli and Leroy 2019). In addition to the road decommissioning, in 2015 phase 5 of the project included constructing 15 large wood structures in Standley Creek to improve instream habitat. CDFW, RFFI, PWA, TU, ERWIG, and the CCC continue to collaborate on developing future restoration projects in the Standley Creek sub-watershed.

**Table 9-1. Estimated sediment savings resulting from road treatments in the Standley Creek sub-watershed (Novelli and Leroy 2019).**

| Standley Creek Project Phase | Miles of Road Treated | Cubic Yards Sediment Saved |
|---|---|---|
| Phase 1 | 5.68 | 18,606 |
| Phase 2 | 4.34 | 24,463 |
| Phase 3 | 1.45 | 16,095 |
| Phase 4 | 2.20 | 5,120 |
| Phase 5 | 2.00 | 14,647 |
| Phase 6 | 3.82 | 22,218 |
| **Totals** | **25.49** | **101,149** |

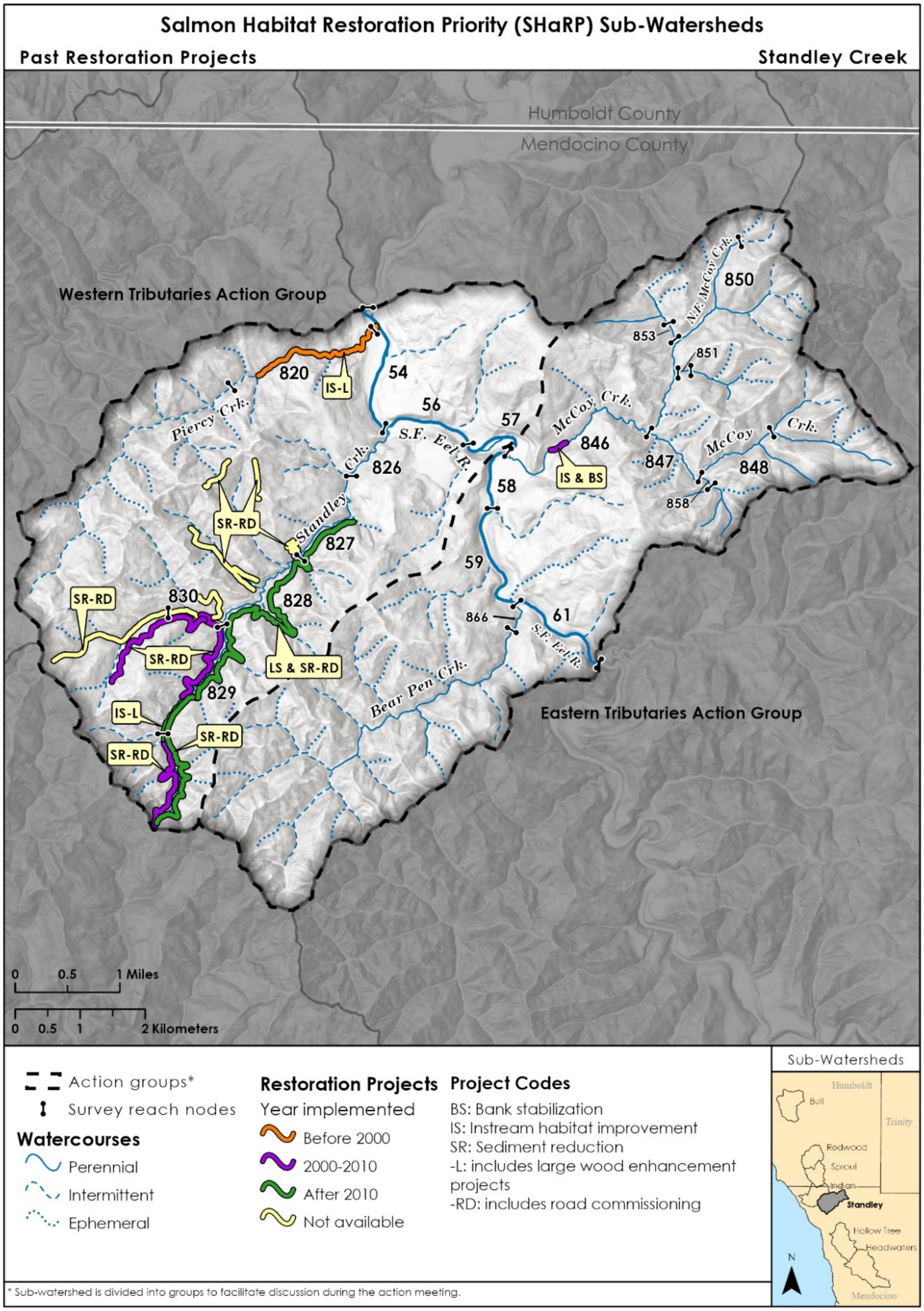


**Figure 9-8. Past and current restoration projects intended to improve salmonid habitat in the Standley Creek sub-watershed.**

## 9.4 Limiting Factors and Threats Affecting Salmonids and Their Habitat in Standley Creek

The Standley Creek Expert Panelists discussed available data and personal observations of the sub-watershed on March 25, 2019. During this discussion, each participant scored how limiting they thought each limiting factor and threat was to each life stage of each species through an interactive process. The limiting factor tables (Table 9-2 and Table 9-3) describe conditions in two areas: 1) the tributaries (McCoy, Piercy, Bear Pen and Standley Creeks), and 2) the mainstem (the portion of the mainstem of the SFER in the Standley Creek sub-watershed area). When rating threats, Expert Panel considered all of the sub-watershed as a whole and ranked the relative impact of each threat on all life stages and species (Table 9-3). All Expert Panel scores for each factor and life stage were averaged and categorically ranked to indicate how much each factor and threat limits the viability of each life stage of each salmonid. The lower the number, the greater the impact; thus cells scoring less than 2 are red (very high impact), scores between 2 and 2.9 are yellow (high impact), scores between 3 and 3.9 are light green (moderate impact), and scores of 4 and above are dark green (low impact). When reviewing the ratings as a group, the Expert Panel considered that limiting factors and threats scoring high or very high impact likely need restoration treatment, if possible. The data used during this meeting are available on the SHaRP web site at https://www.fisheries.noaa.gov/west-coast/habitat-conservation/identifying-salmon-habitat-restoration-priorities-northern.

## *Limiting Factors*

**Table 9-2. Effect of each limiting factor on each life stage of Coho Salmon and steelhead in two areas of the Standley Creek sub-watershed.**

| | Life Stages and Areas | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Tributaries | | | | Mainstem | | | |
| Coho Salmon and Steelhead | McCoy, Piercy, Bear Pen, and Standley Creeks | | | | S.F. Eel River | | | |
| Limiting Factor | Eggs | Summer Parr | Winter Parr | Migrating Adults | Eggs | Summer Parr | Winter Parr | Migrating Adults |
| Barriers | | 3.9 | 4.5 | 3.2 | | 4.7 | 4.7 | 4.7 |
| Channel complexity, including pool depth | 1.7 | 1.9 | 2.4 | 2.1 | 1.1 | 1.2 | 2.1 | 4.2 |
| Climate change next 10 years | | | | 2.3 | | | | 3.0 |
| Dry season flow | | 2.6 | | | | 2.1 | | |
| High water temperature | | 3.9 | | | | 1.0 | | |
| Large wood recruitment, canopy cover | | 1.8 | 2.0 | 2.0 | | 1.2 | 1.3 | 4.0 |
| Off-channel habitat | | 1.8 | 1.4 | | | 1.0 | 1.6 | |
| Sediment (catastrophic road failures and chronic turbidity) | 2.2 | | 2.7 | | 2.6 | | 1.6 | |
| Wet season flow (timing and volume) | 3.4 | | 2.6 | 3.4 | 3.0 | | 3.6 | 4.3 |

**Table 9-3. Effect of each limiting factor on each life stage of Chinook Salmon in two areas of the Standley Creek sub-watershed.**

| | Life Stages and Areas | | | | | |
|---|---|---|---|---|---|---|
| | Tributaries | | | Mainstem | | |
| Chinook Salmon | McCoy,Piercy, Bear Pen, and Standley Creeks | | | S.F. Eel River | | |
| Limiting Factor | Eggs | Fry | Migrating Adults | Eggs | Fry | Migrating Adults |
| Barriers | | 3.0 | 3.0 | | 5.0 | 4.3 |
| Channel complexity, including pool depth | 1.7 | 2.0 | 2.0 | 1.4 | 2.4 | 3.0 |
| Climate change next 10 years | | | 3.0 | | | 3.0 |
| Large wood recruitment, canopy cover | | 2.0 | 2.2 | | 1.3 | 3.6 |
| Off-channel habitat | | 1.4 | | | 1.7 | |
| Sediment (catastrophic road failures and chronic turbidity) | 2.6 | 2.3 | | 2.6 | 1.5 | |
| Wet season flow (timing and volume) | 3.8 | 2.7 | 2.5 | 3.3 | 3.6 | 3.3 |

Many of the highest impact limiting factors for Coho Salmon, Chinook Salmon, and steelhead in Standley Creek are related to a relative lack of physical habitat complexity (Table 9-2 and Table 9-3). Channel complexity and off-channel habitat rated high or very high impact for all juvenile life stages of all species in all areas of the sub-watershed. The Expert Panel hypothesized that due to sedimentation, lack of instream wood, and channel incision, much of the instream habitat has been simplified and disconnected from adjacent floodplains, resulting in the poor pool depth and cover rating observed. Large wood recruitment and canopy cover were also rated as high or very high impact for juvenile salmonids due primarily to the lack of instream wood and relatively young age of the riparian forest due to the logging activities of the past. Most tributaries in the sub-watershed have excellent riparian shading based on stream inventories conducted in the 2000-2010 surveys; however, canopy cover was a concern in the mainstem SFER because shading of the wide mainstem channel requires taller trees than in the narrower tributary channels.

Other limiting factors related to water quality and quantity were also rated as high or very high impact for one or more species. For all species, life stages, and areas considered, sediment was a high or very high impact limiting factor. Extensive legacy logging road networks and associated land failures are delivering excess sediment yields to the sub-watershed, embedding gravel, filling pools, and directly impacting juvenile fishes. Though there has been a concerted effort to treat these roads, the Expert Panel indicated that there were many more untreated roads and other land disturbances continuing to contribute sediment to the sub-watershed. For Coho Salmon and steelhead summer parr, high water temperatures were rated close to 1, the highest impact, in the mainstem SFER but were rated as only a moderate impact in tributaries of the sub-watershed due to the drastically different summer water temperatures of those two areas (Figure 9-5). Despite good canopy cover and cool temperatures in the tributaries, dry season flow was rated as a high impact limiting factor for Coho Salmon and steelhead summer parr in both the tributaries and the SFER. It was noted that a few of the tributaries of Standley Creek go dry in the summer, but it was uncertain if this was a result of recent timber harvests in the area or if this was the natural character of the stream. Additionally, the Expert Panel was concerned about residential and agricultural water use in McCoy Creek and the cumulative impacts to dry season flow. The timing and volume of wet season flow was rated as high impact for Coho Salmon and steelhead winter parr in tributaries and eggs in the mainstem SFER, and for Chinook Salmon fry and migrating adults in tributaries and fry in the mainstem SFER. These rating reflect the diversity of challenges faced by different life stages in different parts of the sub-watershed. Additionally, Expert Panel indicated that climate change over the next 10 years could be a high impact migrating adult Coho Salmon and steelhead in tributaries.

## *Threats*

**Table 9-4. Effect of each threat on each life stage of Coho Salmon, steelhead, and Chinook Salmon in the Standley Creek sub-watershed overall.**

| | Life Stages and Species | | | | | | |
|---|---|---|---|---|---|---|---|
| | Egg | | Summer Parr | Winter Parr | Fry | Migrating Adult | |
| Threat | Coho & Steelhead | Chinook | Coho & Steelhead | Coho & Steelhead | Chinook | Coho & Steelhead | Chinook |
| Channel impingement | 3.4 | 3.0 | 3.7 | 3.0 | 3.3 | 3.3 | 3.0 |
| Land conversion, development* | 4.4 | 4.7 | 4.6 | 4.9 | 5.0 | 4.9 | 5.0 |
| Pikeminnow | 3.0 | 3.5 | 2.0 | 4.0 | 4.3 | 5.0 | 5.0 |
| Road crossings, debris accumulation, and other barriers | 2.3 | 2.5 | 1.8 | 2.3 | 2.3 | 2.5 | 2.5 |
| Rural private roads (chronic) | 1.8 | 2.3 | 2.8 | 2.8 | 2.7 | 2.8 | 3.0 |
| Vegetation and fire management | 2.2 | 3.2 | 2.8 | 3.2 | 2.8 | 2.8 | 2.8 |

* Subdivision of large parcels, rural residential development, land clearing, and increased road network development

Several aspects of road networks, fish passage barriers, and vegetation and fire management are of broad concern in Standley Creek, affecting multiple life stages of all three species. Barriers, including road crossings and debris accumulations, have a very high impact on Coho Salmon and steelhead summer parr because they prevent these species from distributing during the summer low-flow period when such barriers are be the most severe. Barriers were rated as a key threat to all other species and life stages. Chronic impacts from rural private roads, including sediment delivery, increased storm runoff, and routing flows out of watersheds rated very high impact to Coho Salmon and steelhead eggs. Roads have a less severe, though still high impact on Chinook Salmon eggs because Chinook Salmon can successfully spawn in larger tributaries with higher flows. Roads pose a high impact to juveniles of all three species, both in the winter and summer due to chronic sediment delivery and its associated direct and indirect impacts to these sensitive life stages. The Expert Panel rated Vegetation and fire management (i.e., fire suppression) as a large threat to all life stages of all species except for Chinook Salmon eggs and winter parr. Poor forest management practices can threaten the forest recovery process and until mature forest characteristics return, stream habitat processes will be disrupted, broadly impacting all species. While timber harvest practices have greatly improved over the years, taking an active role in shaping the recovery of a diverse riparian forest has generally not occurred and forests are largely managed to maximize harvest, not stand diversity or resilience. Many of the forests in the sub-watershed have a high fire risk as a result of post-logging forest regeneration and several decades of fire suppression. The Piercy Fire Protection District has recently begun conducting fuel reductions in the sub-watershed including prescribed burns, but much more of the sub-watershed remains to be treated and this should become a regular practice.

Invasive Sacramento Pikeminnow were rated as a major threat to Coho Salmon and steelhead summer parr. While this species has broadly invaded the SFER sub-basin, piscivorous-sized adults have not been observed in tributaries and juvenile salmonids likely only encounter these fish as predators during spring smolt emigration or while rearing in the mainstem SFER during the summer. During that time, it is likely that many juvenile salmonids could be consumed. Summer parr may also compete with juvenile Sacramento Pikeminnow while rearing in tributaries. The Expert Panel did not consider Sacramento Pikeminnow to be a threat within the sub-watershed otherwise.

Channel impingement due to streamside roads and land conversion and development was rated a moderate to low threat for all species and life stages in the Standley Creek sub-watershed. This is likely due to existing ownership by a very few number timberland managers as well as the restoration history of the sub-watershed.

## 9.5 Recovery Strategy

The Action Team reviewed the results of the Expert Panel and discussed restoration actions to address high and very high impact limiting factors and threats. Because limiting factors and threats affecting the mainstem SFER could not be treated by actions in the sub-watershed alone, treatments were not recommended for this area. Limiting factors and threats affecting the mainstem SFER will be the focus of a subsequent SHaRP effort. The Action Team considered the remaining tributaries as two Action Groups based on their similar characteristics: 1) the Western Tributaries (Piercy Creek and Standley Creek), and 2) the Eastern Tributaries (Bear Pen Creek and McCoy Creek).

The recovery strategy for the Standley Creek sub-watershed is targeted at improving habitat complexity for juvenile fish during the summer and winter, storing and sorting sediments to increase suitable spawning habitat and reduce stream entrenchment, assessing and nullifying upslope erosion hazards, and improving the riparian forests through active riparian management. This strategy identifies reach-scale regions where treatments will likely have the greatest benefit to salmonids, but specific project locations and the methods of implementation will require further investigation and site-specific design. Where high-resolution data were available and/or members of the Action Team could identify treatment areas, specific project locations were identified for treatments (Figure 9-9, Table 9-5); however, further designs are likely required to appropriately implement the recommendations. As more data becomes available based on further assessment and analyses of the sub-watershed, these treatments may be applicable to other reaches in the future.

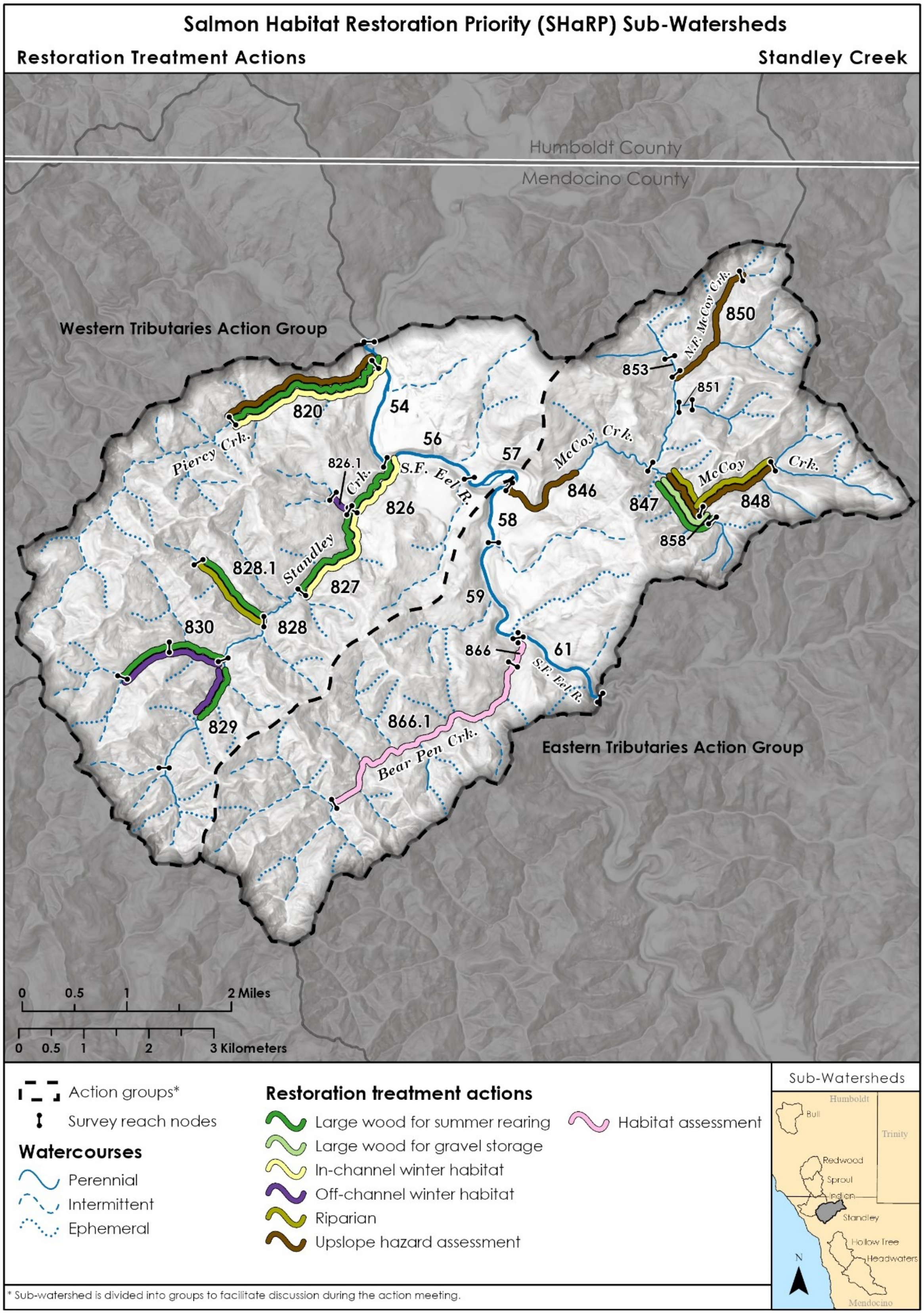


**Figure 9-9. Restoration treatments recommendations identified by Standley Creek Action Team.**

**Table 9-5. Recommended treatments to improve salmonid habitat in the Standley Creek sub-watershed. Treatment descriptions, targets, stream name(s), and survey reach codes are listed for all treatments identified by the Action Team.**

| Target | Treatment Description | Stream Name(s) | Survey Reach Code |
|---|---|---|---|
| *Summer Juvenile Rearing* | Large wood for summer rearing (pools, sorting gravel) | Piercy Creek, Standley Creek, “Clark’s Fork” Standley Creek, Tributary to Standley Creek, McCoy Creek | 820, 826, 827, 828.1, 829, 830, 830.1, 847, 866, 866.1 |
| *Winter Juvenile Rearing* | In-channel winter habitat | Piercy Creek, Standley Creek | 820, 826, 827 |
| | Off-channel winter habitat | Tributary to Standley Creek, Standley Creek | 826.1, 829, 830, 830.1 |
| *Adult Spawning* | Large wood for gravel storage | McCoy Creek | 847 |
| *Watershed Processes* | Riparian Treatment | “Clark’s Fork” Standley Creek, McCoy Creek | 828.1, 847, 848 |
| | Mass wasting assessment | McCoy Creek | 846, 848 |
| | Road network | Piercy Creek | 820 |
| | Upslope erosion hazard assessment | McCoy Creek, N.F. McCoy Creek | 846, 847, 848, 850 |
| | Habitat assessment | Bear Pen Creek | 866, 866.1 |

### Treatments to Improve Overwinter Conditions for Winter Parr and Fry

Habitat which provides refuge from winter flows, whether instream or off-channel, is crucial to the survival of juvenile salmonids. Adding instream large wood to increase channel complexity and provide velocity refuge during winter flows is recommended in the lower mainstem Standley Creek, a portion of McCoy Creek, and Piercy Creek (reaches 820, 826 – 827, and 847) (Figure 9-9, Table 9-5). These reaches have low gradients that will likely provide instream habitat for juveniles during winter months; however, they lack enough large wood to create winter velocity refugia and are generally lacking complexity. These reaches are also topographically confined which means fish may have to rely more heavily on instream refugia to avoid being swept downstream. Treatments to improve access to suitable off-channel habitats are recommended in upper Standley Creek, an unnamed tributary at the reach node between reaches 826 and 827 (reaches 826 – 827, 829 – 830) (Figure 9-9, Table 9-5). These reaches have wide valley widths and low gradients suitable for off-channel winter habitat. Additionally, off-channel habitat could be created at the mouth of the unnamed tributary at the end of reach 826 by backing up water with instream structures in the mainstem of Standley Creek. This treatment was identified by the Expert Panel based on field observations but will require a focused survey effort and associated designs. Specific locations for creating or improving access to off-channel habitat at other locations could not be identified based on the available data.

### Treatments to Improve Adult Salmonid Spawning Distribution

Large wood can be strategically placed to trap and sort gravels and effectively increase the amount of suitable spawning habitat in a stream. The Expert Panel identified a portion of McCoy Creek which supports spawning salmonids but would benefit from increased gravel storing and sorting to expand spawning opportunities (reach 847) (Figure 9-9, Table 9-5). This reach has low stream complexity, very little instream large wood, and currently has vehicle access making it an ideal location to install large wood structures.

### Treatments to Improve Conditions for Summer Parr

Large wood can also create or augment habitat used by salmonids during summer months by scouring pools. The availability of deep pools with complex cover provides juvenile salmonids with thermal refugia, shelter from predators, and a lengthened hydroperiod during hot, dry summers. Treatments using large wood to create summer rearing habitat are recommended in Piercy Creek, most of Standley Creek (including an unnamed tributary in the center of reach 828), and a portion of McCoy Creek (reaches 820, 826 – 828, 829 – 830, and 847) (Figure 9-9, Table 9-5). These reaches are at or near popular spawning areas where salmonids are born and will likely rear and they have suitable water temperatures year-round; however, they lack high quality pool habitat and enough instream large wood to create suitable summer habitat.

## *Treatments to Improve Watershed Processes*

### Sediment Sources and Riparian Treatments

Managing upslope habitat to improve soil stability, reduce sediment input and improve riparian forest cover and composition can improve instream conditions by reducing sedimentation, increasing stream shade, and by providing a source of large wood. Two landslides were identified by the Expert Panel as needing treatment to reduce sediment delivery to McCoy Creek (reaches 846 and 848) (Figure 9-9, Table 9-5). Understanding the causes of these slides and the most appropriate treatment will require more investigation. Riparian tree planting and active riparian management is recommended for the upper McCoy Creek, and an unnamed tributary in Standley Creek to stabilize landslides (reach 848) and improve the wood recruitment potential (reach 828, and 848) (Figure 9-9, Table 9-5). While canopy cover and stream temperatures are suitable in most of these streams, the chronic shortage of instream wood is likely due to the deficit of mature riparian conifers. The history of timber harvest and flood disturbances in the sub-watershed decimated much of the riparian forest and forest recovery and succession is likely progressing too slowly to aid in the recovery of salmonids. Riparian planting and active management to increase the rate of forest succession should be applied as appropriate to improve the composition and function of the riparian forest in these reaches. Additionally, the unnamed tributary in the center of reach 828 of Standley Creek has recently been logged and would benefit from riparian tree planting to maintain and improve riparian cover and long-term sources of large wood.

In addition to the acute land disturbances described above, many portions of the sub-watershed have untreated legacy logging disturbances that are likely chronic sources of sediment to the streams. In particular, the Expert Panel identified Piercy Creek and upper North Fork McCoy Creek as having a significant number of problematic roads that have yet to be treated (reaches 820 and 850) (Figure 9-9, Table 9-5). Legacy road networks and associated stream crossing and land disturbances in those areas will need to be assessed to determine the appropriate course of treatment.

### Habitat Assessment

The Expert Panel and Action Team noted that little was known about Bear Pen Creek due to its relatively inaccessible nature and because it is seldom surveyed for salmonids, but the presence of anadromous salmonids and relatively high IP values indicate this stream warrants further investigation for restoration potential. Habitat inventories indicate that pool depth, pool shelter, and embeddedness ratings are all poor; however, the appropriate treatment is not apparent. The same habitat inventories suggest that there is an abundance of both large and small wood within the stream, though much of this wood may be stored within large debris accumulations. Additionally, little is known about the condition of the upslope environment and it is likely that legacy logging roads and stream crossing may be contributing sediment to the stream. Riparian forest age and composition are also poorly suited to recruiting large wood in the future and may require planting or other treatments. Digital elevation models suggest suitable gradients and valley widths exist in the middle and upstream portions of the stream, but it is unknown if these areas provide suitable off-channel habitat or if salmonids can access these areas regularly. Juvenile Coho Salmon and steelhead have been observed in Bear Pen Creek well above many of the aforementioned debris accumulations indicating that it is an important anadromous salmonid stream and adult fish passage within the lower 2 miles of stream may not be limiting access to the habitat. The Action Team recommends further investigation of Bear Pen Creek to determine the most appropriate treatments to improve salmonid habitat in this area.

If you have questions or would like to collaborate on implementing the actions in this chapter, please contact Julie Weeder, NMFS recovery coordinator (707-825-5168, julie.weeder@noaa.gov) or Allan Renger, CDFW area supervisor (707-725-7194, Allan.Renger@wildlife.ca.gov).