

# Dam Remediation Improves Fish Passage on Mill Creek

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## Flashboard Dam Identified as Bottleneck to Coho Recovery

### Introduction

Coho salmon (*Oncorhynchus kisutch*) are listed as endangered in the Russian River watershed under state and federal endangered species acts. The Russian River Coho Salmon Conservation Program produces coho to supplement wild populations with the long-term goal of re-establishing self-sustaining runs. In order to achieve this, adult salmon need access to high quality spawning grounds and juveniles need rearing habitat that remains wet throughout the dry summers. Mill Creek is a critical coho stream in the basin and the upper reaches contain some of the best coho spawning and rearing habitat. For decades, a flashboard dam has acted as a partial barrier for returning adult salmon, forcing most to spawn in the lower reach of the stream which, generally, has low summer flow. Monitoring data was used to justify barrier remediation and, following project implementation, to document project efficacy.

### Monitoring Methods

**Figure 2-3.** Adult spawner surveys were conducted approximately every two weeks on Mill Creek, each winter since 2011, to document fish presence and redd distribution above and below the dam.



**Figure 4.** A fraction of all juvenile hatchery coho released into Mill Creek each year are PIT-tagged. When a tagged coho pass by an antenna's transceiver field, a reader records tag number, date and time.

**Figure 5.** Locations of PIT antennas and stage loggers used to determine fish passage points. Data from two stage loggers was used to calculate a relative passage point due to data gaps.

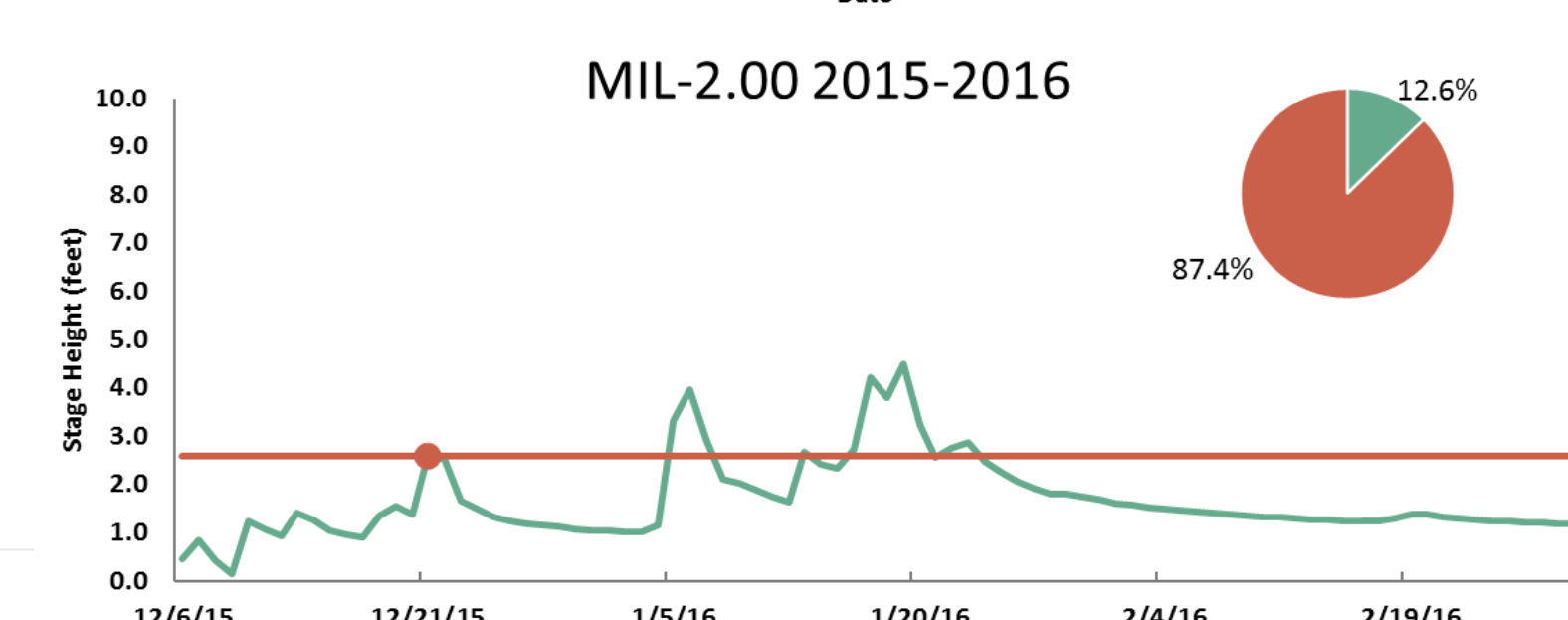
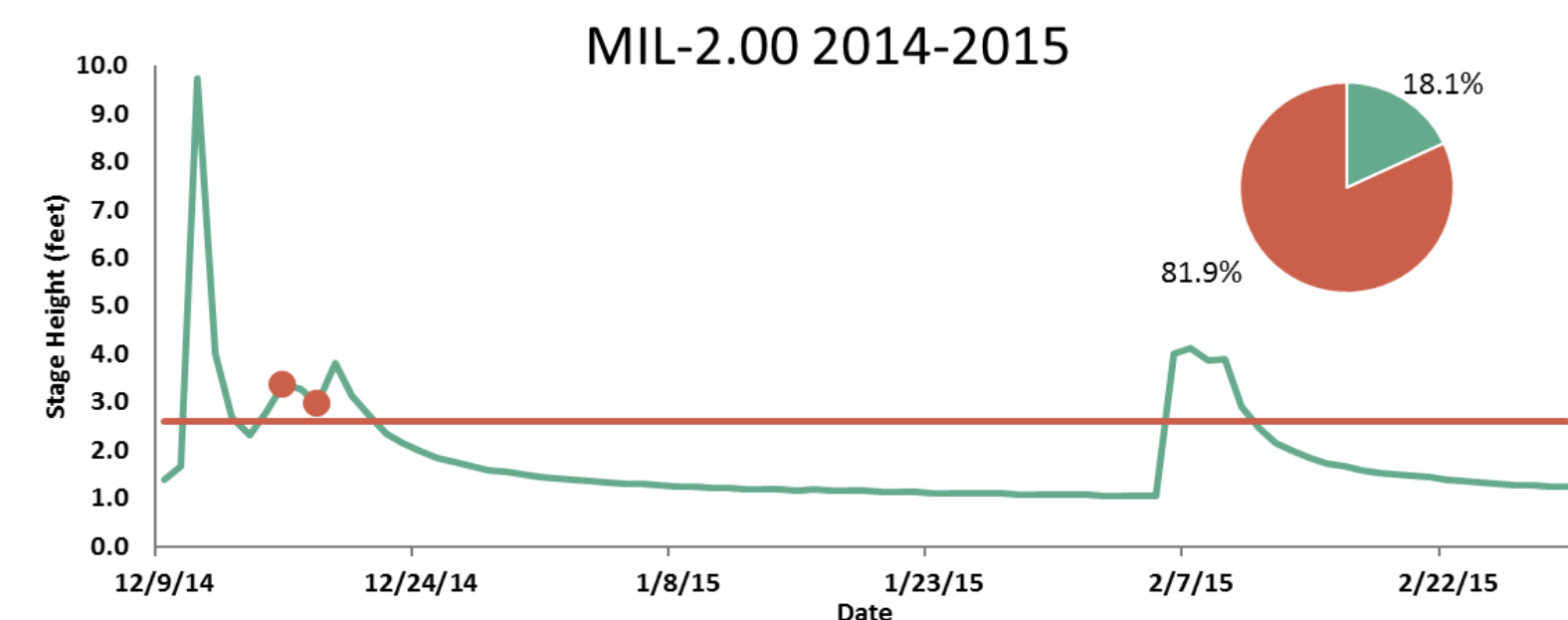
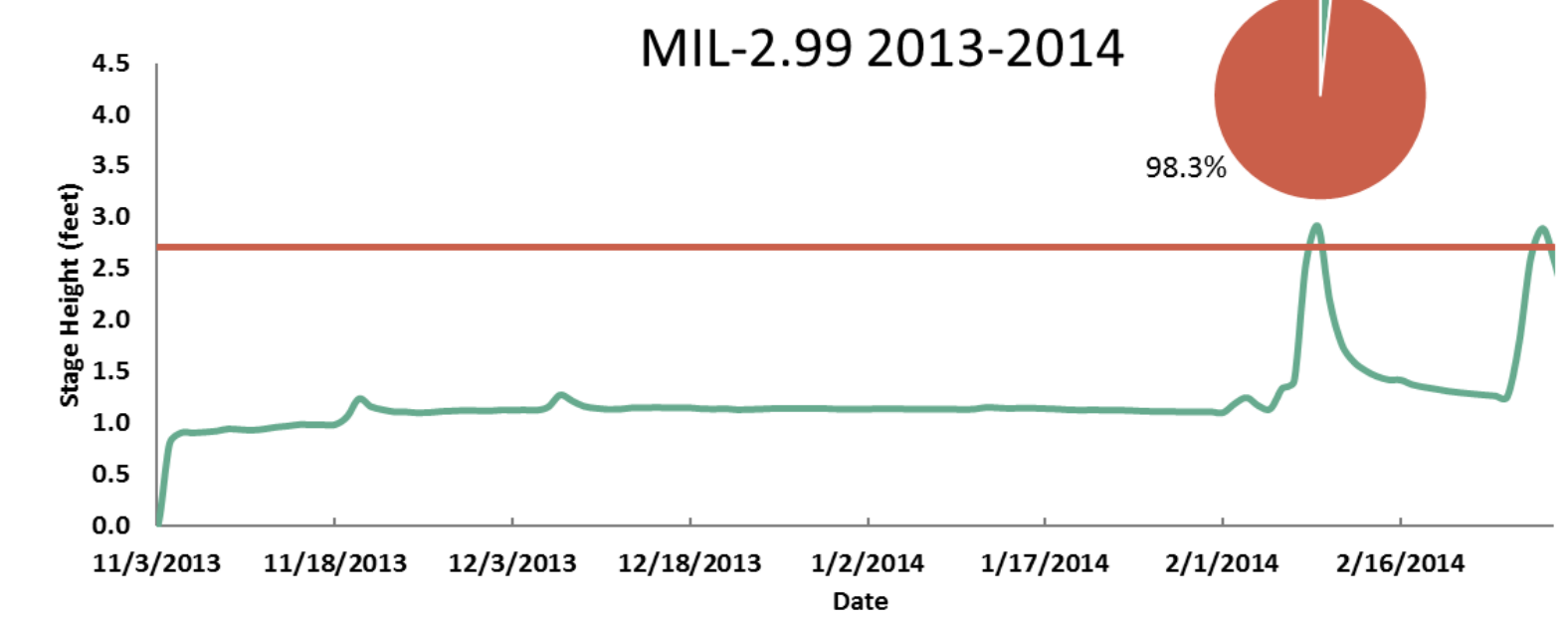
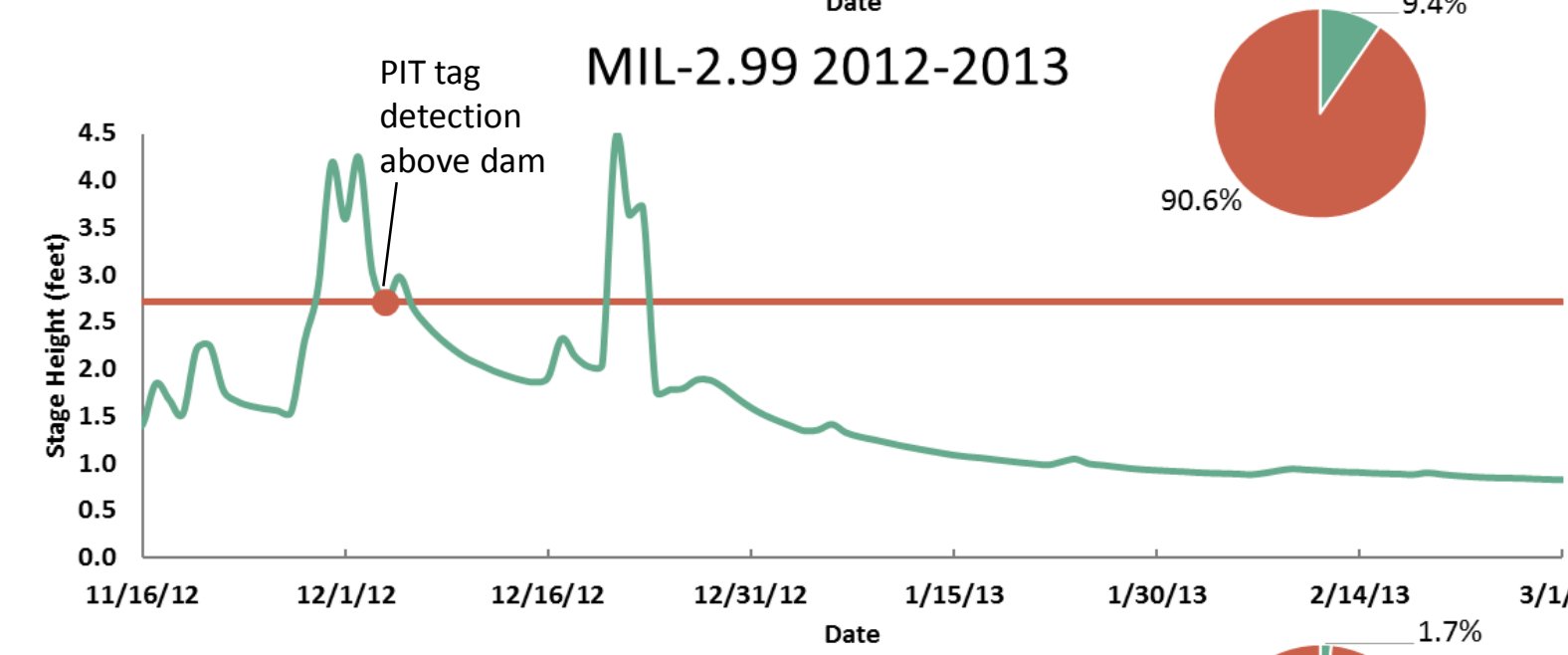
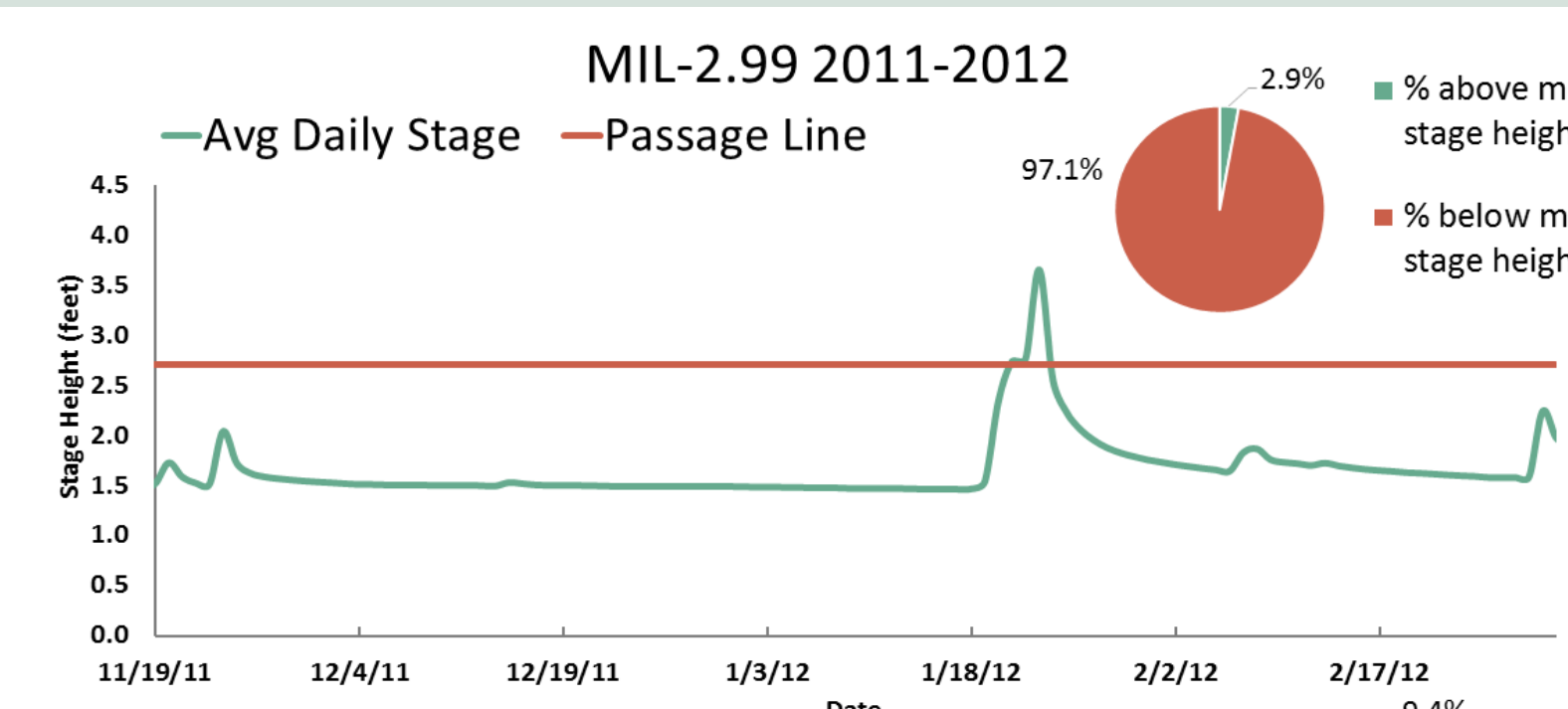


**Figure 1.** Overview map of Central California Coast Coho ESU and Russian River.



### Identification of Passage Barrier

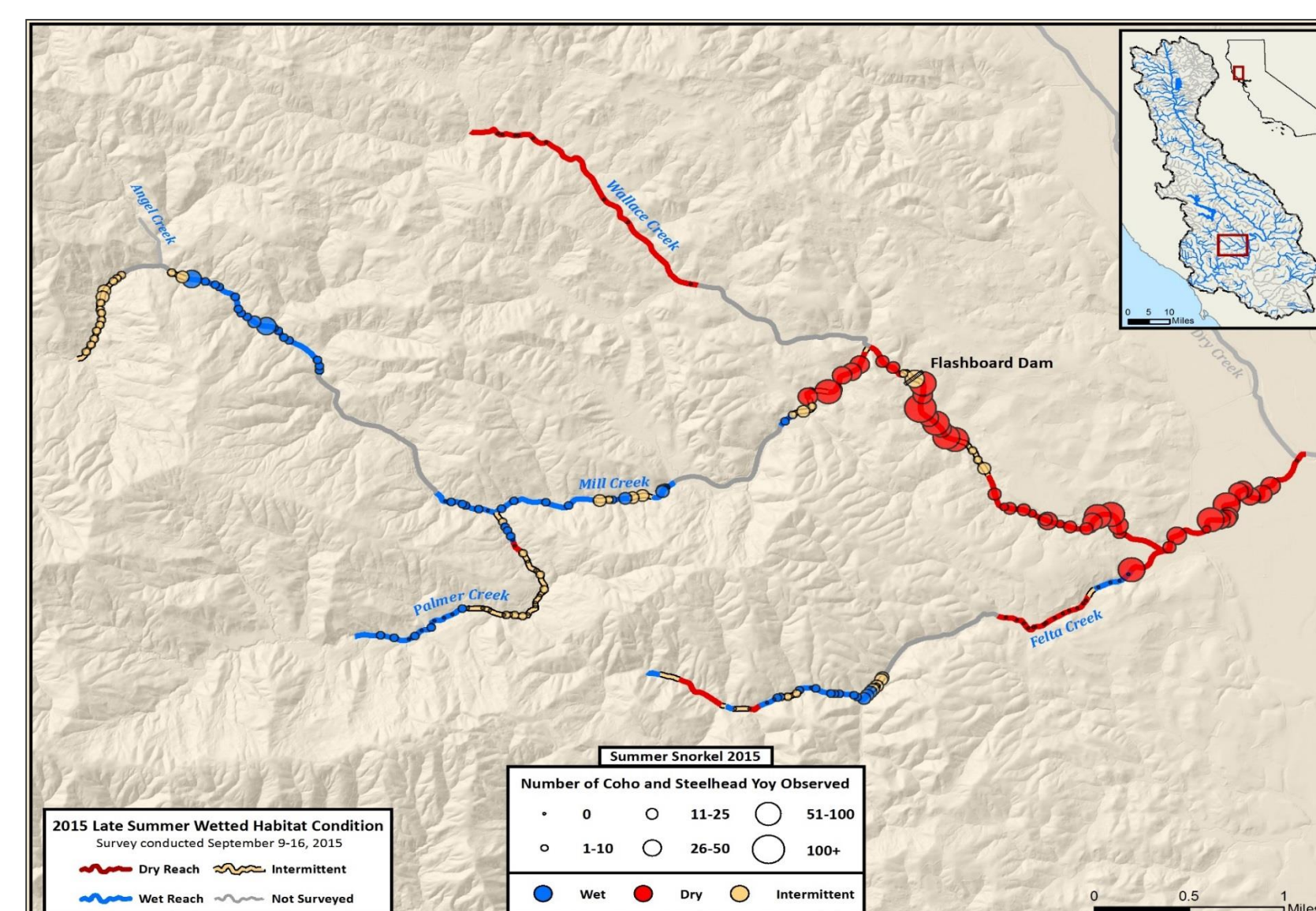
Graphs to the right show stage height during coho spawning season and adult PIT tag detections upstream of the dam for the winters of 2011/12 through 2015/16, prior to dam remediation. Each year, the coho spawning season began with the first significant rain event, usually in early winter, and extended through March 1. PIT-tag antenna detections were used to estimate the minimum stage height at which passage over the dam site was known to occur (passage line on graphs). The minimum stage height at which fish were detected upstream of the dam was 2.70' at MIL-2.99 and 2.60' at MIL-2.00. Pie charts show the percentage of the season when stream depth was above the minimum stage height at which fish were detected upstream of the dam. For 2011/12-2013/14 the MIL-2.99 gauge was used while in 2014/15-2015/16 the MIL-2.0 gauge was used.



**Figure 6.** 93% of coho salmon redds observed prior to winter 2016/17 were downstream of the flashboard dam, providing evidence that adult coho were only rarely able to access the upper reaches of Mill Creek.

**Prior to dam remediation:**  
In the winters of 2011/12 through 2015/16, daily average stream depth was above the estimated minimum stage height required for passage just 8.9% of the time.

**Figure 7.** The majority of juvenile offspring were confined to habitat that went dry during the summer months. For example, in 2015, 89% of juvenile salmonids observed during summer snorkeling surveys had no chance of surviving when pools became dry in late summer. In contrast, survival of hatchery-released juvenile coho upstream of the barrier have been consistently high, even in drought years.



## Success Documented Following Dam Remediation

### Mill Creek Dam Fish Passage Project



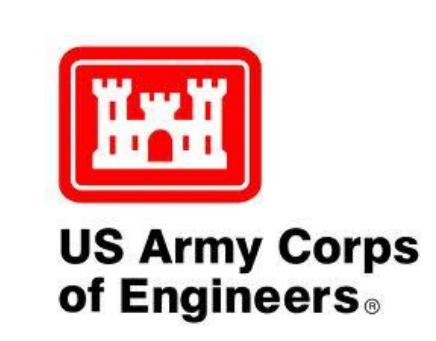
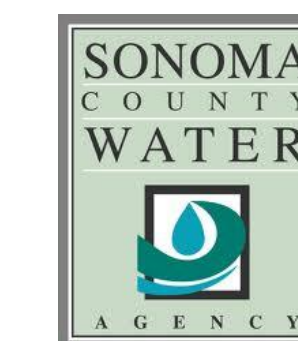
Dam before remediation.



Passage project construction, October 2016



Post remediation, Winter 2016/17



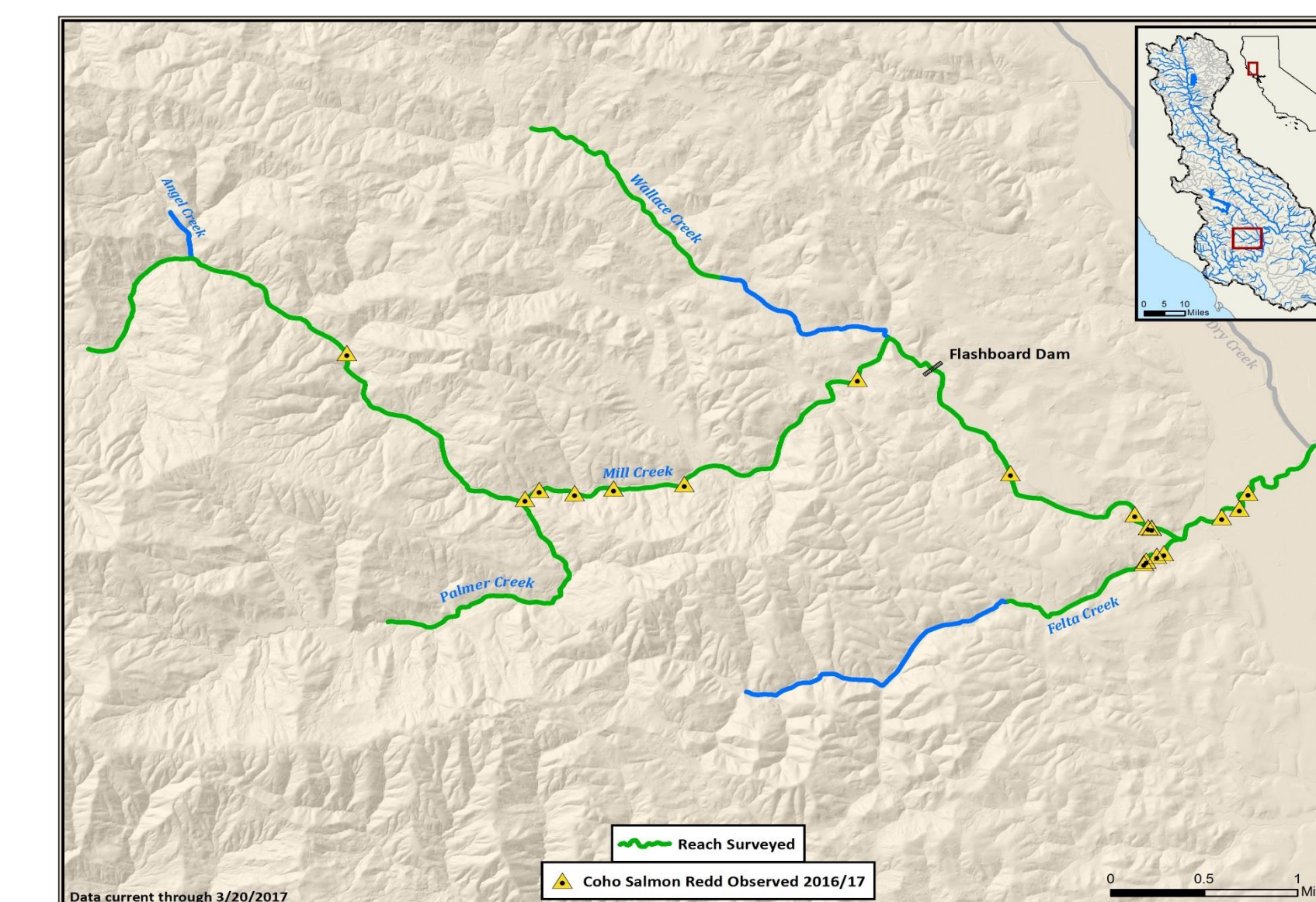
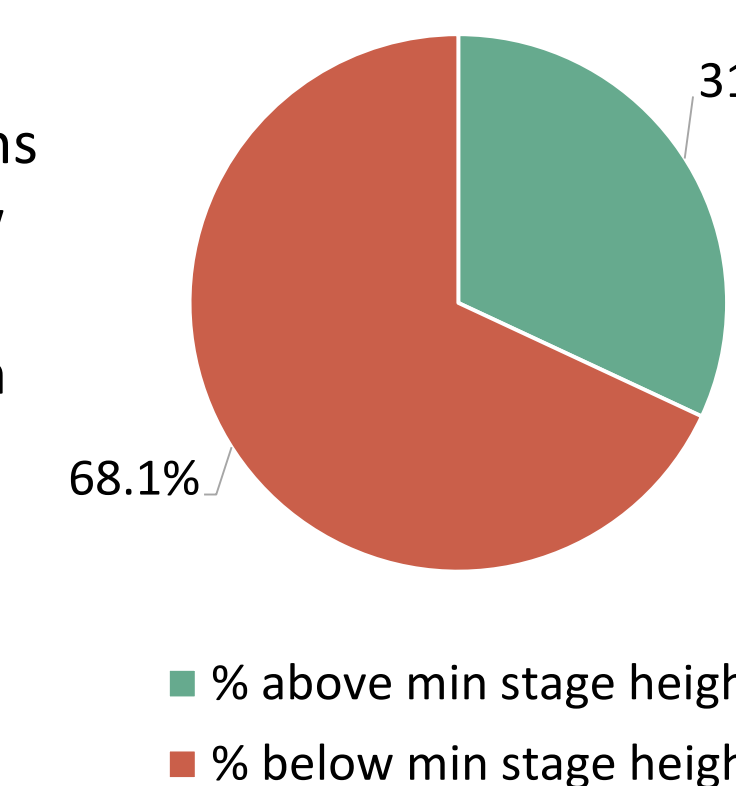
### Preliminary Results



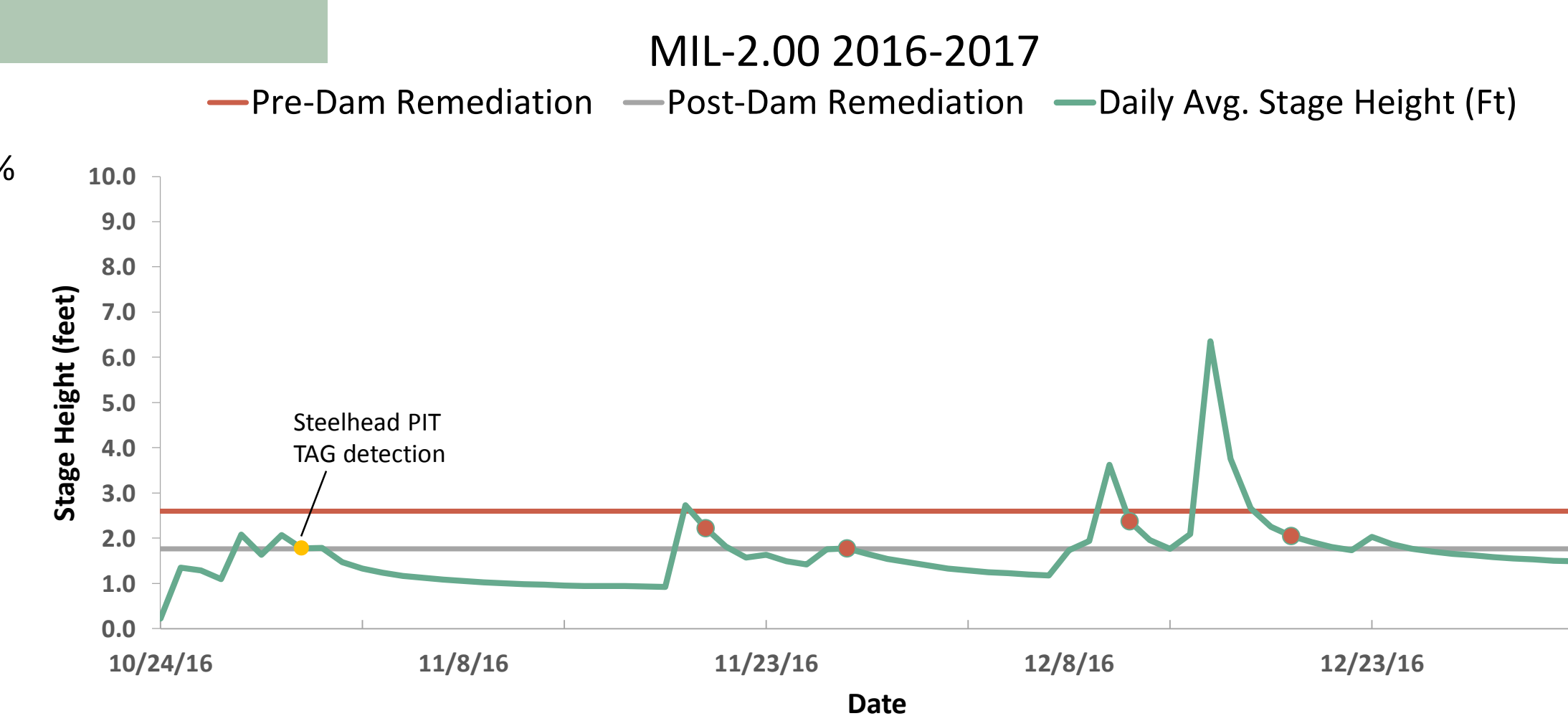
**Figure 8.** Adult coho and steelhead were observed above the dam site during the 2016/17 spawner season.

**After dam remediation:**  
In the winter of 2016/17, daily average stream depth was above the estimated minimum stage height required for passage 31.9% of the time.

Graphs to the right show, Winter 2016/17 PIT detections of adult coho occurred below the pre-project estimated minimum stage height, which decreased from 2.60' to 1.77' after dam remediation work. Stage data does not include dates after 1/3/2017 due to a technical failure.



**Figure 9.** Coho redds observed during the 2016/17 spawner season. Nearly twice as many redds were documented in the 11.2 miles of Mill Creek upstream of the dam site than in the previous five years combined.



### Conclusions

From winter of 2011/12 through 2015/16 only three coho salmon redds were observed upstream of the flashboard dam. By contrast, after the remediation of the dam, seven redds were observed upstream in a single spawning season. Of the seven redds observed, six were in a section of Mill Creek that remains wet throughout the entire summer. The barrier modification reduced the estimated stream depth required for upstream passage of adults by approximately 0.83'; a depth that was achieved or exceeded for at least 31.9% of the 2016/17 season. Thanks to many years of biological monitoring, restoration planning, and implementation efforts, coho salmon are now able to access high-quality spawning and rearing habitat in Mill Creek—a stream considered to be among the highest priority for coho salmon recovery in the Russian River watershed.

### Acknowledgements

The data presented in this poster was collected through support from numerous partners including California Department of Fish and Wildlife, Sonoma County Water Agency, U.S. Army Corps of Engineers, National Marine Fisheries Service, CEMAR, Trout Unlimited, and numerous volunteers and student interns. We thank the many landowners who have graciously allowed us to traipse through their backyards to conduct our surveys and the Mill Fish Passage Project team for making long-term recovery of coho a possibility in Mill Creek.