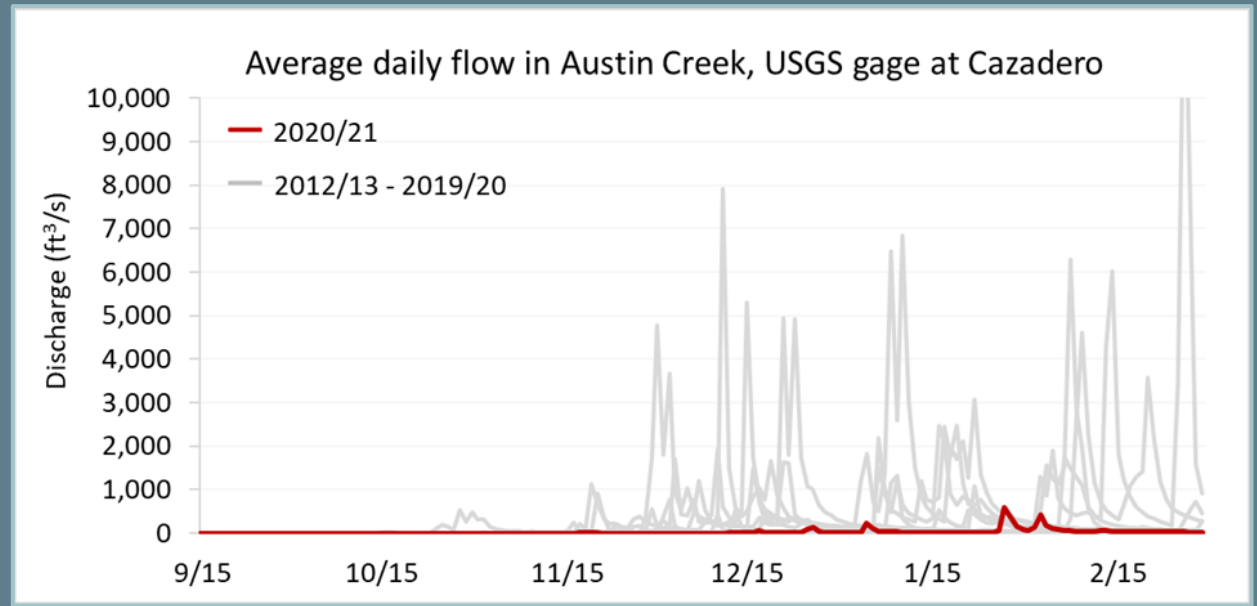




2021 Drought Impacts to Salmonids

Presented by Troy Cameron
California Sea Grant

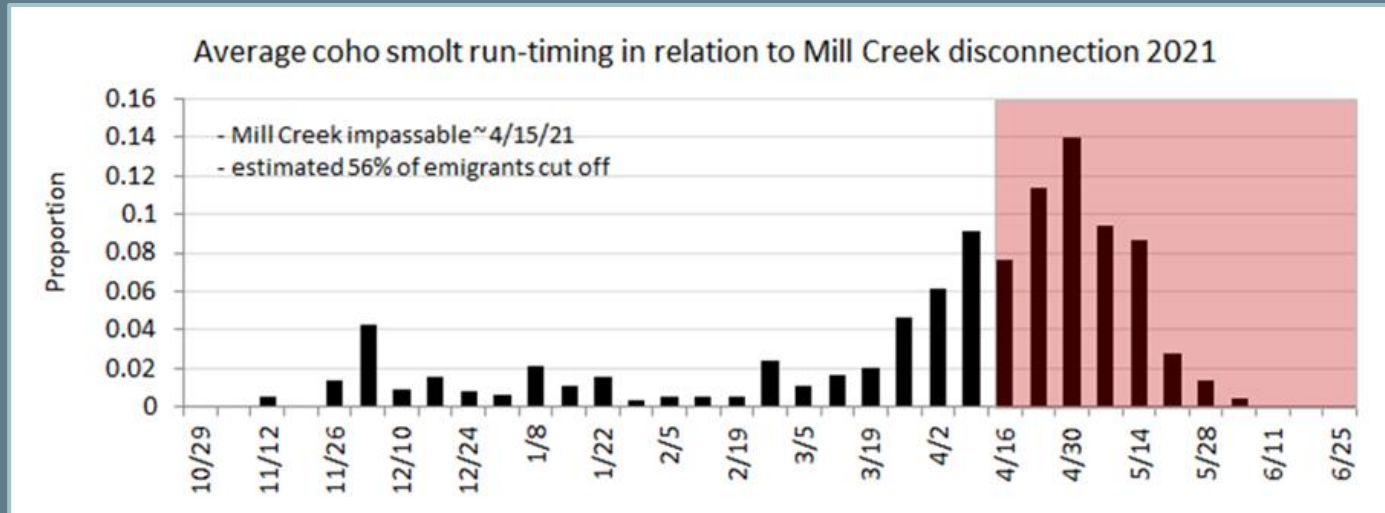
Adult Spawners



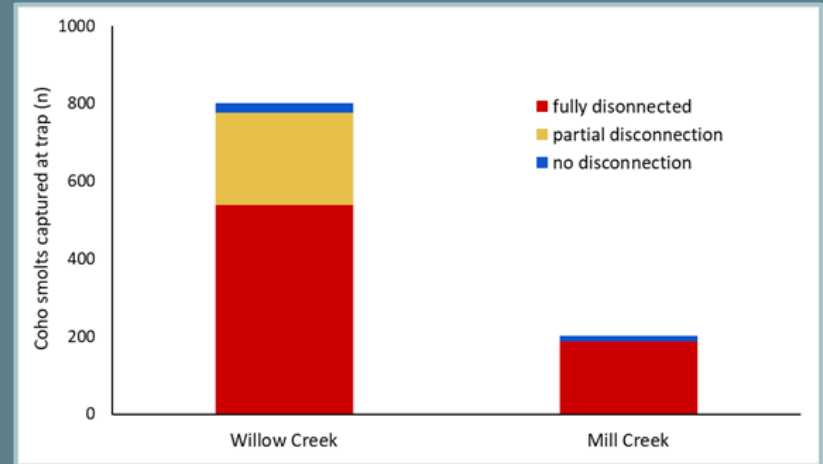
- Low and late precipitation delayed coho salmon spawning until January (approximately a 6-week delay)
- Low flows made fewer spawning streams accessible
 - Coho salmon present in only 24% of coho streams surveyed
 - 50% of coho redds observed in Austin Creek
 - Only 1 coho salmon redd in Green Valley and Willow Creeks combined
- Many redds dried out before hatching out, adults became stranded

Outmigrating Smolts

- All broodstock streams experienced early spring disconnection, interrupting the smolt outmigration window
- Earliest observed mouth closure in all trap streams including Mill, Green Valley, Willow and Dutch Bill Creeks
 - ~1 month earlier than in 2014 for Mill Creek
- Low downstream migrant trap capture numbers, smolts likely stranded upstream

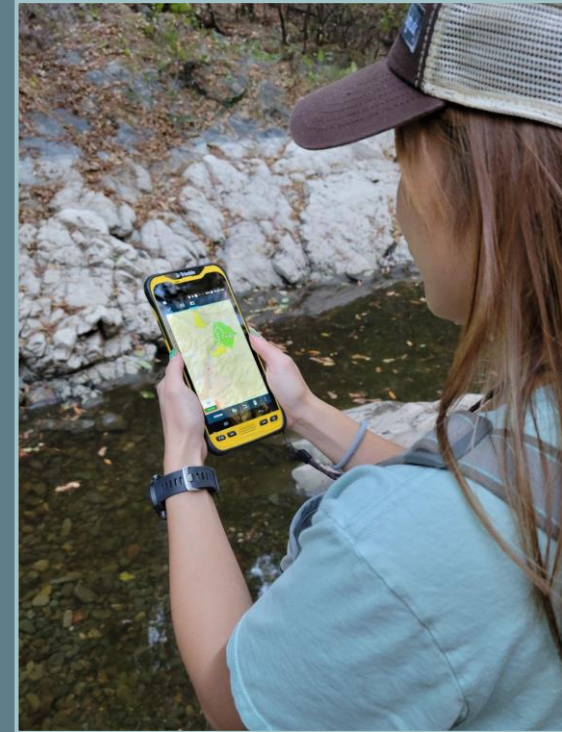


- Downstream migrant smolt trapping efforts became relocation efforts when disconnections occurred downstream
- Fish were relocated below disconnection points
 - Relocations could have started earlier
- Majority of smolts in broodstock streams would have been stranded without intervention



Wet/Dry Mapping

- Mapping presence/absence of surface water as “wet”, “intermittent” or “dry” lines
- Temperature, dissolved oxygen measurements at 5 minute intervals
- Conducted May-October
- Some streams surveyed monthly, others just late-summer baseflow



Russian River: 2021 Wetted Habitat

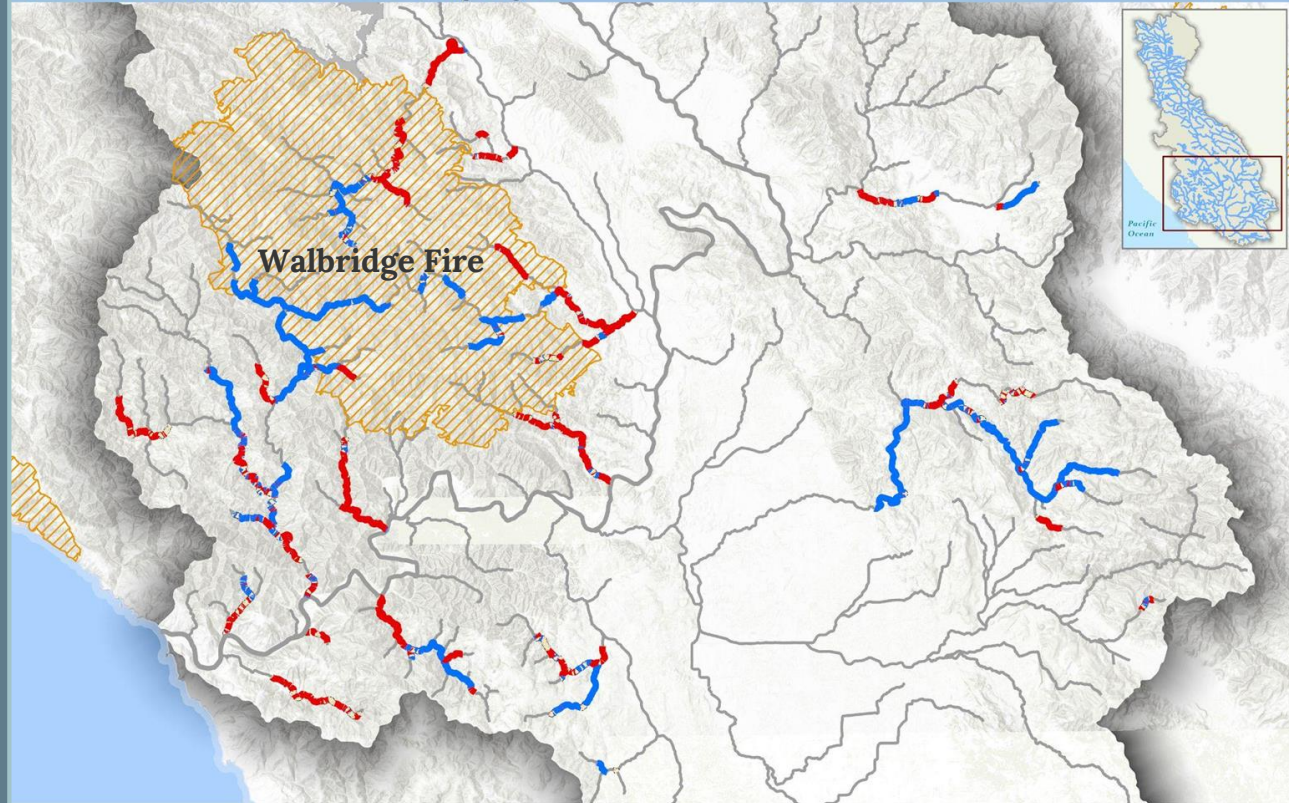
Russian River Salmon and Steelhead Monitoring Program



Late Summer Baseflow

Over 120 stream
miles surveyed,
45 streams

51% Wet
10 % Intermittent
39% Dry



Surface Flow Condition

— Dry — Intermittent — Wet



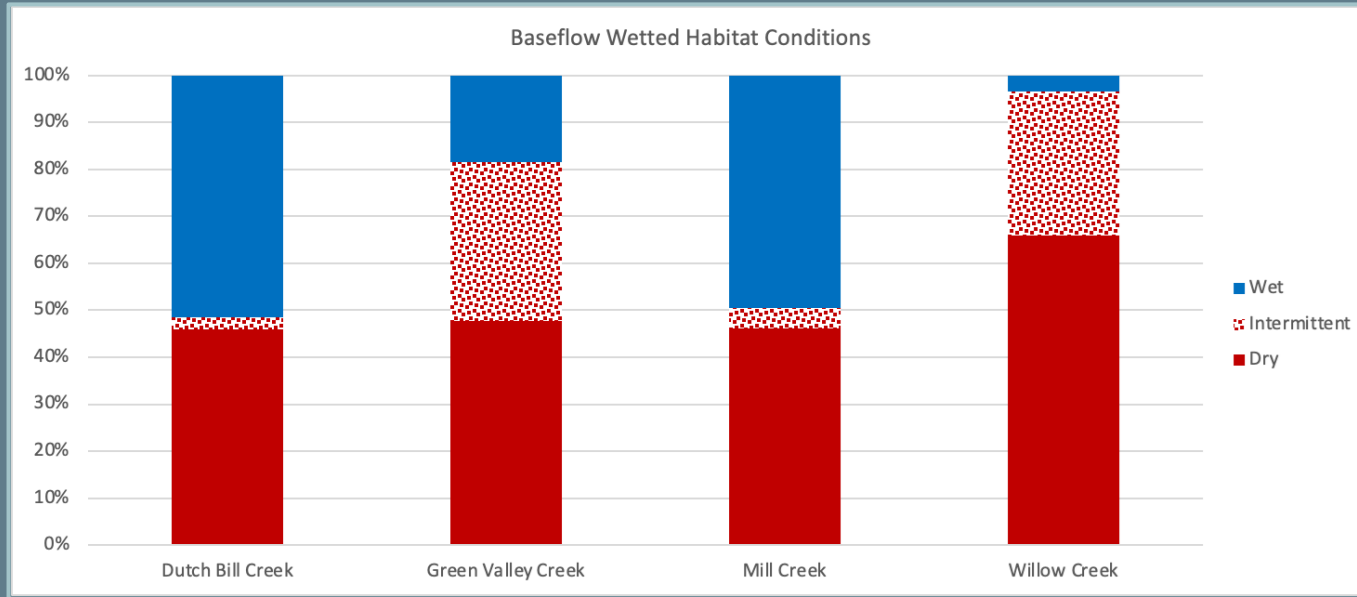
Surveys Conducted Between August and October, 2021

Projection: NAD 1983 UTM Zone 10N
Source: Streams (County of Sonoma),
Map Prepared By: California Sea Grant, Santa Rosa, CA
Map Name:





2021 Life Cycle Monitoring Streams Habitat Conditions



28% Wet
20% Intermittent
52% Dry

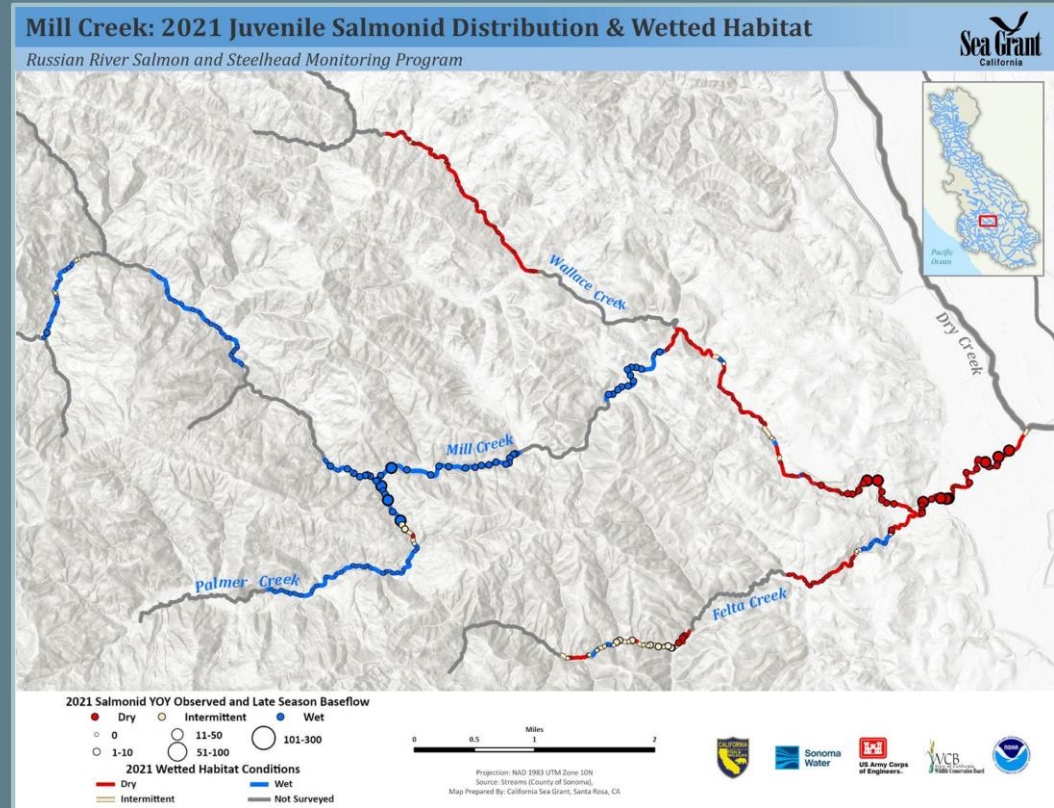
What did this mean for fish in 2021?



Juvenile Salmonid Occupancy & Wetted Habitat

Snorkel surveys conducted
June-August

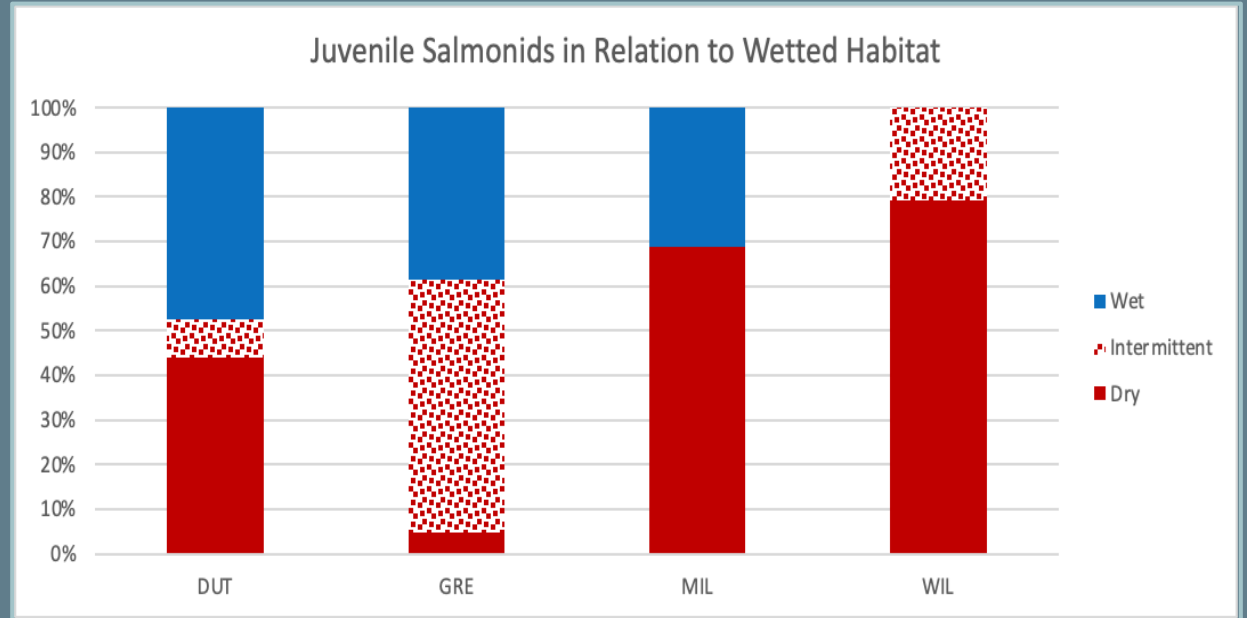
Wetted habitat conducted
August-October



Baseflow Conditions for Salmonids in Life Cycle Monitoring Streams

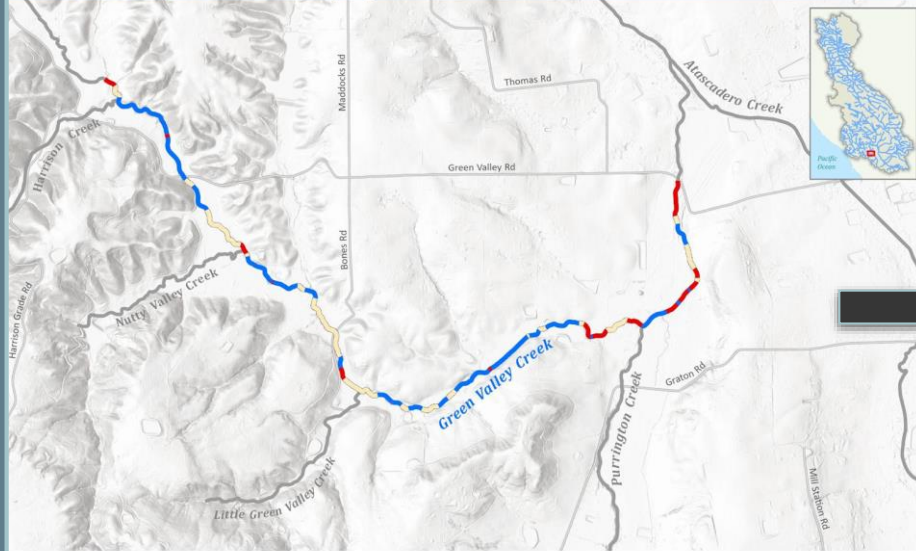
30% Wet
21% Intermittent
49% Dry

N= 1,635 coho and steelhead juveniles across broodstock streams (unexpanded counts)



Green Valley Creek: July 2021 Wetted Habitat

Russian River Salmon and Steelhead Monitoring Program



Surface Flow Condition
Dry Intermittent
Wet Not Surveyed

Surveys Conducted: July 19-20, 2021

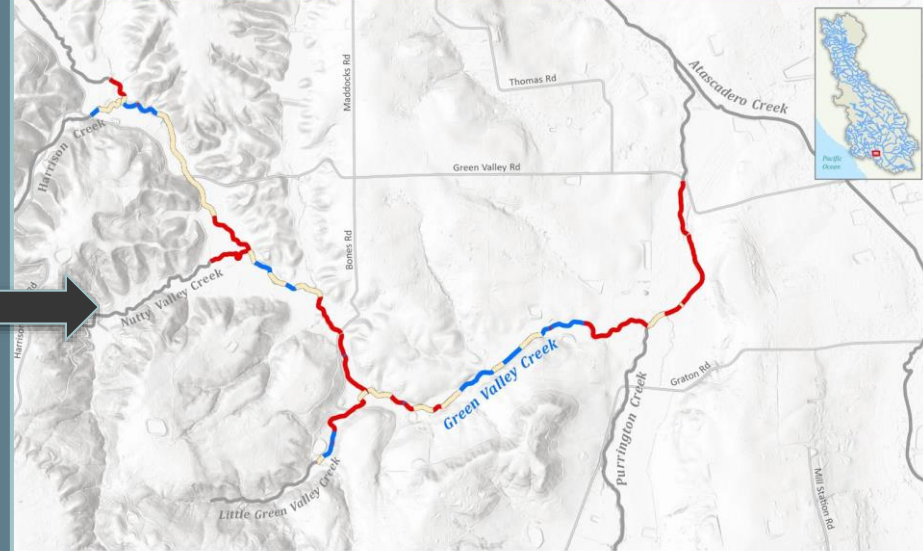


Projection: NAD 1983 UTM Zone 20N
Source: Streams (County of Sonoma),
Map Prepared By: California Sea Grant, Santa Rosa, CA



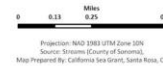
Green Valley Creek: 2021 Wetted Habitat

Russian River Salmon and Steelhead Monitoring Program



Surface Flow Condition
Dry Intermittent
Wet Not Surveyed

Surveys Conducted: September 20-22, 2021



Projection: NAD 1983 UTM Zone 20N
Source: Streams (County of Sonoma),
Map Prepared By: California Sea Grant, Santa Rosa, CA



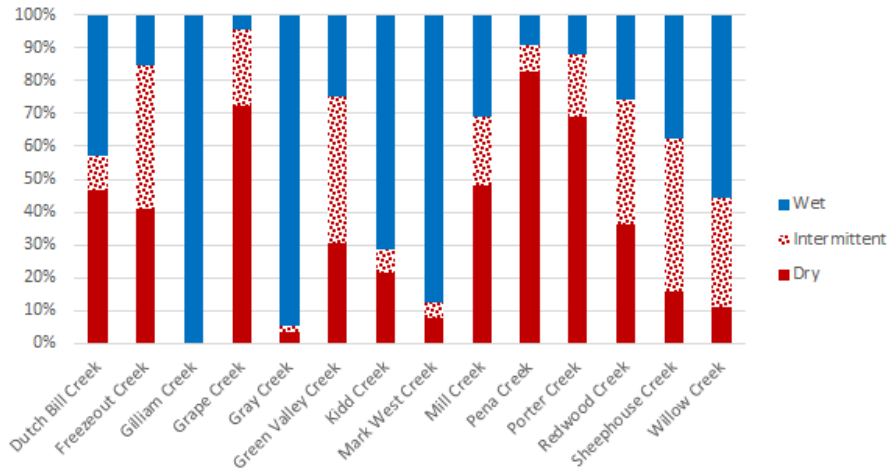
Average Dissolved Oxygen: 6.28mg/L in June

3.63mg/L in July

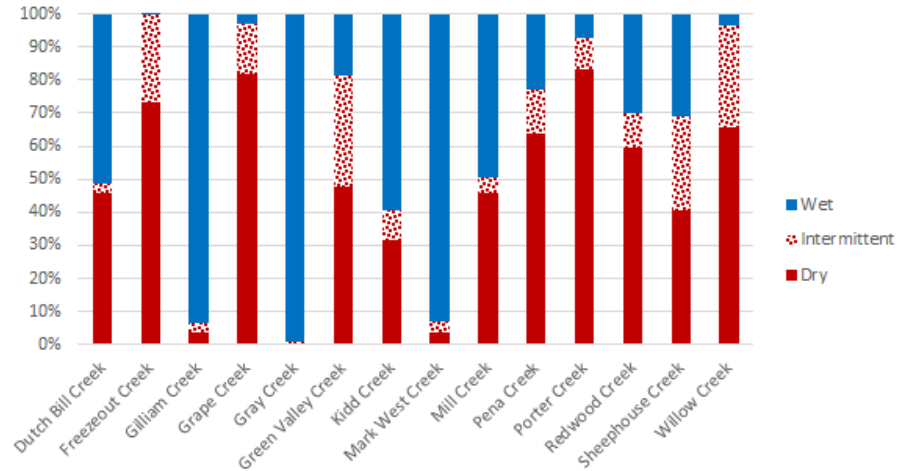
2.51mg/L in September

2015 vs 2021

44% Wet
21% Intermittent
35% Dry

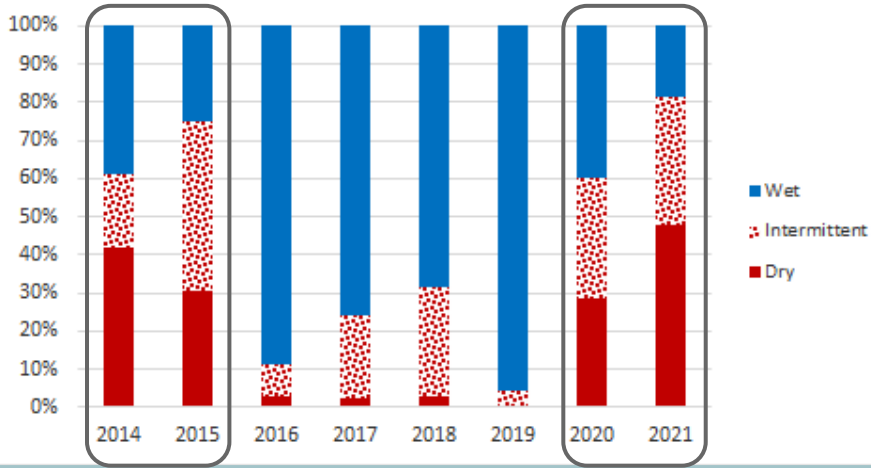


40% Wet
14 % Intermittent
46% Dry



Cycle of Drought

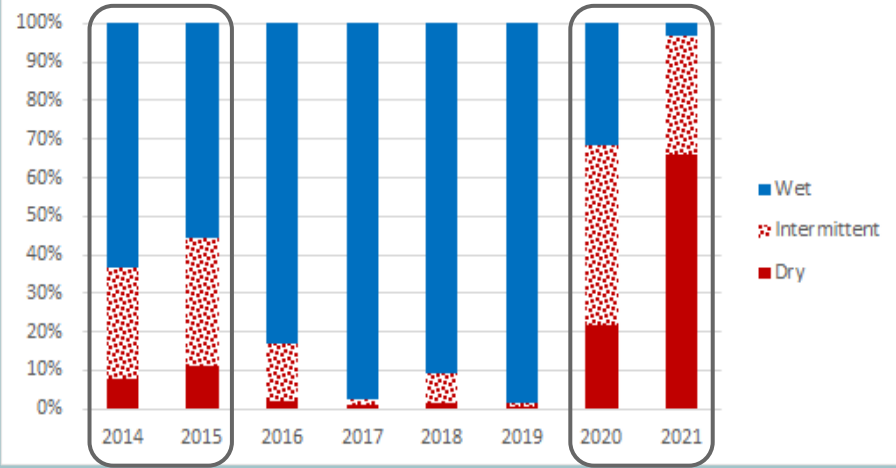
Green Valley Creek Baseflow Conditions



↑
Drought years

↑
Drought years

Willow Creek Baseflow Conditions



↑
Drought years

↑
Drought years

2021 Takeaways

- Limited and late adult spawning tributary access
- Early spring stream disconnection trapped a significant proportion of smolts during peak outmigration
- Just 30% of juvenile salmonids counted in 4 life cycle monitoring streams were in pools that stayed wet and connected through the dry season
- Wetted habitat that was present was often not habitable for salmonids
- Driest instream conditions since our monitoring began
- Seeing cumulative effects of multi-year droughts





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of Engineers**®



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**Sonoma
Water**

