CLIMATE CHANGE

- Warmer temperatures
- Reduced snowpack
- Longer dry seasons
- Increase in floods and drought
- More intense wildfires
CLIMATE CHANGE INTERACTS WITH HUMAN MODIFICATIONS

- Habitat loss
- Water management (flow and temperature)
- Habitat condition
- Hatchery influences

THANK YOU SPONSORS!
Habitat loss

Point 1 information
Point 2 information
Point 3 information

Source: NMFS, Lindley et al. 2006

Historic habitat: > 125 miles
Current habitat: 23 miles
CA Natural Flows Web Tool: rivers.codefornature.org
California Environmental Flows Framework (CEFF) Functional flow components

- Peak magnitude flows
- 90th & 10th percentile of flow
- Median (50th percentile) flow
- Fall pulse flow
- Wet-season baseflow
- Spring recession flow
- Dry-season baseflow
Water year 2011 – wet year

- **10-year peak:** 29800
- **Max September temperature:** 17º C
- **Dry season baseflow:** 641
- **Spring recession:** 16500
- **Wet season baseflow:** 5570
- **Fall pulse:** 1760

Water year 2011 – wet year

Flow Value (cfs)
Water year 2015 – dry year

- 2-year peak: 14,000
- Spring recession: 4780
- Max September temperature = 22° C
- Wet season baseflow: 1720
- Dry season baseflow: 293
- Fall pulse: 1100
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Fall-run escapement

American River

AFRP natural production target = 160,000

1992-2015 doubling period average = 98,419

(Source: AFRP)

Source: “State of Salmon in California”: https://casalmon.org/
Modified Flow Management Standard (FMS)

- Fall-run Chinook salmon
  - Adult Immigration
  - Adult Pre-spawn Staging
  - Spawning
  - Incubation through Emergence
  - Juvenile Rearing
  - Fry Emigration
  - Sub-yearling Juvenile Emigration

- Steelhead
  - Adult Immigration
  - Adult Holding
  - Spawning
  - Incubation through Emergence
  - Juvenile (Y0Y)\(^1\) Rearing and Emigration
  - Yearling (post-Y0Y)\(^1\) Rearing
  - Smolt (yearling+) Rearing

Relative Abundance: High

![LAR Water Temperature at Watt Ave.](chart)
Simulated Dry Year Water Temperature
926 redds observed – 24% of all redds

91% in medium or high quality habitat
Emigrating Salmonid Habitat Estimation (ESHE) - https://fishsciences.shinyapps.io/sacramento-eshe/

Assume 27% habitat suitability = approx. 30 acres

Before restoration
Density = 0.10 m²
<3 juvenile fish per 25 m²

After restoration
Density = 3.25 m²
>82 juvenile salmon per 25 m²