Evaluation of Restoration Actions in the San Joaquin River: Lessons Learned

Chip McConnaha willis.mcconnaha@icfi.com
Greg Blair
Laura McMullen
Monique Briard
ICF International

SAN JOAQUIN RIVER RESTORATION PROGRAM

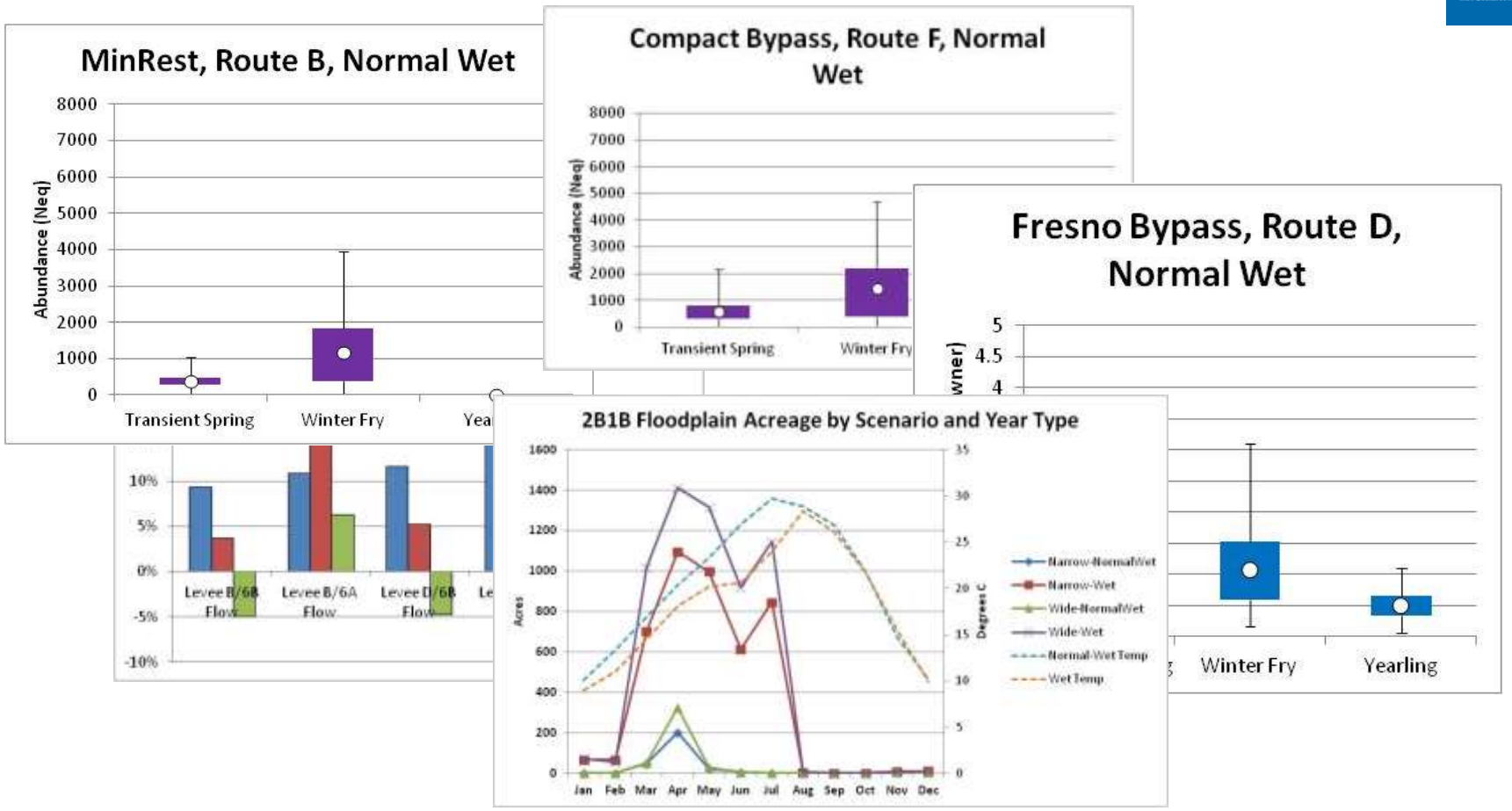
San Joaquin River Restoration Program (SJRRP)

San Joaquin River Settlement Agreement (2006):

- **Restoration Goal** – To restore a naturally producing population of spring-run Chinook salmon to the main stem San Joaquin River below Friant Dam to the confluence of the Merced River
- **Water Management Goal** – To reduce or avoid adverse water supply impacts on water contractors
- **SJRRP** was created to implement the settlement agreement
  - TAC
  - Fisheries Work Group

Spring-run Chinook Habitat Restoration Evaluation

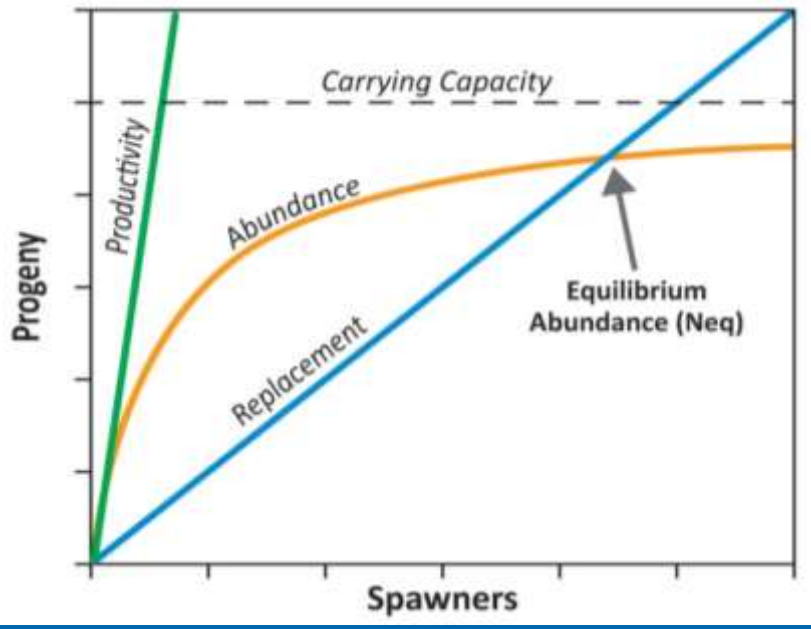
- Minimum Restoration (Baseline)
- Reach 2B: 8 alternatives (restoration + flow routing)
  - Narrow vs. wide floodplain restoration
  - Mendota Pool Bypass (new)
  - Fresno Slough Dam (new)
  - Short Canal (new)
  - **Combinations**
- Reach 4B: 15 Alternatives (restoration + flow routing)
  - Levee setbacks
  - Flow routing (SJR, Eastside Bypass, Sand Slough, Mariposa Bypass
  - Re-vegetation
  - **Combinations**
- 2B + 4B Aggregate
  - Reach 2B: Wide floodplain, maximum conveyance; Mendota Pool Bypass
  - Reach 4B: Eastside bypass-Mariposa-Mainstem, maximum floodplain



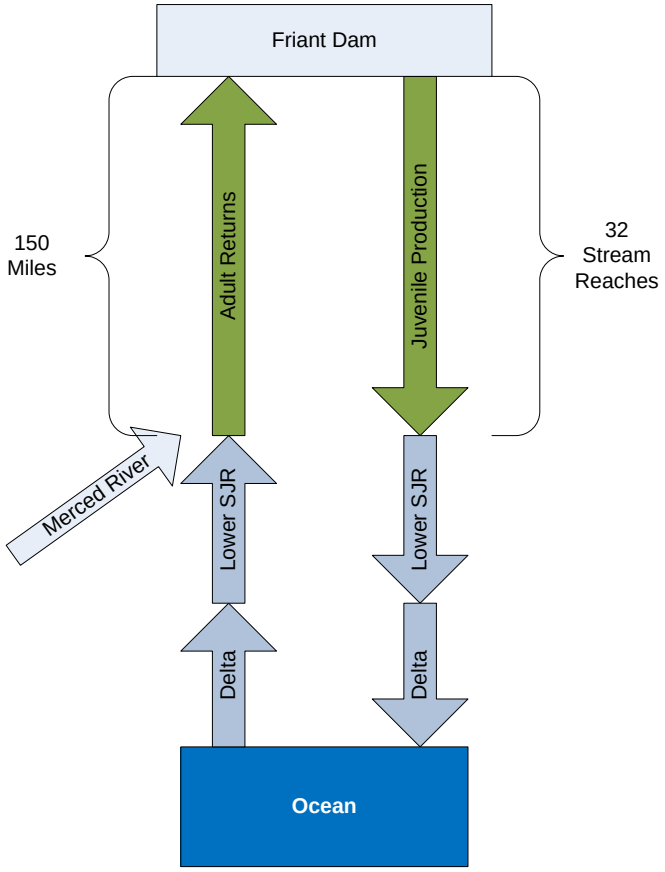
THE SAN JOAQUIN SPRING CHINOOK HABITAT MODEL

San Joaquin Spring Chinook Habitat Model

- Evaluated potential of habitat to support spring-run Chinook
- Computes parameters of a Beverton-Holt relationship as a function of habitat quantity and quality
- Habitat evaluated across multiple life history pathways and integrated to population level
- Based on Ecosystem Diagnosis & Treatment (EDT) platform
- Parameterized using reach-level environmental data
- HEC-RAS
- Riverware
- HEC-5Q 1-D Temperature



Model Setup

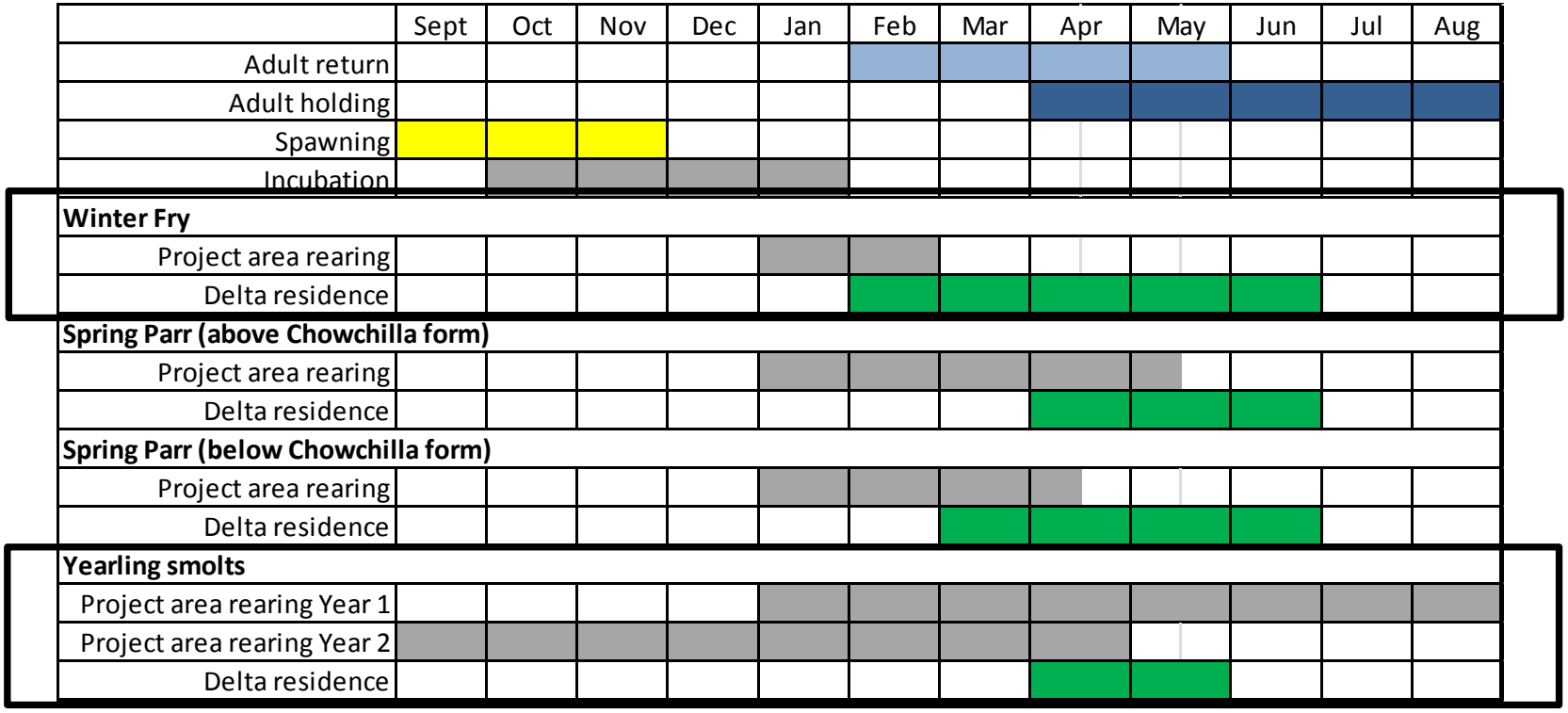


All scenarios analyzed under 3 water year conditions:

- Dry
- Normal-Wet
- Wet

Modeled Spring-run Chinook Life Histories

Hypothesized and evaluated alternative potential life history tactics

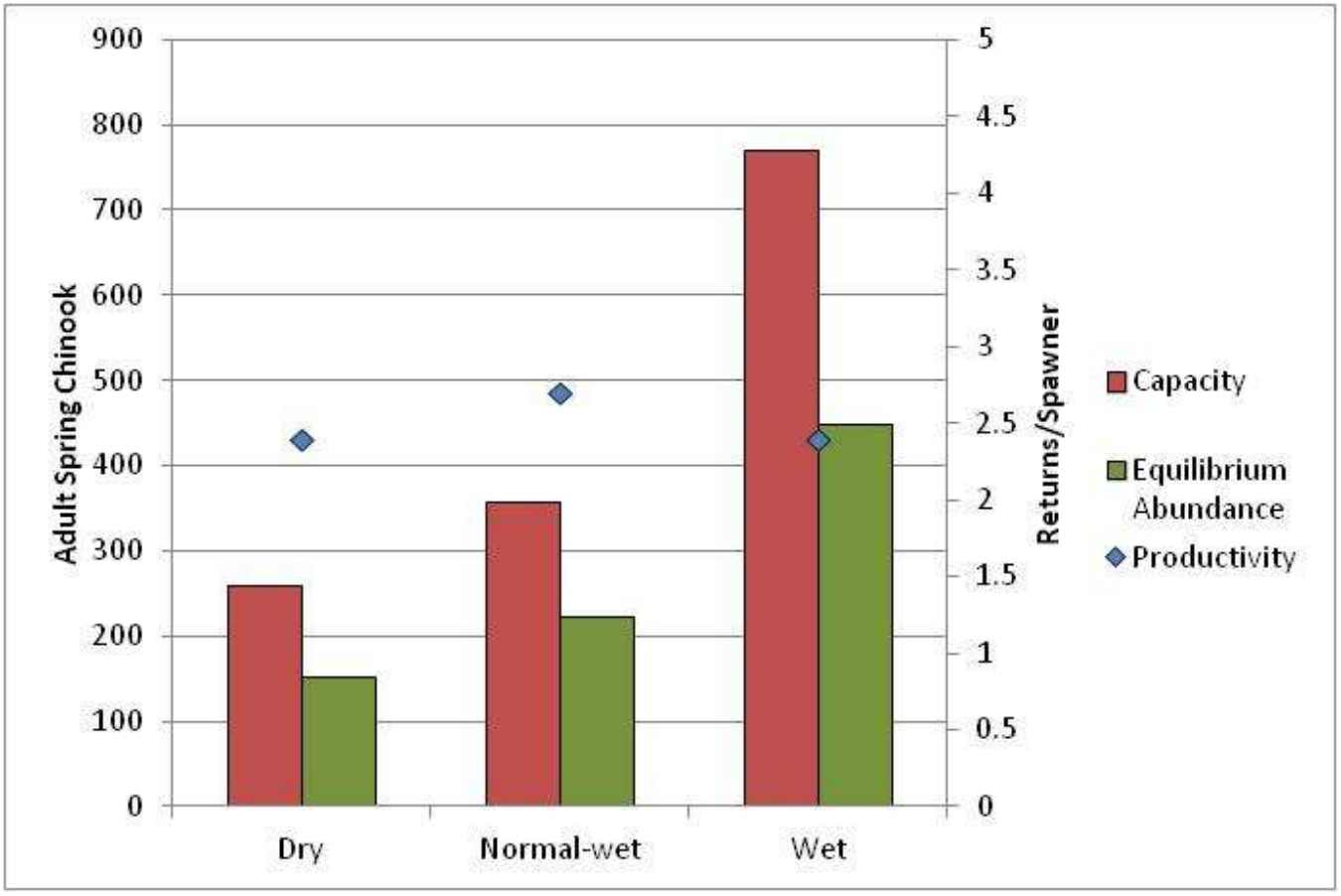


MINIMUM RESTORATION BASELINE

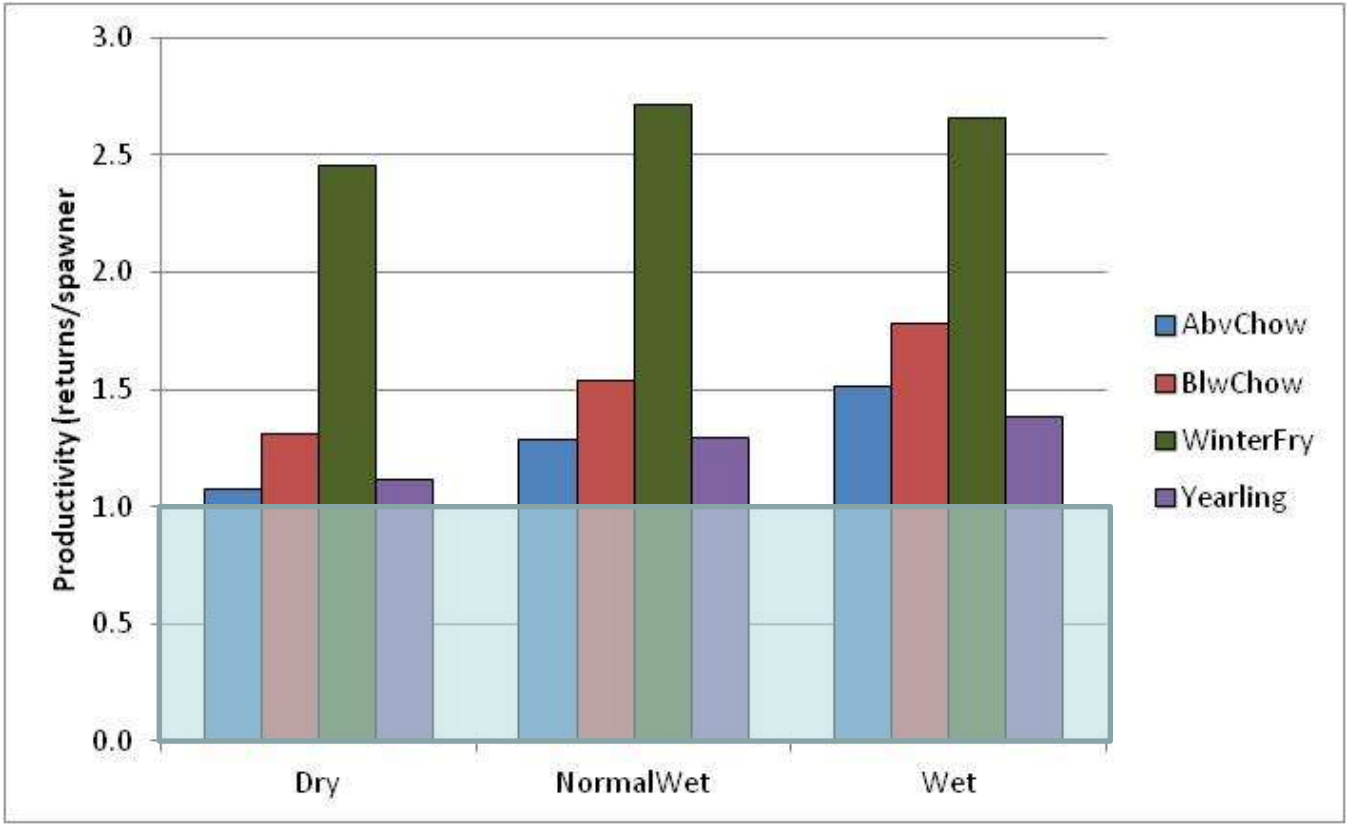
Minimum Restoration Scenario (base condition)

- Temperature Adjusted Settlement Agreement flow: 4500 cfs through Reach 2B
- Full fish passage at all existing barriers
- Baseline for comparison to all restoration alternatives

San Joaquin River Habitat Potential for Spring-run Chinook under Minimum Restoration



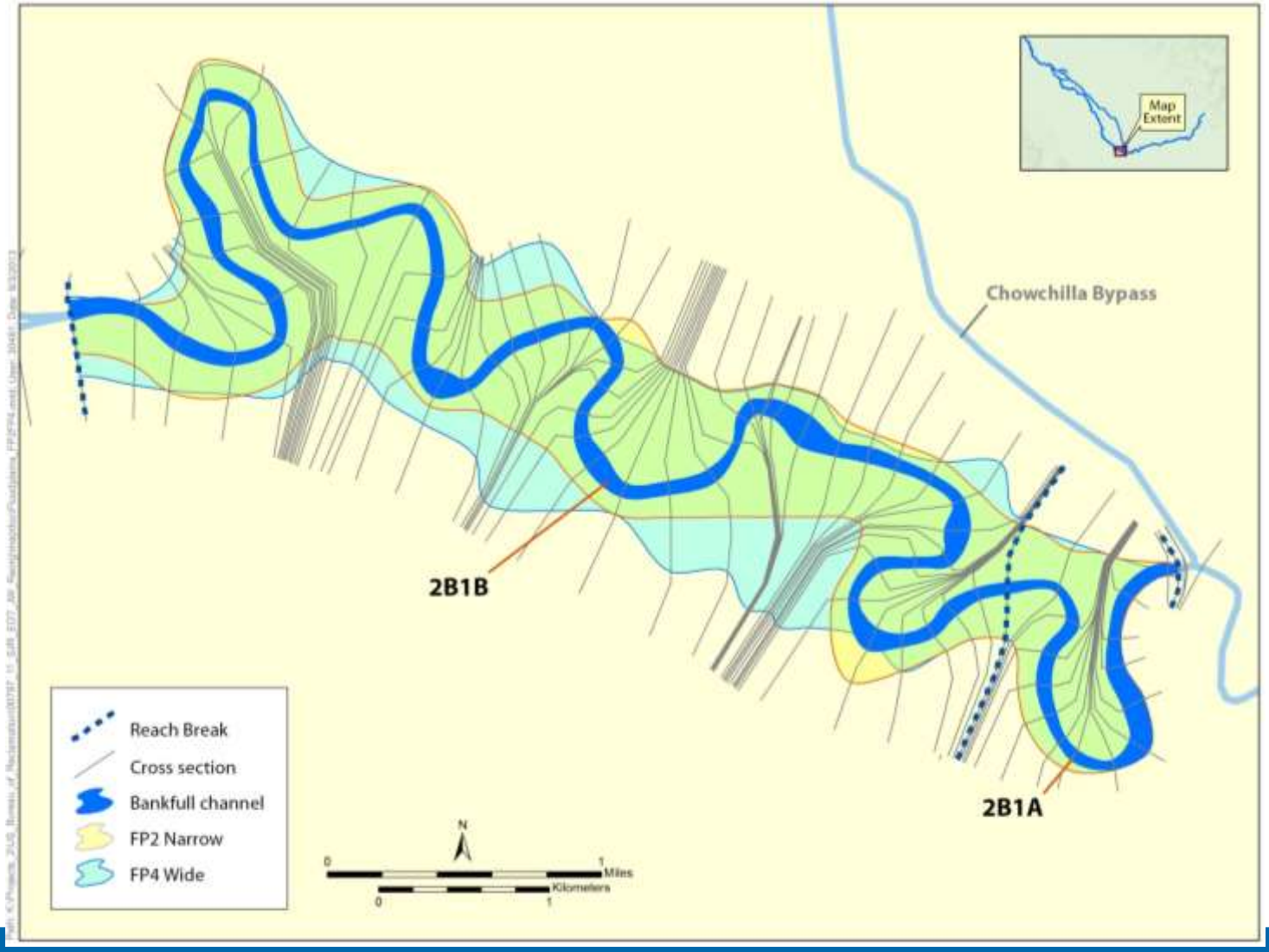
Integrated Performance of Spring-run Chinook Life Histories—Minimum Restoration



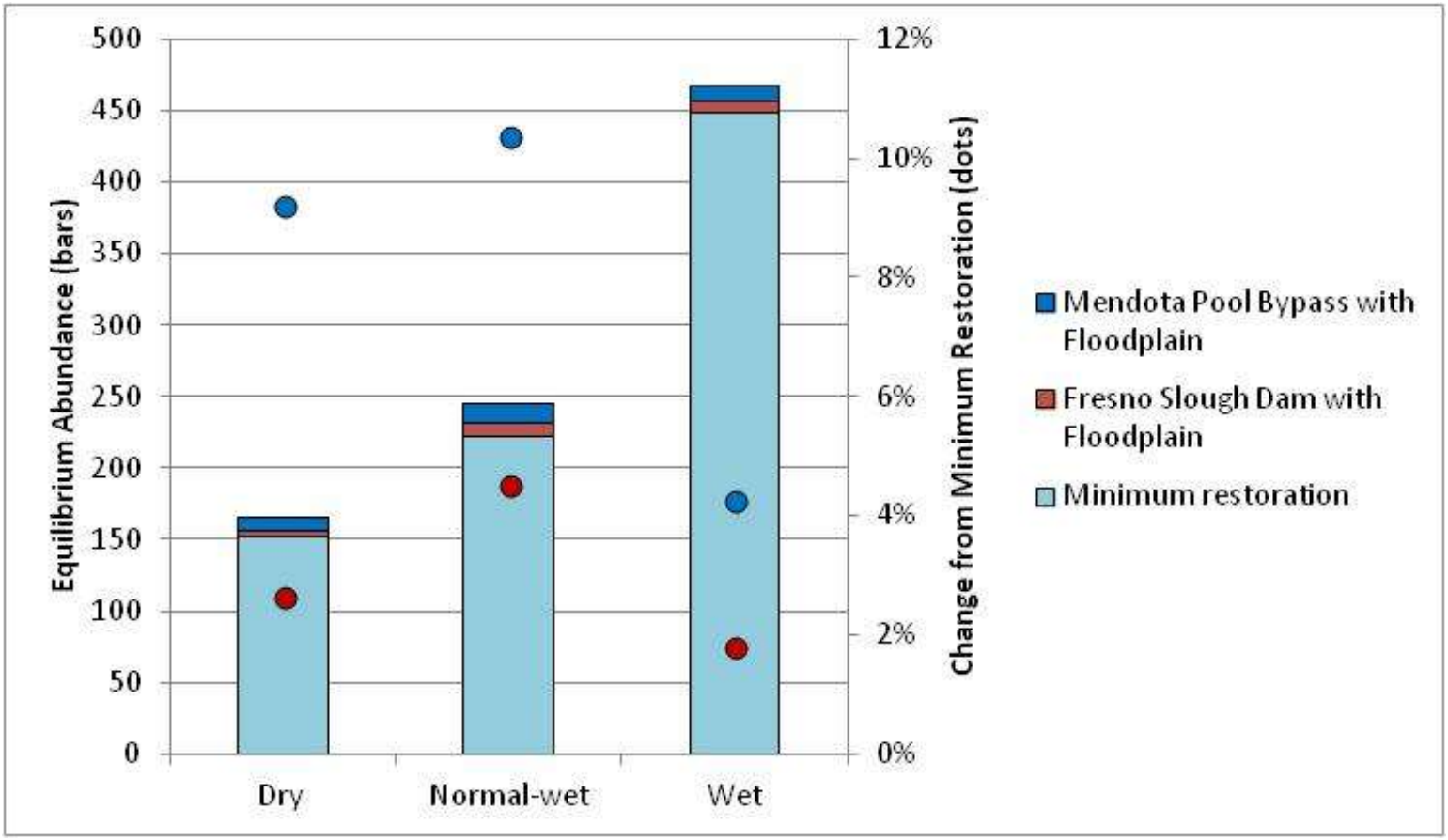
REACH 2B RESULTS

Reach 2B Project Area

Modeled Reach 2B Floodplain Restoration



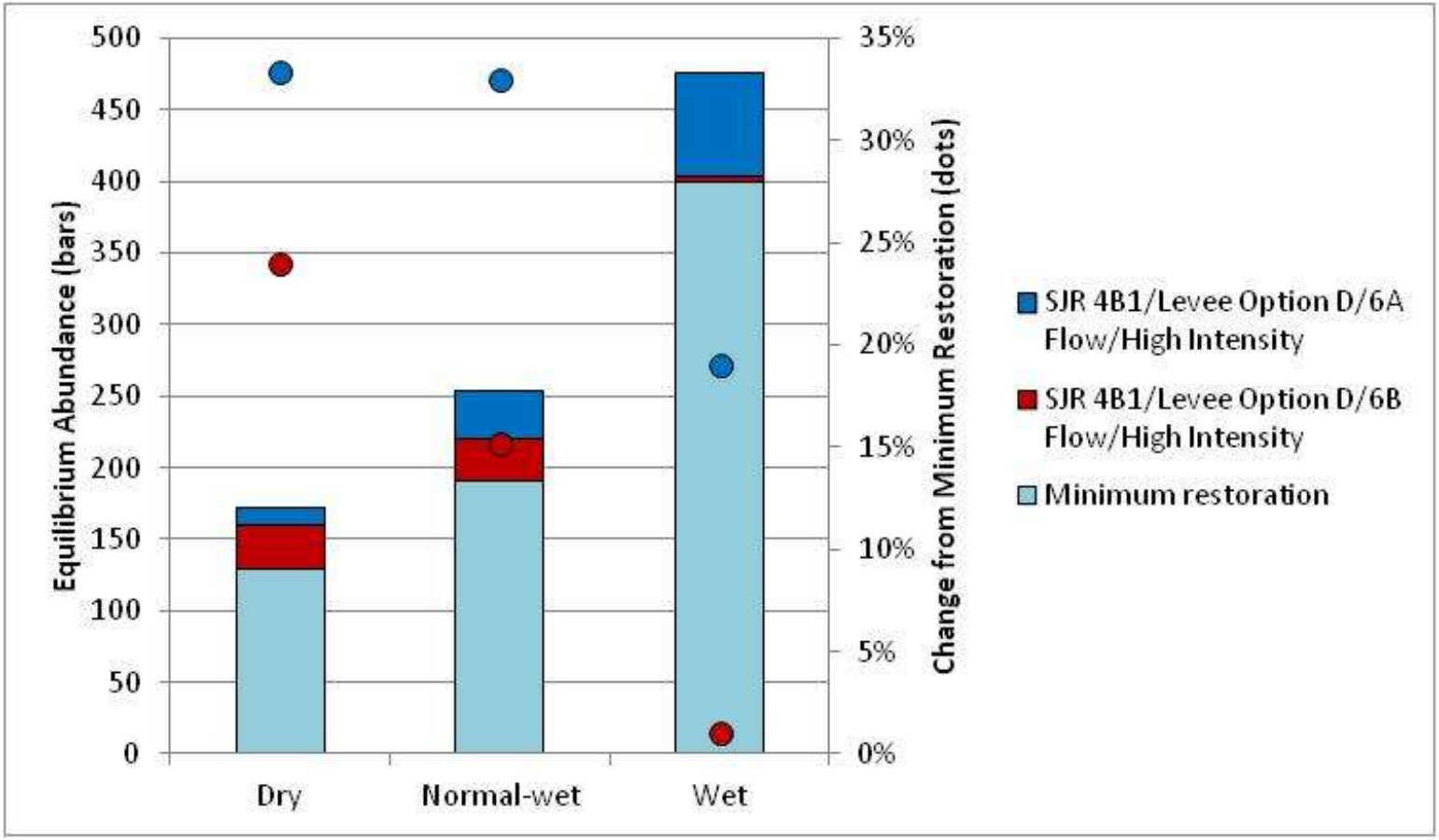
Reach 2B Restoration Combination Results



REACH 4B RESULTS

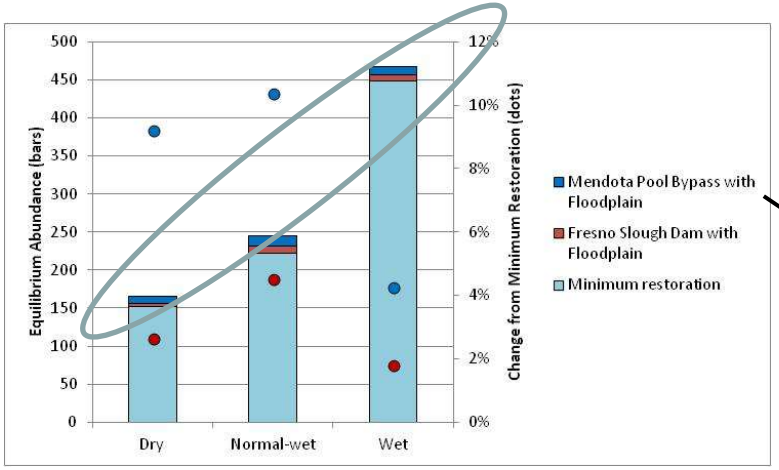
Reach 4B Project Area

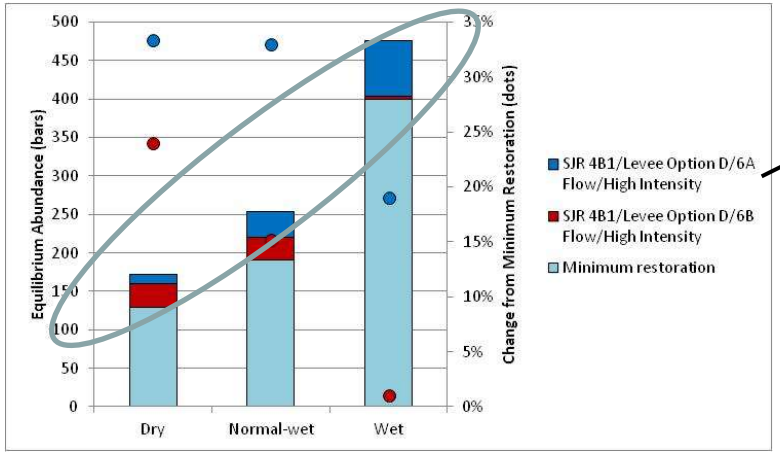
Reach 4B Restoration Combination Results



AGGREGATE RESULTS

Aggregate Scenario

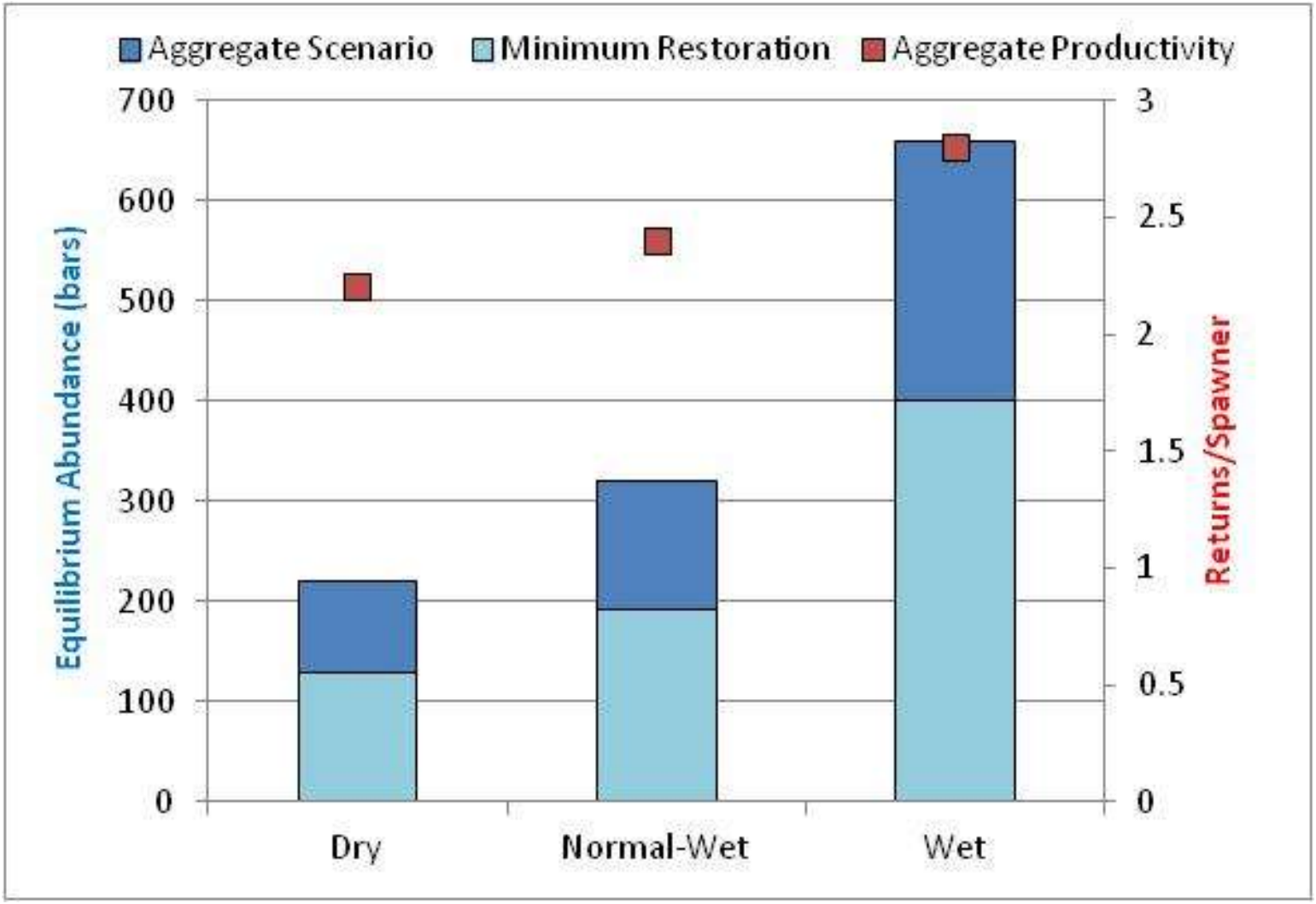




Other floodplain restoration (15%-30% increase in maximum width)

Aggregate Scenario

Results of Combined 2B and 4B Restoration on Spring-run Chinook



CONCLUSIONS: LESSONS LEARNED

Lessons Learned

- Lesson 1: The model provides the means to evaluate and compare restoration actions
- Lesson 2: Restoration of spring-run Chinook will require multiple actions throughout the project area
  - Actions act synergistically
  - Order of restoration matters
- Lesson 3: Large-scale constraints limit effectiveness of local actions
  - Rapid rise in water temperature downstream of Friant Dam
  - Lower San Joaquin and Delta issues
- Lesson 4: Restoration actions must be closely matched to fish life history
  - Floodplain inundation, flow and temperature sync with fish movement
- Lesson 5: Local and large-scale factors will limit spring Chinook abundance
  - Aggregate scenario=> 200-500 fish, productivity ~2.5 returns/spawner