

Conservation hatchery programs: it's not easy!

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Introduction

- CDFW operates ~40 hatchery programs
- Transition to using native stocks
- Developing guidelines for conservation hatchery programs
- Once in captivity, we "own" the results
- Minimize risk

Keeping "wild" fish wild



- Many negative hatchery effects
- Focus on long term viability
- Minimize ecological and genetic impacts
- It's all about risk...

A sense of purpose:

Restoration?

Rescue?

Recreational uses?

Who's responsible for success/failure?

Are the expectations reasonable and
results measureable?

Staffing and facilities

- Stable long term funding?
- Can the facility and staff handle the workload?
- Technical experts?
- Is the hatchery staff enthusiastic?

Rearing and fish culture

“Naturalized rearing”

Simulate rearing conditions

Low densities

Varied habitat

Natural light and cover

Rear all families under same conditions

Genetics: do we have the "right" fish?

Very relevant to inland trout!

Introgression?

Hybridization?

Population structure?



Genetics of source populations and preserving genetic integrity

- Is there anything left to preserve in small pops?
 - Can be "functionally extinct"
 - May not retain any significant diversity over all brood years
 - May not retain adaptive features, and likely has little adaptive potential
 - Amplification of small numbers of individuals can cause more harm than good
- Potential for natural migration from a nearby genetically and ecologically similar stock?
- Potential for natural stock improvement with artificial propagation supplementation over time (phased approach to recovery)

Inbreeding: keepin' it in the family

- Inbreeding depression well documented
- Function of *effective size* (N_e)
- Often $N_e \ll$ Number of breeders
- Builds up over time – may not be obvious until damage is done!

Broodstock genetic management

Need a GMP!!

Lots of management options:

Active management (\$\$\$)

Periodic monitoring (\$\$)

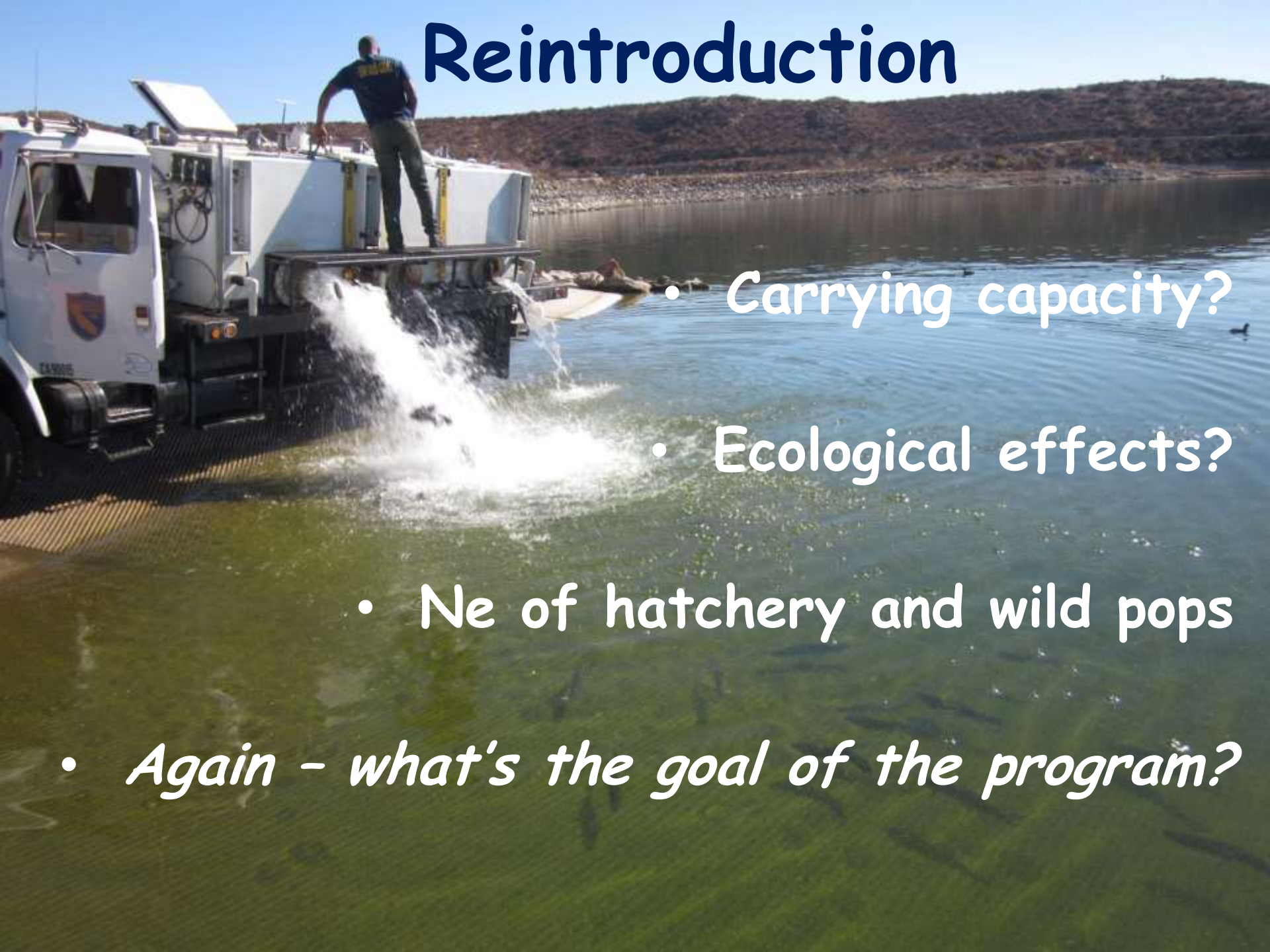
Various breeding schemes

All require careful
tracking and mating

Mistakes might not be fixable!



Reintroduction

- 
- A white truck with a large pump is discharging water into a lake. A person is standing on the truck's platform, and the water is splashing. The background shows a lake and a hill.
- Carrying capacity?
 - Ecological effects?
 - Ne of hatchery and wild pops
 - *Again - what's the goal of the program?*

Release Strategies

- Location(s) and timing
- Size and numbers at release
- Life-stage(s) released
- Balance isolation and gene flow
- Effective population size of HO + NO population
 - Ryman-Laikre effect
- Maintain natural spawning areas with little or no hatchery influence?

Using headwater trout pops

Particularly problematic...

- Low population sizes
- Reduced genetic diversity
- Taxonomic status and "purity"?
- May require more genetics management

Monitoring: are we making a difference?

Domestication selection?

Performance of hatchery fish?

Genetic changes in wild pops?

Demographics of wild pops?

Some reading materials:

- **Fisch KM et. al 2015** Fish Hatchery Genetic Management Techniques: Integrating Theory with Implementation. *North American Journal of Aquaculture*, 77:3, 343-357
- **Flagg, T.A., and C.E. Nash (eds). 1999.** A conceptual framework for conservation hatchery strategies for Pacific salmonids. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-NWFSC-38, 46 p
- **Kostow K. 2012.** Strategies for reducing the ecological risks of hatchery programs: Case studies from the Pacific Northwest. *Environ Biol Fish* 94:285–310
- **Hatcheryreform.us** – HSRG reports and recommendations