

Type N Hard Rock Study: Post-harvest genetic diversity for three stream-associated amphibians



Landscape and Wildlife Advisory Group (LWAG)

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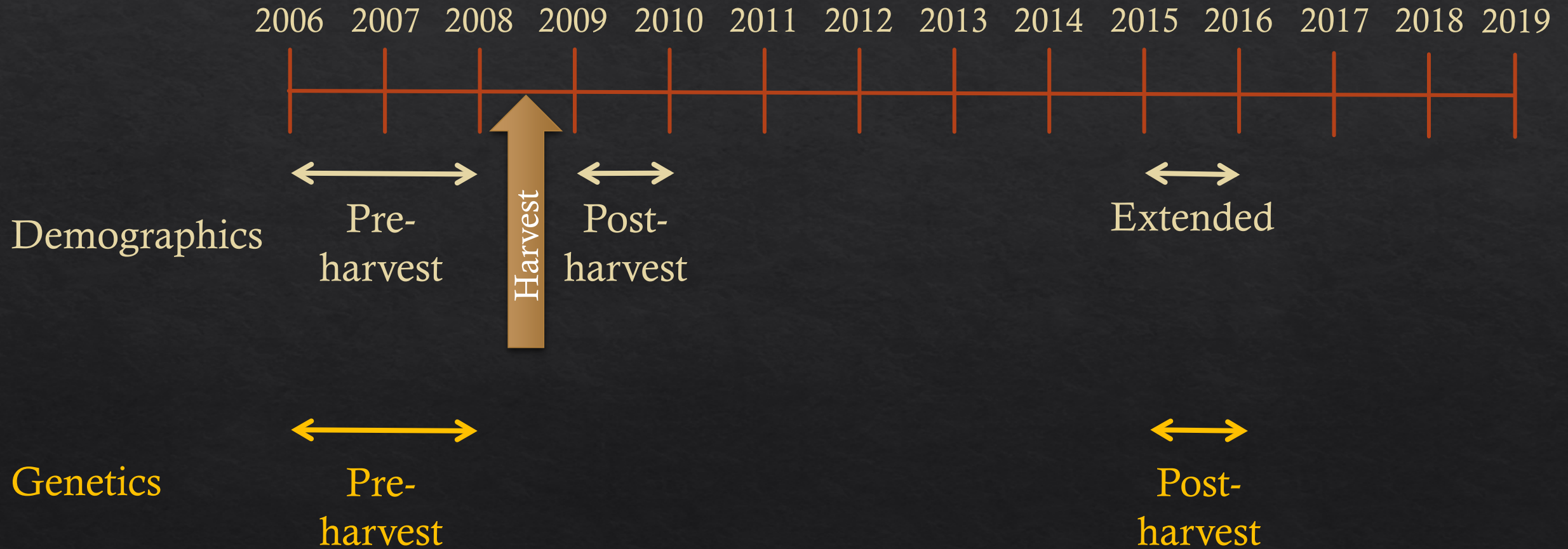
Study Objectives

Evaluate effectiveness of alternative riparian buffers on non-fish-bearing perennial (Type Np) streams:

- **amphibian occupancy, density, and genetics**
- riparian stand characteristics
- water quality
- primary production
- exports to fish-bearing streams
- response of fish downstream



Timeline – Study Periods for Amphibian Response



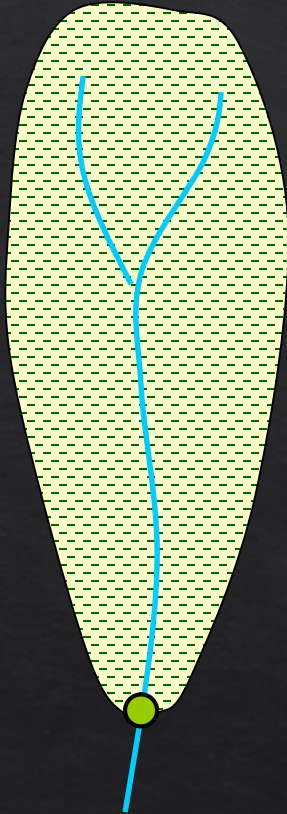
Study Sites

- Perennial, non-fish streams
- Hard rock lithology
- Managed 2nd-growth forests
- Private/state/federal timberlands
- 30-80 yr old stands
- 31-133 ac basins

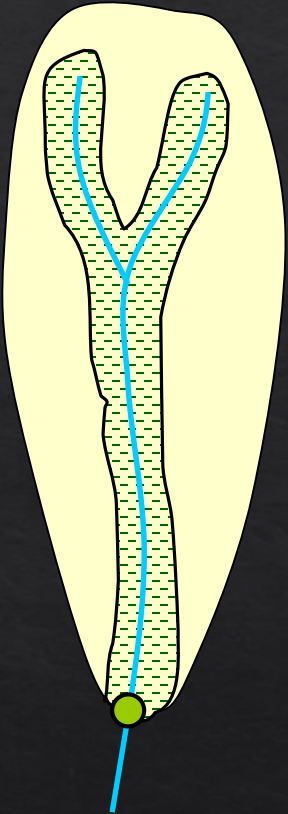


Experimental Treatments

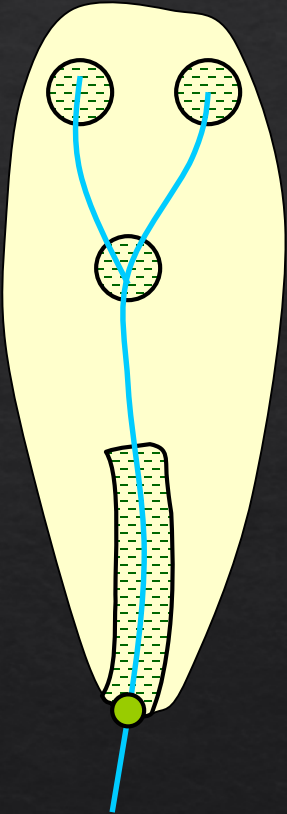
Unharvested
Reference



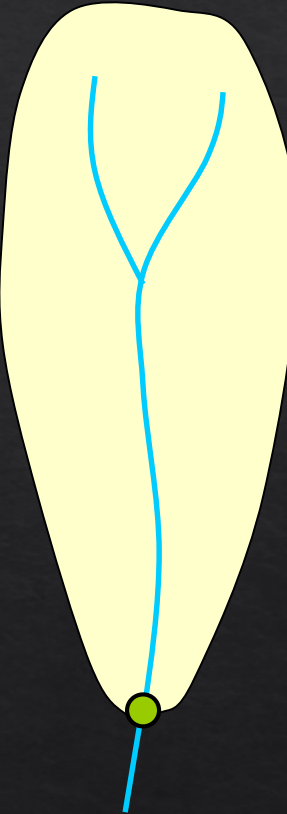
100%



FP



0%



 = Type N basin

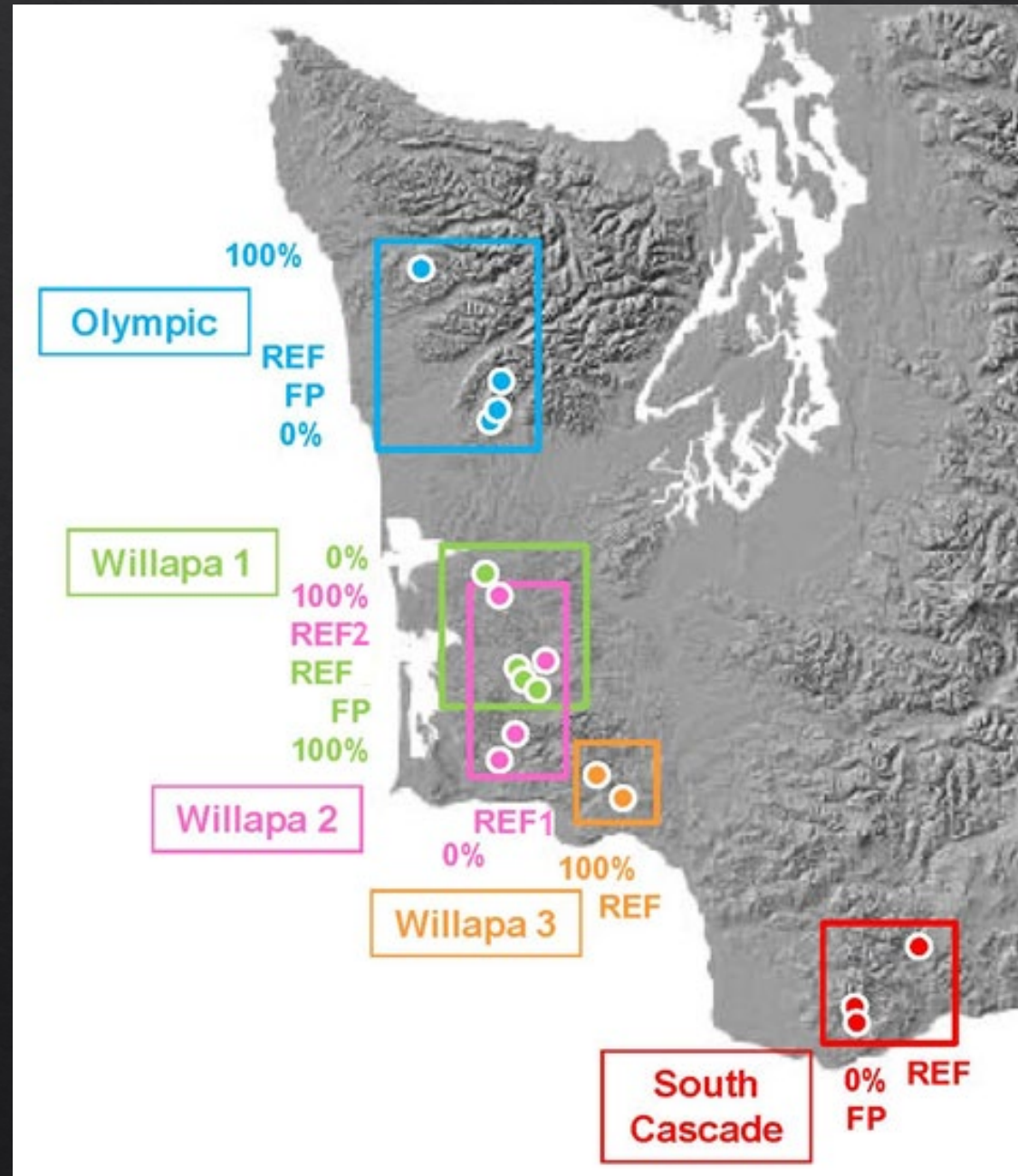
 = unharvested / 50-ft buffer

 = stream

 = fish end point

Study Sites

- 17 study sites
- Blocked geographically
(5 blocks, 2-4 sites each)



Why Genetic Monitoring?

- Relative ease of sampling
- Identify family relationships
- Relevant to evolutionary potential
- Help predict future change
- DNA can be archived



Stream-associated Amphibians



Coastal Tailed Frog
(*Ascaphus truei*)

Cope's Giant Salamander
(*Dicamptodon copei*)



Coastal Giant Salamander
(*Dicamptodon tenebrosus*)

Data Analyses

BACI (Before-After Control-Impact)

- *Before-After* – pre-/post-harvest; evaluate harvest effect
- *Control-Impact* – reference/treatment; account for environmental variability



Genetic Metrics

- Species ID/Hybridization: Increase = reduced fitness
- Full Sibling Groups: Increase = reduced effective population size
- Allelic Diversity: Decrease = reduced fitness
- Observed Heterozygosity: Decrease = reduced fitness
- Inbreeding Coefficient: Increase = inbreeding depression
- Genetic Bottlenecks: Increase = reduced population size
- Population Clustering: Increase = reduced movement across area
(*impacted by out of site factors*)

Interbreeding (two species); Inbreeding (close relatives); Genetic diversity/variation;
Successful reproduction; Movement (immigration/emigration)

Results

Coastal Tailed Frogs

- Greatest genetic diversity / gene flow
- Evidence of population reductions but not related to treatment
- No change in migration

Cope's Giant Salamander

- No change in hybridization
- Some evidence of population reductions but not related to treatment
- Some evidence of increased migration in 100%

Coastal Giant Salamander

- No evidence of population reductions
- Evidence of increased migration in 100% and 0%



Conclusions

- No evidence of severe population declines
- Limited opportunity to detect change
- Preliminary demographic results indicate declines in Coastal Tailed Frog
- Rare opportunity for long-term genetic monitoring before and after disturbance
- Increased power after one or more generational turnovers
- New genetic tools with more power now available