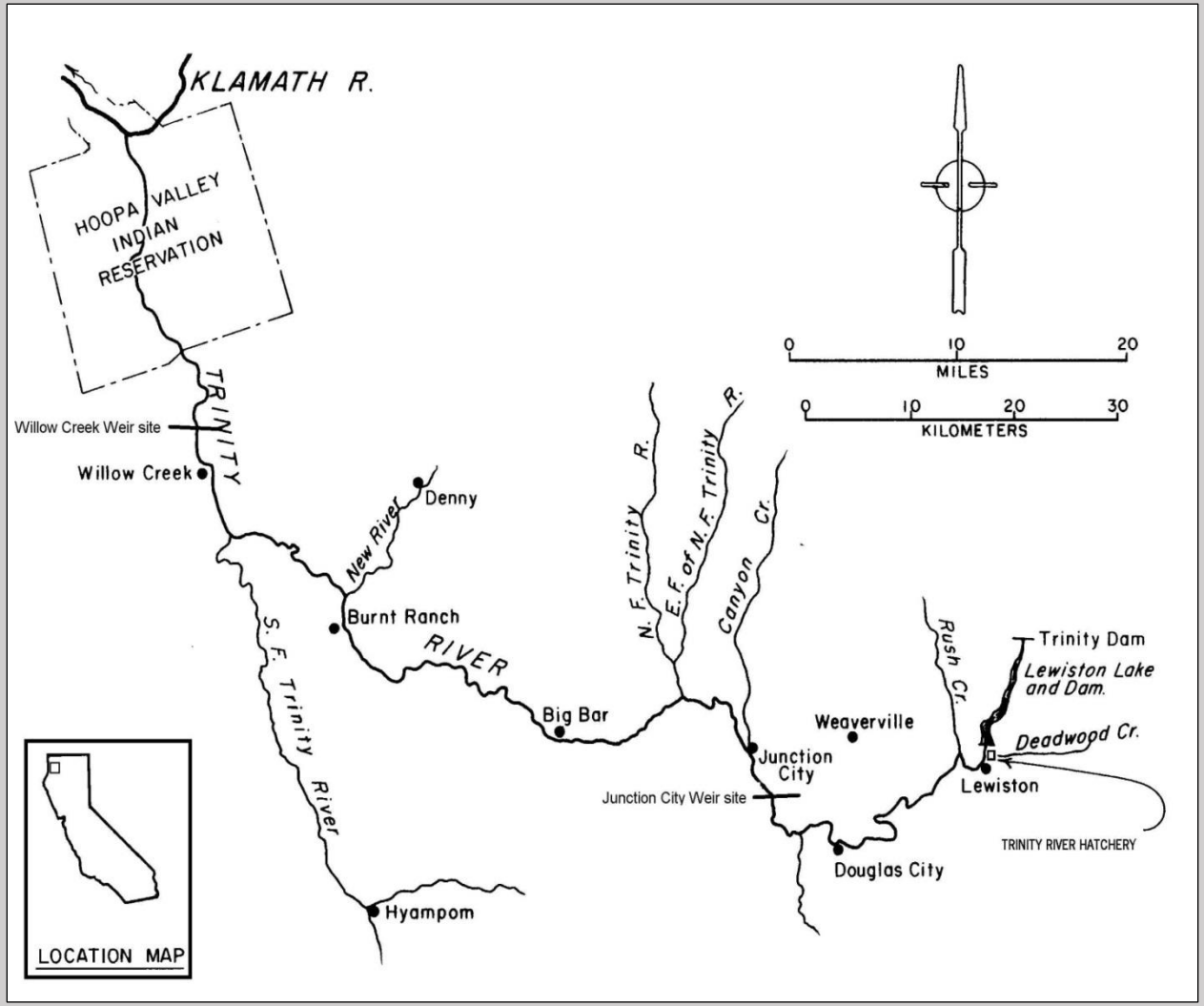
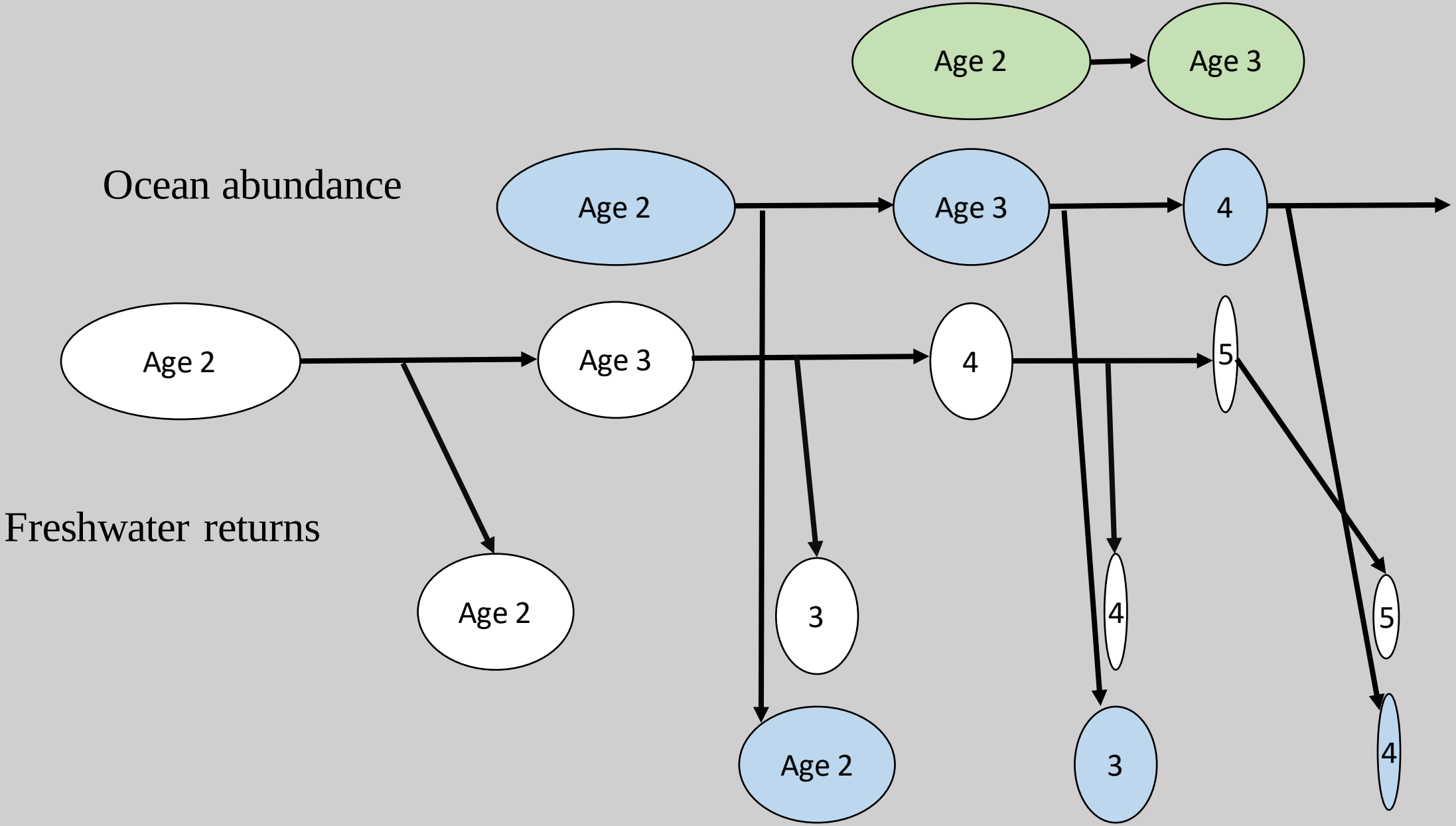
Introduction to Cohort Reconstruction for Trinity River Naturally-produced fall Chinook Salmon



Objectives

- What is a cohort reconstruction?
- Brood year production vs. run year escapement?
- Why is it important for TRRP to do this work?
- Status of the project and expected outcomes

What is a cohort reconstruction?



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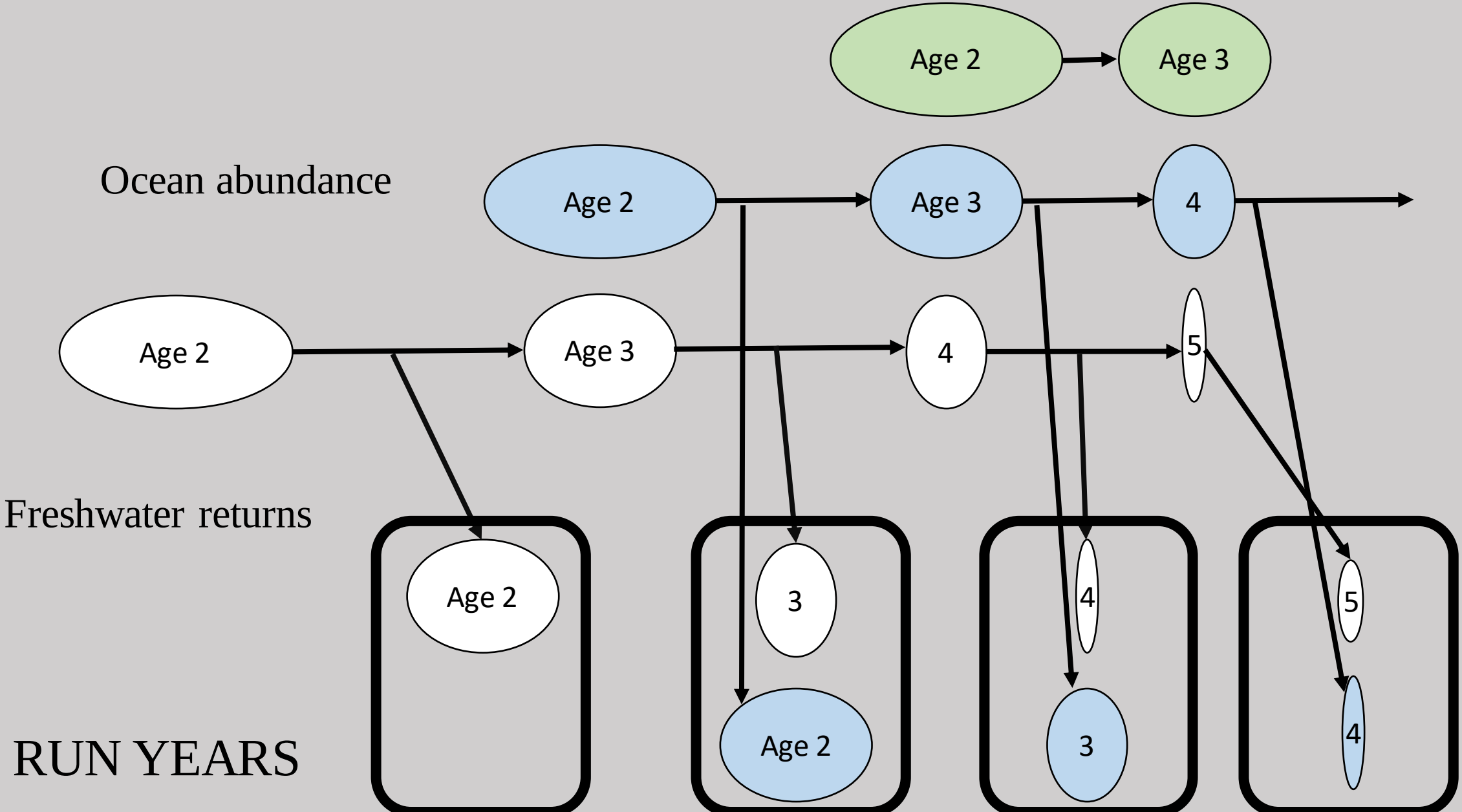

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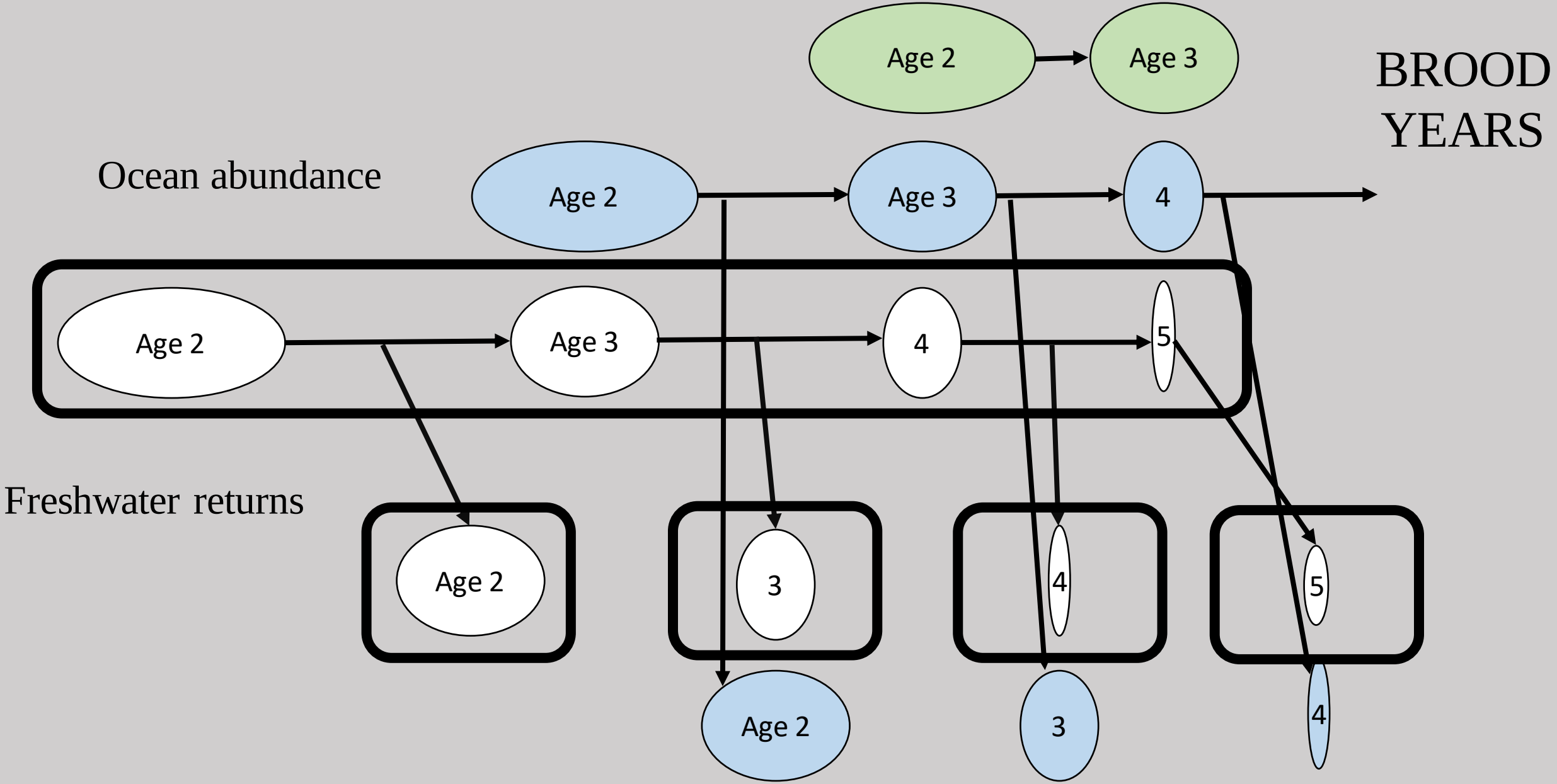

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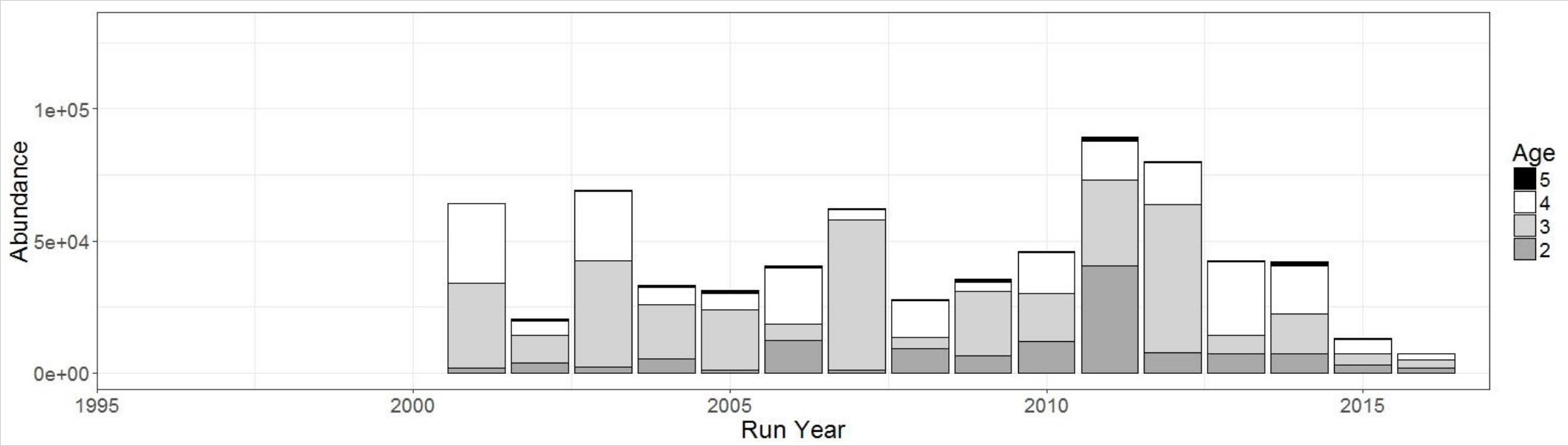


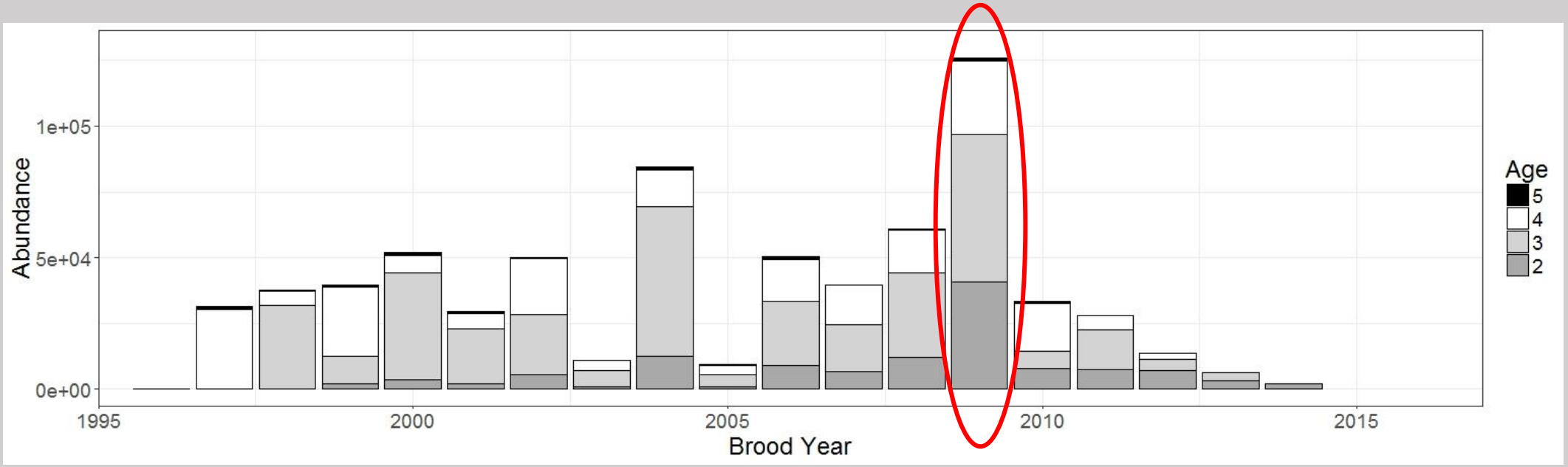
Each year we estimate the age-structured freshwater return of fall Chinook:
"How many fish came back"

- The common adult metric we all intuitively understand
- Used for management decisions (e.g., harvest opportunities)
- Commonly used for evaluation of restoration performance (e.g., TRRP objectives)

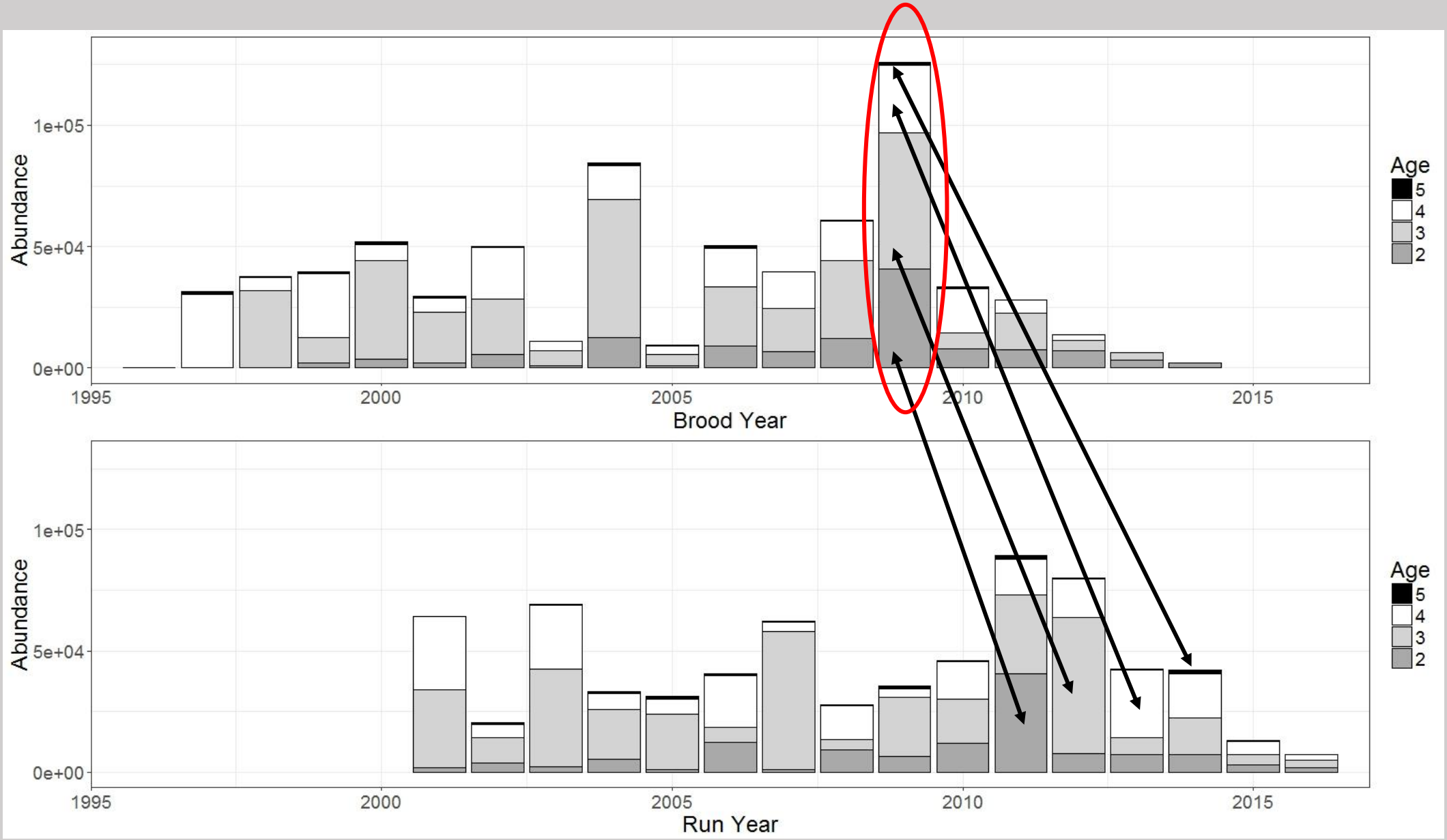
What is a cohort reconstruction?

Retrospectively combine abundances at age:
"How many fish were produced"

- A bit more abstract
- Often a critical "under the hood" component of fisheries management (e.g., KOHM)
- Provides an additional tool to evaluate restoration performance



What is a cohort reconstruction?



Brood year production vs. run year escapement

Run Year Escapement
Cohorts are mixed in a given year

- Obscures signals of brood year performance
- Cannot evaluate early life survival/production
- Cannot relate survival/production to causative factors

Brood Year Production (i.e., cohort reconstructions)
Cohorts are combined to their year of origin

- Direct metric of brood year performance
- Best adult metric to evaluate early life survival/production
- Allows survival/production to be compared to causative factors (e.g., disease, drought, ocean conditions)

Why is it important for TRRP to do this work?

- Best indicator of adult production
  IAP objective 3:
  "Restore and maintain natural production of anadromous fish populations"

- Best data for contributions to dependent fisheries
  IAP objective 4:
  "Restore and sustain natural production… to facilitate dependent tribal, commercial, and sport fisheries…"

- Most appropriate data for smolt:adult metric
  full life cycle model

- Most appropriate data to estimate total harvest on the Trinity stock

Status of the project

- TRRP partners: CDFW, USFWS, Hoopa tribe
  non-TRRP partners: CDFW Ocean Salmon Project, NMFS Southwest Fisheries Science Center

- Model identified – R implementation of KOHM cohort reconstruction submodel (*mostly*)
  - beta testing started

- Final methods for estimating lower Klamath impacts

Status of the project – lower Klamath harvest

Assumption: age-specific proportions of TRH vs. IGH fish harvested in a given sector are equal to the proportions of Trinity vs. Klamath natural-origin fish harvested in that sector

more specifically, for each age:

$$\frac{H_{tf}}{H_{tf} + H_{kf}} = \frac{H_{tn}}{H_{tn} + H_{kn}}$$

H = Harvest
t = Trinity-origin
k = Klamath-origin
f = hatchery-origin fingerlings
n = natural-origin fish

Status of the project – lower Klamath harvest

Benefits

- Only requires data collected from harvest sectors in which estimates are derived
- Cannot estimate more harvest of Trinity natural-origin fish than total estimated natural-origin
- Method applies equally to Klamath vs. Trinity stocks – could be used in a Klamath-specific cohort model

Drawbacks

- Sensitive to sample sizes of CWT recoveries (same for all methods)
- relies on some assumptions about run timing of components (hatchery and natural) of individual stocks (Trinity and Klamath) as they relate to the timing of harvest

Expected outcomes

- Brood year-specific estimates of total production (harvest and escapement)
- Contributions to dependent fisheries by sector (e.g., Tribal, recreational, ocean)
- Appropriate adult data for smolt:adult ratios
- Evaluation of trends in adult production
- Appropriate data for full life cycle model
- Tool (method) for continuing this work into the future