

Assessing Extinction

Part 1: Jason Baumsteiger
Understanding Extinction

Part 2: Peter Moyle
Extinction in California fishes



UCDAVIS

CENTER FOR WATERSHED SCIENCES

What is extinction?

Examples from California

GRAY EXTINCTIONS

1. Mitigated extinction
2. Regional extinction
3. Extinct in native range
4. Extinct in the wild

FULL EXTINCTIONS

1. Apparent extinction
2. Complete (global) extinction



Tecopa Springs pupfish

Gray extinction

Mitigated extinction

- Conservation-reliant species
- Extinct without human help.



Photo by Robert Campbell

Winter-run Chinook salmon

Gray extinction

Regional Extinction

- Species still extant, but extirpated from distinct part of native range.



2ND TO LAST

BULL TROUT

CAUGHT in CA

SEPT. 1975

Gray extinction

Native Range Extinction

- Still extant as wild populations but absent from native range
- Delta



Sacramento perch

Gray extinction

Wild Extinction

- entirely maintained by captive populations
- no presence in a natural environment.
- extreme conservation-reliance.

Mohave tui
chub

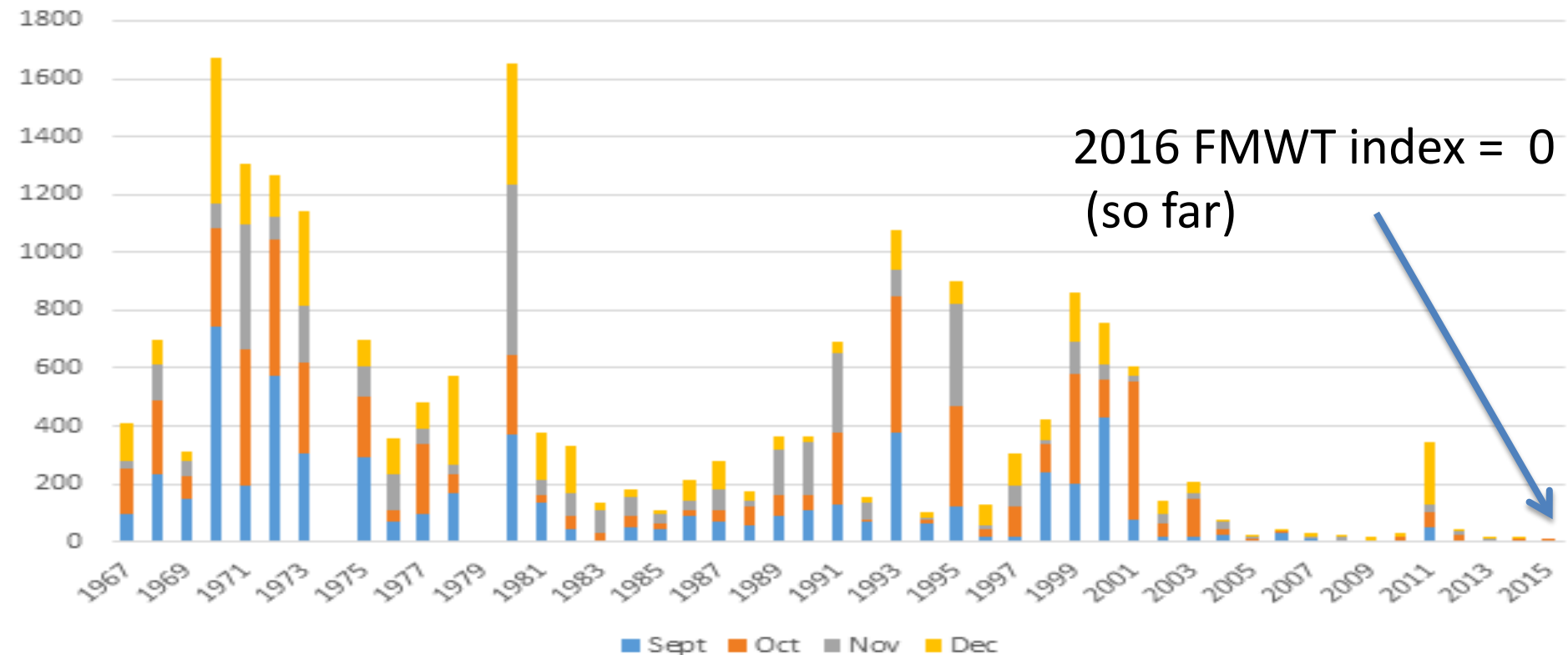


Delta smelt: extinction in wild is likely



Graph by Tom Cannon

Delta Smelt Midwater Trawl Survey



Gray extinction

Apparent Extinction

- Species so rare, no one sees them any more; unverified extinction.
- Next stage for delta smelt?



IUCN (1994): a species is extinct “when there is no reasonable doubt the last individual has died.”



High Rock Springs
Tui Chub
Gila bicolor subsp?
Last seen: 1989

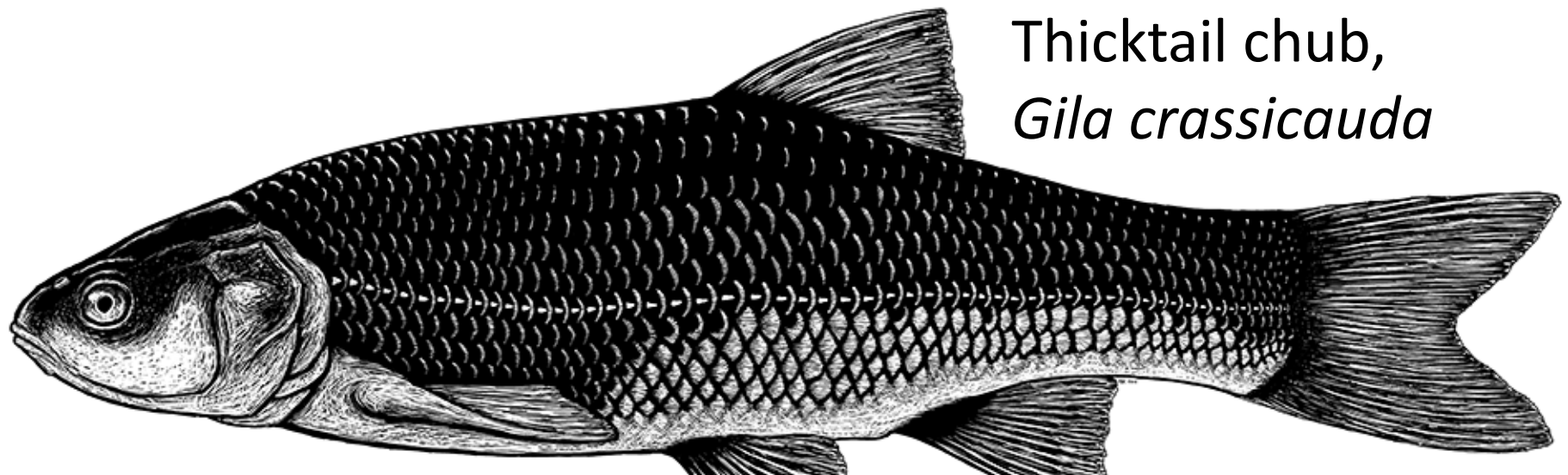
Black and white extinction

Global (absolute) extinction

- A species which is no longer present in wild or in captive populations on planet Earth.

3 known globally
extinct species in CA
since surveys began





Thicktail chub,
Gila crassicauda



Clear Lake splittail,
Pogonichthys ciscooides

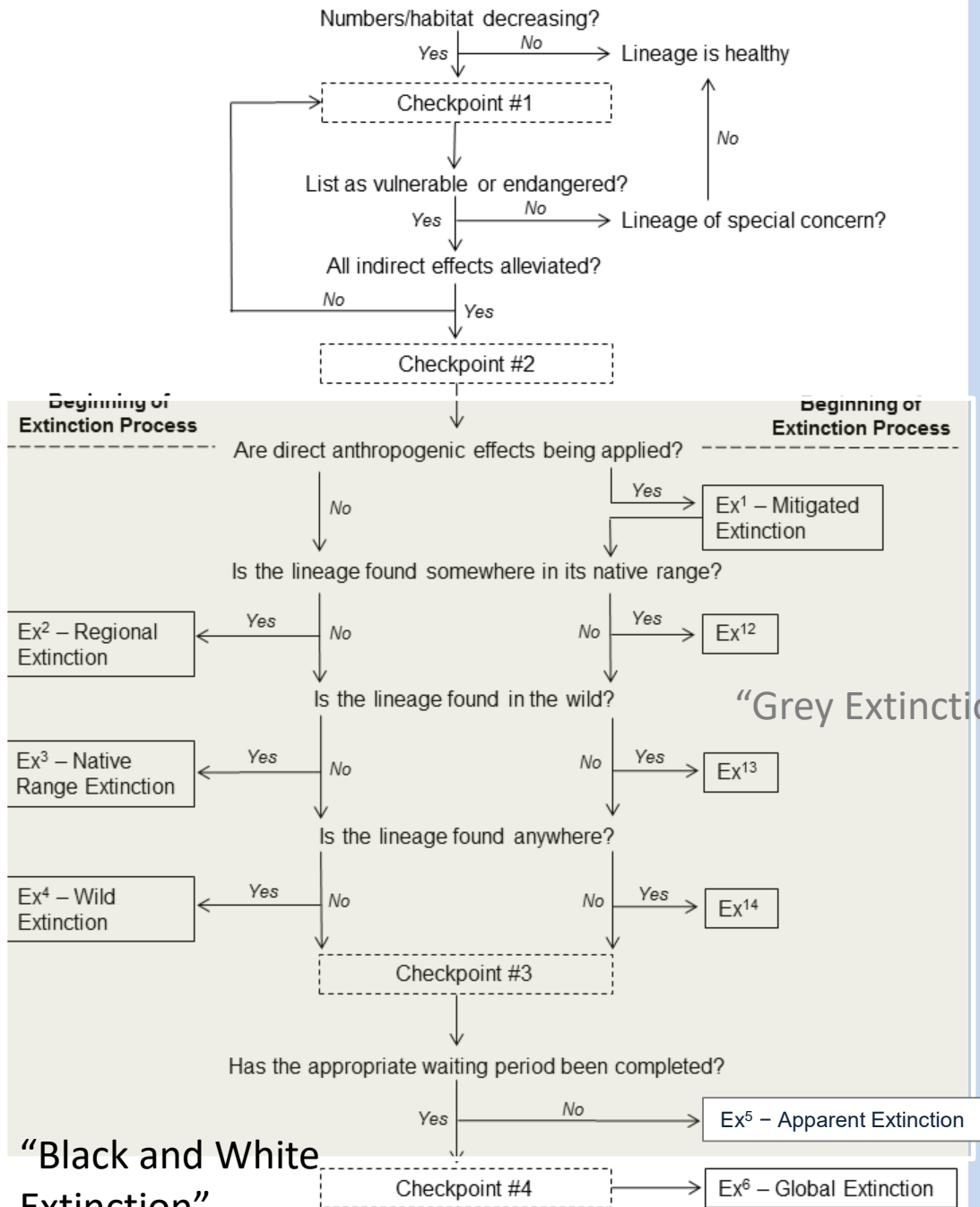


Wikipedia

Tecopa pupfish, *Cyprinodon nevadensis calidae*,



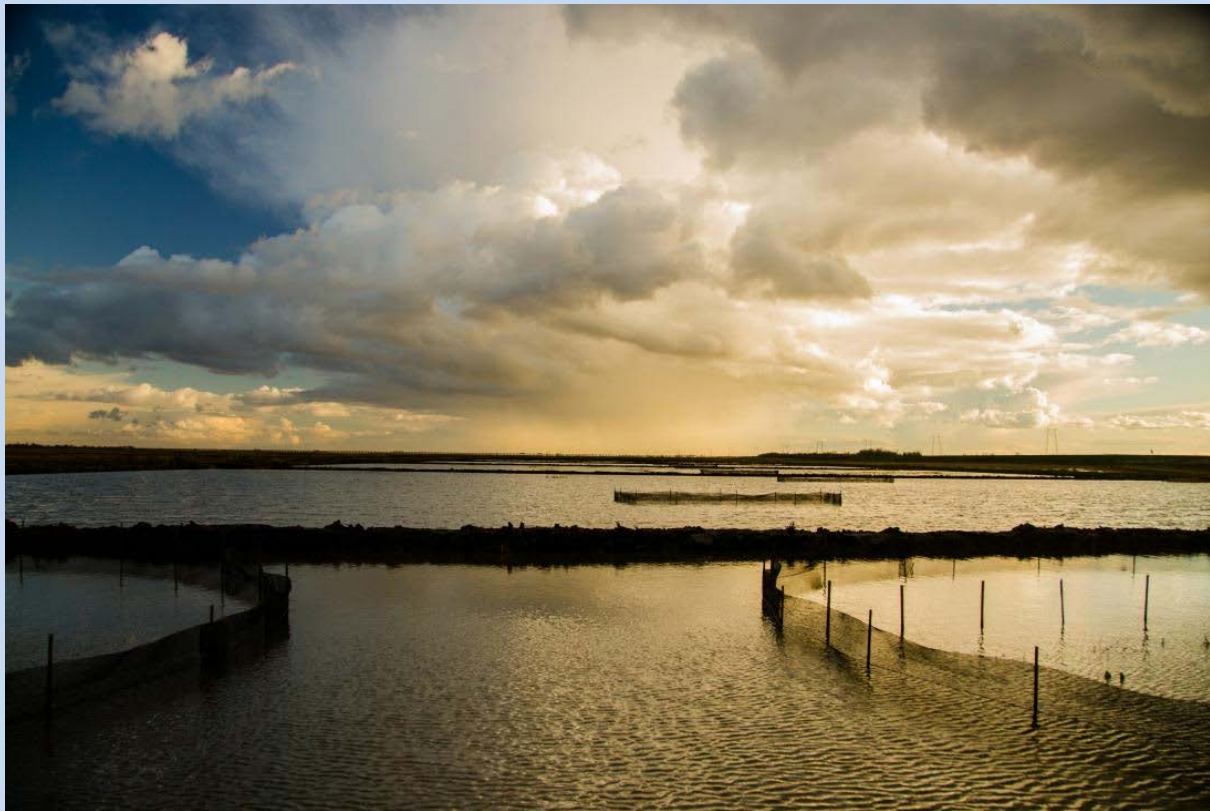
8 Steps to declaring extinction in California



National Geographic

1. Determine recovery measures have failed

including extraordinary measures

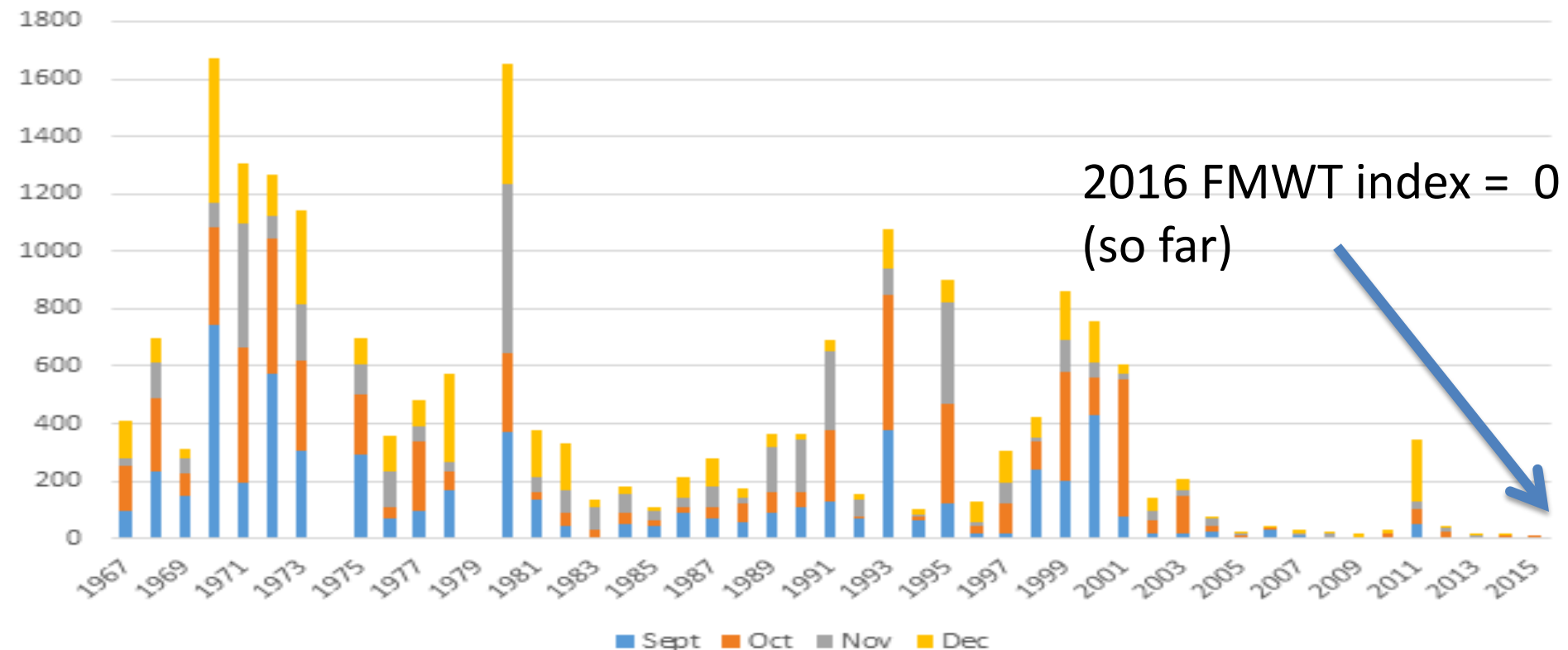


Experimental outplanting of captive delta smelt?

2. Determine absence from routine surveys



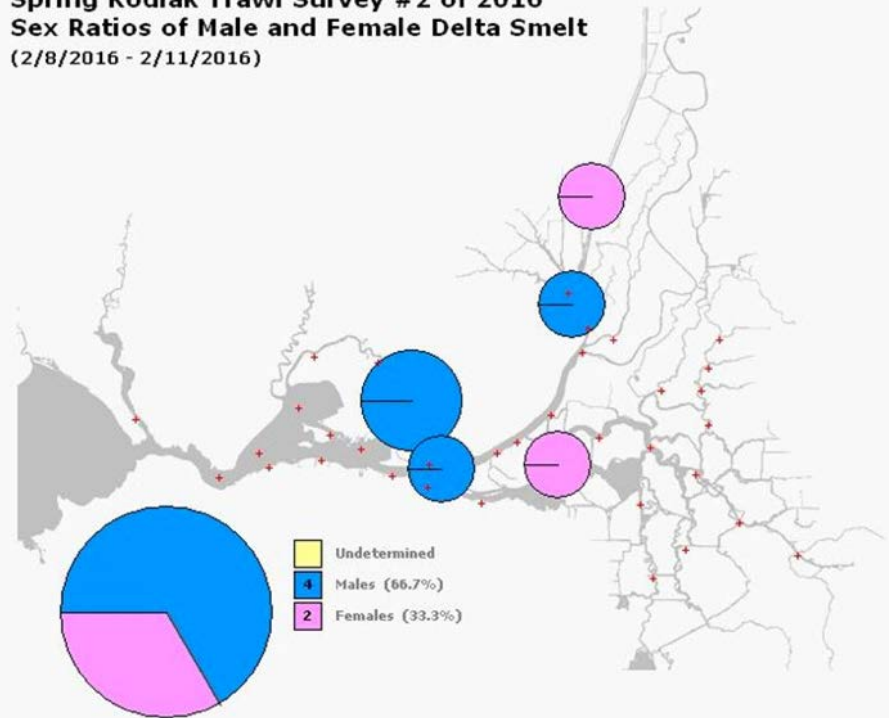
Delta Smelt Midwater T



3. Conduct intensive surveys in likely and unlikely places



Spring Kodiak Trawl Survey #2 of 2016
Sex Ratios of Male and Female Delta Smelt
(2/8/2016 - 2/11/2016)



4. Go back to routine surveys for x generations

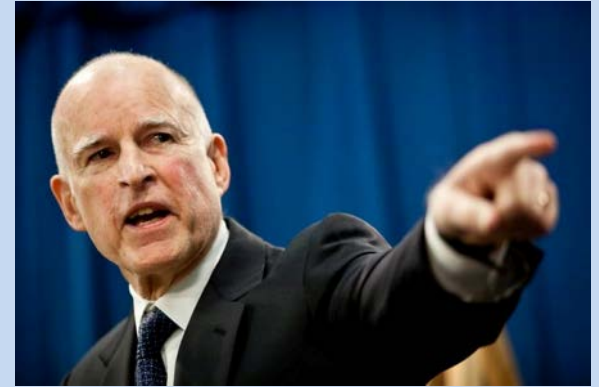
- Generation time 1-5 years = 10 generations
- Generation time 5+ years = 5 generations



Delta smelt = 10 or 20 years

Final Steps

5-8



5. Determine likelihood species is still extant
 1. Expert opinion
 2. Data
 3. Modeling
6. Present findings to multi-agency Committee
7. Committee makes recommendation to
Director of CDFW or FG Commission
8. Governor declares extinction

Extinction: summary

- Likely to be common in future in CA
- Gray vs Black and White
- Formal process needed for determination.

?



Is Delta Smelt our Test Case?

- Absent/rare in routine surveys
- Captive populations
 - Aquaria animals?
 - How many years 'til declared domesticated?
 - Experimental introductions?
- Who determines extinction?



Questions?