

# CWT Tagging Levels

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*An updated  
Review*

*April 2019*

# Problems with CWT Program

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- Decrease in survival
- Decrease in fishery harvest
- Redistribution of CWTs to fisheries where CWT recoveries and accurate estimates of total catch are more difficult to obtain
- Increase in escapement, including strays to natural spawning grounds
- Complications from mass marking and mark-selective fishing

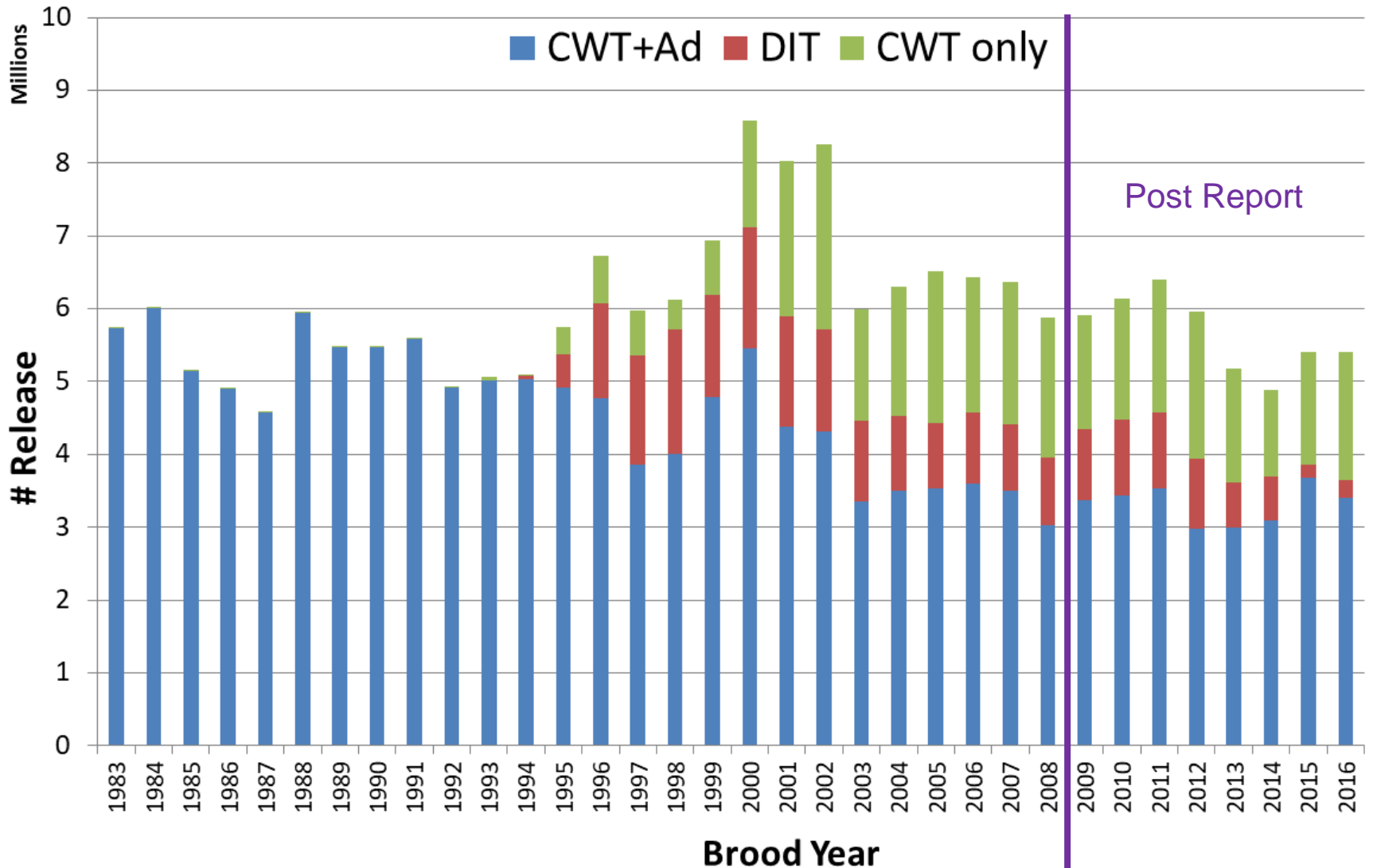
- ⇒ Decrease in number of CWTs recovered
- ⇒ Increase in statistical uncertainty

# 2008: PSC CWT Working Group

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- Reviewed the past performance of the CWT program
- Assessed its current status
- Developed guidelines to improve the statistical basis for the future program
- Recommended agencies further review their programs and attempt to meet the following criteria to achieve desired precision

# Coho Indicator Tag Releases (AK, BC, SUS)



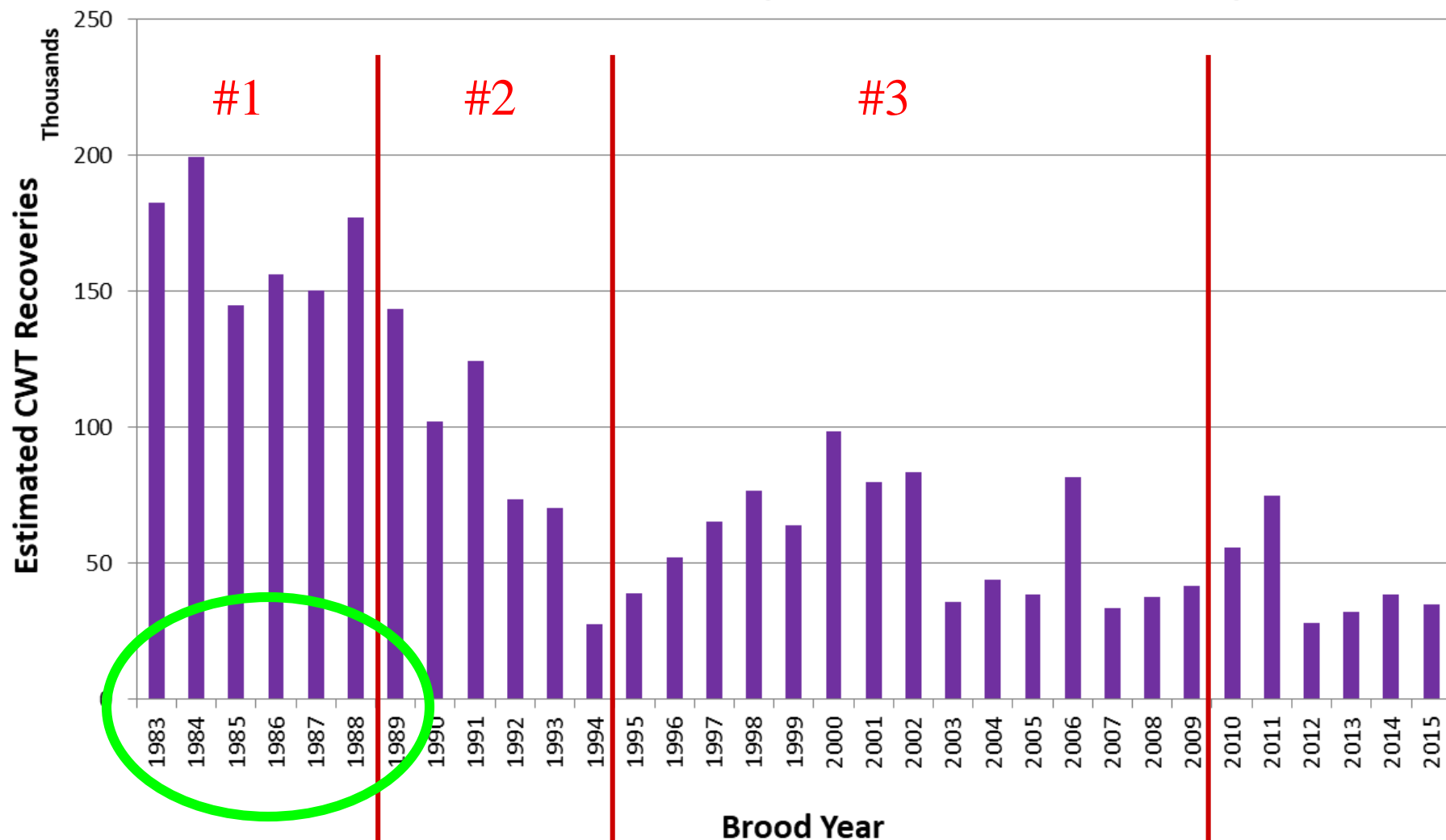
# Uses of CWTs

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- Individual assessments
- Coastwide cohort reconstructions
- FRAM base period
  - ◆ Pre-season planning
  - ◆ Post-season assessment

→ FRAM base period is quite old!

## CWT Recoveries in Fisheries (Pre-Terminal + Terminal)



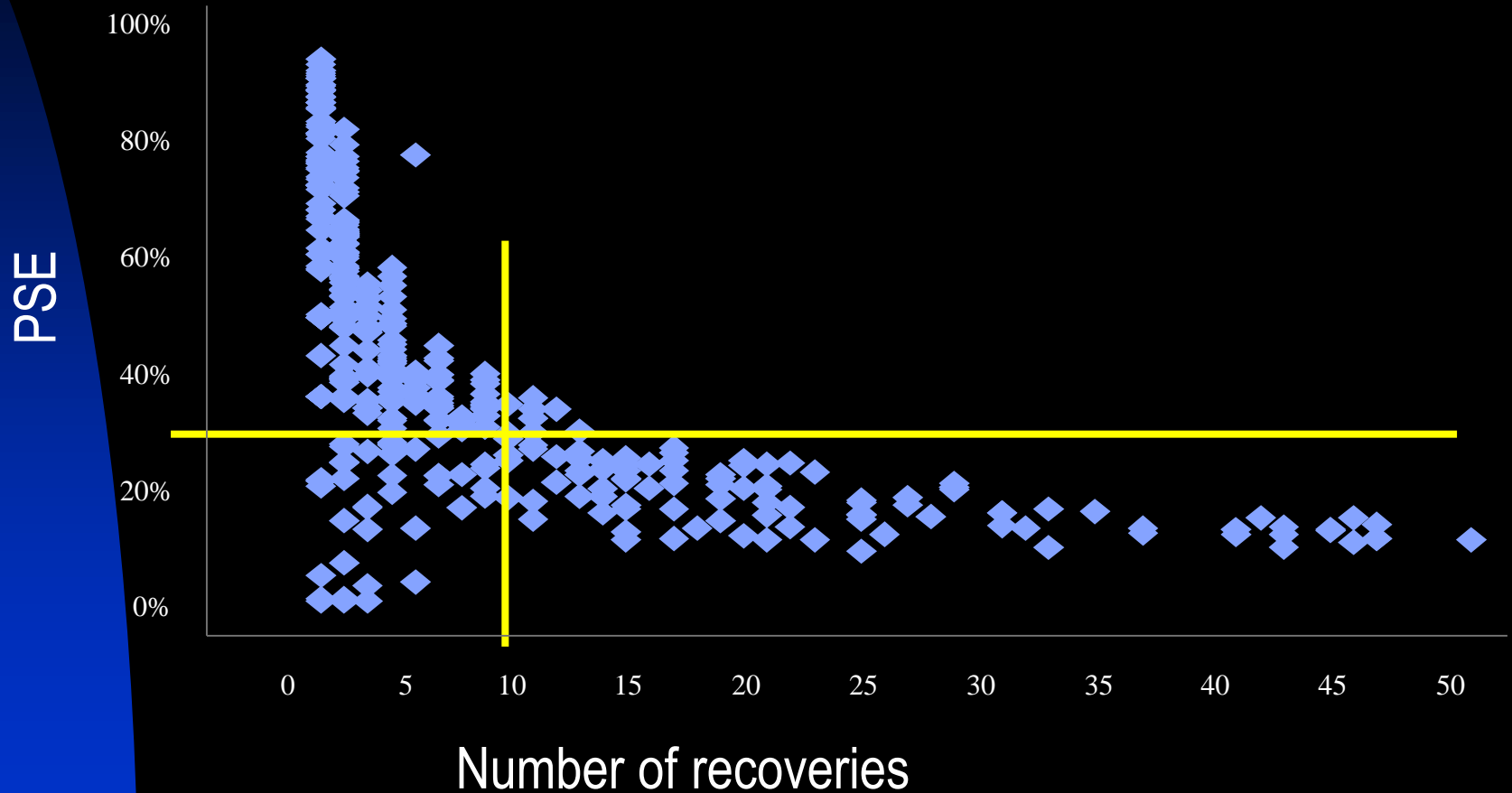
FRAM Base Period

# Tag recovery goals

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- All stocks are represented
  - ◆ Surrogate
  - ◆ Tagged
- Minimize error around estimates of exploitation rates
  - ◆ Temporally
  - ◆ Spatially
- Example – FRAM base period
  - ◆ Annual time step, coastwide

# Uncertainty in CWT Estimates of ERs (PSE = % Standard Error)



10 tags → PSE(ER) ~ 30% if PSE(N) = 0%



# Tagging Evaluation - Criteria

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**Achieve:**  $\leq 30\%$  percent standard error around the estimates of exploitation rate

- $\geq 10$  observed tags; 80% of the time
- ERs of 2.5% or greater
- Assumes 20% fishery sampling and 100% sampling at the hatchery

*Used the Sampling Guidelines Model  
created by the CWT Workgroup*

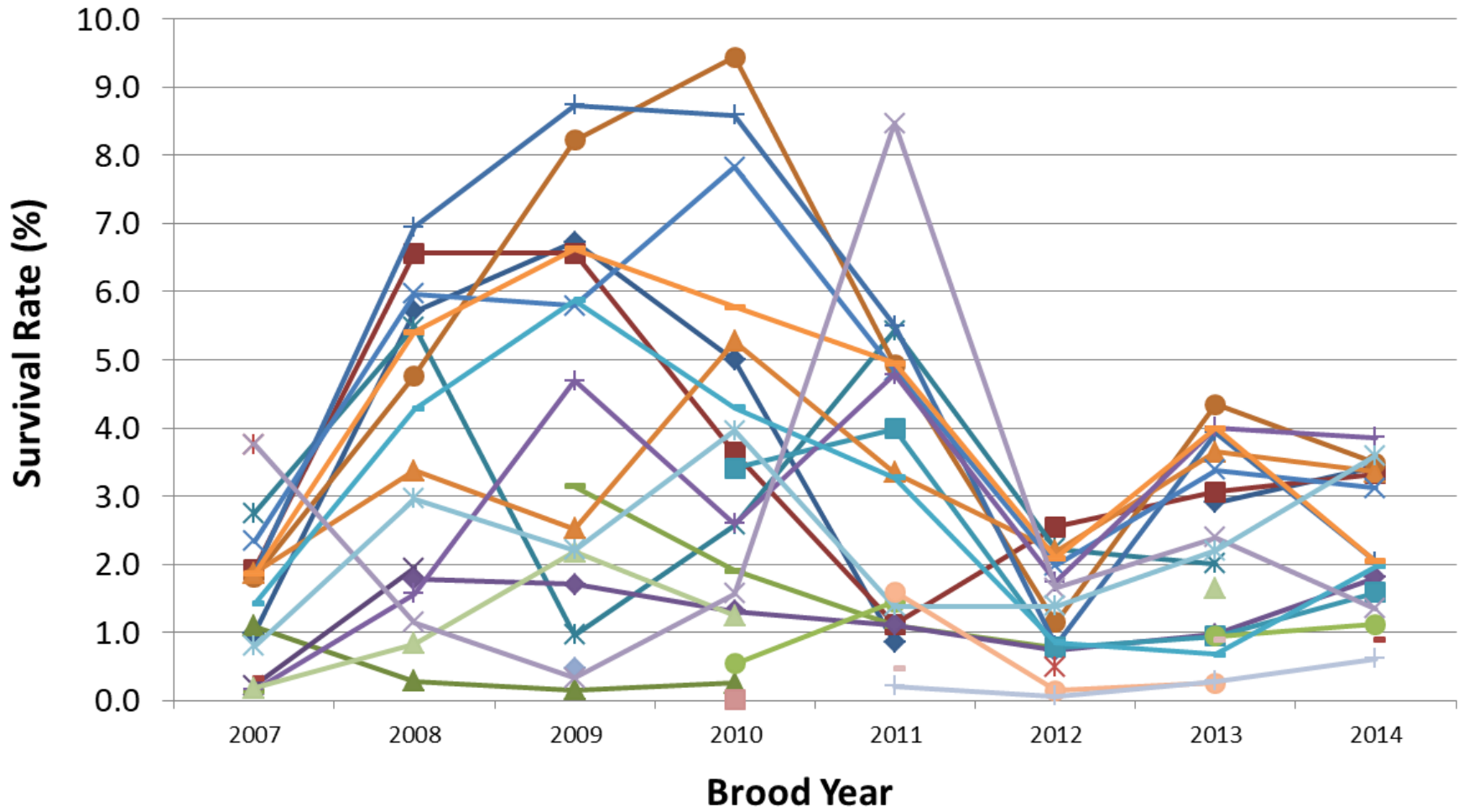
# Tagging Evaluation

- BY 2007 to 2014
- Puget Sound
  - ◆ Quilcene NFH
  - ◆ Marblemount
- WA Coast
  - ◆ Bingham Creek
  - ◆ Quinault NFH

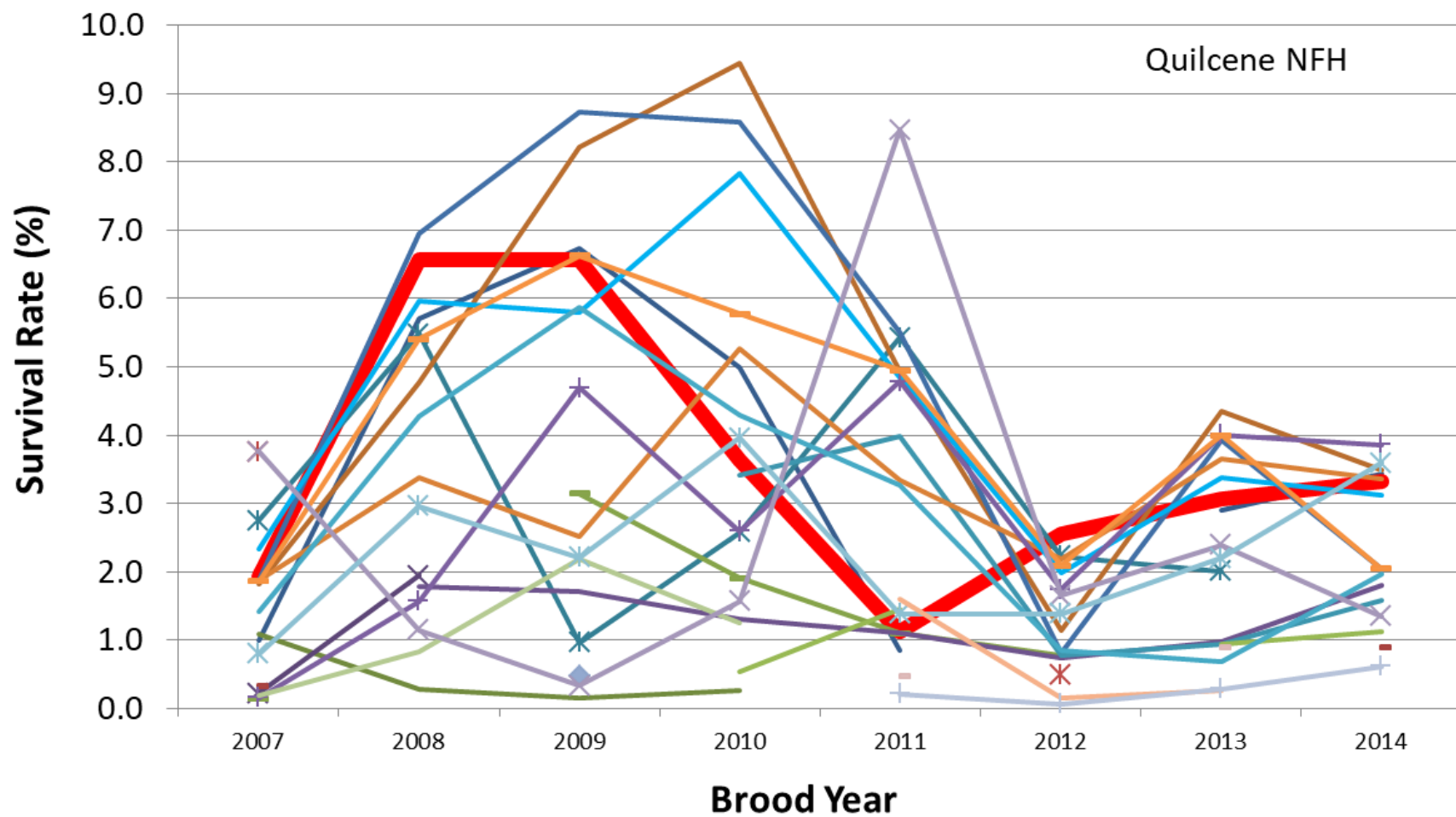


# Puget Sound + SJDF

$\bar{x} = 2.8$

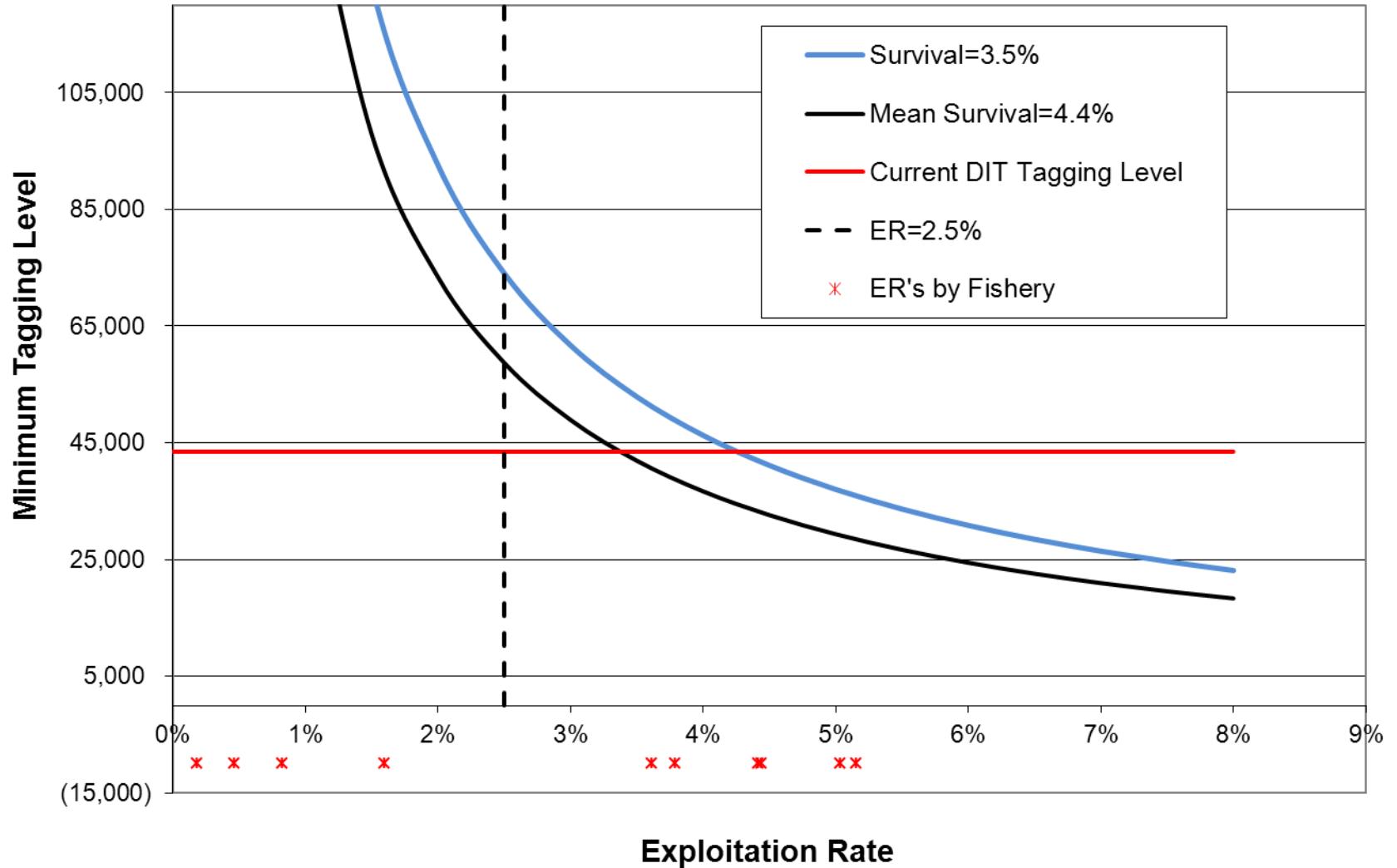


## Puget Sound + SJDF

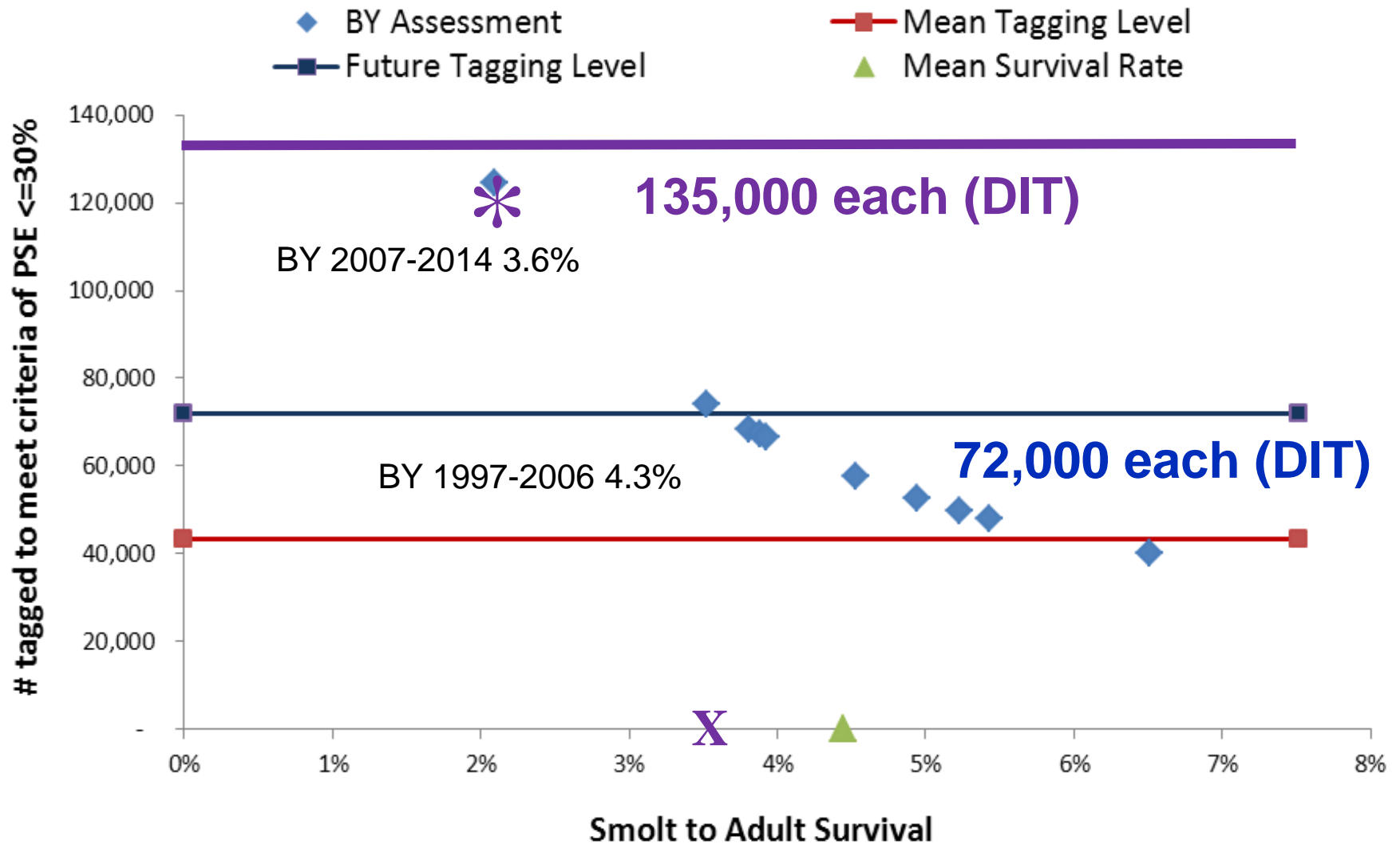


## Example

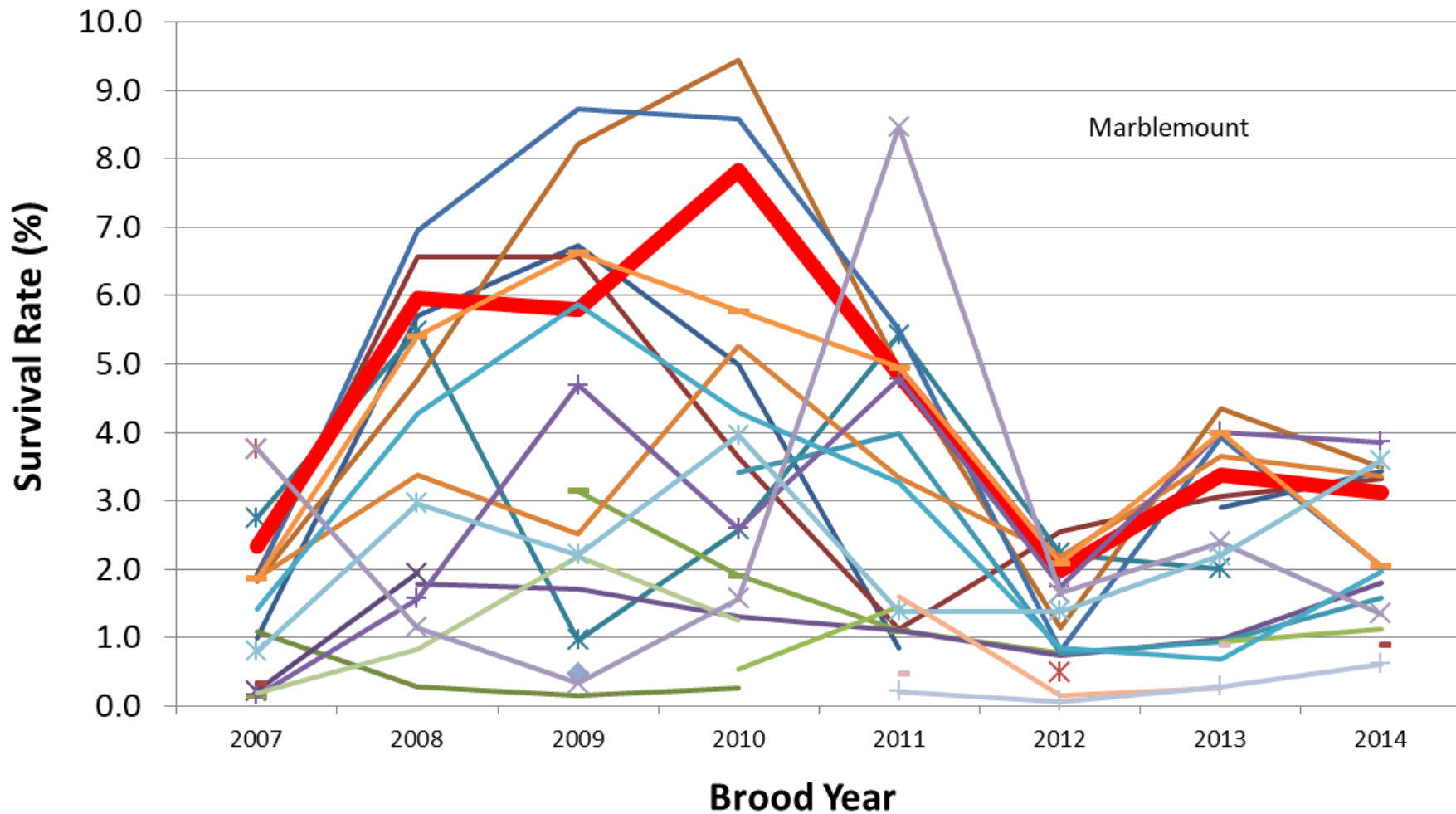
- Minimum Number of Tags to be Released;  
Given 20% Sampling Rate



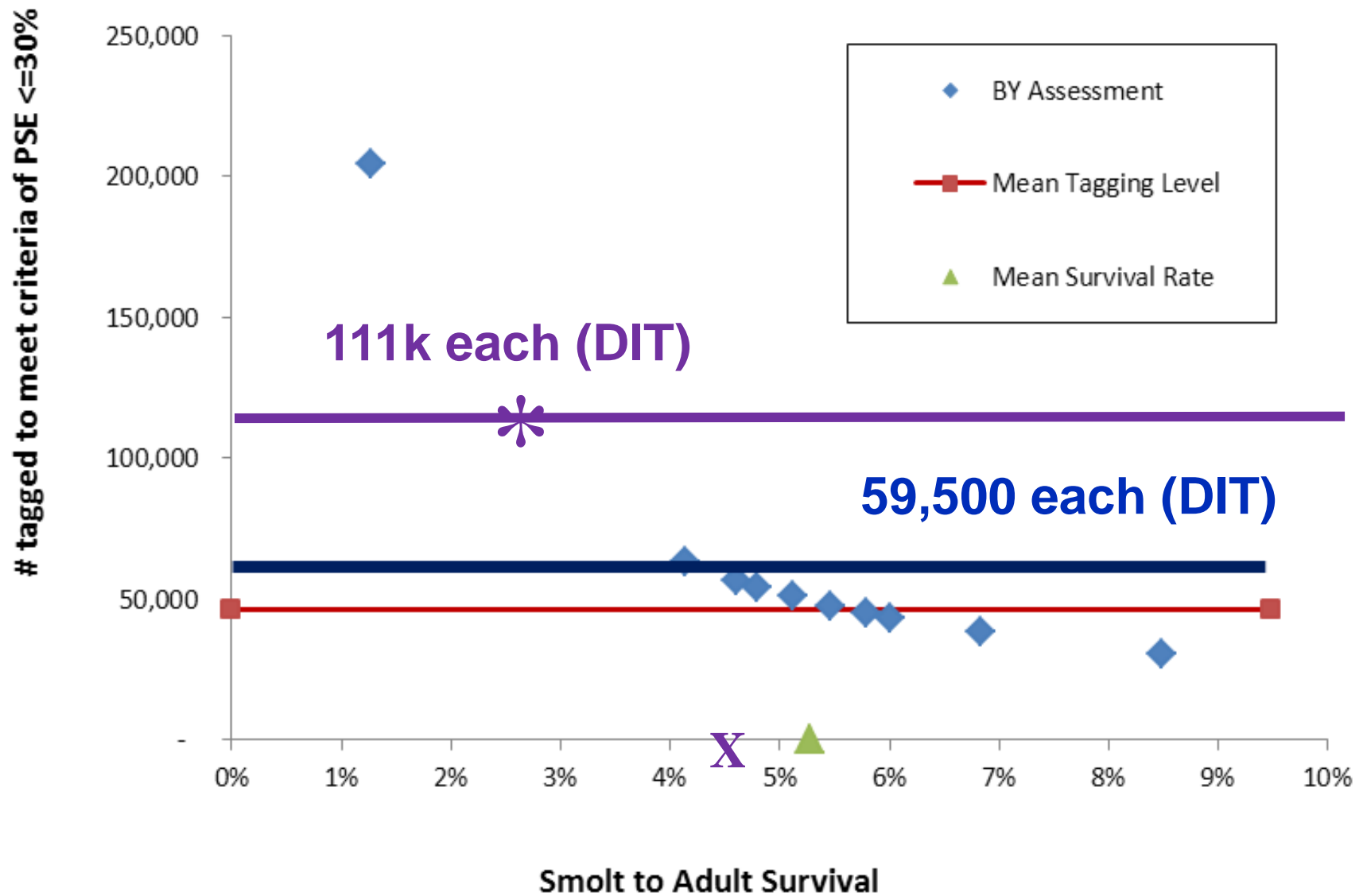
## Quilcene NFH - Marked Coho



## Puget Sound + SJDF



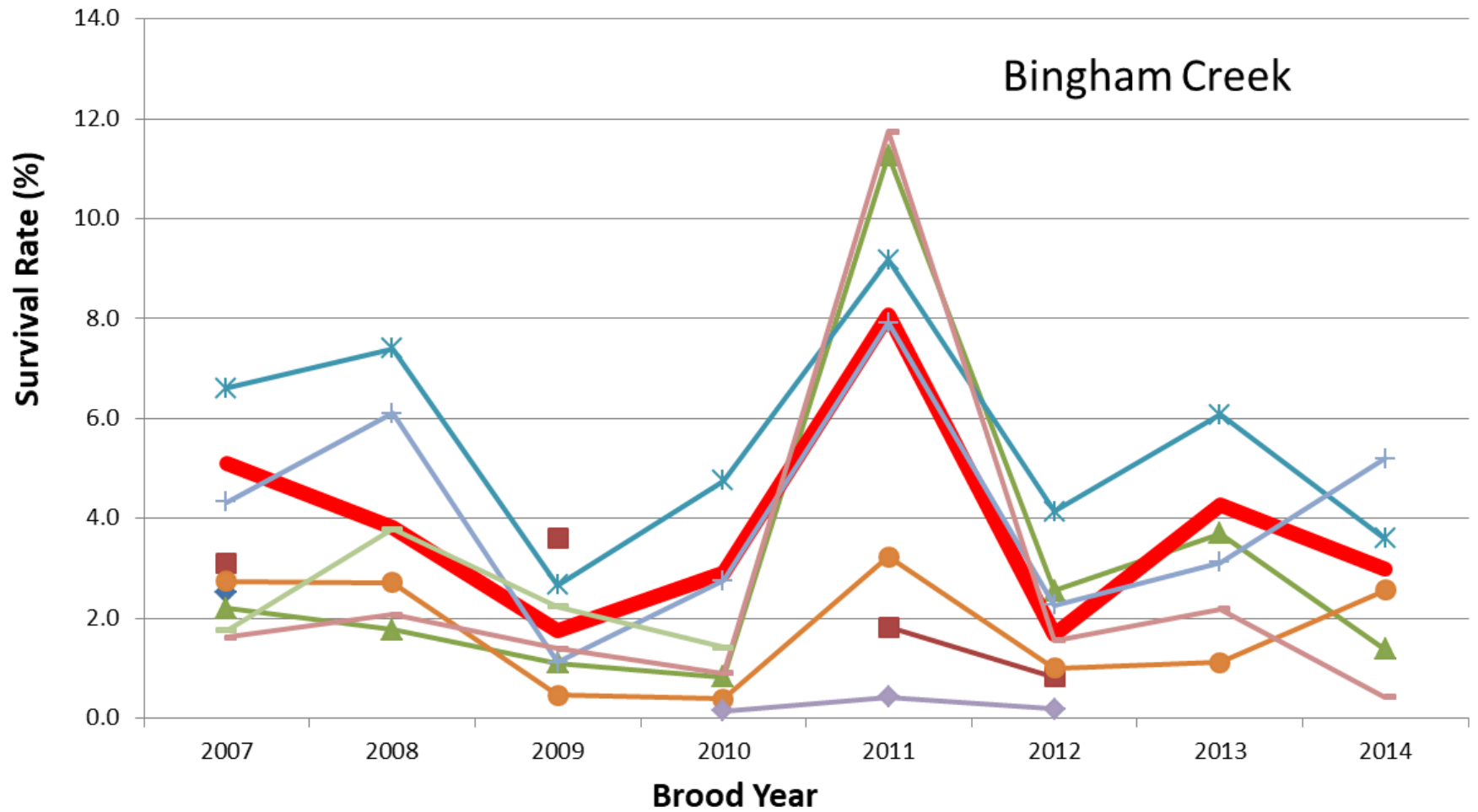
## Marblemount H. (Cascade River)



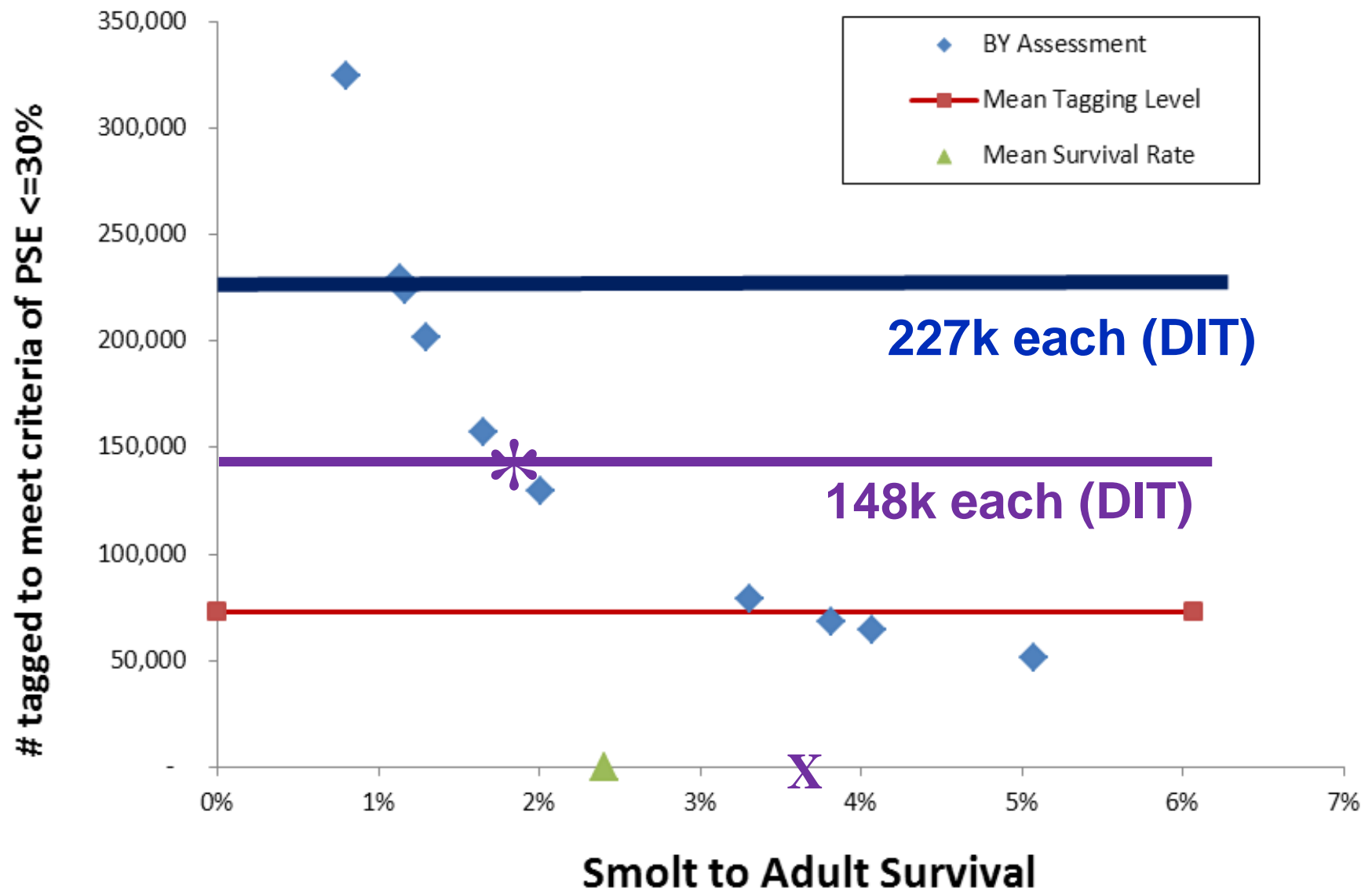


## WA Coast

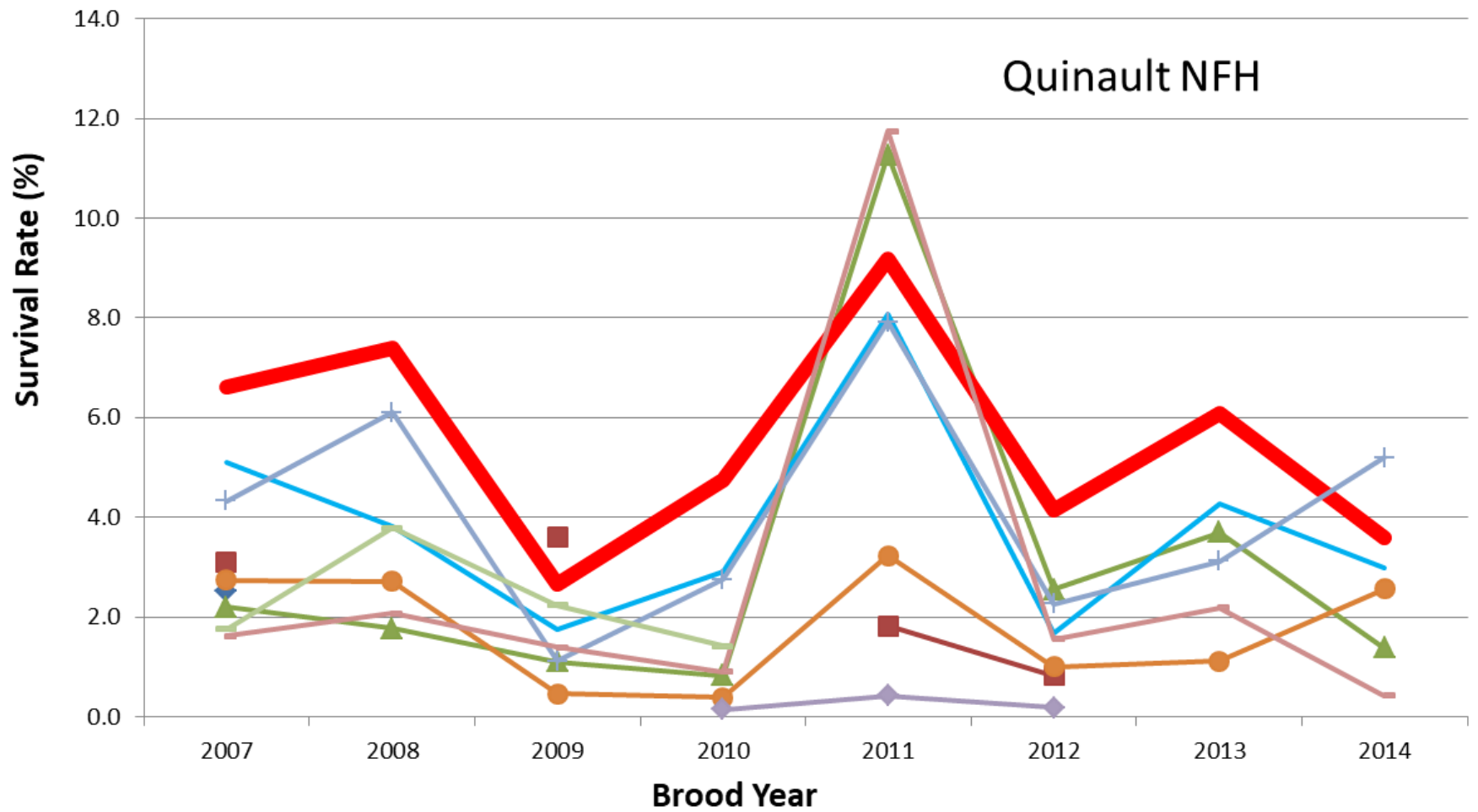
## Bingham Creek



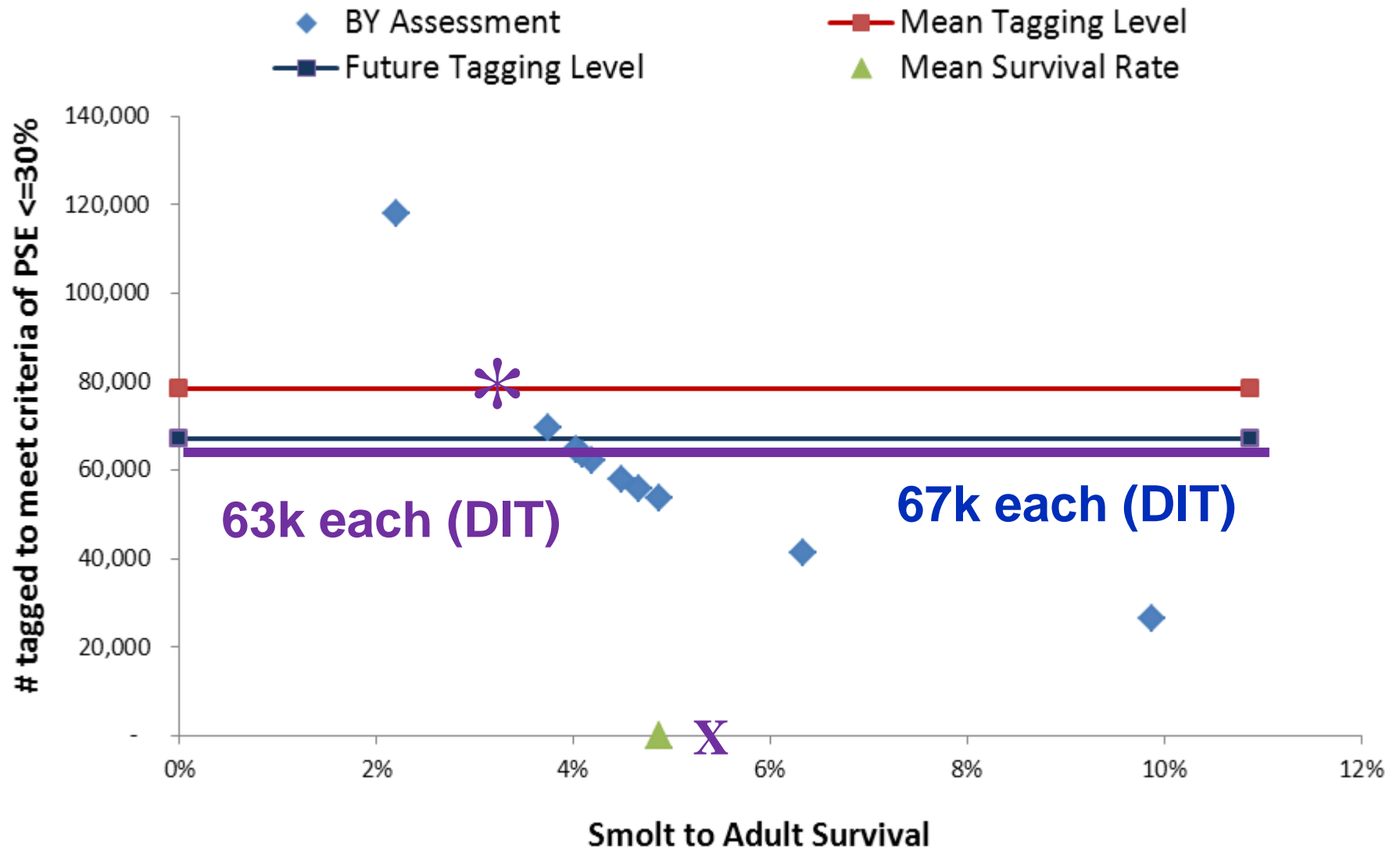
## Bingham Creek H.



## WA Coast



## Quinault NFH - Marked Coho

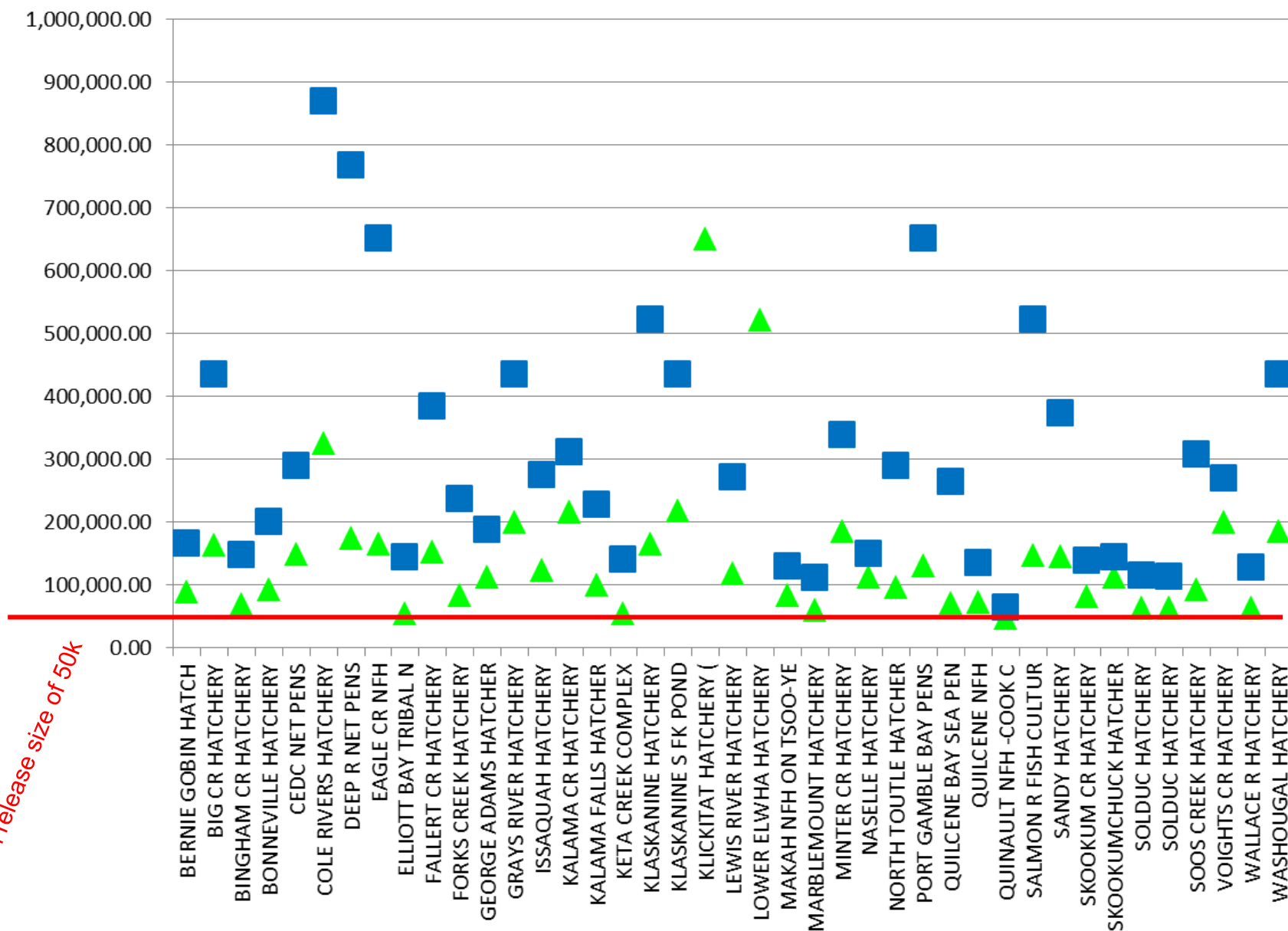


# Tagging Levels Needed to Meet Criteria

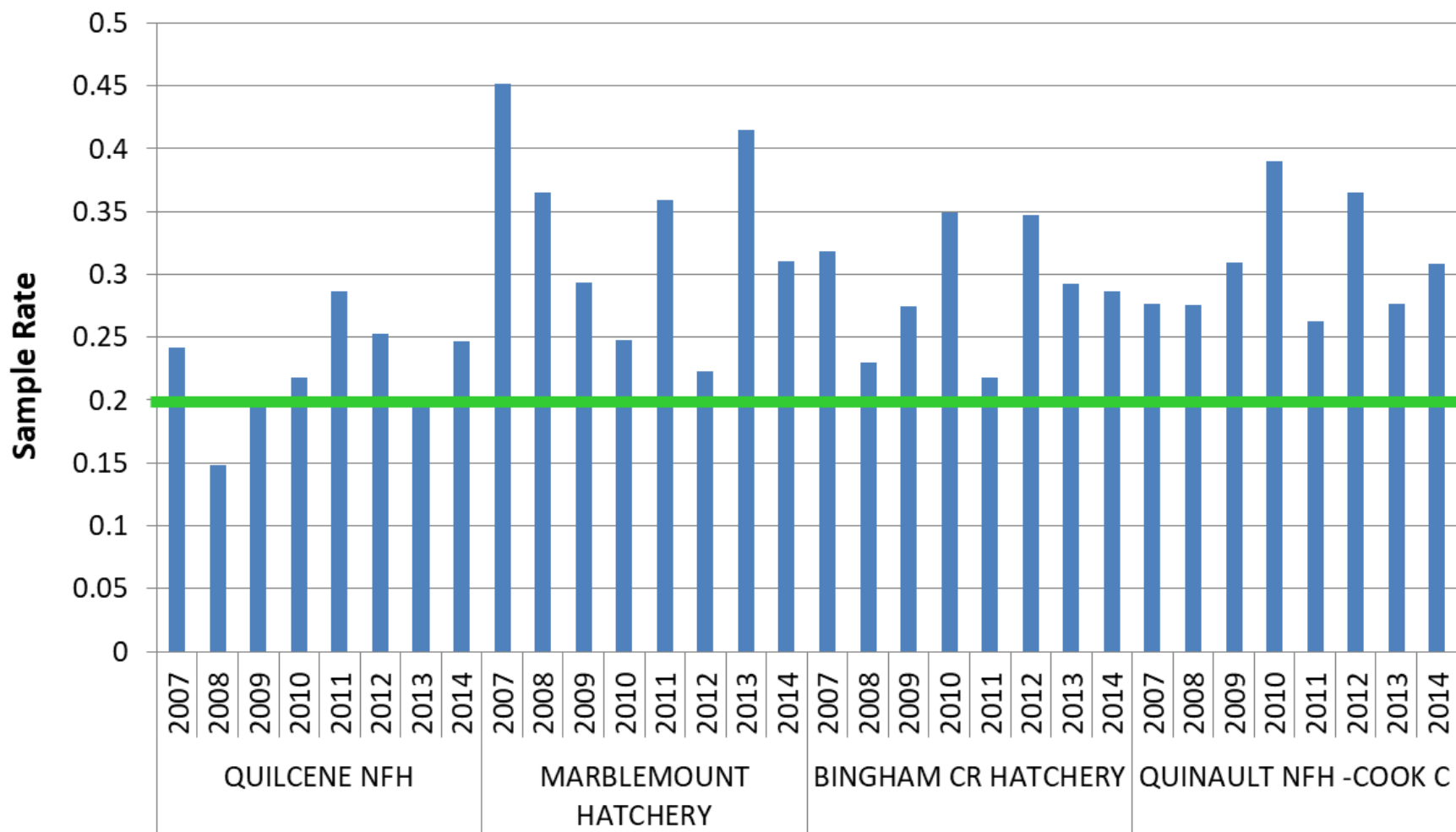
▲ Mean SR ■ 80%

# of Tags to Release

Mean release size of 50k



## Mean sample rate across all fisheries



# Conclusions

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- Fishery recoveries continue to be low
- Survival rates
  - ◆ vary by region
  - ◆ were more variable in recent years
- If ERs remain low and sample rates aren't increased → we need to apply more tags

# Thoughts

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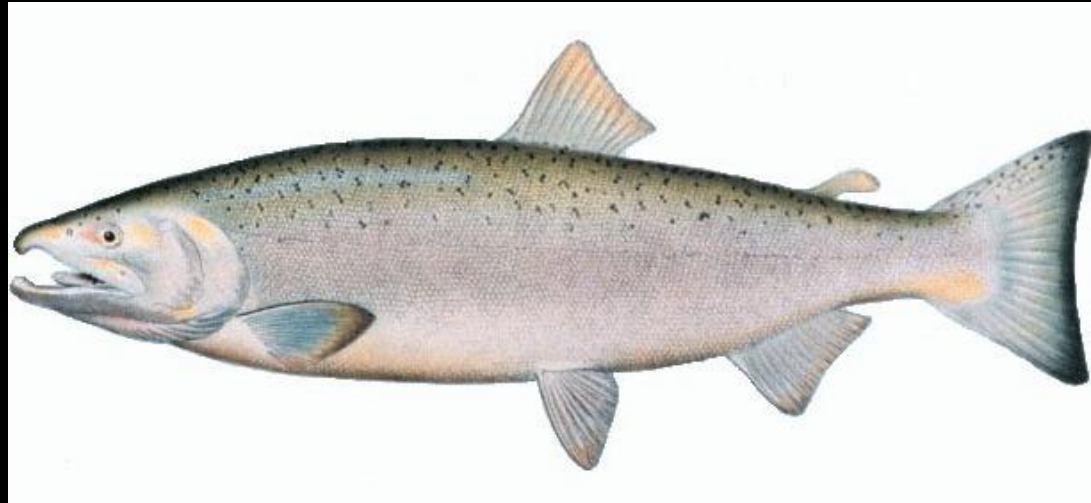
- Increase sampling?
- DITs to SITs?
- Combine tags?
- Other data?
  - ◆ Genetics
- Further test the model (FRAM)



# Southern Fund Project

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## *Coho FRAM Model Validation and Mixed Stock Model (MSM) Updating*



# Project

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- Angelika Hagen-Breaux (WDFW)
- Concerns about 30 yr-old base period
- Re-establish confidence in the model
  - ◆ Assess contemporary data

# Project – 1<sup>st</sup> Phase

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Assess the performance and sensitivity of Coho FRAM by evaluating:

- ◆ stock-specific exploitation rates
- ◆ fishery mark rates
- ◆ sensitivity of exploitation rates of key stocks to abundance changes

# Project – 2<sup>nd</sup> Phase

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Incorporate contemporary CWT recoveries and other stock/fishery data into FRAM

- ◆ aggregating CWT recoveries over years
- ◆ finding stock and fishery surrogates
- ◆ incorporating genetic stock information
- ◆ using hybrid methods to augment CWT recoveries from base period years with CWT recoveries from a different time period (out-of-base procedures)