

# Artificial Lighting Experiments 2014-15

## Lake Washington and Lake Sammamish

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# Background

- 2001-2005 Habitat use of juvenile Chinook salmon in the nearshore areas of lakes
  - Tabor et al. 2011 NAJFM - Habitat use in Lake Washington
  - Tabor et al. 2011 NW Science - Use of non-natal tributaries
- One preliminary experiment on artificial lighting was conducted in 2005 but no further evaluation was conducted
- Partnered with King County to conduct a more comprehensive evaluation in 2014 and 2015

# Introduction

- January to May, juvenile Chinook salmon inhabit nearshore, shallow water (0-1 m deep)
- Shoreline of Lake Washington and Lake Sammamish is highly developed and nighttime artificial lighting is common
- Influence of nighttime artificial lighting on juvenile Chinook salmon and other salmonids is not well known

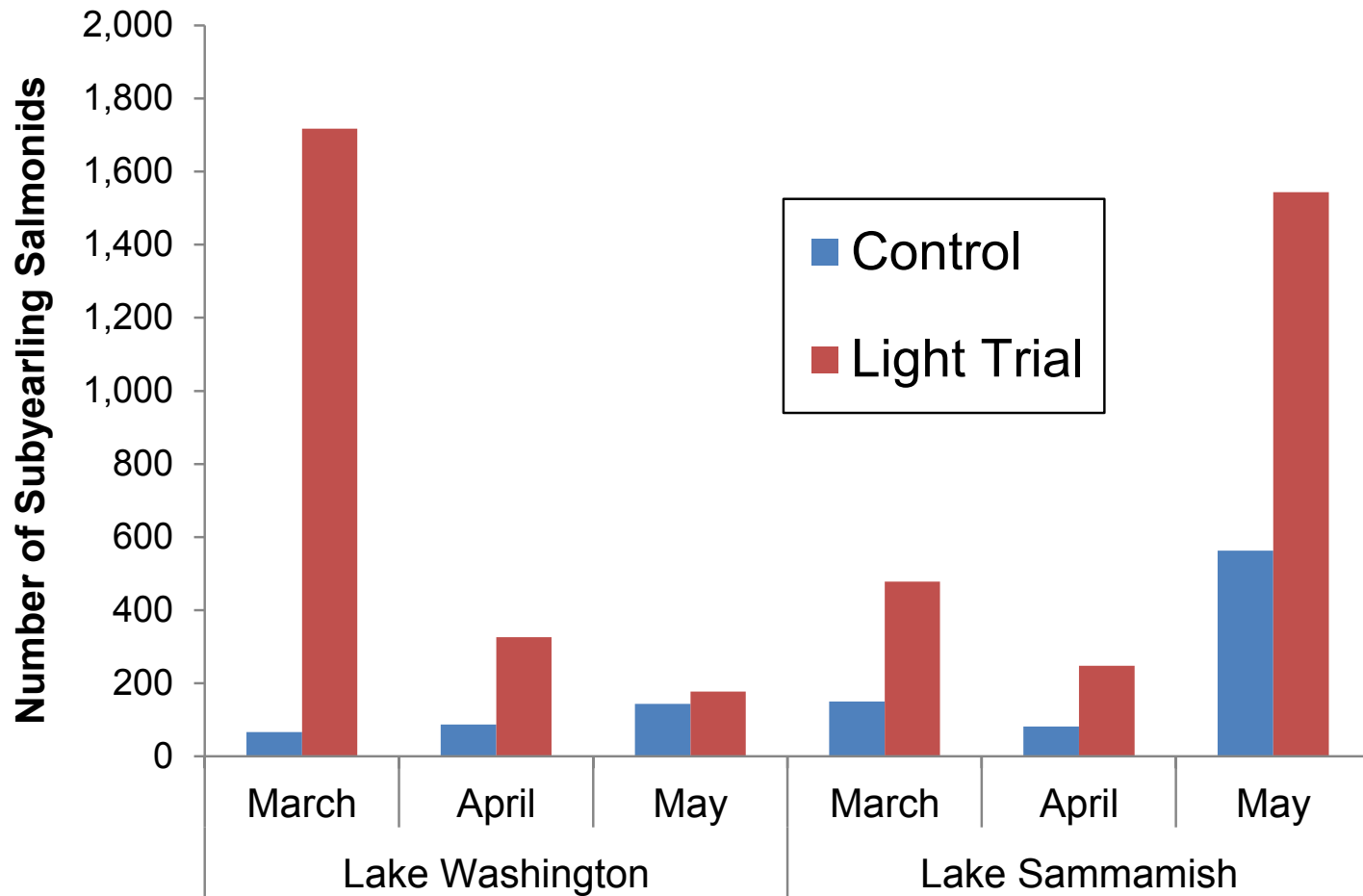
# Study Design – Field Experiments

- Study sites – 156-m shoreline section
  - Uniform habitat conditions, good Chinook habitat and near major tributary, no nearby light sources
- Lake Washington 2014 - Gene Coulon Park
- Lake Sammamish 2015 - Lake Samm. State Park
- Nine treatment sections – each 4-m long with two lights, a light at opposite ends and pointed inwards
  - 3 sections with bright lights - max 50 lux
  - 3 sections with dim lights – max 5 lux
  - 3 sections with no lights
- 15-m buffer sections between treatments
- Treatments systemically assigned
- Incandescent light bulbs used

# Study Design

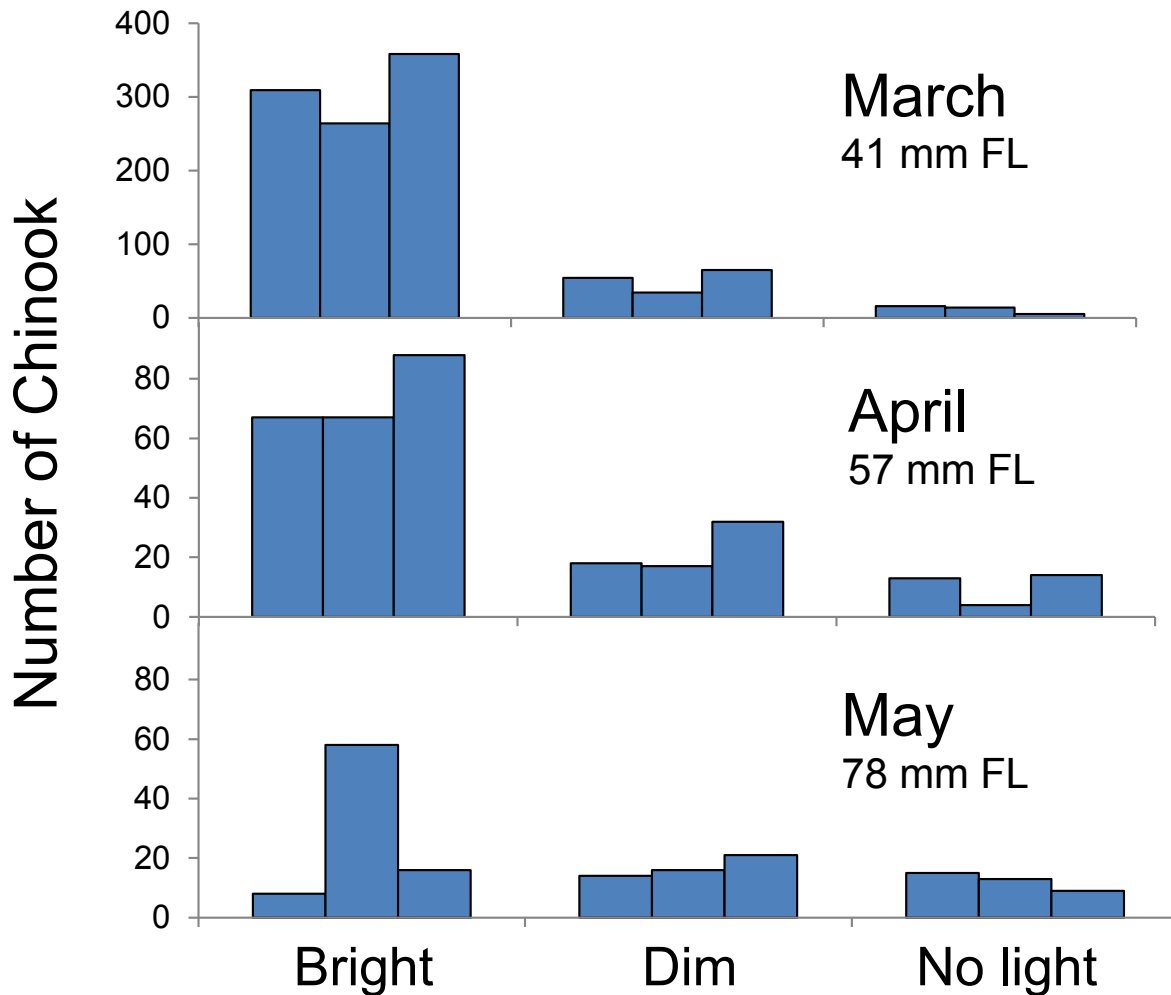
- Light trials conducted on one night in March, April, and May
- Lights started at dusk and ran for one to two hours
- For each trial, also sampled one control night with no lights used (a few days before or after each light trial)
- Fish collected with small beach seine for each 4-m treatment section
- Fish counted and a subsample were measured for length

# Total Number of Subyearling Salmonids Chinook, Coho, and Sockeye



# Chinook Salmon

## Lake Washington 2014



## Two-Way Anova

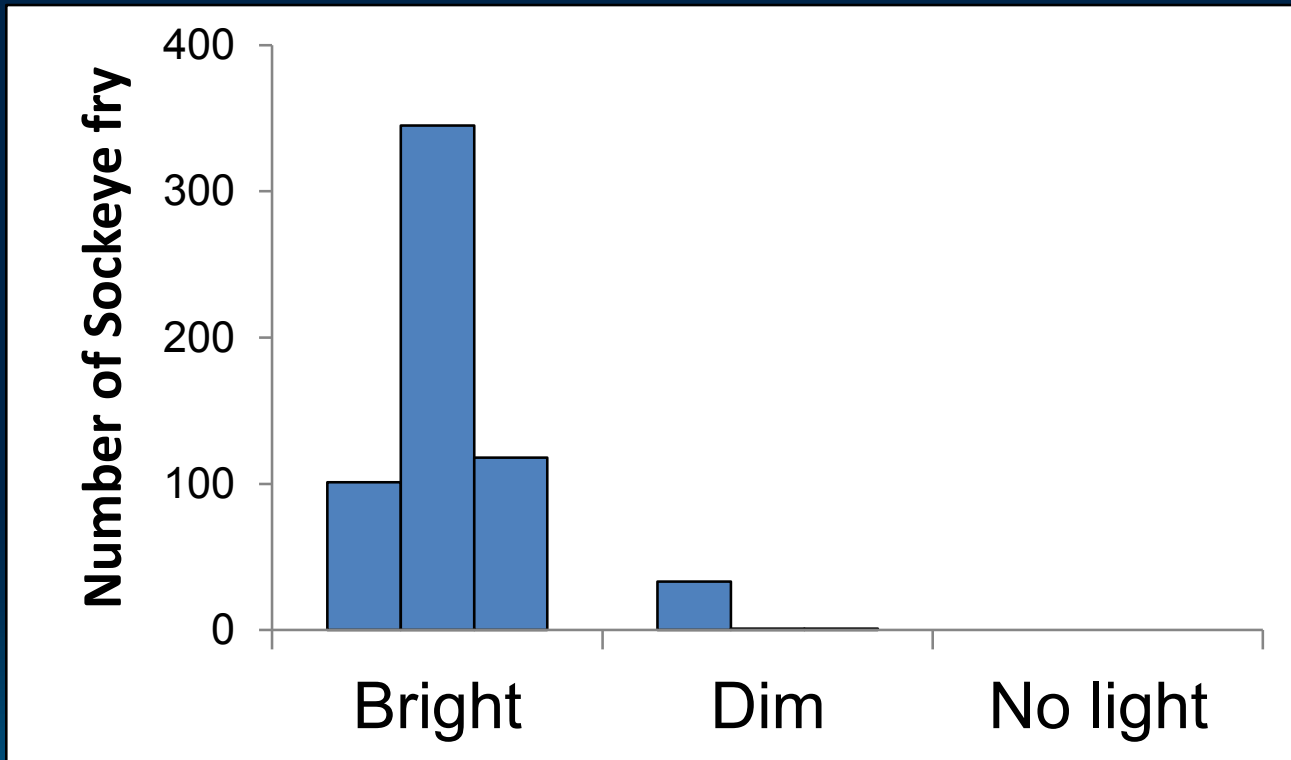
Light level, Month, and Interaction effects all significant ( $P < 0.001$ )

Multiple comparisons:

March – all different  
April – bright different  
May – no differences

# Sockeye Salmon Fry

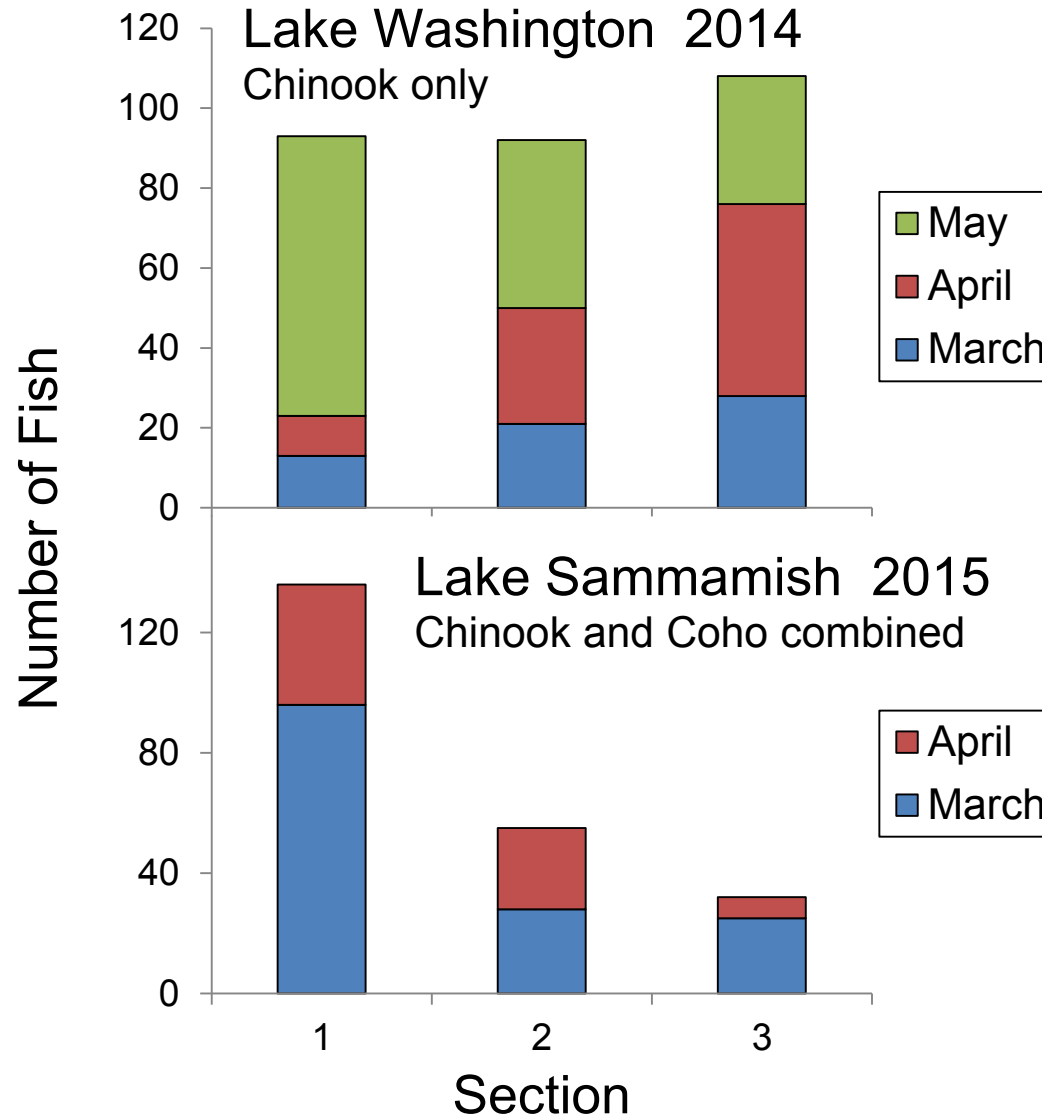
## March - Lake Washington 2014



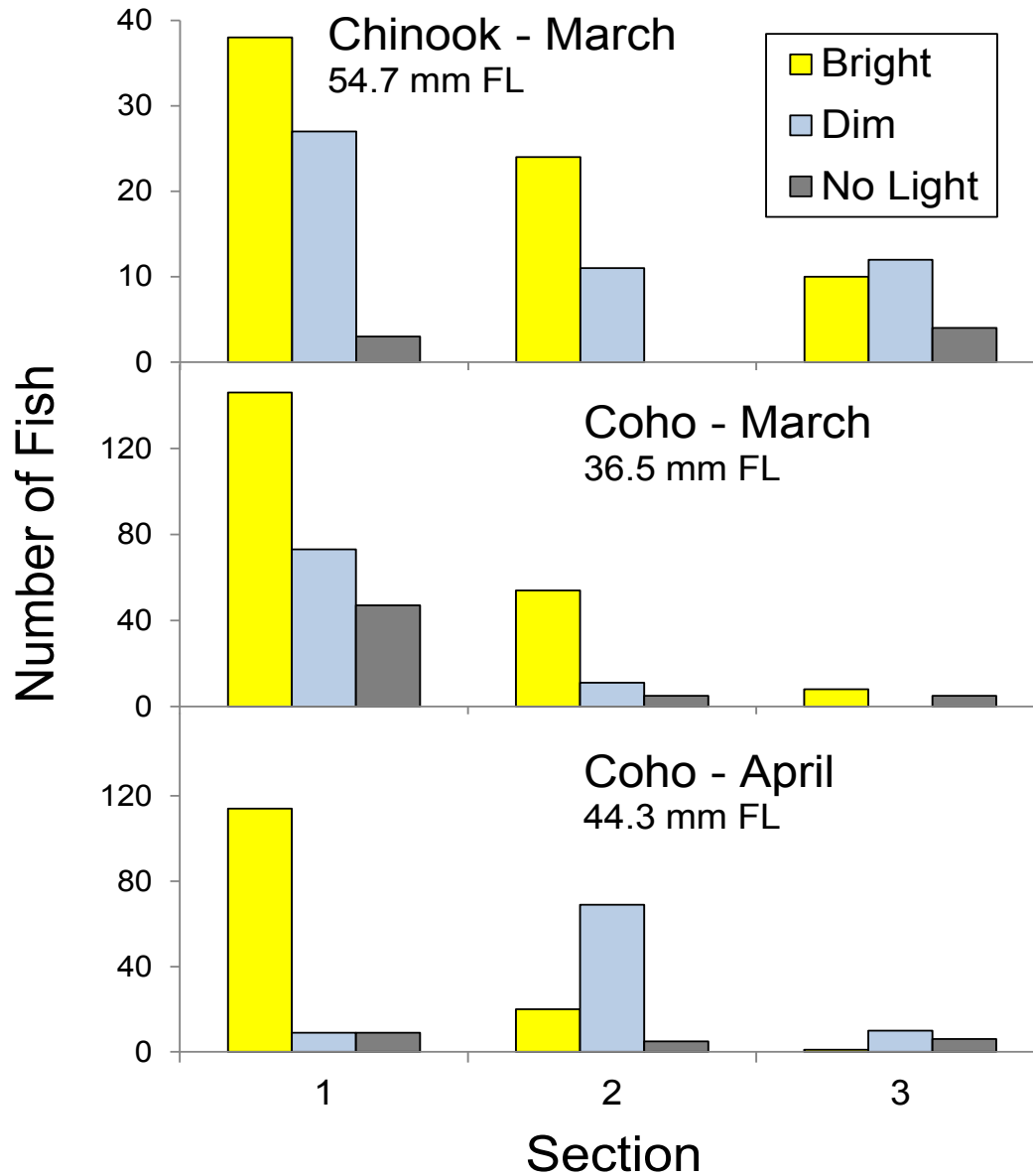


# Fish Distribution along Shoreline

## Control Nights (No lights used)

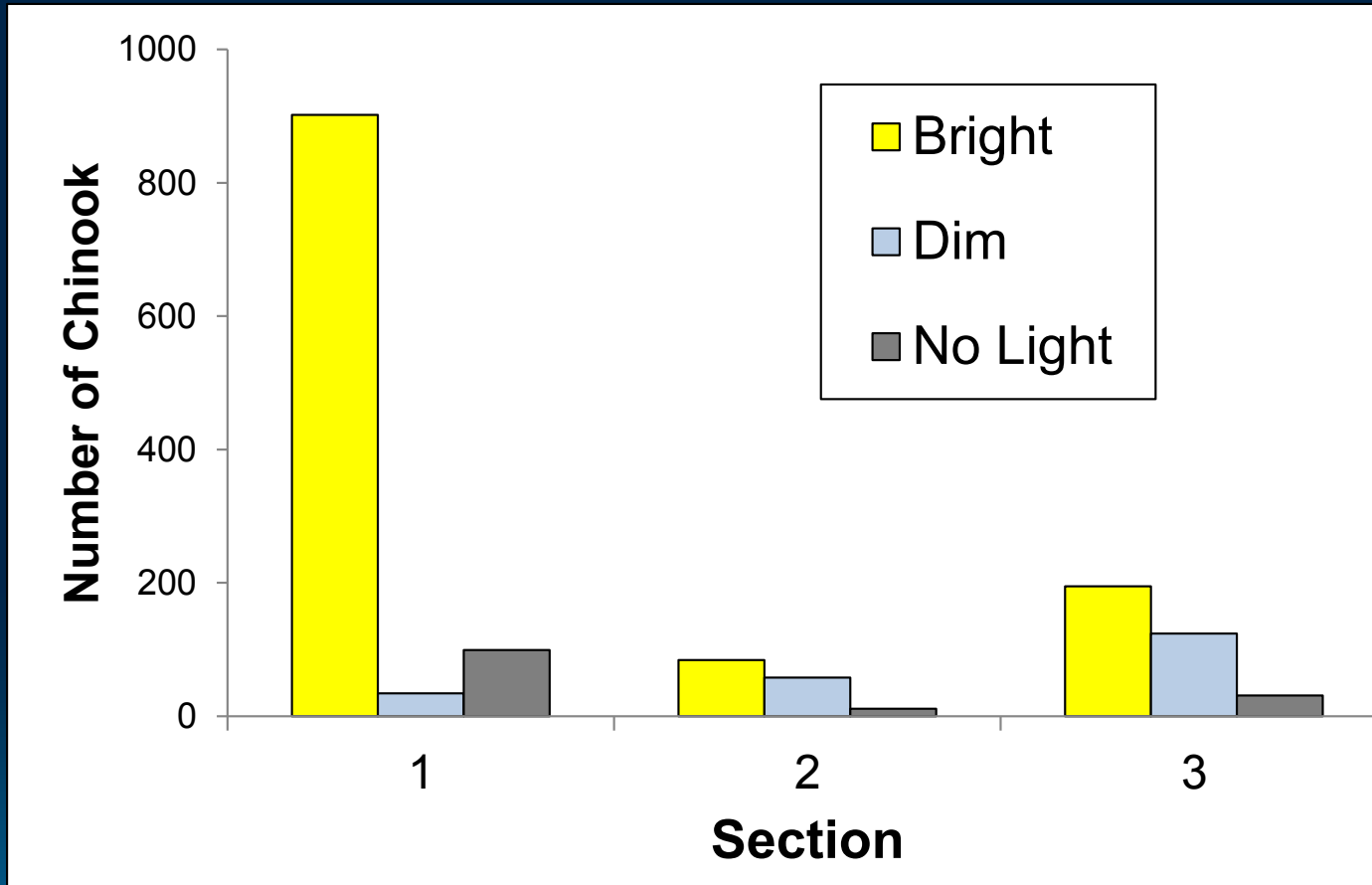


# Lake Sammamish 2015

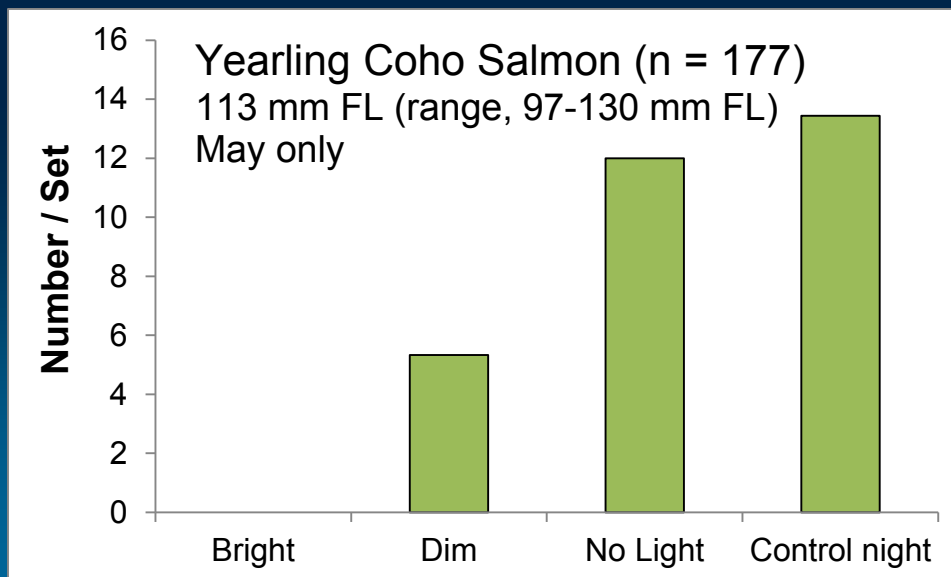
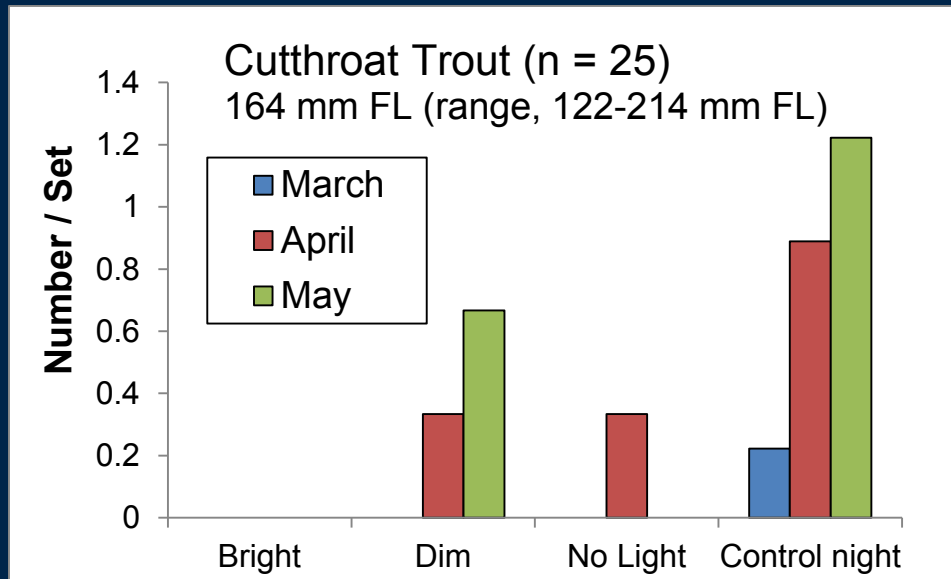


# Hatchery Chinook Salmon

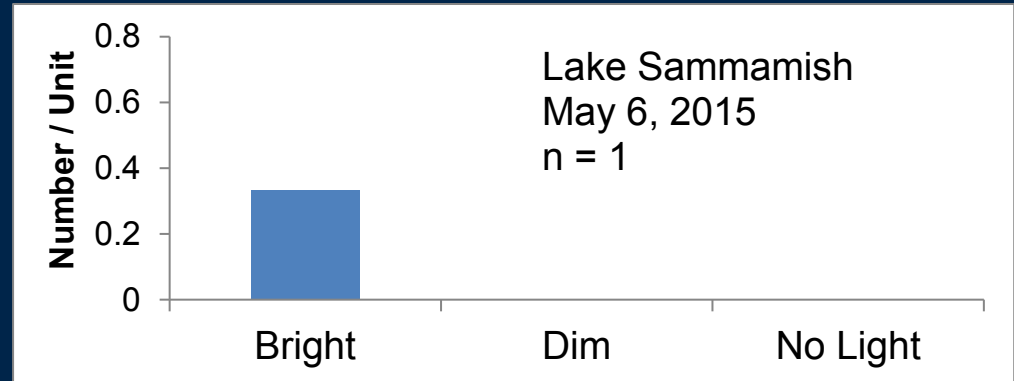
## Lake Sammamish, May 6, 2015



# Other Fish – Lake Washington 2014



# Great Blue Heron



# Conclusions

- **Experimental field trials were effective in collecting preliminary information on artificial lighting and could be used for further evaluation (e.g., testing types of light)**
- **Subyearling salmonids appeared to be attracted to artificially lit areas**
- **Effect was strongest in March when fish were small – Our experiments were conducted in March-May but should have included January and February**
- **Nighttime lighting can have a strong effect on fish behavior and may increase their vulnerability to predation**