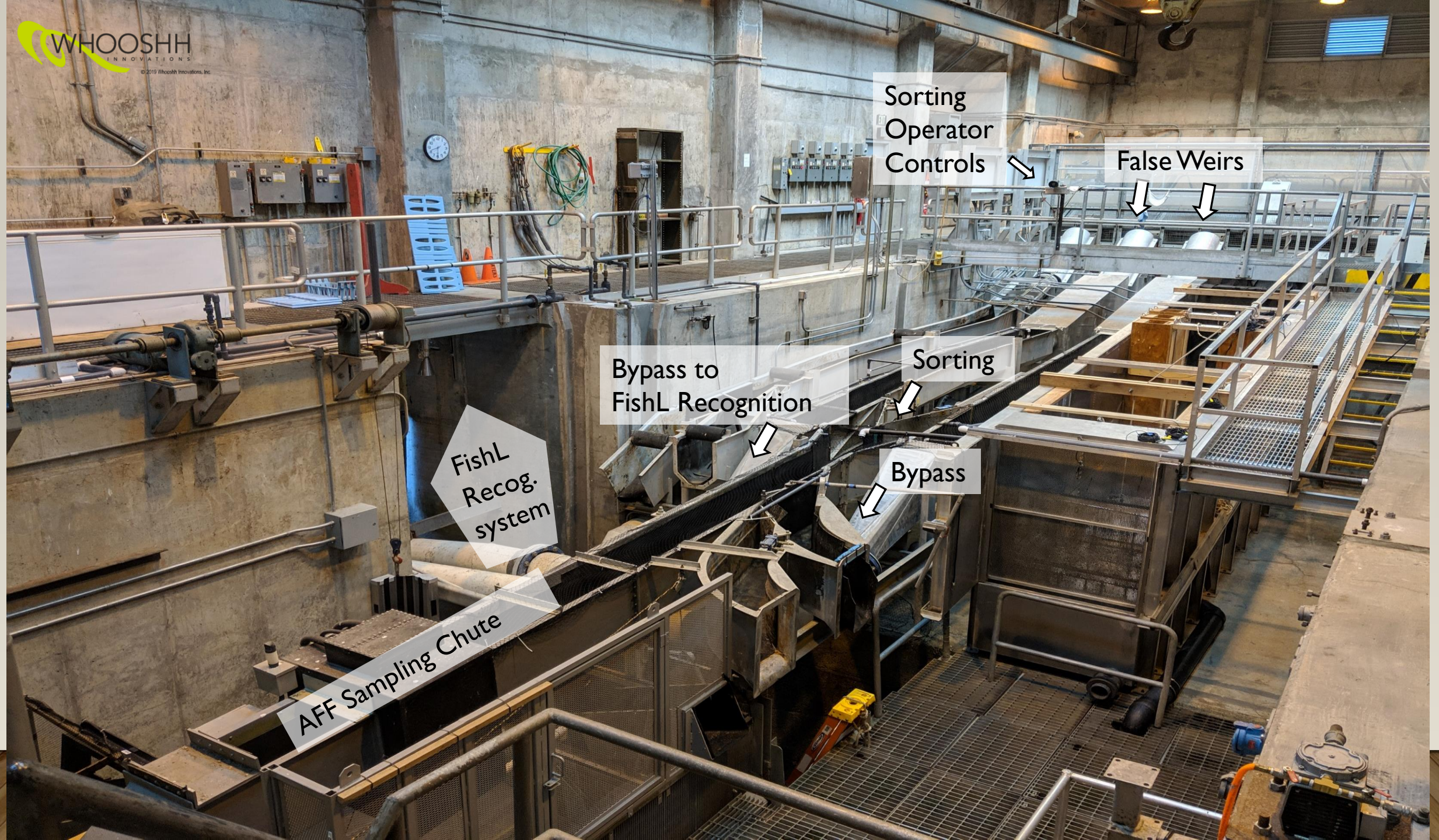
FISHL™ Recognition System Whooshh Installation at Bonneville AFF

Species Counts, Fork Length Distributions By Species, Adipose Status, Injury Assessment Bonneville AFF Whooshh FishL™ Recognition Image Data

2019 FPOM Update


WHOOSHH
INNOVATIONS
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Sorting Operator Controls
False Weirs
Bypass to FishL Recognition
Sorting
FishL Recog. system
Bypass
AFF Sampling Chute


WHOOSHH
AFF Sampling Chute


WHOOSHH
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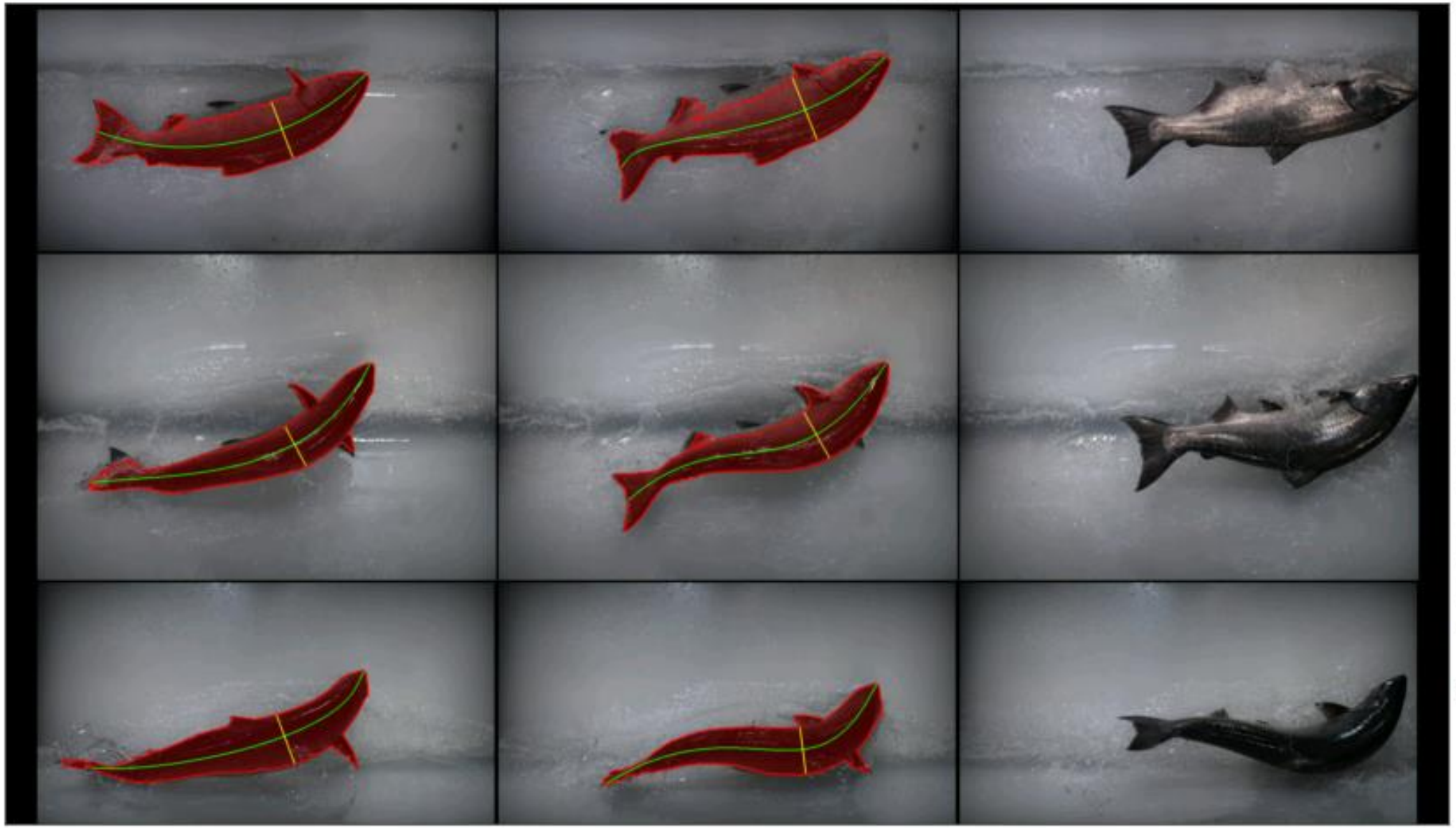
AFF Sampling Chute

WHOOSHH INNOVATIONS

ADAPTING TO THE CONDITIONS OF THE BONNEVILLE AFF

- Calibration Parameters Modified to address:
  - Increased fish speed over typical Whooshh False Weir Design (speeds up to 5 m/s)
  - Excess Water
  - Erratic Behavior
  - Spiders



Column	Result
Circumference	491.9 mm
Length	830.4 mm
PercentageAdipose...	
PercentageNotAdip...	
Reversed	0
Speed	3.66 m/s
TotalImagesSent	
TotalImagesTimeout	

- [ ] Show native resolution
- [ ] Show corrected image
- [ ] Show NIR image
- [ ] Show Raw Foreground
- [x] Show Fish

Gamma

Pen

Inference Server Status : OK

1x Zoom

Fit

WHOOSHH INNOVATIONS

April 25-Aug 1, 2019 FishL™ Recognition System Operational 2520 hr but fish passed through only 210 hr

# of Weeks	Week # of yr	Days Sampled/wk	% of day/wk	Hrs Sampled/ wk	% of hr/wk
1	17	2	29%	2.75	2%
2	18	5	71%	13	8%
3	19	5	71%	15.5	9%
4	20	4	57%	12.75	8%
5	21	5	71%	14.5	9%
6	22	4	57%	10	6%
7	23	5	71%	15.5	9%
8	24	5	71%	17.5	10%
9	25	4	57%	13	8%
10	26	5	71%	19	11%
11	27	4	57%	13.5	8%
12	28	5	71%	17	10%
13	29	5	71%	17	10%
14	30	4	57%	13	8%
15	31	4	57%	16	10%
Total		66	63%	210	8%

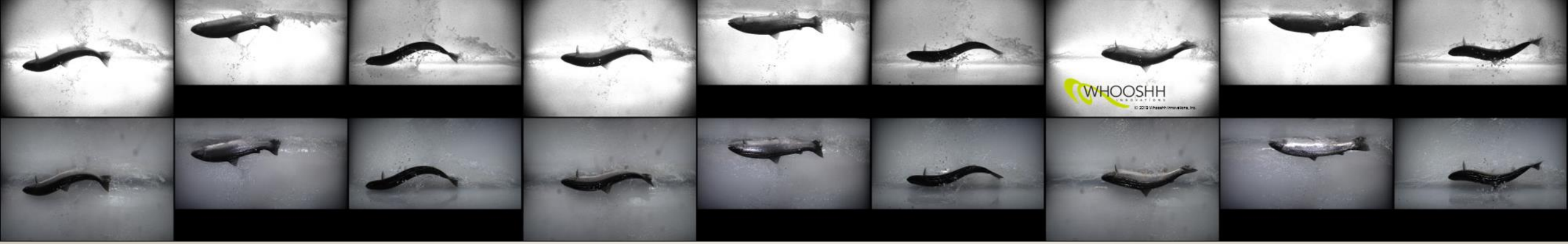
WHOOSHH INNOVATIONS

Species through Sept 4	Count	Percentage
American Shad	818	10.3%
Chinook	2899	36.7%
Coho	157	2.0%
Large Scale Sucker	22	0.3%
Mini jack	1286	16.3%
Northern Pikeminnow	4	0.1%
Pacific Lamprey	12	0.2%
Peamouth Chub	1133	14.3%
Pink	18	0.2%
Small Mouth Bass	2	0.0%
Sockeye	1266	16.0%
Steelhead	290	3.7%
Whitefish	1	0.0%
Total	**7908**	**100.0%**

12 species Classified

Current status ~12000 scans, over 200,000 images

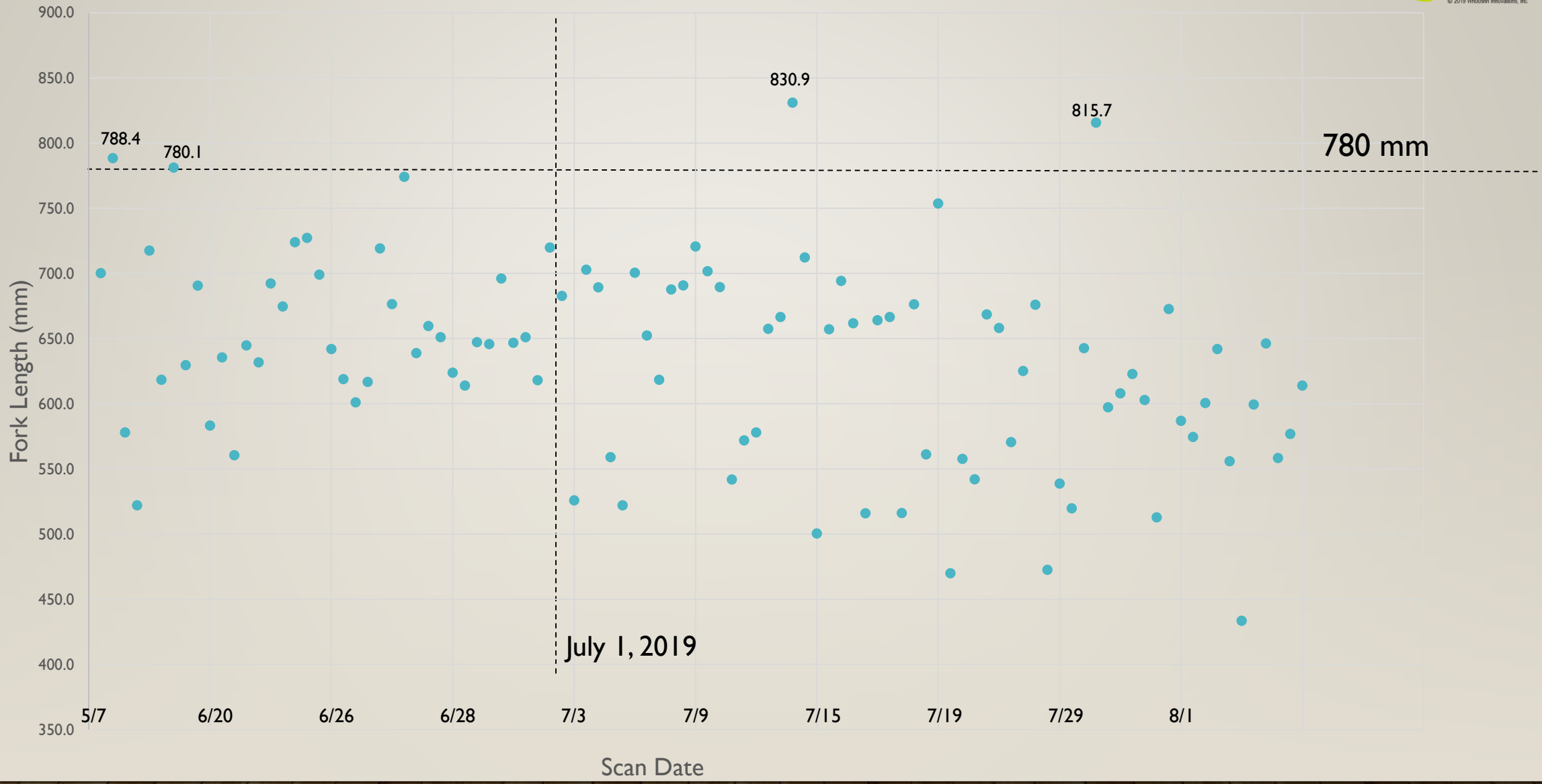
* *Non-Native Species to Bonneville Reach: Small Mouth Bass, American Shad, Whitefish*



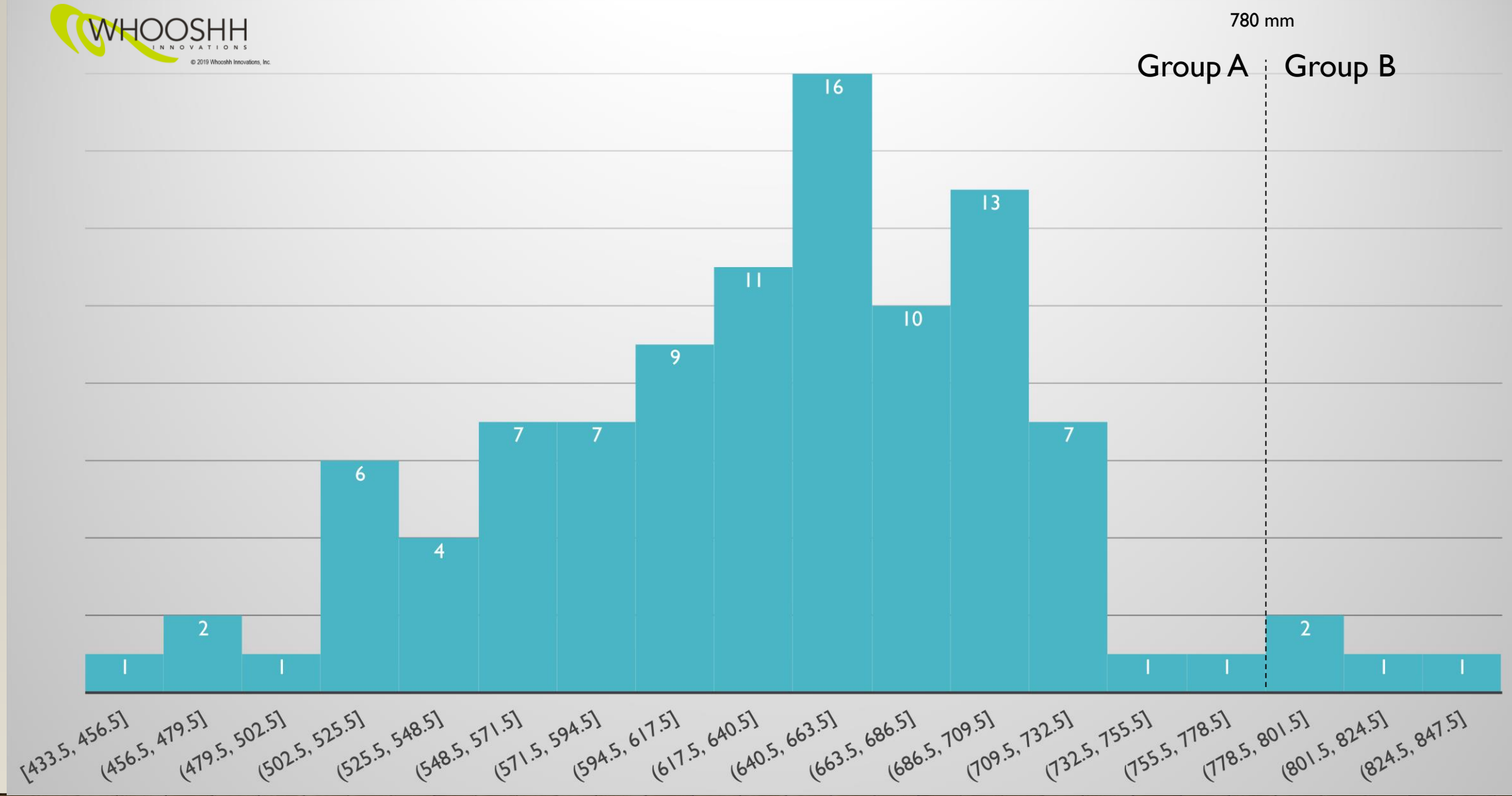
April – Aug 1, 2019 **103 Steelhead**

April – Aug 31 **270 Steelhead**
(Aug 2-Aug 31 sampling on only 9 days)

Steelhead Fork Length by Count Number

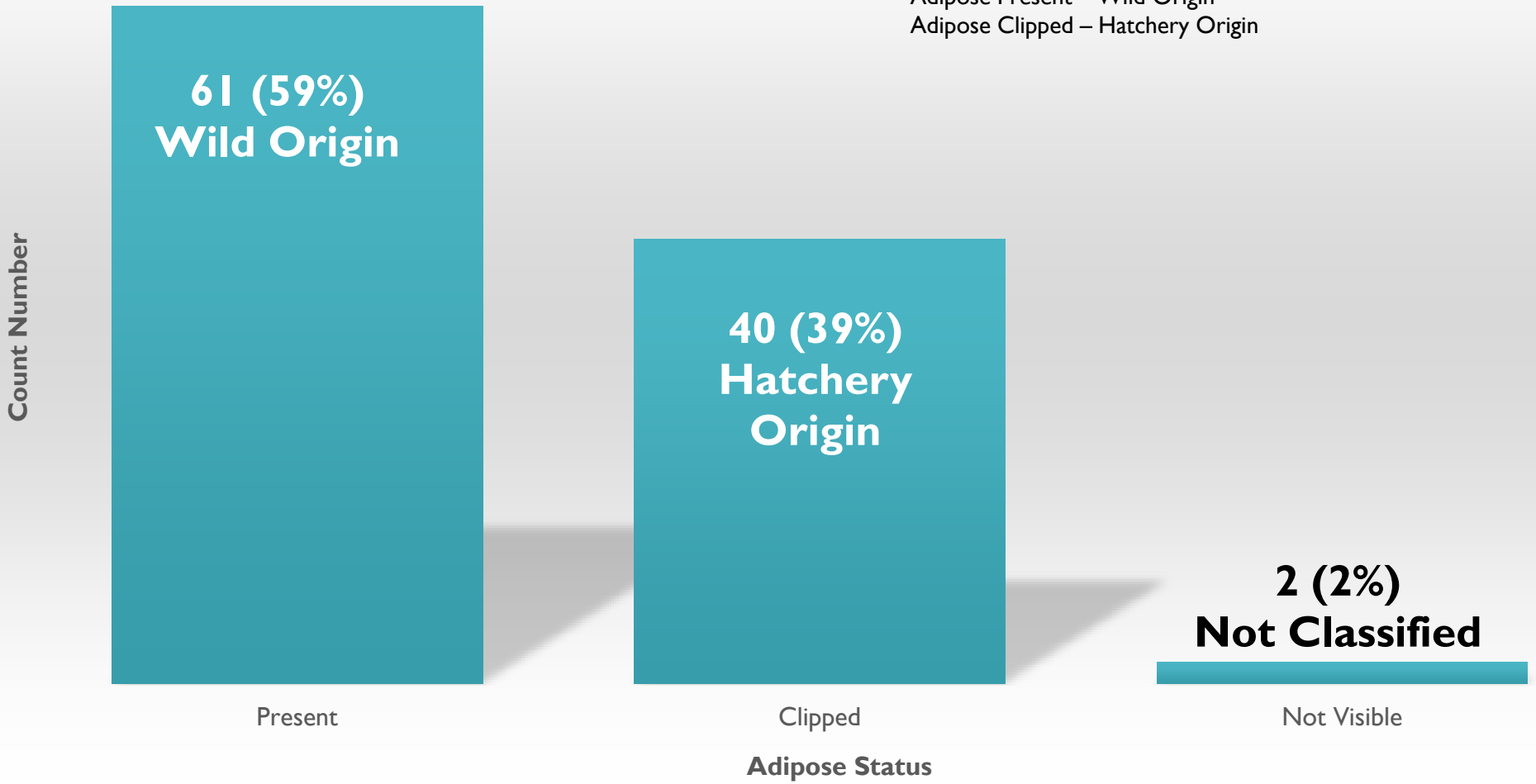


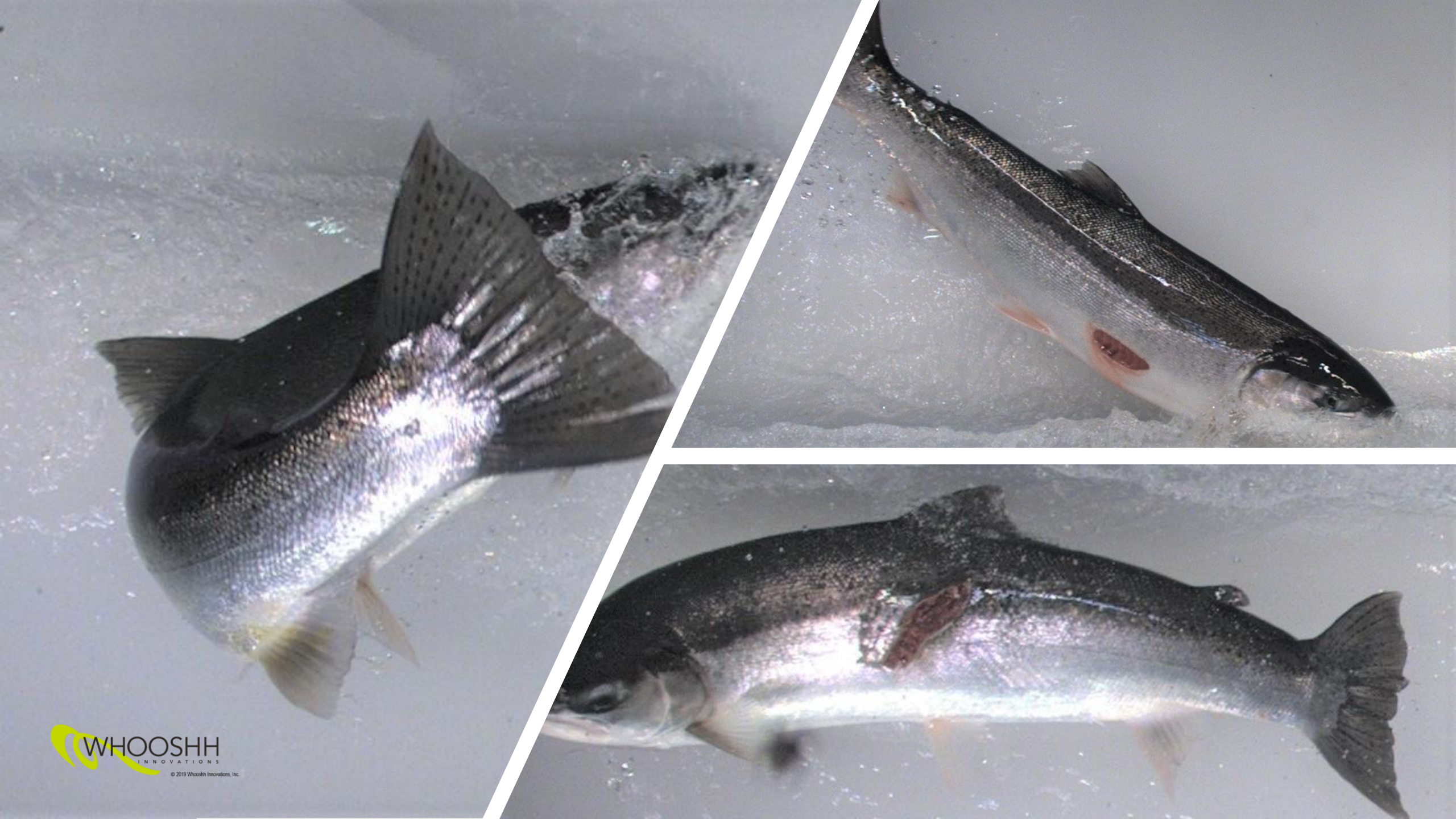
Steelhead Fork Length Distribution (mm)



Steelhead Adipose Status

Adipose Present – Wild Origin
Adipose Clipped – Hatchery Origin





Steelhead sampled or scanned at Bonneville AFF April – Aug 1, 2019 (Wk17-31)

	Sample Size	
Week	AFF	Whooshh
17	2	
19	1	2
20	2	1
21	2	1
22	2	1
23	4	
24	2	1
25	5	8
26	8	25
27	15	12
28	30	10
29	61	13
30	42	9
31	70	20
Total	**246**	**103**

- Steelhead volitionally enter 1 of 2 chutes via 2 false weirs
- AFF selects steelhead for sampling from both chutes
- Whooshh scans non-selected, bypassed fish, from only the right-side chute

- AFF sampling plus Whooshh scanning gave positive increase in Steelhead data collected during the 2019 15 wk period.

Combined => **142% of AFF sample set**

- Combined Total sample: 349

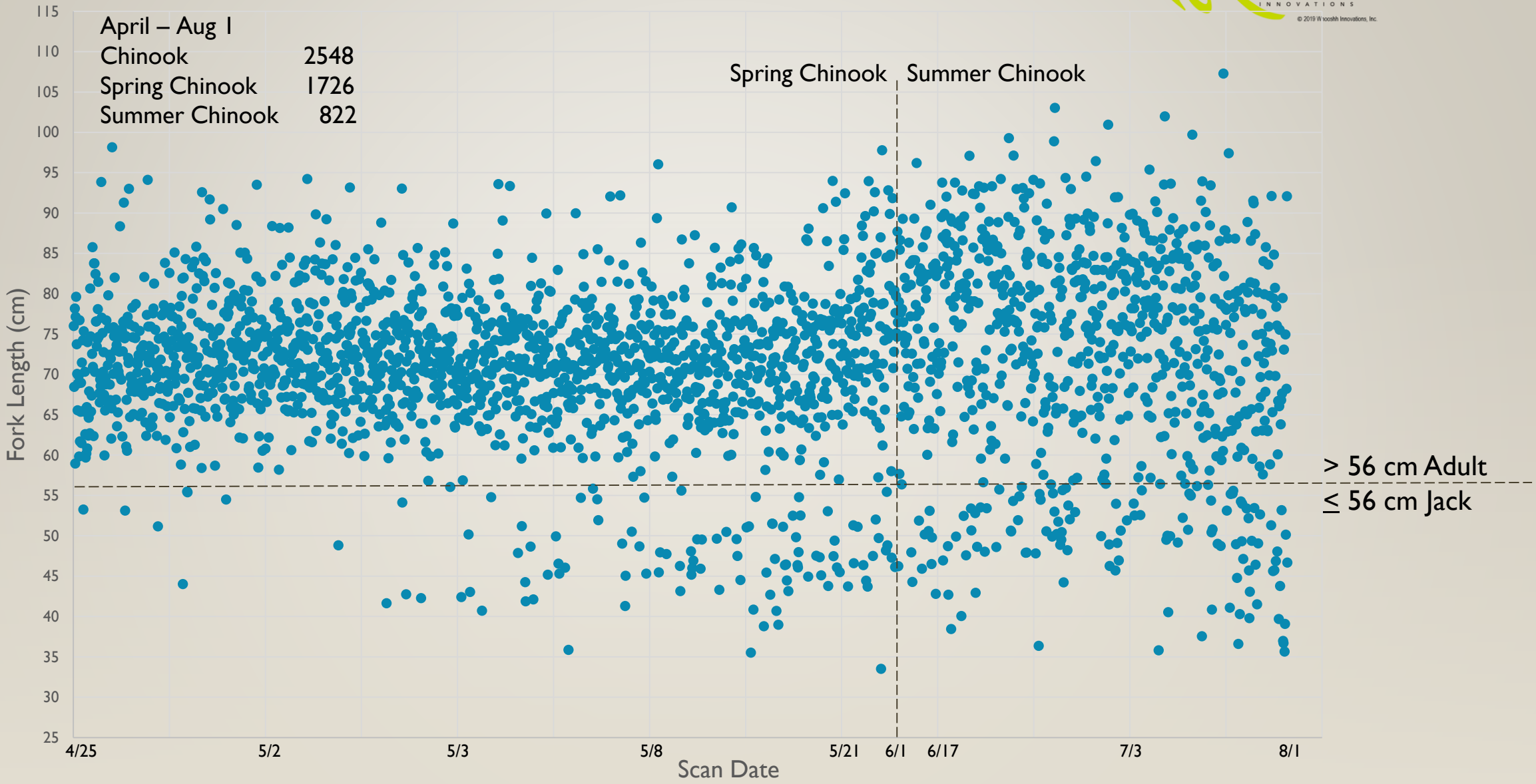
Chinook

FishL™ Recognition System Image

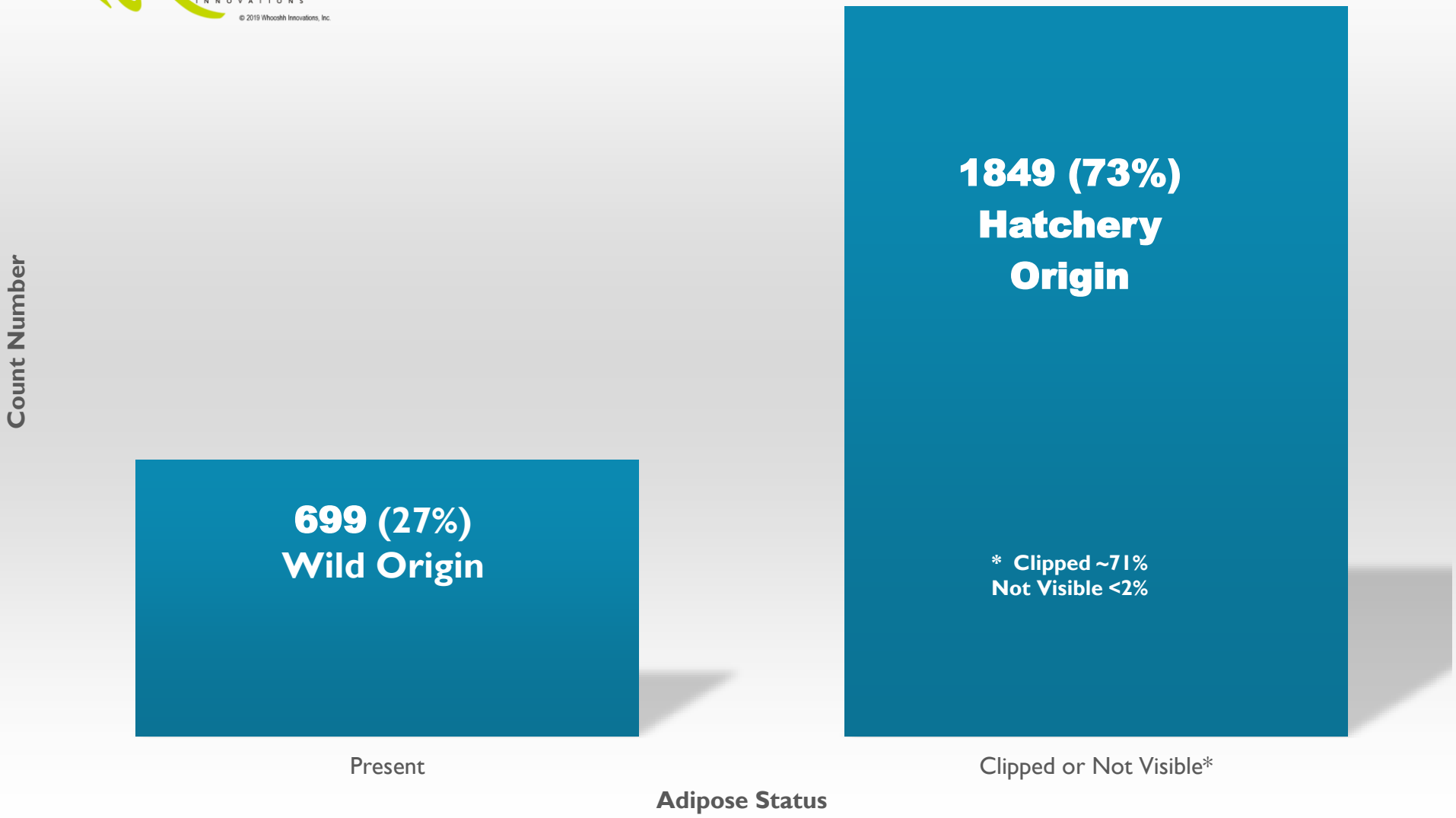
April – Aug 1, 2019 2548 Chinook

By week 36 AFF sampled 2757 Chinook and FishL 2899 Chinook = Total 5656 205% of AFF sampling alone

Chinook Fork Length per Count Number Logged

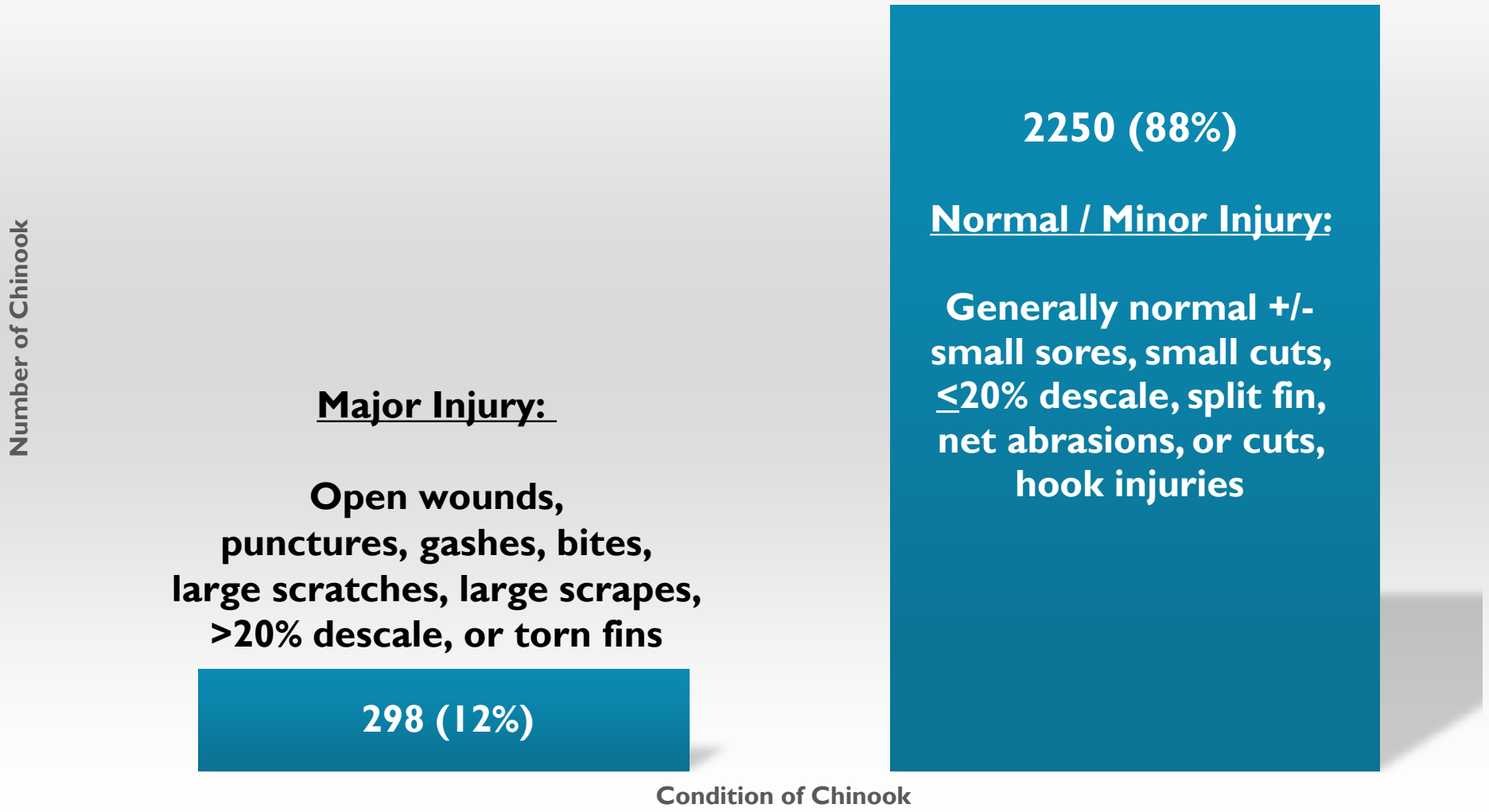


Chinook Adipose Status: Wild vs Hatchery April – Aug 1, 2019



* Lack of adipose visibility in images due to water obstructing clear view or the position/ behavior of the fish in the scanner. Water impact to visualization was size related with smaller fish more occluded. The Chinook **Not Visible Rate is estimated to be <2%** based upon general size relationship to Steelhead, Steelhead no visible rate of 2% and unrecorded observations of less Chinook visualization challenges related to position in comparison to Steelhead.

Chinook First Pass Injury Observations



Sockeye

FishL™ Recognition System Image

April – Aug 1, 2019 1256 Sockeye

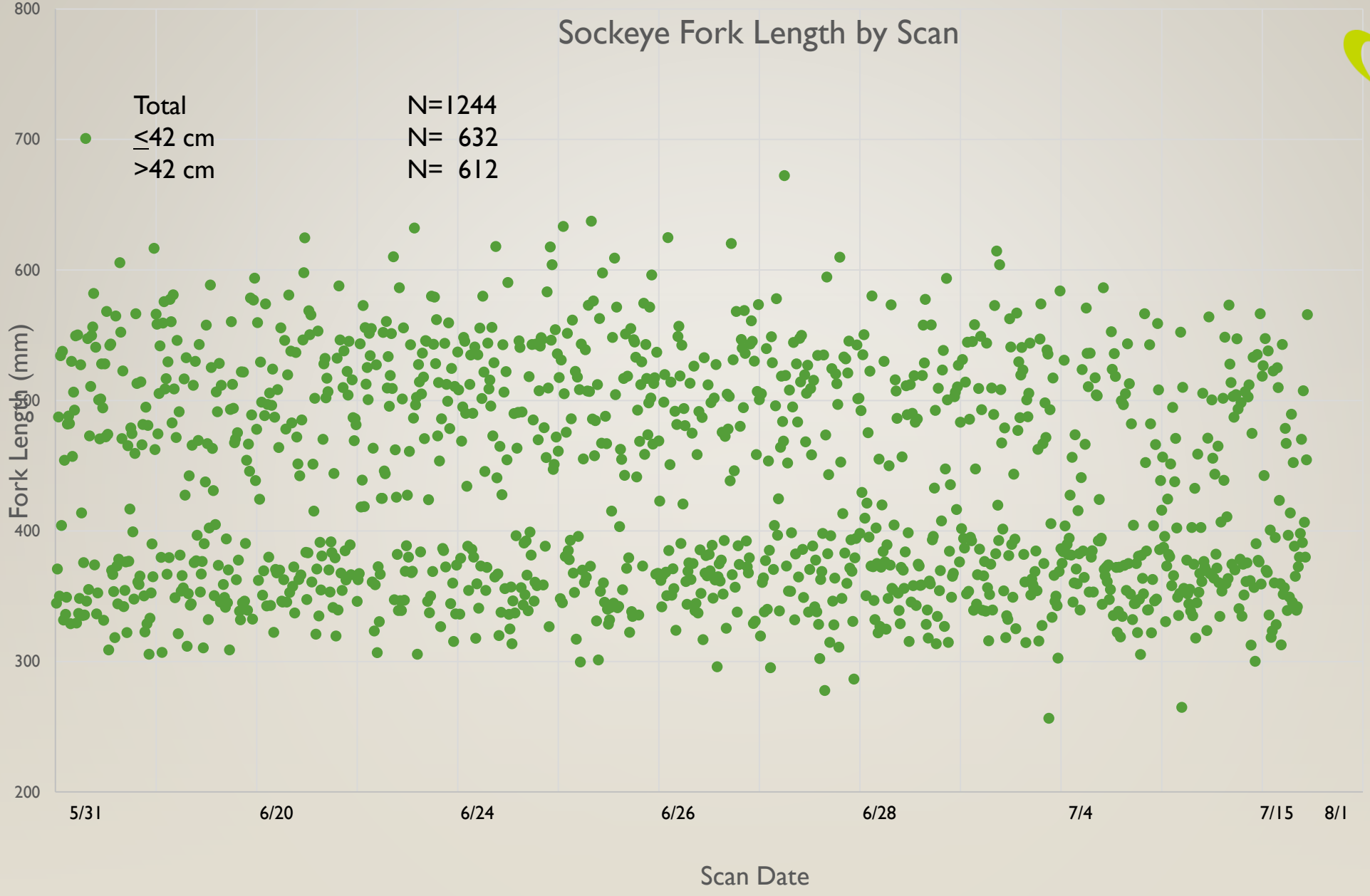
Sockeye

Mean			Mean	
Week	AFF FL (mm)	AFF N	Whooshh FL (mm)	Whooshh N
23	485	15	440.9	6
24	453	66	452.3	66
25	464	139	441.4	258
26	458	289	446.9	491
27	432	209	423.5	247
28	424	148	408.8	135
29	434	67	416.3	41
30	452	28	398.7	10
31	443	20	510.2	2
Weighted	450	981	437	1256

Combined sample set= 2237, Increase, total sample set size 228%

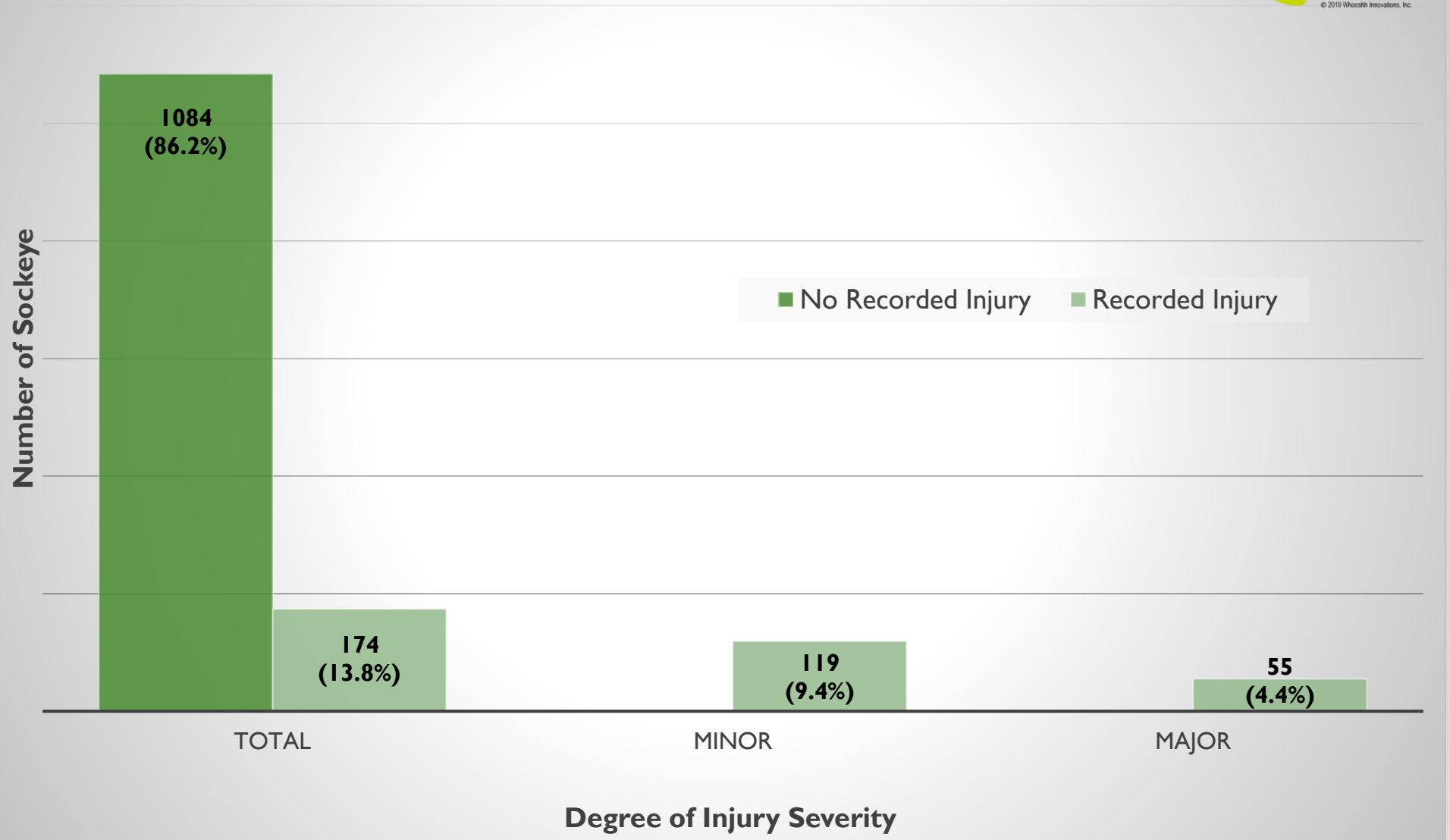
Difference in weighted sample set fork length means just 1.4 cm across 2237 sockeye

Sockeye Fork Length by Scan



Two Populations Distinguished by Size

Sockeye Recorded Injuries



Minor Injury – Descaling ≤ 20%, scrapes, split fins, small sores
Major Injury - Open wounds, gashes, pinniped bites, long scratches

Pinniped Predation Report – visual confirmation of consumption

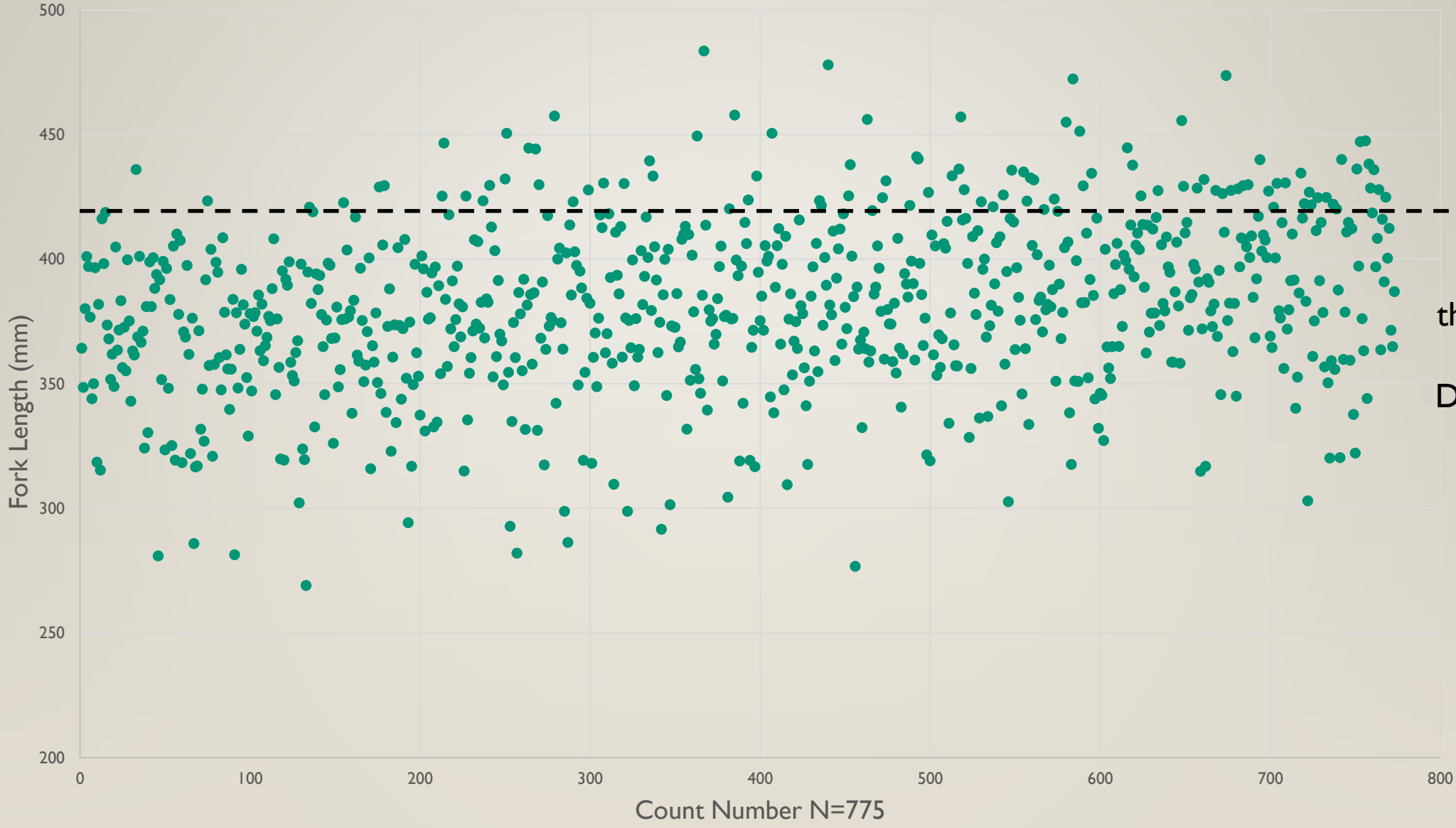
Post imaging analysis of Whooshh FishL scans can provide supplemental, additional data: **Pinniped Injury Estimates** relative to fish species and dates of observation, injury data could be correlated with assessments of pinniped mitigation actions

American Shad

FishL™ Recognition System Image

April – Aug 1, 2019 779 American Shad (2 multiple fish images)
Fork Length Recorded 775 with Average Fork Length 381 mm (15 in)

American Shad Fork Length by Count Number



Post Imaging Analysis – Many possible assessments:

Injury Reports

- Pinniped
- Net
- Hook
- Other

Visual Characterization Reports or Reference/Education Guide

- Photo Examples of Defining Species Characteristics
  - ie., Anal ray number in Steelhead (8-12)

Representative Sampling: Model the Comparisons

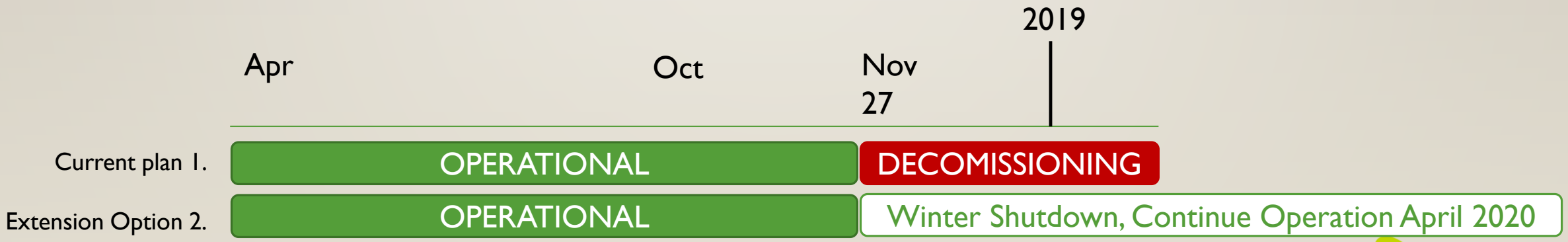
- -AFF species run timing and distribution vs Dam counts
- -AFF species count distributions vs environmental factors: temperature, weather, etc.

FISHL™ RECOGNITION DATA: VALUE ADD HIGHLIGHTS

1) Addition more than doubled AFF sampling output data
    1) species counts, forklength and adipose status
2) Provides a more complete estimate of AFF fish counts
3) Provides data on all species bypassed through the AFF
4) Fork lengths correlate well with manual measurements
5) Rapid fish evaluation, a fraction of a second, no handling or delay
6) Operational 24/7, rapid automated data output
7) Permanent record, scan image files, expand fisheries possibilities:
    1) Data confirmation
    2) Data mining
    3) Educational tools
    4) Outreach messaging

TIMELINE: REMOVAL VS. 2020 CONTINUATION

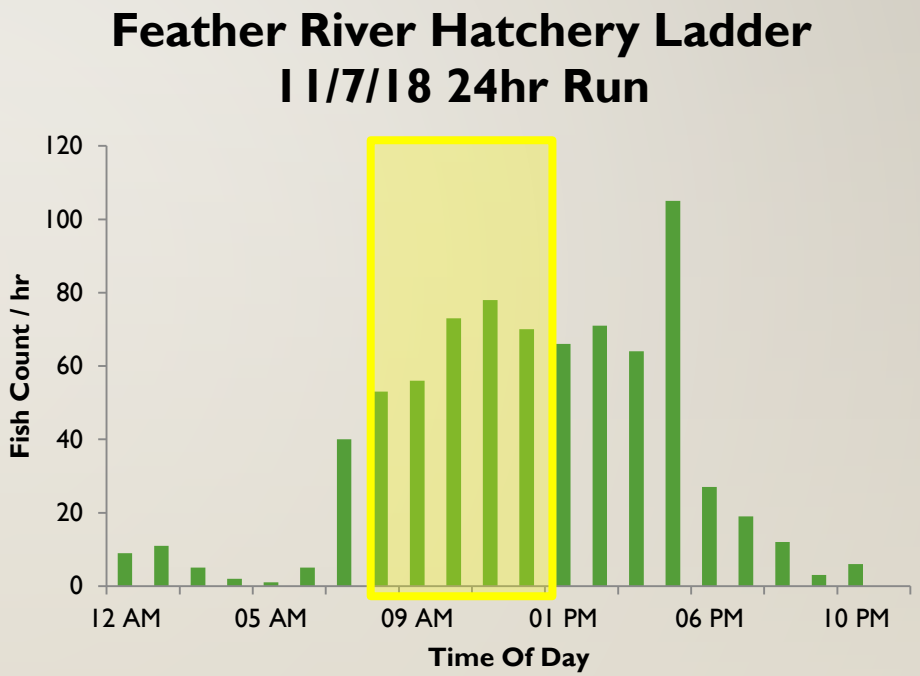
- Current plan if no action is taken is for removal in Dec 2019
  - Current agreements expire at end of 2019 season
- FPOM update and consideration of extending installation for another year October 2019
- Funding Agreement in Place by Nov 27 for continued operation in the AFF



RECOMMENDATIONS FOR GOING FORWARD (NEAR TERM) IF OPERATION CONTINUED IN 2020

- Continue Species Classification and Counting
- Continue Adipose Classification and Counting
- Post Imaging Analysis for Value-Add Datasets
- Conduct Length Evaluation Direct Comparison Study at AFF
  - Whooshh vs AFF hand measure of same fish
- Potentially Conduct an Expanded Day Bypass Count Study

  ? If there is value and interest ?
  - AFF watered up and bypass open to log who and what come through during an extended operation day
  - Identify if, what, when and how well the current sampling process represents the fish runs



WHOOSHH PASSAGE PORTAL : CHIEF JOSEPH DAM

https://www.youtube.com/watch?v=17qyh611alA

THANK YOU!