Utility of Commercial Salmon Traps for Lower Columbia River Fisheries

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PERSISTENCE

The Mixed-Stock Fishery Challenge

- Gill nets can cause harm to wild salmonid bycatch.
- Mortality of wild salmonids constrains fisheries.
- Detrimental to fish and fishermen.

Harvest and Hatchery Reform Policies

- "…develop and implement alternative fishing gear to maximize catch of hatchery-origin fish with minimal mortality to native salmon and steelhead."
  –Policies 3619 and 3620

Benefits of Alternative Gear

- **<u>Good for fish:</u>**
  - Reduce bycatch and hatchery impacts to wild salmonids.
- **<u>Good for fishermen:</u>**
  - Increase fishing opportunity.
  - Improve the quantity and quality of harvested fish products.


RESEARCH
2016-2020

Research Objectives

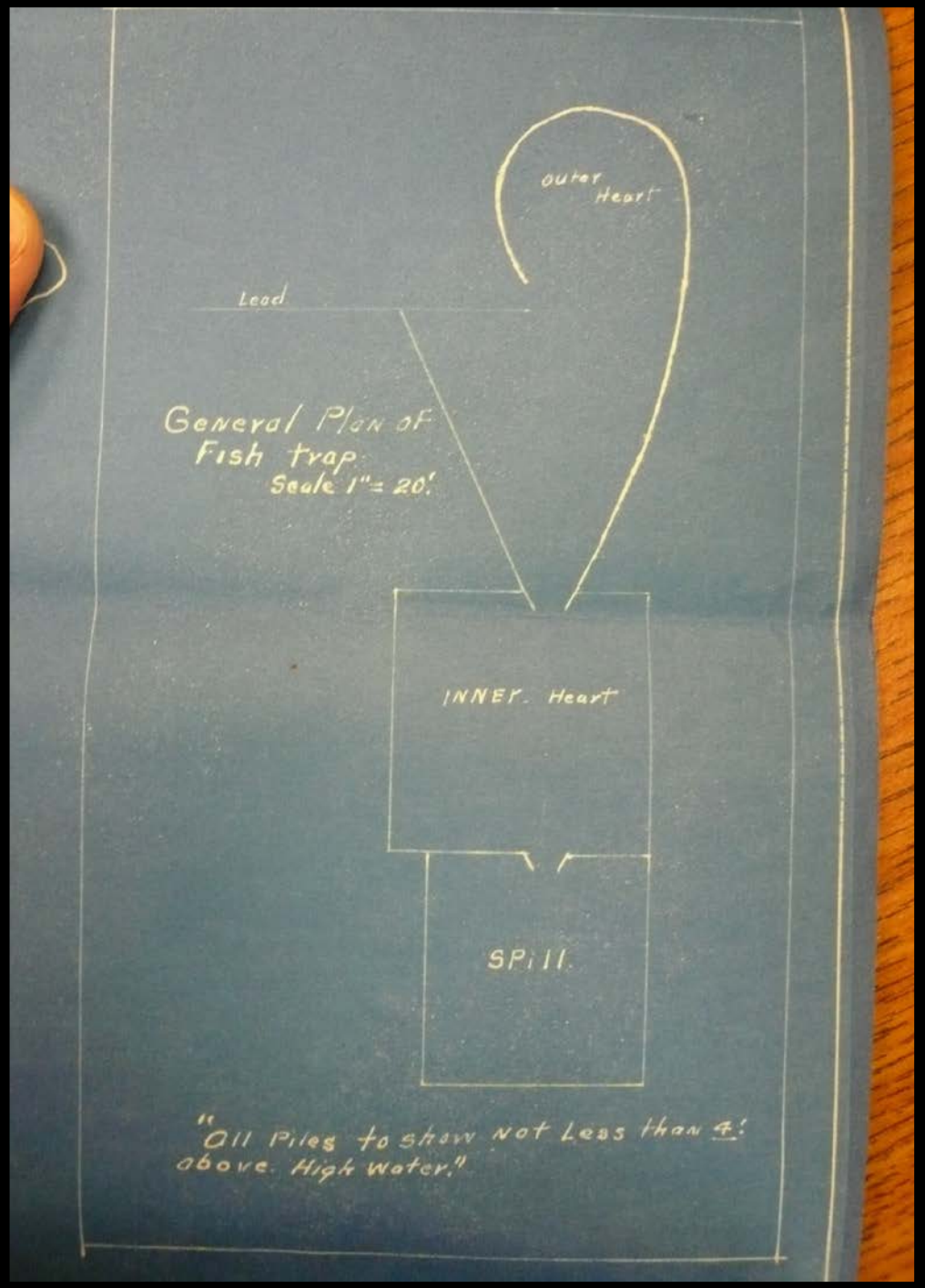
1) Construct and test operation of a fish trap for ecological monitoring and selective harvest.
2) Determine the effectiveness of the gear in capturing salmon.
3) Estimate immediate and post-release survival of salmonids.

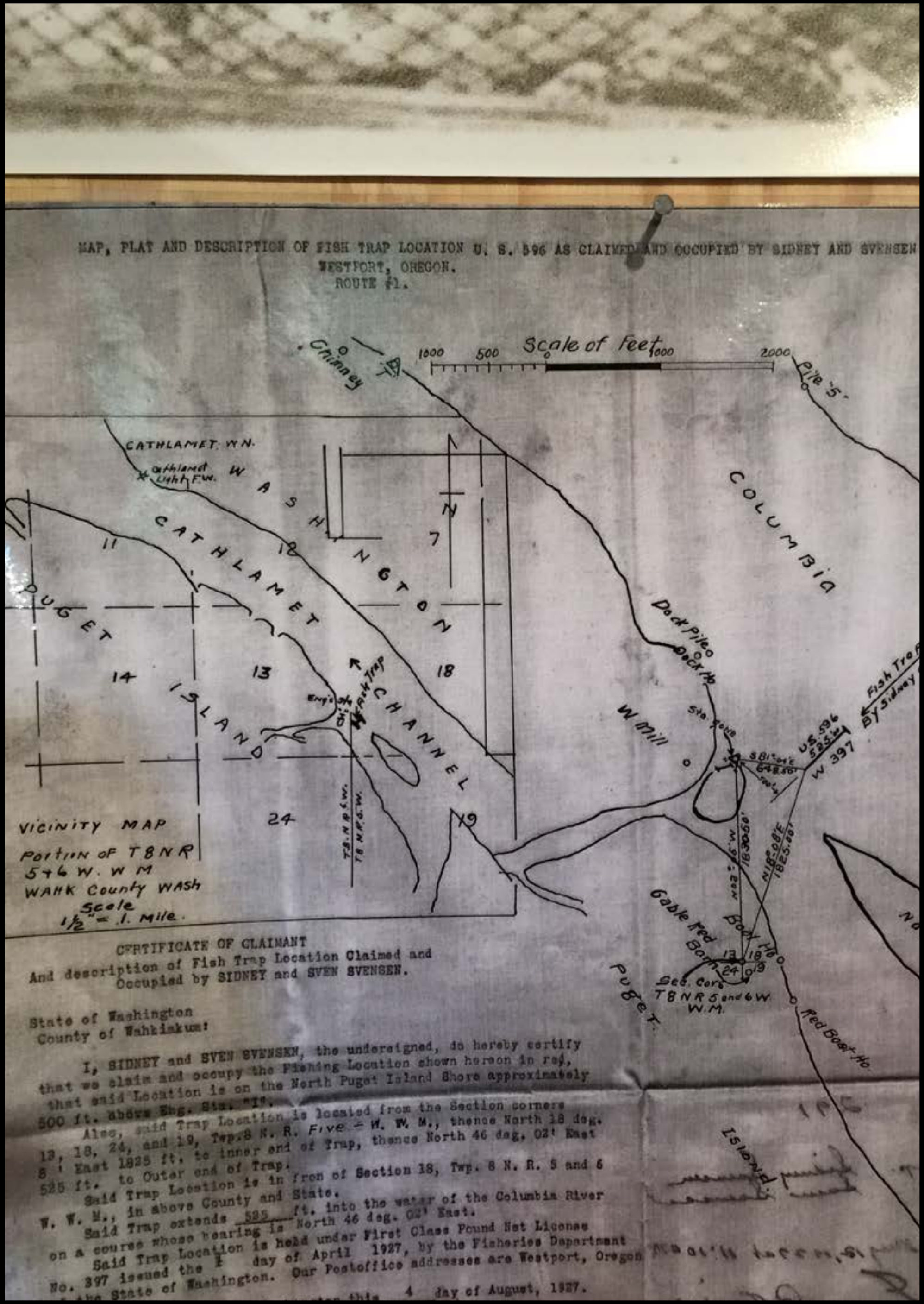
“[Bycatch release mortality rates] are necessary prior to either implementing the gear for commercial fisheries or monitoring.”

-ODFW

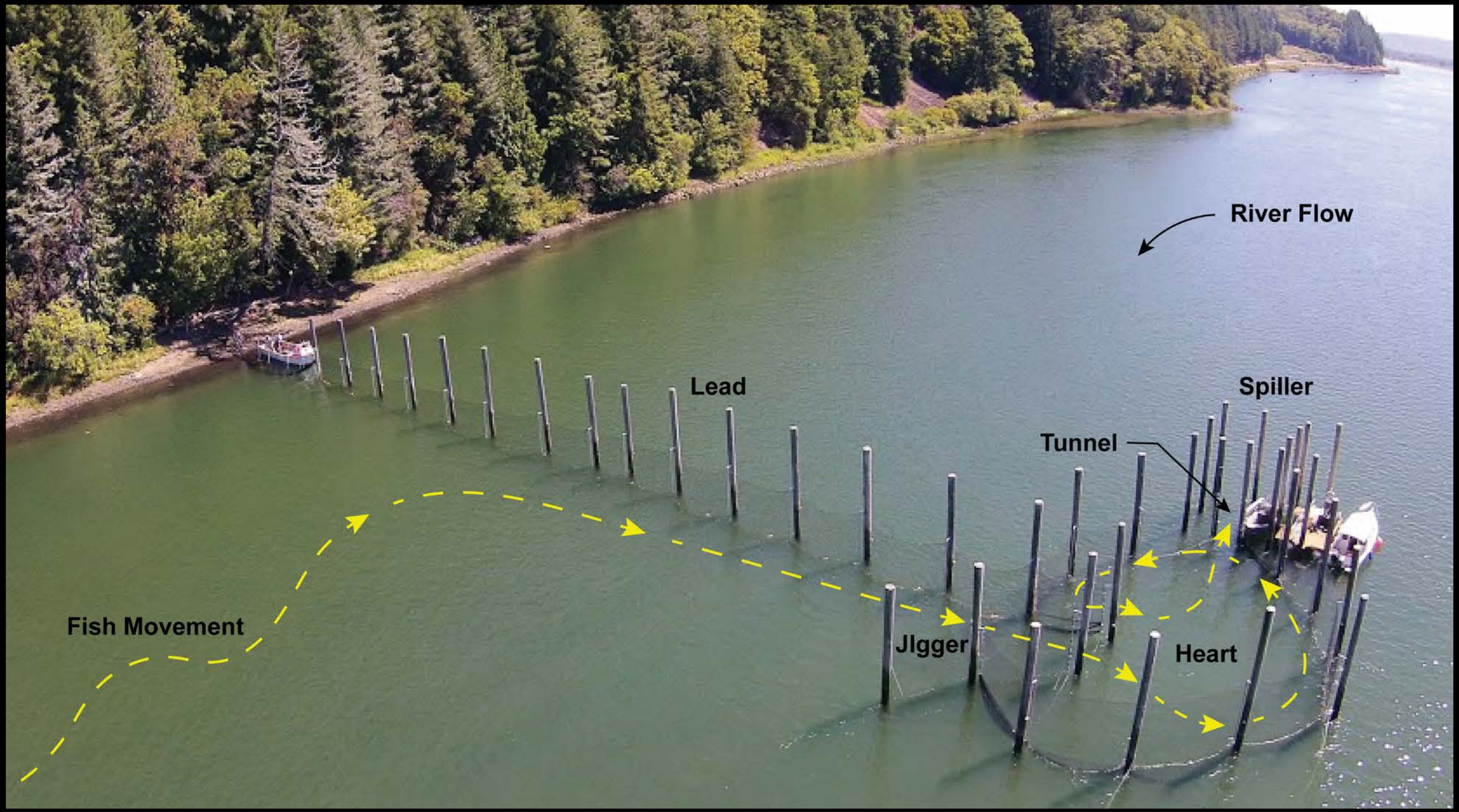
Methods

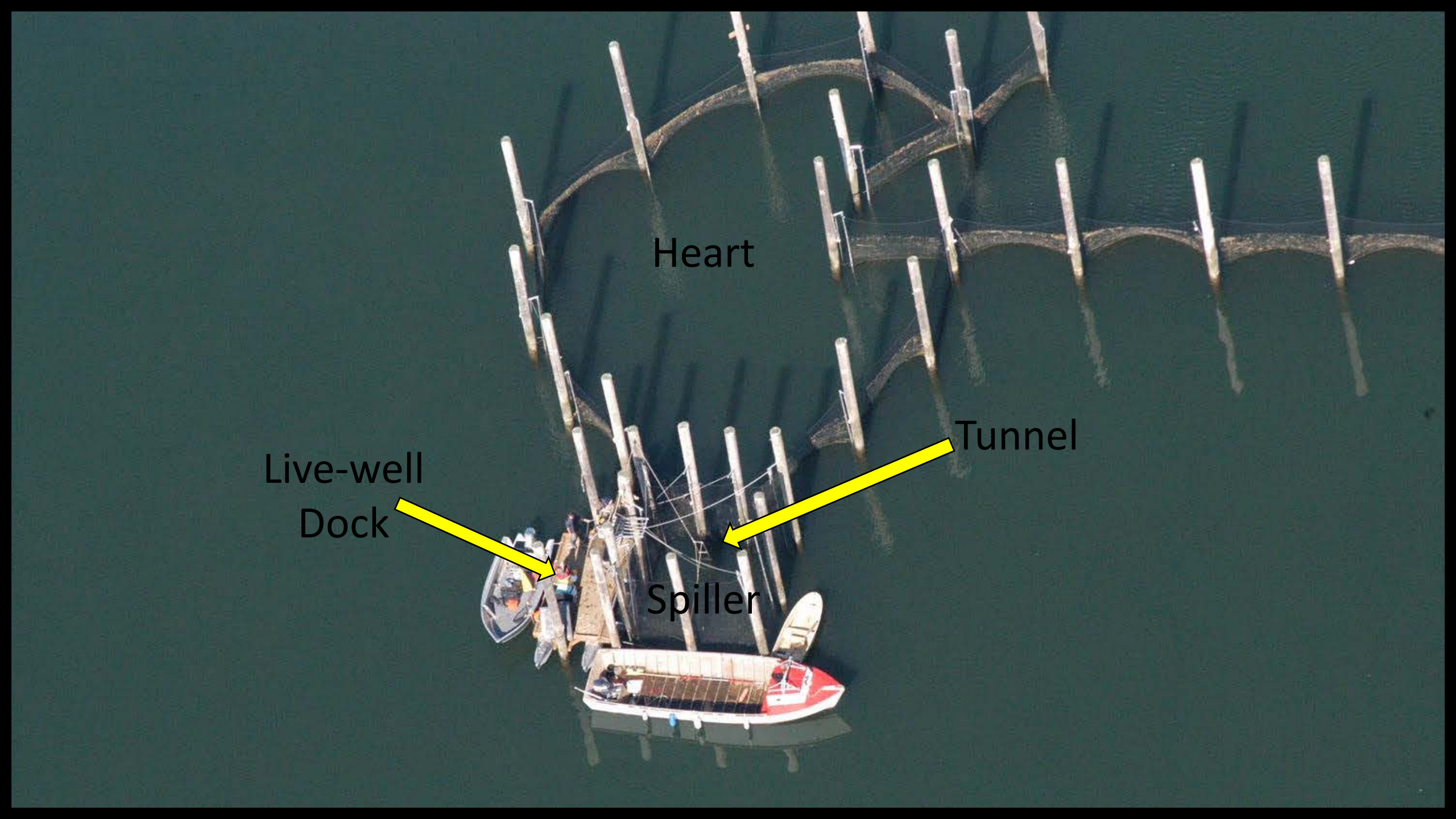

BRUSCO
OLD RECORDS


Outer Heart
Lead
General Plan of Fish trap
Scale 1" = 20'
INNER Heart
SPILL
"All Piles to show not Less than 4' above High Water."

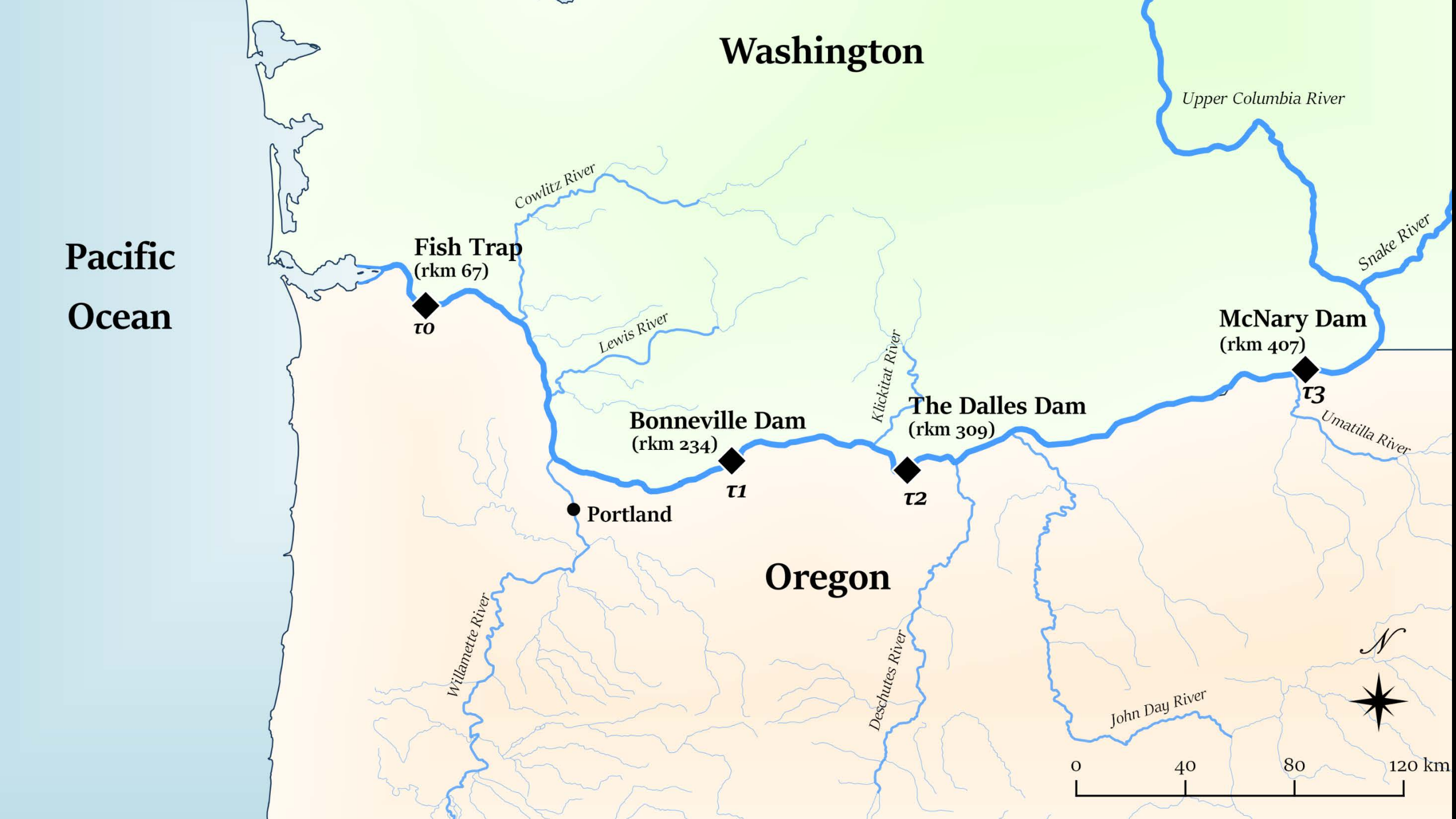

MAP, PLAT AND DESCRIPTION OF FISH TRAP LOCATION U. S. 596 AS CLAIMED AND OCCUPIED BY SIDNEY AND SVENSEN
WESTPORT, OREGON.
ROUTE #1.
Scale of Feet
1000 500 2000
Chimney
Pile '5'
CATHLAMET W.N.
Cathlamet Light Fw.
WASHINGTON
CATHLAMET CHANNEL
COLUMBIA
PUGET ISLAND
11 12 7 14 13 18 24 19
Dock Piles
W Mill
US 596
W 397
Fish Trap By Sidney
Gable Red
Red Boat Ho.
VICINITY MAP
Portion of T8NR
5+6 W. W M
WAHK County WASH
Scale
1/2" = 1. Mile.
CERTIFICATE OF CLAIMANT
And description of Fish Trap Location Claimed and
Occupied by SIDNEY and SVEN SVENSEN.
State of Washington
County of Wahkiakum:
I, SIDNEY and SVEN SVENSEN, the undersigned, do hereby certify
that we claim and occupy the Fishing Location shown hereon in red,
that said Location is on the North Puget Island Shore approximately
500 ft. above Eng. Sta. "I".
Also, said Trap Location is located from the Section corners
13, 18, 24, and 19, Twp. 8 N. R. Five - W. W. M., thence North 18 deg.
8 ' East 1825 ft. to inner end of Trap, thence North 46 deg. 02' East
525 ft. to Outer end of Trap.
Said Trap Location is in fron of Section 18, Twp. 8 N. R. 5 and 6
W. W. M., in above County and State.
Said Trap extends 525 ft. into the water of the Columbia River
on a coures whose bearing is North 46 deg. 02' East.
Said Trap Location is held under First Class Pound Net License
No. 397 issued the day of April 1927, by the Fisheries Department
State of Washington. Our Postoffice addresses are Westport, Oregon
4 day of August, 1927.


T-SHIRT THURSDAY
GIVE ME
10% OFF


River Flow
Lead
Spiller
Tunnel
Fish Movement
Jigger
Heart

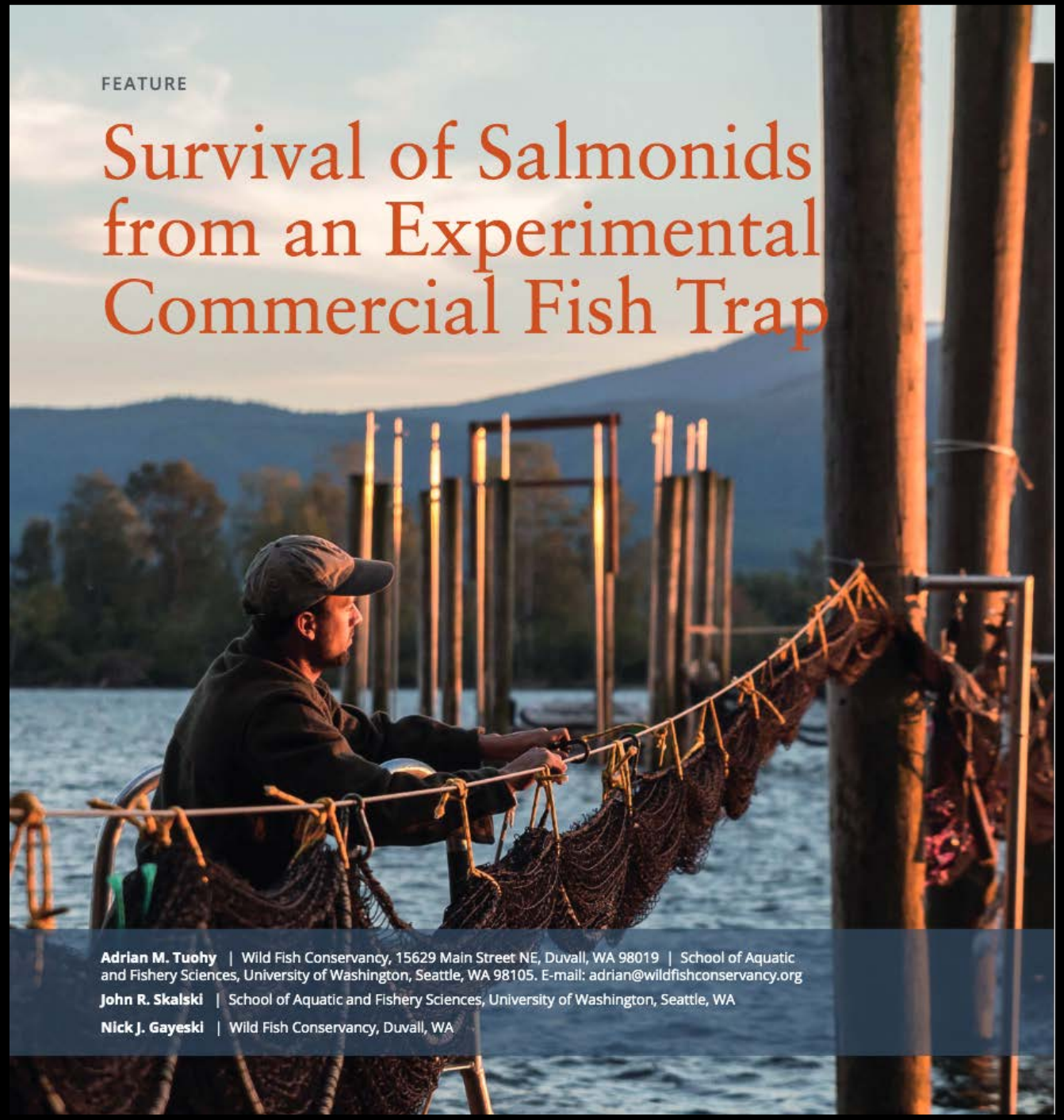

Heart
Tunnel
Live-well
Dock
Spiller


Tunnél Outlet


Pacific Ocean
Washington
Oregon
Upper Columbia River
Cowlitz River
Snake River
Fish Trap
(rkm 67)
τ0
Lewis River
Klickitat River
McNary Dam
(rkm 407)
τ3
Umatilla River
Bonneville Dam
(rkm 234)
τ1
The Dalles Dam
(rkm 309)
τ2
Portland
Willamette River
Deschutes River
John Day River
N
0
40
80
120 km

FEATURE

Survival of Salmonids from an Experimental Commercial Fish Trap



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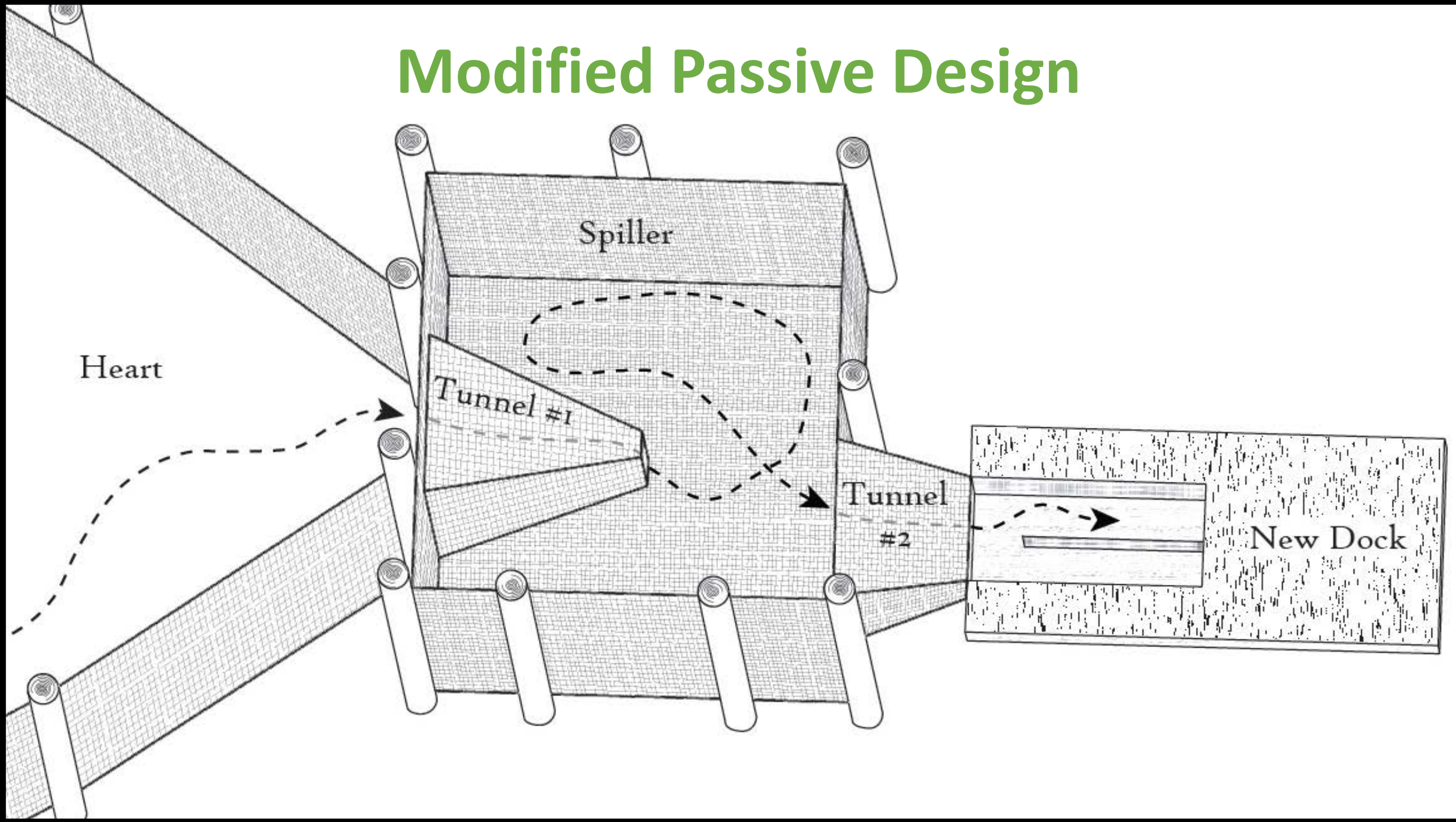
Chinook Survival

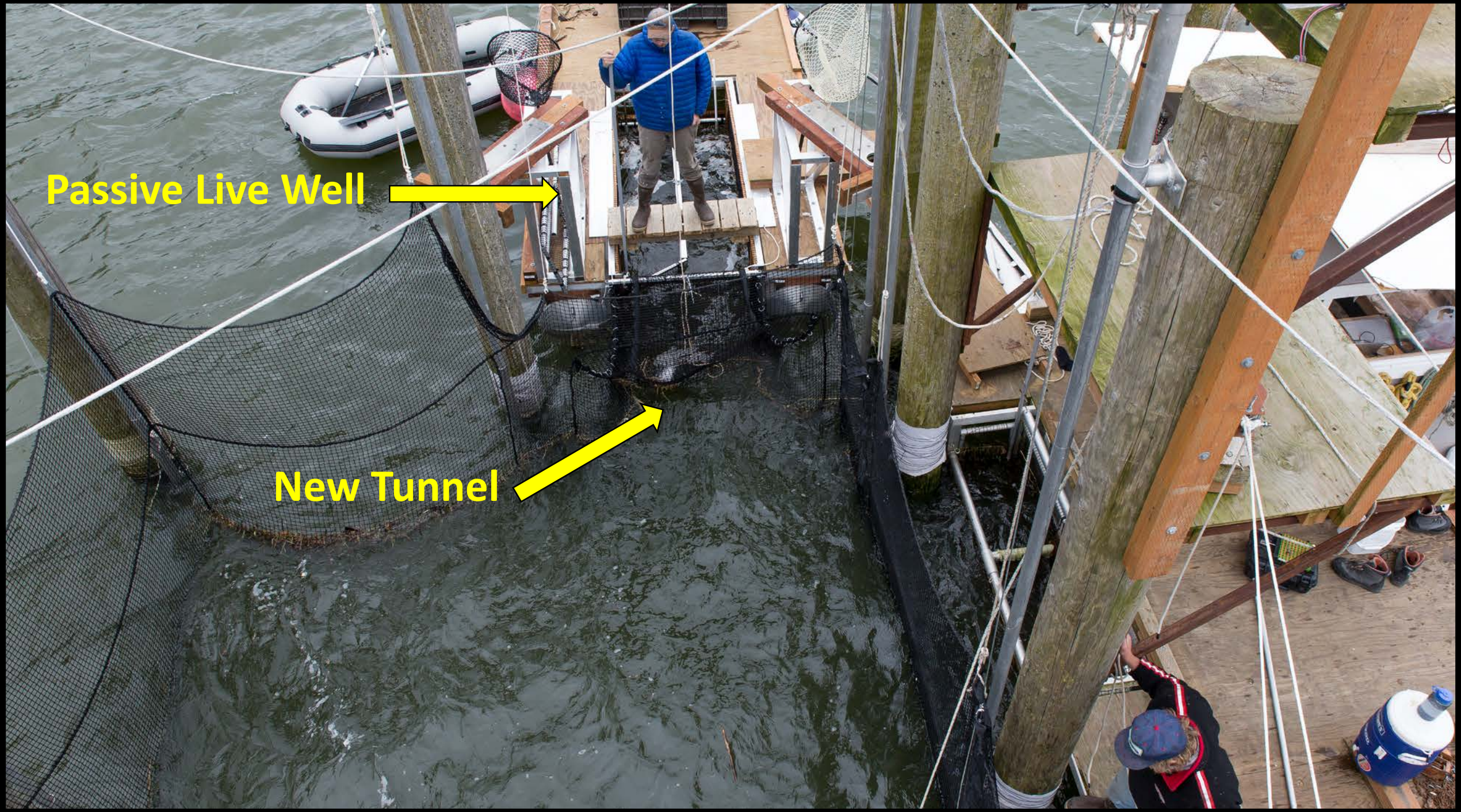
River Reach	Survival Point Estimate	Profile Likelihood 95% Confidence Interval
Gear to Bonneville Dam (τ_1)	0.970	0.901 – 1.044
Bonneville Dam to The Dalles Dam (τ_2)	1.060	0.965 – 1.166
The Dalles Dam to McNary Dam (τ_3)	0.968	0.877 – 1.070
Cumulative for 400 km Migration ($\tau_{1*}\tau_{2*}\tau_3$)	0.995	0.924 – 1.071

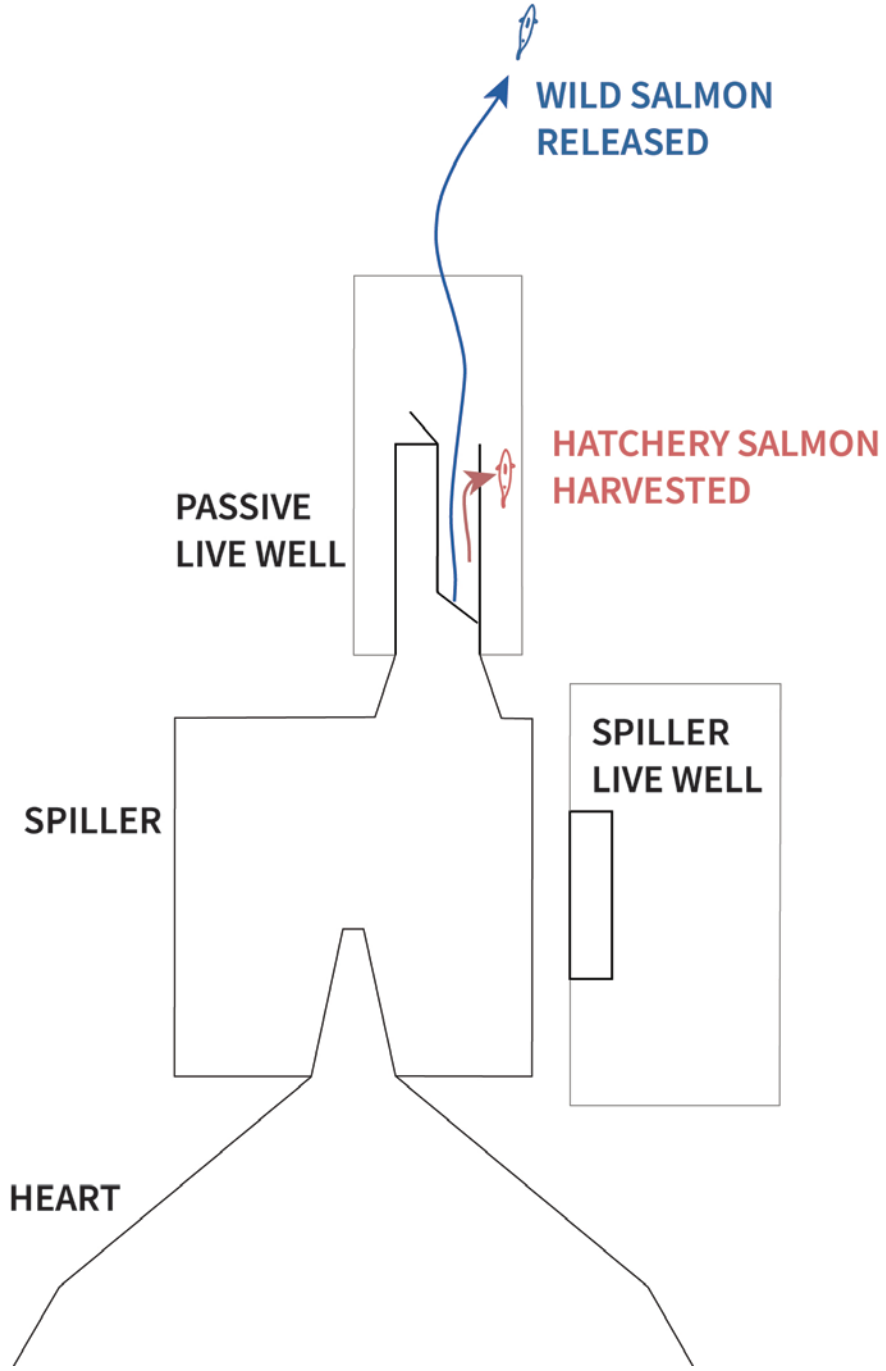
Steelhead Survival

River Reach	Survival Point Estimate	Profile Likelihood 95% Confidence Interval
Gear to Bonneville Dam (τ_1)	0.977	0.911 – 1.048
Bonneville Dam to The Dalles Dam (τ_2)	0.983	0.935 – 1.032
The Dalles Dam to McNary Dam (τ_3)	0.983	0.939 – 1.028
Cumulative for 400 km Migration ($\tau_{1*}\tau_{2*}\tau_3$)	0.944	0.880 – 1.012

Modified Passive Design




Passive Live Well
New Tunnel


WILD SALMON
RELEASED
HATCHERY SALMON
HARVESTED
PASSIVE
LIVE WELL
SPILLER
SPILLER
LIVE WELL
HEART

Benefits of Passive Design:

- Reduced Net Contact.
- Zero Air Exposure.
- Minimal Handling of Bycatch.
- No Overcrowding.
- No Burst Swimming.
- Passive Bycatch Release.
- Selective Harvest.
- No Bruising.
- No Scale-loss.

Sockeye Survival from Passive Design

River Reach	Survival Point Estimate	Profile Likelihood 95% Confidence Interval
Gear to Bonneville Dam (τ_1)	0.983	0.942 – 1.024
Bonneville Dam to The Dalles Dam (τ_2)	1.008	0.974 – 1.041
The Dalles Dam to McNary Dam (τ_3)	1.033	0.995 – 1.072
Cumulative for 400 km Migration ($\tau_{1*}\tau_{2*}\tau_3$)	1.017	0.974 – 1.059

Coho Survival from Passive Design

Holding Period	Survival Point Estimate	Sample Size
Immediate (τ_0)	1.000	n = 3523
Short-Term 48 h (τ_1)	1.000	n = 121

*Short-term net pen holding was conducted instead of mark-recapture to estimate survival due to the migratory nature of the coho species in the Columbia Basin. Since coho salmon spawn lower in the basin and do not migrate over the mainstem dams in significant numbers, mark-recapture is known to be ineffective for the species.

Results from the 2019 passive design study suggest that trap modifications may achieve nearly 100% survival of Steelhead and Chinook if tested.

Release Survival from Five Gears

Gear	Fall Chinook	Coho	Sockeye	Steelhead
Gill net	N/A	N/A	N/A	Unknown
Tangle net	0.764	0.764	Unknown	Unknown
Beach seine	0.750	0.620	Unknown	0.920
Purse seine	0.780	0.710	Unknown	0.980
Fish trap	0.995	1.000	1.000	0.944


2018 – 2020 Test Fisheries

Commercial Capture Process

SPILLED

OR PASSIVELY CAUGHT


WILD SALMON
AND STEELHEAD
RELEASED

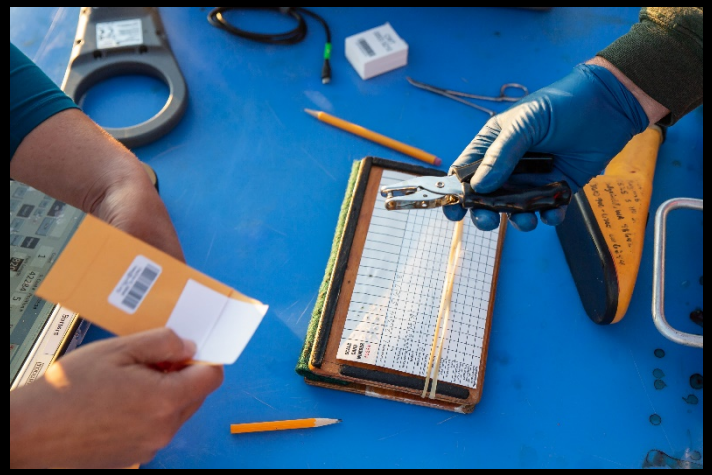
TARGETED
HATCHERY FISH
DIPNETTED FROM
LIVE WELL

LIVE BLED
INTO SLUSH ICE

WEIGHED

COMMERCIAL SAMPLED

PACKED
INTO FRESH ICE




OCEAN EAGLE


YAMAHA


Columbia River
Trap Caught Salmon
COHO O/R
Date: 10-14-2019

Seattle Chef Renee Erickson: Eat This Salmon

> It redefined what we can serve people," says Erickson. "The trap avoids all the noise, the engines, the plastic, the nets."

"Fish out of a trap is remarkable; it's untouched, pristine," says Erickson. "We roast it in butter, cure it. There's very little you should do to it when it's so fresh and perfect."

Test Fishery Conclusions

- The fish trap can match or exceed the capture effectiveness of other gears.
- Very minimal estimated mortality to ESA-listed stocks.
- Low-carbon footprint and fuel costs.
- High likelihood of sustainable market certification.
- Product quality is very high (no bruising, scale-loss, net damage, etc.).
- Substantial potential for added-value to trap-caught products.

Additional Research Needs

- Test fish trap designs in new river locations (2021-2022)

  → Evaluate potential improvements in gear efficiency for selective harvest and differences in bycatch encounters.

- More research of passive trap design to identify likely improvements to steelhead and Chinook release survival (2021-2022)

  → Reduce ESA bycatch impacts and improve selective fishing opportunity with alternative gears.

- Research gill net release mortality effects for the first time for steelhead bycatch

  → Improve precision of fishery ESA impact estimates and enable unbiased comparison with alternative gears for implementation and policy review purposes.

Putting the Pieces Together…

1. Identify viable alternative gears. ✓
2. **Implement alternative gears.**
3. Add value to seafood products through best harvest practices, market certification, and/or direct marketing.
4. Establish transition program to subsidize alternative gear and assist with permitting, implementation, etc.
5. Regulate and monitor alternative gear experiment and adjust accordingly.

The Future: Benefits to Fishermen

- Multiple tools in the toolbox: gill nets, tangle nets, seines, and traps.
- Appropriate tools are applied by resource managers and fishers depending on the challenges faced.
- Greater quantity of hatchery fish harvested.
- Greater quality of harvested products.
- Higher fish prices: sustainable certification, branding, marketing, and advertising.
- Greater profitability of lower Columbia River fisheries.

Benefits to Wild Salmon Recovery

- In-river, selective harvest of hatchery fish to reduce pHOS.
- Bycatch mortality reduction.
- Potential for improvement in wild salmonid escapement.
- ‘Wild Salmon Safe’

Benefits to Resource Management

- Traps may serve dual purpose of sustainable harvest and research.
- Improve the sustainability of hatchery programs.
- Traps serve as effective in-river research and monitoring stations:
  - Run timing
  - Run size
  - Stock composition
  - Survival
  - Behavior
  - Genetics

"[Bycatch release mortality rates] are necessary prior to either implementing gear for commercial fisheries or monitoring."

-ODFW

- Release mortality has been researched, peer-reviewed, and published for alternative gears. More research is scheduled to occur.
- Gill net release mortality for critical bycatch stocks has not been researched, yet the gear is implemented annually with unknown impacts to ESA-listed fishes.
- Impacts from harvest policy or gear changes remain a guess until release mortality is evaluated for all gears in an equivalent manner.

Thank You!

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