

Yuba County Water Agency

Yuba River Development Project

(FERC Project No. 2246)

- Unresolved Potential 4(e)s -

**June 8, 2016
YCWA Presentation to Forest Service and Other Agencies**

Potential 4(e) Agreements

~\$115 Million Over 30 Years

Staffs Have Reached Tentative Agreement	Staffs Are Close to Agreement	Staffs Expect to Reach Agreement
Employee Training	New Bullards Bar Floating Material Management Plan*	Upper Yuba River Aquatic Monitoring Plan*
Erosion and Sediment Control Plan*	Our House Diversion Dam Spill Cessation	Log Cabin Diversion Dams Spill Cessation
Our House and Log Cabin Diversion Dams Sediment Management Plan*	Aquatic Invasive Species Management Plan*	Water Quality Monitoring Plan*
Our House and Log Cabin Diversion Dams Large Woody Material	Historic Properties Management Plan*	Water Temperature Monitoring Plan*
Hazardous Material Management Plan*		New Bullards Bar Reservoir Minimum Pool
Our House and Log Cabin Diversion Dams Water Year Types		Recreation Facilities Plan*
Streamflow and Reservoir Level Compliance Monitoring Plan*		
Flood Control		
Our House and Log Cabin Diversion Dams Minimum Flows		
New Bullards Bar Reservoir Fish Stocking Plan*		
Integrated Vegetation Management Plan*		
Bald Eagle and American Peregrine Falcon Management Plan*		
Bat Management Plan*		
Recreation Flow Information		
Our House Whitewater Boating Flow		
Transportation System Management Plan*		
Fire Prevention and Response Plan*		
Visual Resources Management Plan*		
18	4	6

* An asterisk means the condition includes a detailed implementation plan.

The Differences – ~\$90 Million Over 30 Years

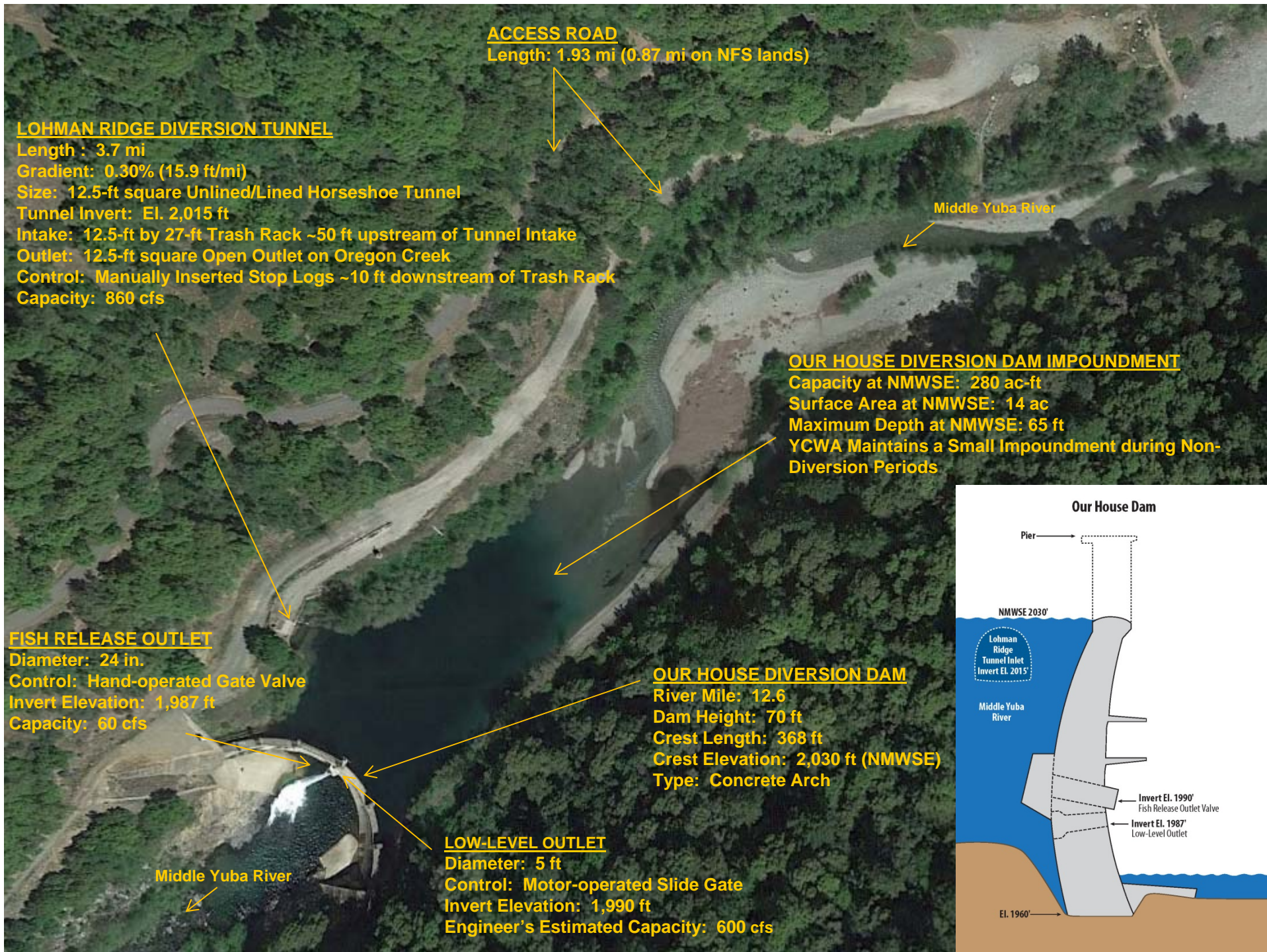
- Issue 1 – Lohman Ridge Diversion Tunnel Entrainment Mitigation
- Issue 2 – Our House Diversion Dam Fish Passage Mitigation
- Issue 3 – Camptonville Diversion Tunnel Entrainment Monitoring
- Issue 4 – Lohman Ridge Diversion Tunnel Periodic Closure

Lohman Ridge Diversion Tunnel Entrainment Mitigation

June 8, 2016

Yuba River Development Project
YCWA Presentation to Forest Service and Other Agencies

Slide 4



ACCESS ROAD
Length: 1.93 mi (0.87 mi on NFS lands)

LOHMAN RIDGE DIVERSION TUNNEL

Length : 3.7 mi
Gradient: 0.30% (15.9 ft/mi)
Size: 12.5-ft square Unlined/Lined Horseshoe Tunnel
Tunnel Invert: El. 2,015 ft
Intake: 12.5-ft by 27-ft Trash Rack ~50 ft upstream of Tunnel Intake
Outlet: 12.5-ft square Open Outlet on Oregon Creek
Control: Manually Inserted Stop Logs ~10 ft downstream of Trash Rack
Capacity: 860 cfs

Middle Yuba River

OUR HOUSE DIVERSION DAM IMPOUNDMENT

Capacity at NMWSE: 280 ac-ft
Surface Area at NMWSE: 14 ac
Maximum Depth at NMWSE: 65 ft
YCWA Maintains a Small Impoundment during Non-Diversion Periods

FISH RELEASE OUTLET

Diameter: 24 in.
Control: Hand-operated Gate Valve
Invert Elevation: 1,987 ft
Capacity: 60 cfs

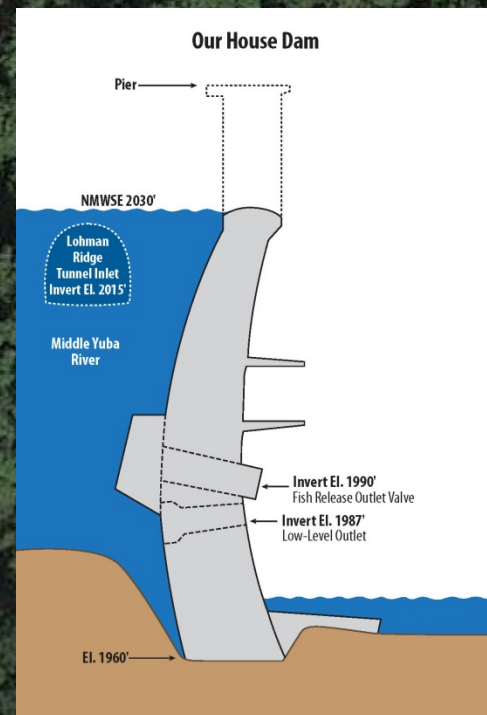
OUR HOUSE DIVERSION DAM

River Mile: 12.6
Dam Height: 70 ft
Crest Length: 368 ft
Crest Elevation: 2,030 ft (NMWSE)
Type: Concrete Arch

LOW-LEVEL OUTLET

Diameter: 5 ft
Control: Motor-operated Slide Gate
Invert Elevation: 1,990 ft
Engineer's Estimated Capacity: 600 cfs

Middle Yuba River



The Difference

- FS staff's position: *“Construction of a fish screen or other device to eliminate entrainment into the Lohman Ridge Tunnel”* (Slide 7 of RP's 11/9/15 presentation)
- YCWA's staff's position: Fish screen or other device not warranted at Lohman Ridge Diversion Tunnel to provide adequate protection to the reservation resources, but YCWA is willing to discuss options with costs in line with effects
 - Basis of YCWA staff's position is overall weight of numerous considerations, not just one piece of evidence

Basis for YCWA Staff's Position

- Fish screen or other exclusionary device not warranted at Lohman Ridge Diversion Tunnel because:
 1. No effect on ESA-listed species or ESA-listed designated critical habitats

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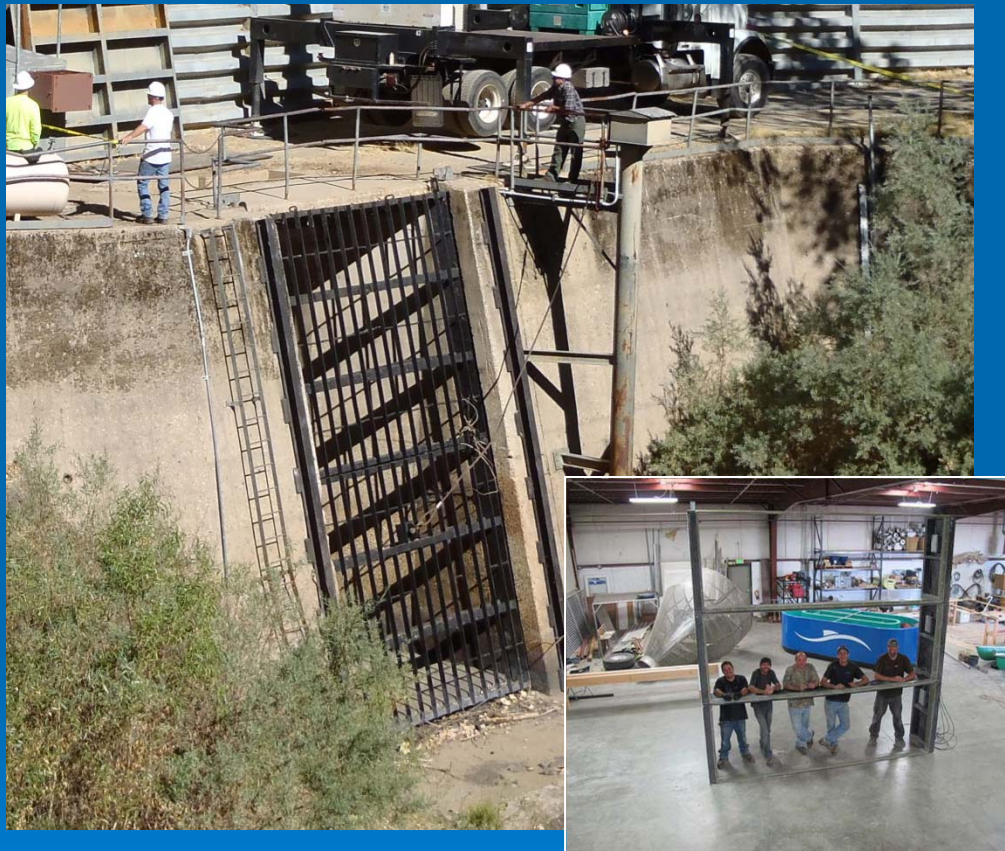
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 10. Low number of rainbow trout enter Lohman Ridge Diversion Tunnel

Low Level of Individual Fish Entrainment (1 of 4)



Lohman Ridge Diversion Tunnel Intake opening.
Three-antenna stacked array installed
about 10-15 feet downstream of the trash rack

- YCWA's Entrainment Study at Lohman Ridge Diversion Tunnel used an automatic passive integrated transponder (PIT) radio tag system and 3-antenna stacked array
- The array was in the tunnel entrance for 381 days (10/22/12 through 11/7/13), during which time diversions occurred on about 265 days. During that time that diversions were occurring, the array was removed for maintenance for a total of 25.2 hrs
- Prior to turning the array on, YCWA tagged 89 trout in the dam pool and 72 trout in the 1.2-mi-long section of river upstream of the pool. All were rainbow trout, except for 2 brown trout. FS agreed WPT not targeted for tagging because none were observed in the area during relicensing studies
- The array was used to detect tagged trout that went into the tunnel

June 8, 2016

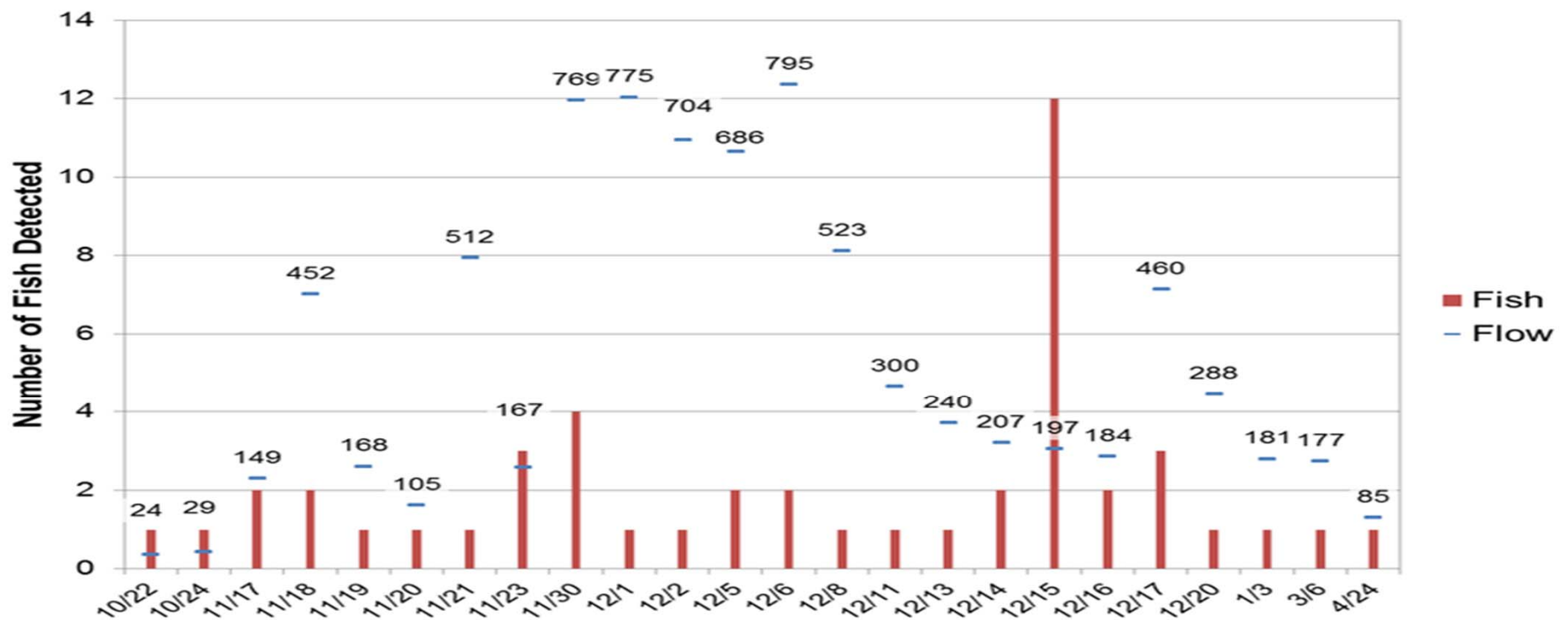
Yuba River Development Project
YCWA Presentation to Forest Service and Other Agencies

Slide 17

Low Level of Individual Fish Entrainment (2 of 4)

- 48 of the 159 rainbow trout tagged in the MYR were detected in the tunnel; the 2 tagged brown trout were not detected
- Fish were detected on 24 of 264 days

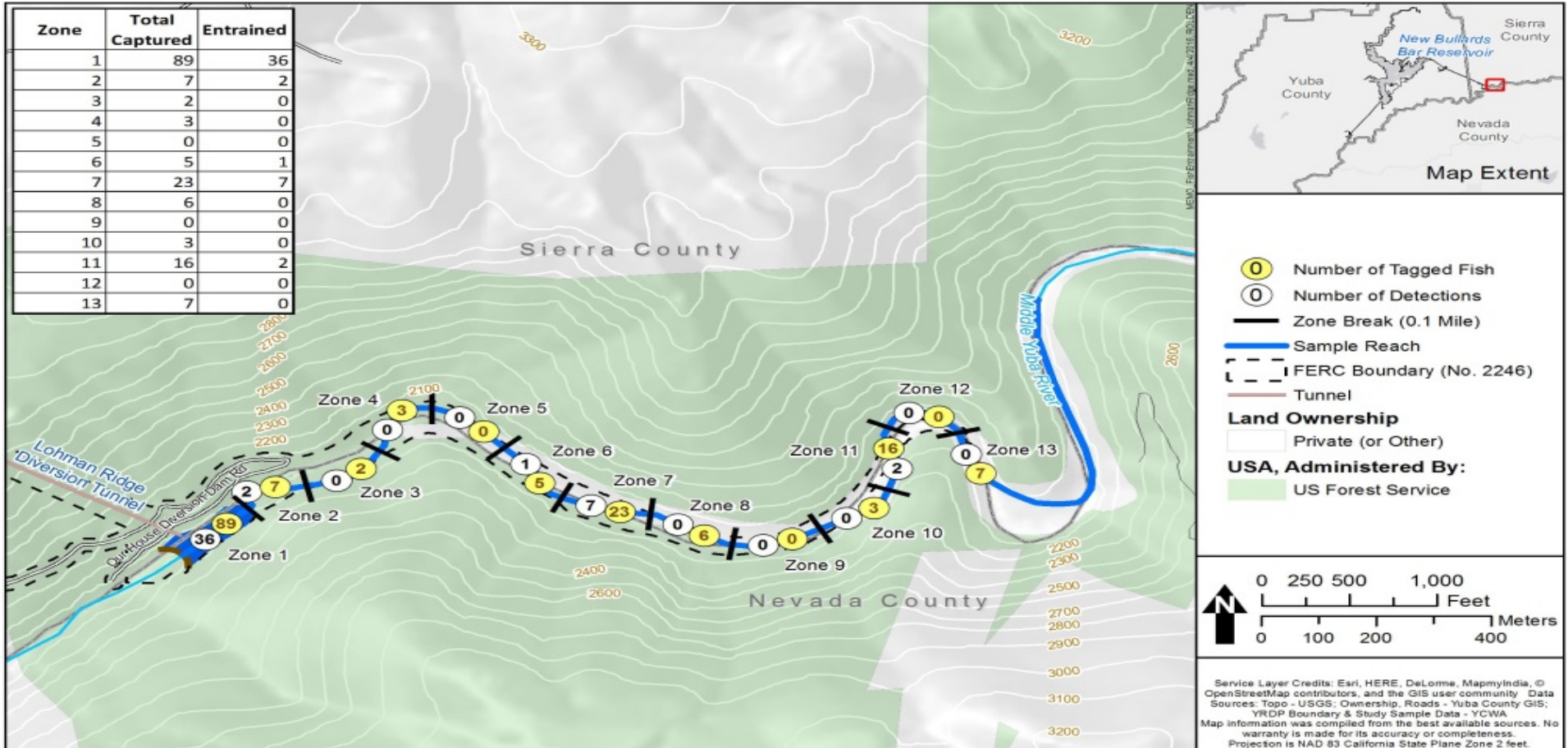
Lohman Ridge Daily Fish Detections and Tunnel Flows



Low Level of Individual Fish Entrapment (3 of 4)

➤ 40.5% of the rainbow trout tagged in the pool were detected

➤ 16.7% of the rainbow trout tagged in the 1.2-mile-long section of river were detected

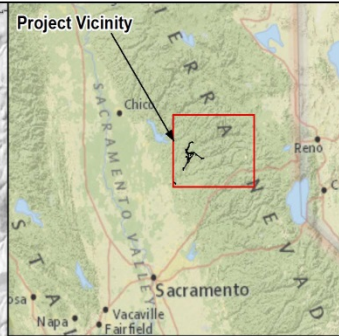
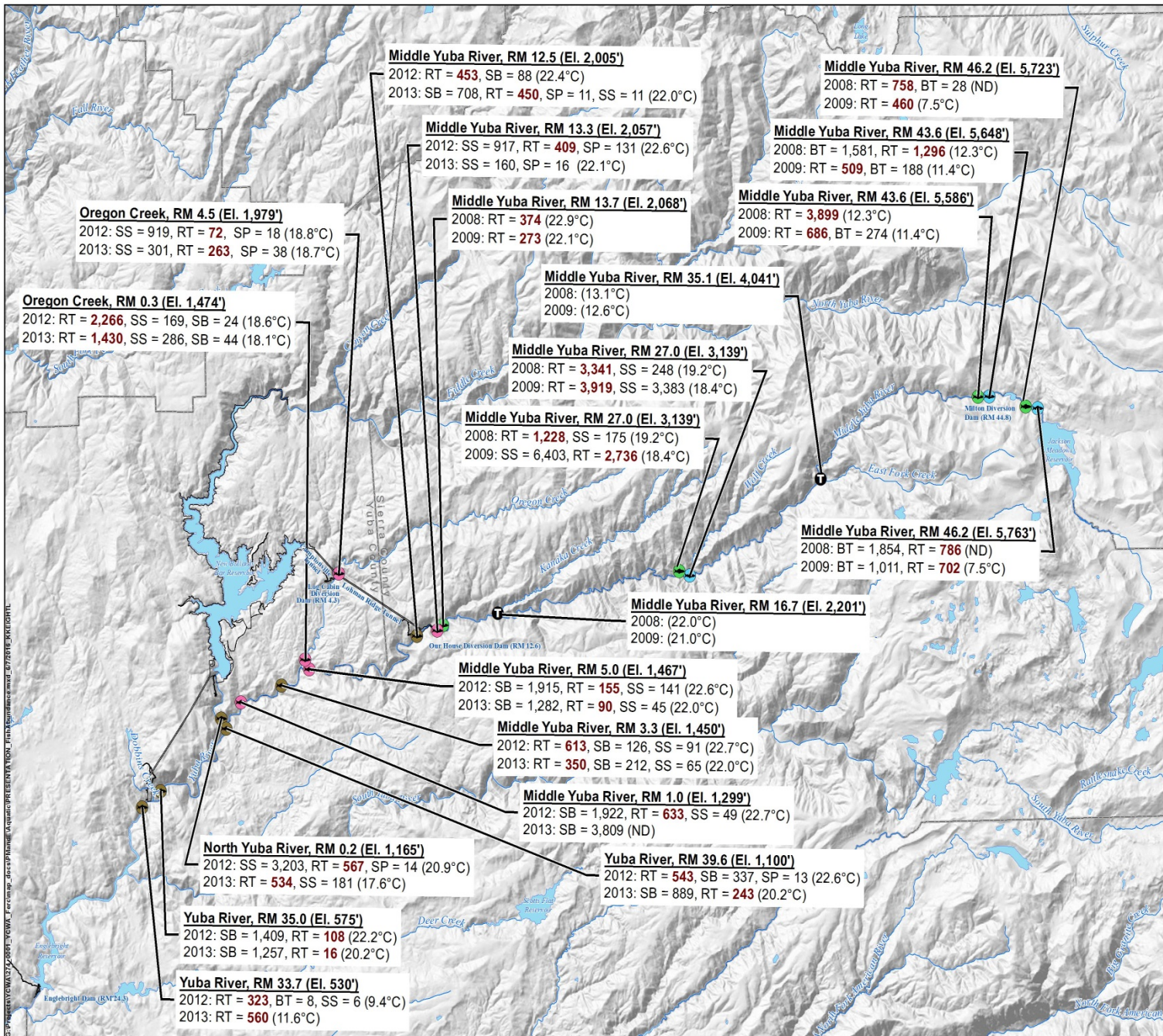


Low Level of Individual Fish Entrainment (4 of 4)

- YCWA staff estimates 641 rainbow trout were in the tagging area
 - In impoundment, mark-and-recapture yielded an estimate of rainbow trout in the impoundment of 150
 - At a site 0.6 mi upstream of impoundment, electrofishing estimated 409 rainbow trout/mi. Multiplying 409 rainbow trout times 1.2 mi of river results in 491
- ... and 142 of these rainbow trout entered the tunnel
 - Assuming 40.2% of the 150 rainbow trout in the impoundment entered the tunnel, results in 60
 - Assuming 16.7% of the 491 rainbow trout in river entered the tunnel, results in 82

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 11. De minimis effect on MYR rainbow trout population due to entering Lohman Ridge Diversion Tunnel



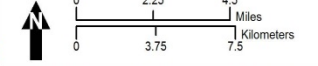
Main Map Extent

Label Key

- WT = Water temperature
- RM = River mile
- Fish Species (Fish per mile)**
- RT = Rainbow trout
- SB = Smallmouth bass
- BT = Brown trout
- SP = Sacramento pikeminnow
- SS = Sacramento sucker
- Survey Method**
- EF = Electrofishing
- SN = Snorkeling

Temperatures reported are Mean Daily Average in August (°C)
 ND = No temperature data collected

- Fish Survey Site**
- Project Relicensing (Survey Method)**
- Yuba-Bear/Drum-Spaulding (EF)
 - Yuba-Bear/Drum-Spaulding (SN)
 - Yuba River Development Project (EF)
 - Yuba River Development Project (SN)
 - Yuba River Development Project (Temp)



**Yuba River Development Project
 FERC Project No. 2246**

Data Sources: Project Data - FERC Boundary-Yuba County GIS; Fish Survey-YCWA, PG&E, NID; Hydrography-CA BLM State Office
 Map Projection: NAD83, UTM Zone 10N, Meters
 Map information was compiled from the best available sources.
 No warranty is made for its accuracy or completeness.

De minimis Effect on MYR Rainbow Trout Population (2 of 2)

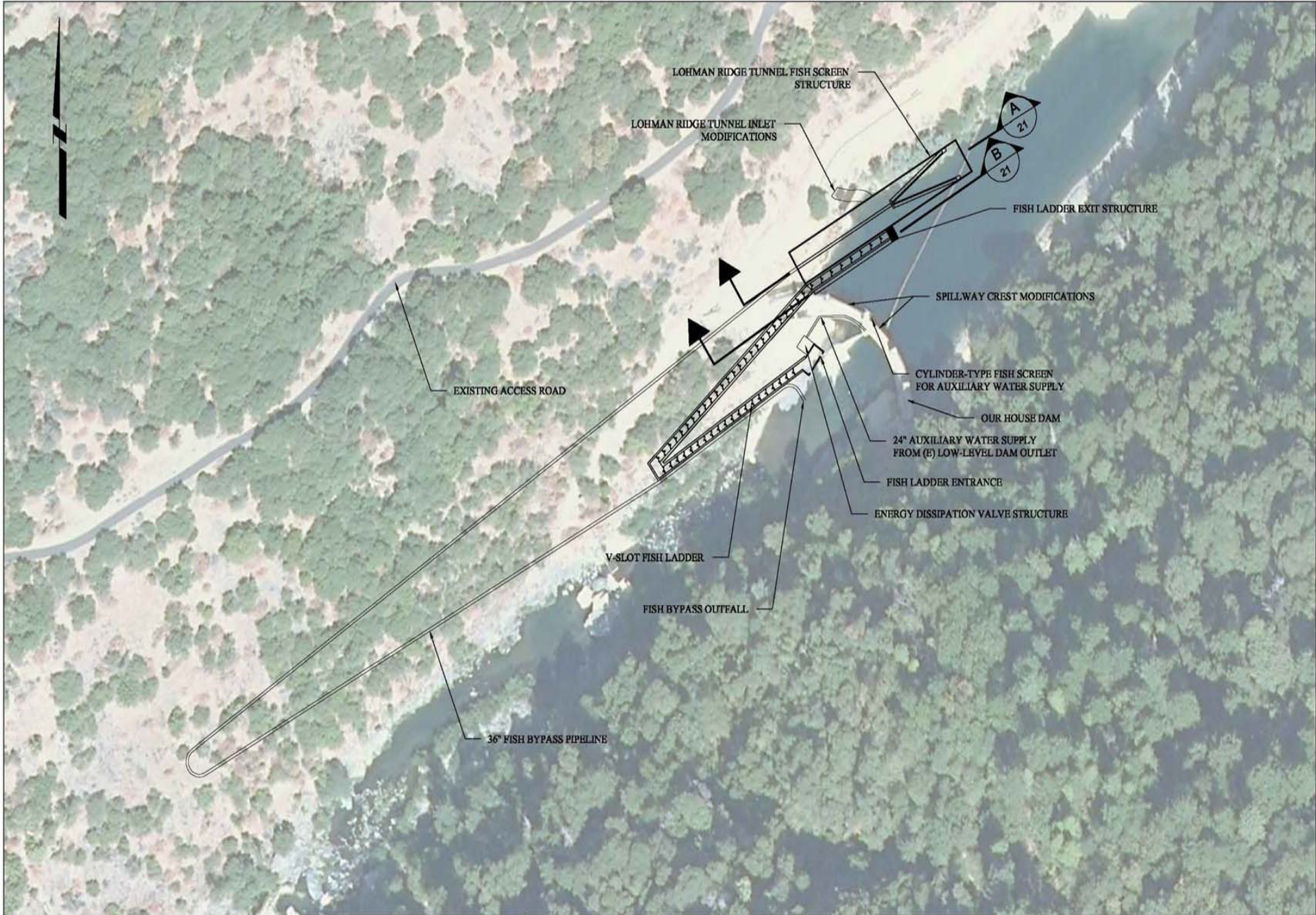
- YCWA staff estimates 46,872 rainbow trout in the main stem MYR
 - Assuming an average rainbow trout/mi density of 1,237.7 in the 34.4 mi of MYR between the Our House Diversion Dam impoundment (RM 12.7) and Jackson Meadows Dam (RM 47.1) based on average of 2008, 2009, 2012 and 2013 density data, yields a rainbow trout population of 42,578
 - Assuming an average rainbow trout/mi density of 340.8 in the 12.6 mi of MYR between the Our House Diversion Dam (RM 12.6) and the North Yuba River confluence (RM 0.0) based on average of 2012 and 2013 density data, yields a rainbow trout population of 4,294
- ... and if 142 of these entered the tunnel, there would be a reduction in the MYR rainbow trout population of 0.30%

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 12. Cost of screen or other exclusionary device not commensurate with effects

Cost of Screen Not Commensurate with Effects (1 of 3)

- For YSF, in 2012 MWH prepared a conceptual design and Opinion of Probable Construction Cost (OPCC, with range of -35% to +65% around estimate) for constructing a fish screen for Chinook salmon and steelhead at Lohman Ridge Diversion Tunnel



SCALE
AS SHOWN



YSF TECHNICAL WORKGROUP
REPRESENTATIVE FISH PASSAGE ACTIONS

OUR HOUSE DAM FISH LADDER AND
LOHMAN RIDGE TUNNEL FISH SCREEN
AND JUVENILE RETURN – PLAN

PLATE
20

Cost of Screen Not Commensurate with Effects (3 of 3)

- YCWA escalated MWH's OPCC for fish screen to 2015 dollars; assumed a construction start date of 2020; and estimated soft costs (e.g., permitting and controls), annual O&M costs, and periodic replacement costs over 30 years
- \$40,073,000 (OPCC=\$22,516,000; Soft Cost=\$7,881,000; Annual O&M=\$181,393; and Periodic Replacement=\$1,653,000), or \$1,336,000 per year over 30 years
 - OPCC assumes fish screen and fish ladder constructed at the same time. If only fish screen was constructed, the fish screen cost would likely be higher than estimate above
 - Screen facilities would be designed to resource agency (e.g., NMFS and CDFW) criteria
- As reference, the average annual cost would be ~\$9,400 per rainbow trout (\$1,336,000 / 142 fish entrained per year)

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 12. Cost of screen or other exclusionary device cost not commensurate with effects
 13. Possibly more effect on fish and other reservation resources due to constructing and operating a screen or other exclusionary device

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 14. Unusual for FS to include a 4(e) condition for a new screen

FS Screen 4(e) (1 of 2)

- Since 2002, FERC issued, or very soon will issue, 69 new licenses across the country with portions of projects on NFS lands
- FS issued 4(e) conditions on 67 of the 69 - 4 were Transmission Line Only licenses and 1 was a wave project
- Of the 62 hydro-only licenses where the FS issued 4(e) conditions, 46 include diversion dams
- Outside of CA, screen 4(e) conditions were included on 2 licenses - both to protect ESA-listed fishes:
 - Trinity Conservancy's Trinity Hydropower Project (FERC No. 719) on Phelps Creek in Washington (for ESA-protected bull trout, Upper Columbia River spring-run Chinook salmon, and Upper Columbia River steelhead)
 - PacifiCorp's North Umpqua Hydroelectric Project (FERC No. 1927) on the North Umpqua River in Oregon (for ESA-protected Oregon Coast coho salmon ESU)
- In CA, screen 4(e) conditions were included on 5 licenses:
 - All 5 involved coldwater fisheries, not transitional fisheries, and 1 involved Wild Trout Waters
 - 4 involved powerhouses (direct fish mortality)
 - 2 involved maintaining existing low-level screens
 - 1 required a screen as an alternative to wild trout stocking

FS Screen 4(e) (2 of 2)

Project		FS 4(e) Condition For Screen	YCWA Comment	
Name	Number of Diversions			
	Total	Dam ≤100 ft		
Lytle Creek	1	1	1	Lytle Creek Diversion (26 cfs) – Existing rotating screen that does not meet CDFW/NMFS criteria; SCE proposed to upgrade; discharges into canal and passes directly through Lytle and Fortuna powerhouses; settlement agreement
Pit 3, 4, 5	4	2	No	
McCloud-Pit	2	0	No	
UARP	9	4	No	
Spring-Gap Stanislaus	2	2	1	Philadelphia Diversion (61 cfs) – Existing screen that does not meet CDFW/NMFS criteria & may be removed for periods due to icing, debris and access; coldwater fishery; directly into Spring Gap Powerhouse; consensus-based agreement
Santa Ana River 1 & 3	6	6	No	
Crane Valley	3	3	No	
Lower Tule River	2	2	No	
Fire Mountain Lodge	1	1	No	
Kern Canyon	1	1	No	
Santa Felicia	0	0	No	
El Dorado	13	13	No	
Borel	1	1	No	
Beardsley-Donnells	2	0	No	
Big Creek No. 4	1	0	No	
Upper Utica	3	3	No	
Utica	1	1	No	
Mill Creek 2/3	2	2	No	
South Feather	3	2	1	Woodleaf Power Tunnel (620 cfs, deep water intake in Lost Creek Reservoir) - FS left new screen option open in 4(e) if preferred option (wild trout stocking) could not be done; directly into Woodleaf Powerhouse
DeSabra-Centerville	3	3	1	Hendricks Diversion (125 cfs) – New screen; not on NFS lands; coldwater fishery; interbasin diversion (Feather to Butte); directly into Toadtown Powerhouse
Yuba-Bear	13	10	1	Milton-Bowman Diversion (450 cfs) – New screen; may be removed for periods due to icing, debris and access; coldwater fishery; designated Wild Trout Waters; interbasin diversion (Yuba to Bear); consensus-based agreement
Drum-Spaulding	4	2	No	
Middle Fork Project	7	5	No	
Big Creek No 3	1	0	No	
Big Creek Nos. 1 and 2	5	3	No	
25	90	67	5	

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 14. Unusual for FS to include a 4(e) condition for a new screen
 15. Options identified by FS staff would cost about the same as, or more than, a screen, and effectiveness is questionable

Options Identified by FS Staff

From Agency/NGO 3/29/16 Draft Table				YCWA Comments
Mitigation Idea / Package Option	Effectiveness	Examples	Comments/Notes	
Seasonal fish screen (October to June) – with monitoring in non-screen months	Meets CDFW and NMFS screening criteria when in place; no mitigation when not in place	Screen on Milton-Bowman diversion tunnel (NID, Yuba-Bear, FERC no. 2266)		Costs would be greater than costs for year-round screen (~\$40 million) because costs would include cost for a year-round screen <u>and</u> for costs for monitoring. Screen on Milton-Bowman involves interbasin diversion (Yuba to Bear) from Wild Trout Waters.
Tunnel closure	Longer closure periods should result in less entrainment		May be most effective for adult fish at the beginning of the rainy season and during spawning	FS staff has not identified what “longer” means, so YCWA cannot estimate the related cost.
Infiltration gallery or Coanda intake	May be highly effective – need to gather info from sites where these have been used	NF American (existing); Duncan Creek (planned) (PCWA, Middle Fork American, FERC No. 2079) On the Lytle, Mill Creek and Santa Ana River projects, infiltration galleries were implemented; fish screens were thus not prescribed in those relicensings.	Would require construction of smaller diversion dam or side channel upstream of tunnel	A coanda screen would be at least as costly as a vee screen configuration. A new dam wall would be constructed upstream of the tunnel inlet to further raise the impoundment pool surface to a minimum of 4 ft above the tunnel crest, and a coanda screen of a minimum of 80 – 100 ft in length constructed. YCWA estimates this would likely cost more than the fish screen, but as not done a cost estimate. The FS included a 4(e) condition for a screen only on Lytle Creek. SCE’s Lytle Creek and Mill Creek each have small diversions (<26 cfs) with sand boxes and existing rotating fish wheel, and SCE’s Santa Anna’s diversions are ~100 cfs, with sand boxes and a rotating fish wheel.
Barrier nets - with year-round monitoring	Unknown – need to gather additional info from existing sites where nets have been used Pacific Netting Products has indicated that this approach could be effective at Our House Diversion Dam (D. Teater, pers. comm. 3/22/2016).	Baker Lake (Puget Sound Energy) Ludington, Michigan (Consumers Energy) - Longest full exclusion net in the world Bagnell Dam, Lake of the Ozarks, Missouri - Full exclusion netting barrier	Nets are able to fluctuate with stage change that occurs in smaller impoundments and could also be removed, seasonally, and stored (during non-diversion period). Debris guidance booms and log booms would also need to be installed to prevent potential damage to the net.	YCWA has serious concerns that the barrier nets would clog and fail, which would result in greater effects than current conditions due to fish impingement on the barrier nets. When used in other locations, velocities are low enough to allow debris to settle before reaching the nets. None of the 3 examples were FS 4(e) conditions, 2 resulted from settlement agreements, and all were nets in large reservoirs. Nets at Baker were installed to guide anadromous fish into a downstream collection facility. Nets at Bagnell were installed to keep slow-moving paddlefish from entrainment

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 15. Options identified by FS staff would cost about the same as, or more than, a screen, and effectiveness is questionable
 16. Much less expensive options, whose costs are more in line with the effects, are available for discussion

Potential Options Identified by YCWA Staff

- While YCWA believes fish screens or other exclusion devices are not needed at Lohman Ridge Diversion Tunnel to provide adequate protection to the resource, it is willing to discuss mitigation options, such as:
 - Option 1. Stock wild trout in the MYR: collect sperm/eggs from rainbow trout in the MYR upstream of the tunnel, contract to raise them in an existing hatchery, and place them in the river upstream of the dam. Target of 200 fish each year. (estimated annual cost – <\$75,000)
 - ✓ This type of a FS 4(e) condition was included for the South Feather Power Project on the Plumas National Forest in 2009
 - Option 2. Increase fish stocking in New Bullards Bar Reservoir: Assume 200 rainbow trout stocked per year (estimated annual cost – <\$10,000)
 - Other?

Our House Diversion Dam Passage Mitigation

June 8, 2016

Yuba River Development Project
YCWA Presentation to Forest Service and Other Agencies

Slide 36

The Difference

- FS staff's position: “Construction of a ladder or other device that allow fish to return upstream of the [Our House] diversion dam” and “Upstream passage design exclude upstream movement of non-native fish” (Slide 7 in RPs 11/9/15 presentation)
- YCWA staff's position: Ladder or other passage device not warranted at Our House Diversion Dam for adequate protection of reservation resources, but YCWA is willing to discuss options with costs in line with effects
 - Basis of YCWA staff's position is overall weight of numerous considerations, not just one piece of evidence

Basis for YCWA Staff's Position

- Fish ladder or other passage device not warranted at Our House Diversion Dam because:
 1. No effect on ESA-listed species or ESA-listed designated critical habitats
 2. Possibly a very low effect on special-status species
 3. No effect on anadromous fish
 4. No effect on unique fish communities
 5. Low effect on a fishery with limited economic/recreation value
 6. No effect on a subsistence fishery
 7. YCWA's current proposal provides reasonable level of protection and enhancement, and a net increase in MYR rainbow trout population and other reservation resources

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No Evidence Trout Population Would Benefit by Passage

- No evidence to support that the MYR rainbow trout population would increase or otherwise benefit if rainbow trout could pass upstream
 - Viable, naturally-reproducing populations of rainbow trout occur both upstream and downstream of the dam
 - Habitat to support all life stages of rainbow trout occur both upstream and downstream of the dam
 - Temperature conditions for rainbow trout are marginal; the area is a transition zone from coldwater to warmwater habitat with summertime water temperatures between ~22°C and 24°C, and maximum temperatures up to 26°C
 - Coldwater ($\geq 20^{\circ}\text{C}$ mean daily water temperature) occurs more than 10 miles upstream of Our House Diversion Dam

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Cost of Ladder Not Commensurate with Benefits

- For YSF, in 2012 MWH prepared a conceptual design and Opinion of Probable Construction Cost (OPCC, with range of -35% to +65% around estimate) for constructing a fish ladder for Chinook salmon and steelhead at Our House Diversion Dam (see Slide 26 for ladder layout)
- YCWA escalated MWH's OPCC for fish screen to 2015 dollars; assumed a construction start date of 2020; and estimated soft costs (e.g., permitting and controls), annual O&M costs, and periodic replacement costs over 30 years
- \$21,740,000 (OPCC=\$13,000,000; Soft Cost=\$4,546,000; Annual O&M=\$141,000; and Periodic Replacement=\$1,100,000), or \$724,666 per year over 30 years
 - OPCC assumes fish screen and fish ladder constructed at the same time. If only fish screen was constructed, the fish screen cost would likely be higher than estimate above
 - MWH designed ladder for a nominal flow of 42 cfs, ladder efficiency may be reduced at flows below 42 cfs

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 11. Rare for FS to include a 4(e) condition for a new ladder

FS Ladder 4(e) (1 of 2)

- Since 2002, FS has not included in its 4(e) conditions a fish ladder on any project for which it has issued 4(e) conditions nationally, excluding in California
- In CA, ladder 4(e) conditions were included on 2 licenses:
 - Both involved coldwater fisheries, not transitional fisheries
 - Both involved low head dams (<15 ft), unlike Our House Diversion Dam
 - 1 involved maintaining an existing low-level ladder

FS Ladder 4(e) (2 of 2)

Project		FS 4(e) Condition For Ladder	YCWA Comment
	Number of Diversions		
	Total		
Lytle Creek	1	1	No
Pit 3, 4, 5	4	2	No
McCloud-Pit	2	0	No
UARP	9	4	No
Spring-Gap Stanislaus	2	2	1 Philadelphia Diversion Dam (11-ft high) – Existing ladder does not meet CDFW criteria; coldwater fishery; consensus-based agreement
Santa Ana River 1 & 3	6	6	No
Crane Valley	3	3	No
Lower Tule River	2	2	No
Fire Mountain Lodge	1	1	No
Kern Canyon	1	1	No
Santa Felicia	0	0	No
El Dorado	13	13	No
Borel	1	1	No
Beardsley-Donnells	2	0	No
Big Creek No. 4	1	0	No
Upper Utica	3	3	No
Utica	1	1	No
Mill Creek 2/3	2	2	No
South Feather	3	2	No
DeSabra-Centerville	3	3	1 Hendricks Diversion Dam (15-ft high) – Not on NFS lands; new ladder; coldwater fishery
Yuba-Bear	13	10	No
Drum-Spaulding	4	2	No
Middle Fork Project	7	5	No
Big Creek No 3	1	0	No
Big Creek Nos. 1 and 2	5	3	No
25	90	67	2

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 12. Some of the options identified by FS staff would cost about the same as, or more than, a ladder

Options Identified by FS Staff

From Agency/NGO 3/29/16 Draft Table				YCWA Comments
Mitigation Idea / Package Option	Effectiveness	Examples	Comments/Notes	
Dam removal with new diversion intake (Also see infiltration gallery in Entrainment Mitigation, above)	Dam removal would be entirely effective in restoring passage for all native fish species.	Dams removed in conjunction with new diversion structures include Gold Ray and Savage Rapids (Rogue River) Removal of barrier to facilitate resident fish movement (PG&E, Upper North Fork Feather, FERC no. 2105)	Infiltration gallery or Coanda intake, if constructed to prevent entrainment at Lohman Tunnel, would eliminate need for Our House Dam.	YCWA has not estimated cost, but would require a new diversion wall, capable of providing a minimum 4 ft of head above the upstream edge of the screen and the screen area would be roughly similar to the vee screens plus additional concrete work. YCWA estimates the cost would be greater than the cost for a new screen. The Gold Ray and Savage dams, neither of which were part of existing FERC projects or FS 4(e) condition, blocked anadromous fish passage, unlike Our House Dam. The Gold Ray dam (35-ft high) was notched because the dam was structurally unsound. The Savage Rapids dam (39 ft high) was notched and replaced with irrigation pumps. At the Upper North Fork Feather River Project, PG&E proposed to remove the 5-ft high Garnser Bar fish barrier., which was constructed in 1975 at the request of CDFW to eliminate spawning access to the upper North Fork Feather River by Sacramento sucker and other non-game fish species.
Trap and transport e.g., WHOOSHH or other methods	Could be effective for passing adult rainbow trout, especially during seasonal migration periods such as pre-spawning.		Would require some kind of collection facility and personnel at the dam, but would likely be less expensive than a fish ladder.	YCWA believes this is not necessary and rainbow trout do not migrate.
Habitat restoration/improvement downstream of Our House and Log Cabin	Population fragmentation would persist with the exception of downstream migrants.	Various tailwater mitigations for migratory species.	Provides enhanced spawning and rearing habitat for trout below dam to mitigate for migration barrier. Effectiveness would be limited by seasonally warm water and invasive species.	YCWA is willing to discuss this option but FS staff has not provided enough details of its proposal for YCWA to estimate cost for what FS staff has in mind.

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Potential Options Identified by YCWA Staff

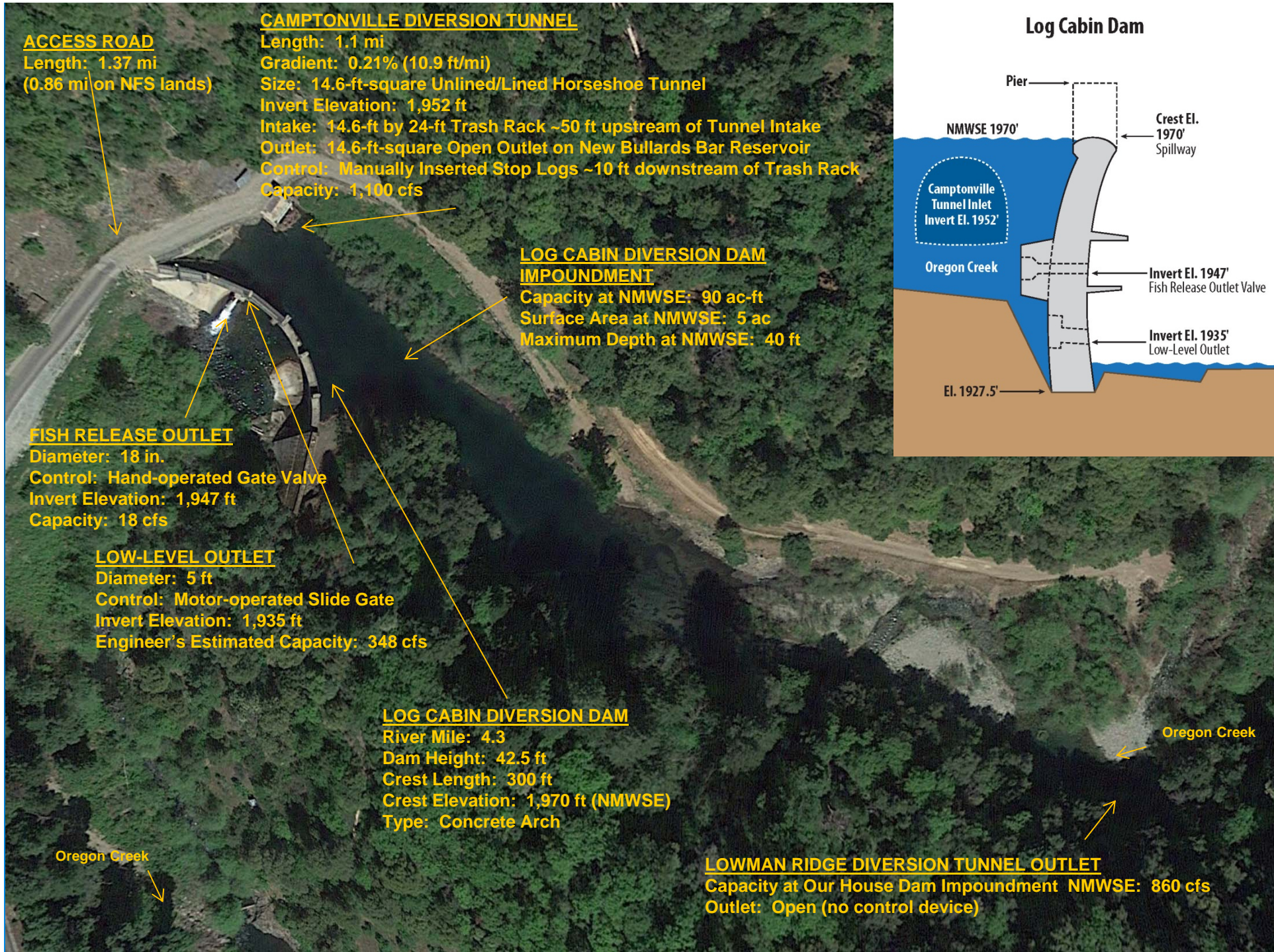
- While YCWA believes a fish ladder or other passage device is not needed at Our House Diversion Dam to provide adequate protection to the resource, it is willing to discuss mitigation options, such as:
 - Option 1. Stock wild trout in the MYR: collect sperm/eggs from rainbow trout in the MYR downstream of the dam, contract to raise them in an existing hatchery, and place them in the river upstream of the dam. Target of 200 returns each year (estimated annual cost – <\$75,000)
 - Option 2. Habitat Improvement in the MYR Downstream of Our House Diversion Dam: details to be discussed but commensurate with effect (estimated annual cost – depends on specific actions, but probably <\$75,000)
 - Other?

Camptonville Diversion Tunnel Entrainment Monitoring

June 8, 2016

Yuba River Development Project
YCWA Presentation to Forest Service and Other Agencies

Slide 51



The Difference

- FS staff's position: *“Continue to monitor fish populations and entrainment (methods to be discussed collaboratively); and “After monitoring that represents a range of WY types, revisit need for continued monitoring and fish screen with agencies”* (Slide 7 of RPs’ 11/9/15 Presentation)
- YCWA staff's position: Monitoring study not needed, but YCWA is willing to discuss options with costs in line with effects
 - Basis of YCWA staff's position is overall weight of numerous considerations, not just one piece of evidence

Basis for YCWA Staff's Position

- Additional entrainment study not warranted at Camptonville Diversion Tunnel because:
 1. No effect on ESA-listed species or ESA-listed designated critical habitats
 2. Possibly a very low effect on special-status species
 3. No effect on anadromous fish
 4. No effect on fish due to passage through a turbine
 5. No effect on unique fish communities
 6. Low effect on a fishery with limited economic/recreation value
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 8. YCWA's current proposal provides reasonable level of protection and enhancement, and a net increase in OC rainbow trout population and other reservation resources

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 8. YCWA's current proposal provides reasonable level of protection and enhancement, and a net increase in OC rainbow trout population and other reservation resources
 9. Existing study showed low number of rainbow trout enter Camptonville Diversion Tunnel; study is adequate to assess effects and inform license requirements

Low Level of Individual Fish Entrainment (1 of 5)



Three-antenna stacked array installed about 10-15 feet downstream of the trash rack location in the Camptonville Diversion Tunnel Intake opening

- YCWA's Entrainment Study at Camptonville Diversion Tunnel used an automatic passive integrated transponder (PIT) radio tag system and 3-antenna stacked array
- The array was in the tunnel entrance for 381 days (10/22/12 through 11/7/13), during which time diversions occurred on about 253 days. During that time that diversions were occurring, the array was removed for maintenance for a total of 126.2 hrs
- Prior to turning the array on, YCWA tagged 379 rainbow trout and 2 WPT in the 1.7-mi-long section of creek upstream of the dam.
- The array was used to detect tagged fish that went into the tunnel

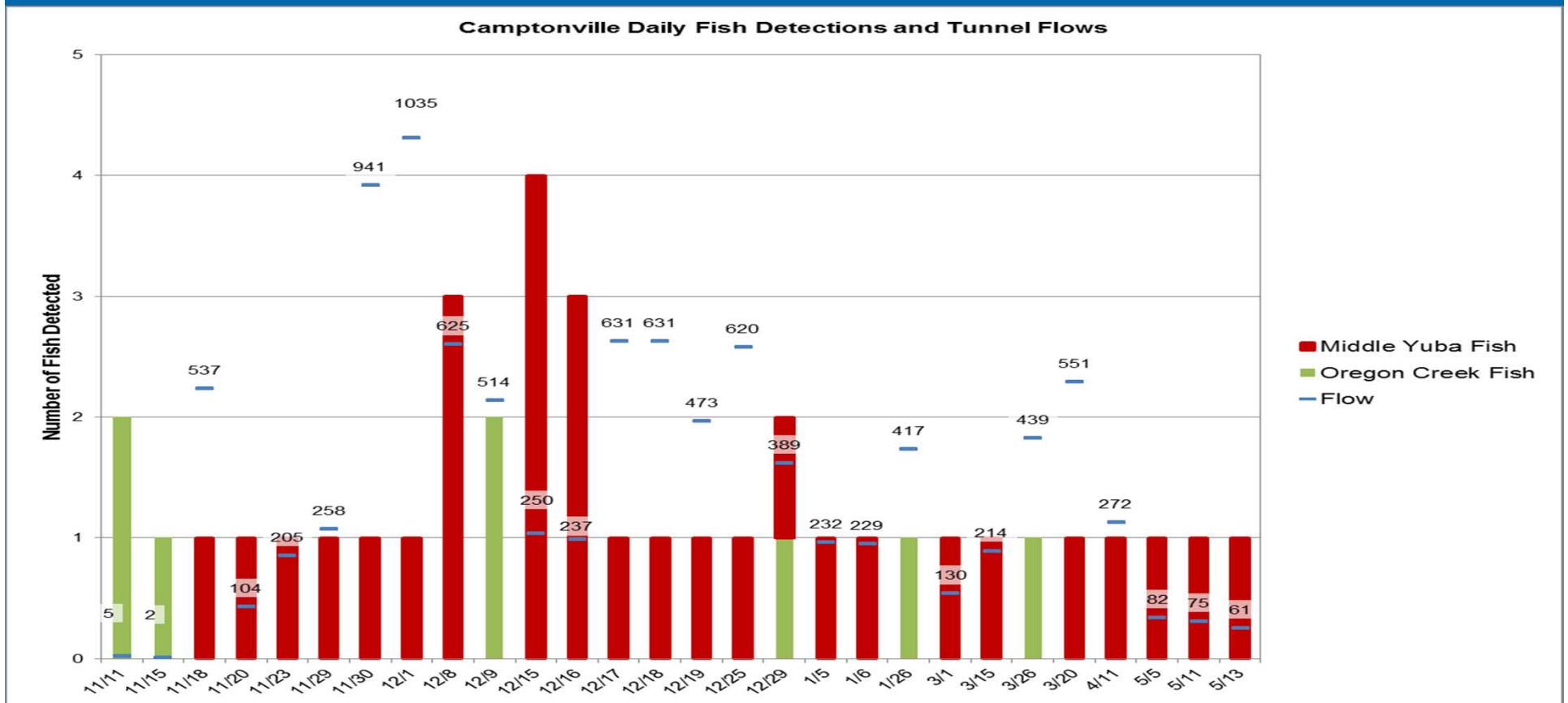
June 8, 2016

Yuba River Development Project
YCWA Presentation to Forest Service and Other Agencies

Slide 56

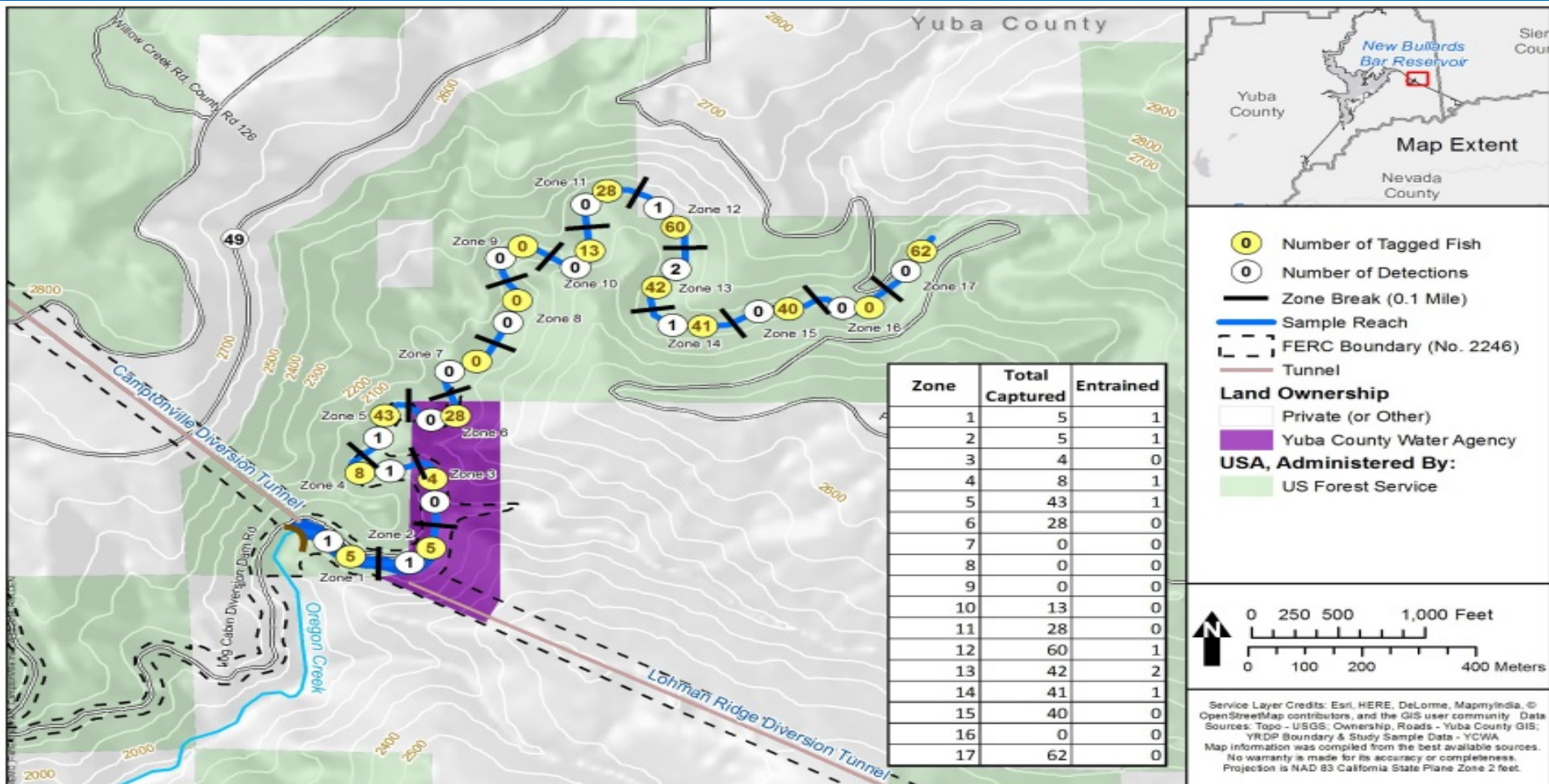
Low Level of Individual Fish Entrainment (2 of 5)

- 8 of the 379 fish tagged in OC were recorded; WPT were not detected
- Fish were detected on 29 of 248 days



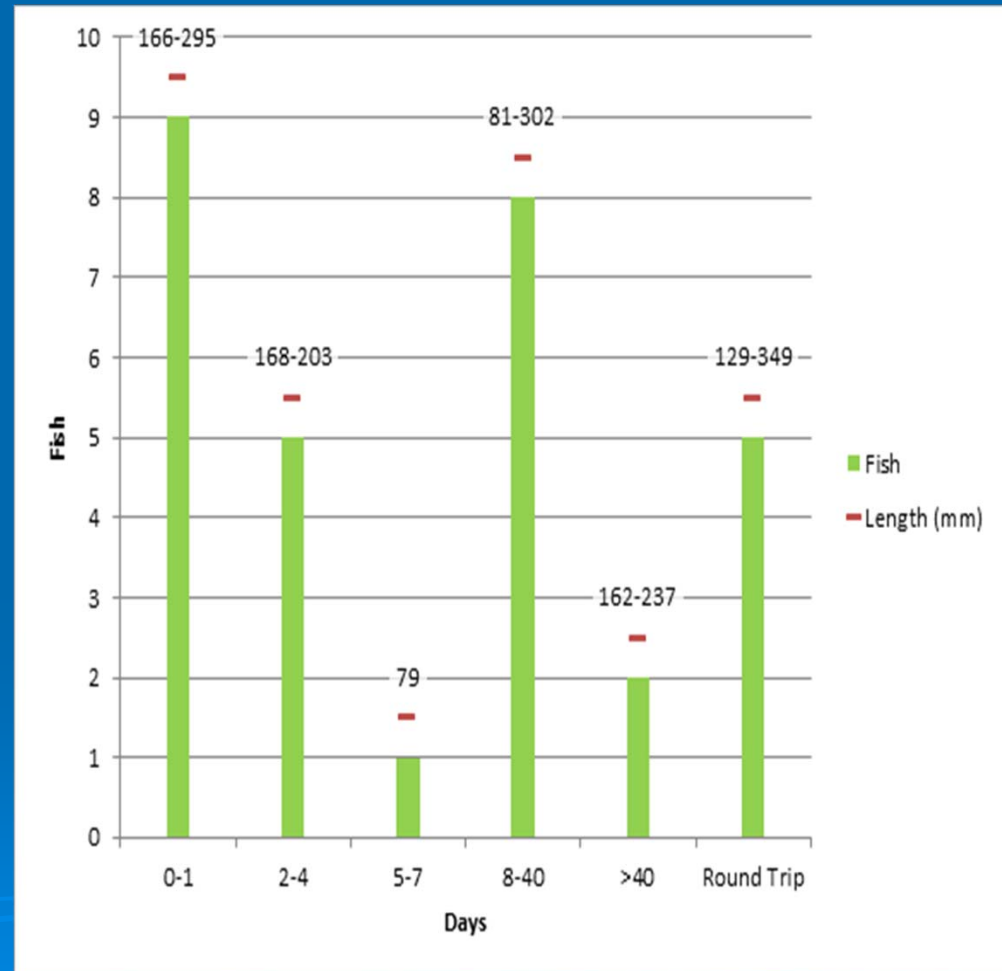
Low Level of Individual Fish Entrapment (3 of 5)

- 2.1% of the fish tagged in OC were detected in the tunnel



Low Level of Individual Fish Entrainment (4 of 5)

- In addition, 30 of the 48 fish tagged in the MYR and detected in the Lohman Ridge Diversion Tunnel were also detected in the Camptonville Diversion Tunnel:
 - The time between detection in Lohman Ridge and Camptonville ranged between 1 day and >40 days
 - 5 of the 30 fish were re-detected at Lohman Ridge after being detected at Camptonville
 - 18 of the 48 fish appeared to have remained in OC (i.e., not detected in Camptonville or again in Lohman Ridge)



Low Level of Individual Fish Entrainment (5 of 5)

- YCWA estimated 529 rainbow trout were in the tagged area
 - During the tagging effort, YCWA caught 436 fish in the 1.3-mi-long section of the OC. Extrapolating to the entire 1.7 mi where tagging occurred yields a rainbow trout population of 529
 - ✓ YCWA did not consider the fish, some of which subsequently entered the Camptonville Diversion Tunnel, that were entrained through the Lohman Ridge Diversion Tunnel into OC because the overall effect on the OC rainbow trout population is an increase in the rainbow trout population

- ... and 11 of these were detected in the Camptonville Diversion Tunnel
 - Assuming 2.1% of the estimated 529 rainbow trout in the tagged area entered the Camptonville Diversion Tunnel, results in 11

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 7. No effect on a subsistence fishery
 8. YCWA's current proposal provides reasonable level of protection and enhancement, and a net increase in OC rainbow trout population and other reservation resources
 9. Existing study showed low number of rainbow trout enter Camptonville Diversion Tunnel; study is adequate to assess effects and inform license requirements
 10. De minimis effect on OC rainbow trout population due to entering Camptonville Diversion Tunnel

De minimis Effect on OC Rainbow Trout Population

- YCWA estimated 8,475 rainbow trout in OC
 - Assuming a population of 529 rainbow trout in the 1.7 mi of OC upstream of Log Cabin Diversion Dam. Note that this does not account for rainbow trout in the 15.4 miles of OC that are upstream or in tributaries, but no data are available for this area
 - Assuming an average rainbow trout/mi density of 1,848.0 in the 4.3 mi of OC between the Log Cabin Diversion Dam and the MYR confluence based on average of 2012 and 2013 density data, yields 7,946
- ... and if 11 of these entered the tunnel, there would be a reduction in the OC rainbow trout population of 0.13%

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 10. De minimis effect on OC rainbow trout population due to entering Camptonville Diversion Tunnel
 11. Additional study results not likely to inform license requirements and costly

Additional Study Not Likely to Inform License Requirements

- If the study was repeated, the results would need to change radically to warrant installing a fish screen or other exclusionary device
 - YCWA estimates cost to repeat the study as proposed by FS staff (each year in 5 WY types) is ~\$2,000,000
 - Cost of a Camptonville Diversion Tunnel fish screen likely more than the ~\$40 million estimated for Lohman Ridge Diversion Tunnel fish screen due to more difficult access at Camptonville and larger diversion
- Unusual for FS to include screen requirement in 4(e) condition

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 12. Much less expensive options, whose costs are more in line with the effects, are available for discussion

Potential Options Identified by YCWA Staff

- While YCWA believes repeating the study is not warranted, it is willing to discuss mitigation options based on the existing information, such as:
 - Option 1. Stock wild trout in OC upstream of dam: Collect sperm/eggs from rainbow trout in OC upstream of the tunnel, contract to raise them in an existing hatchery, and place them in the river upstream of the dam. Target of 50 fish each year (estimated annual cost – <\$30,000)
 - Option 2. Increase fish stocking in New Bullards Bar Reservoir: Assume 20 rainbow trout (estimated annual cost – <\$5,000)
 - Other?

Lohman Ridge Diversion Tunnel Periodic Closure

June 8, 2016

Yuba River Development Project
YCWA Presentation to Forest Service and Other Agencies

Slide 67

The Difference

- FS staff' position: *“Close Lohman Ridge Tunnel from April 1 through September in any year in which both NBB Reservoir storage is 775,000 ac-ft or more on March 31, and DWR’s March median forecast is greater than 2,191,000 ac-ft. If DWR’s April median water year forecast is less than 2,191,000 ac-ft, then open the tunnel by April 11 and provide a ramp down following the spill management measure”* (Slide 4 of RPs’ 10/28/15 presentation), and *“Concurrent with Lohman Ridge Tunnel closure, open low level outlet and fish release valve at Log Cabin Diversion, but leave tunnel open”* (Slide 6 of RPs’ 8/11/15 presentation)
- YCWA staff’s position: Periodic closing of Lohman Ridge Diversion Tunnel and concurrent opening of Log Cabin Diversion Dam low-level outlet not needed for adequate protection of the reservation resources

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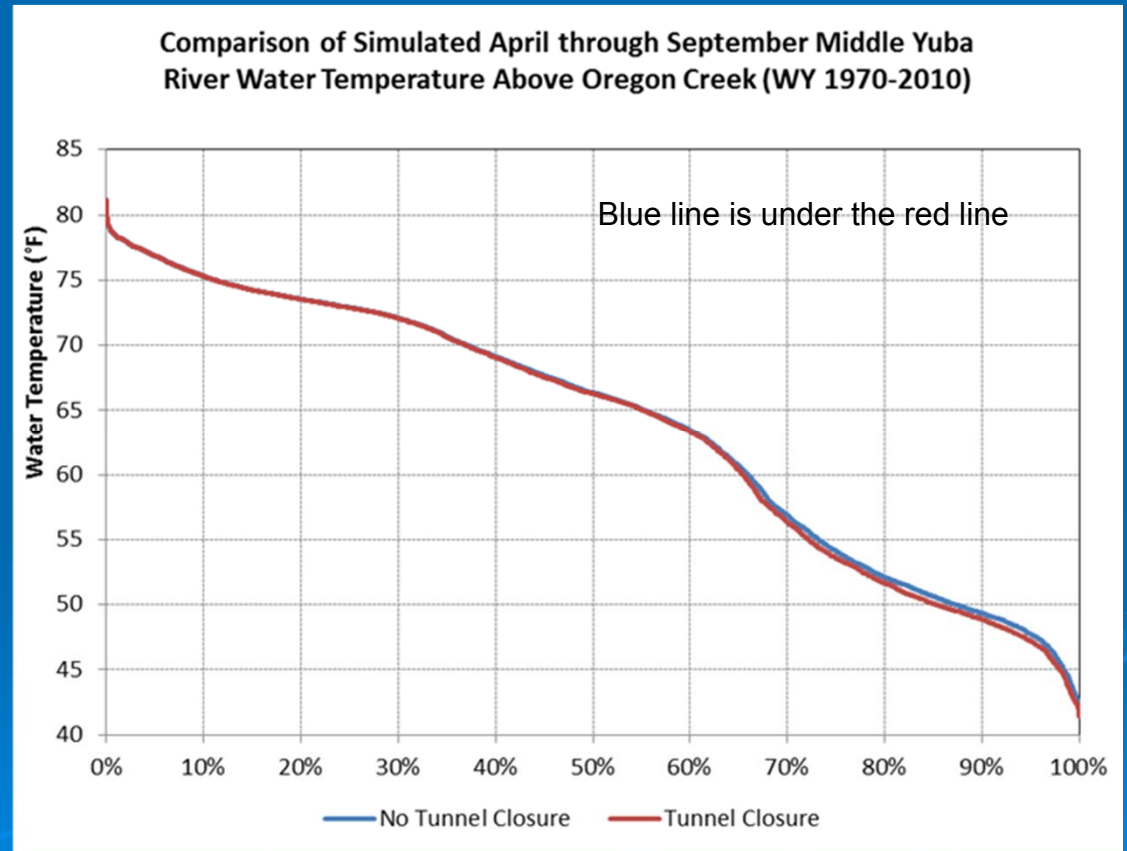
- Proposed tunnel closure and concurrent Log Cabin low-level outlet opening not warranted because:
 1. No evidence proposed tunnel closure needed for adequate protection of any unique reservation resources or particularly valuable resources, including special-status species

Basis for YCWA Staff's Position

- Proposed tunnel closure and concurrent Log Cabin low-level outlet opening not warranted because:
 1. No evidence proposed tunnel closure needed for adequate protection of any unique reservation resources or particularly valuable resources, including special-status species
 2. No evidence proposed tunnel closure needed for adequate protection of channel morphology-related or riparian-related resources
 - Proposed tunnel closure would not change the frequency that MYR and OC bankfull and floodprone zones inundated (about the same frequency with and without the Project, based on Ops Modeling)
 - Proposed tunnel closure would not affect MYR or OC water temperatures

Tunnel Closure Would Not Affect Water Temperatures

- Closing tunnels does not create different temperature regime
- Suitable water temperatures for rainbow trout (i.e., $\sim 20^{\circ}\text{C}$) and for FYLF to begin breeding (i.e., $\sim 10^{\circ}\text{C}$) would occur at similar timing and frequency



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 3. No evidence tunnel closure would reduce invasive species

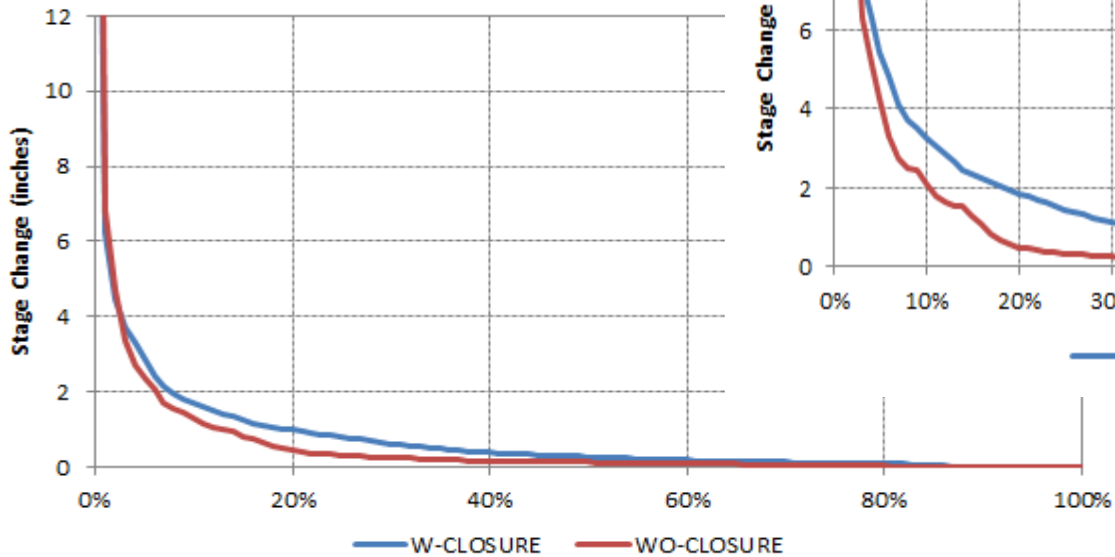
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 4. Proposed tunnel closure would adversely affect fish and FYLY due to increasing frequency and magnitude of stage changes

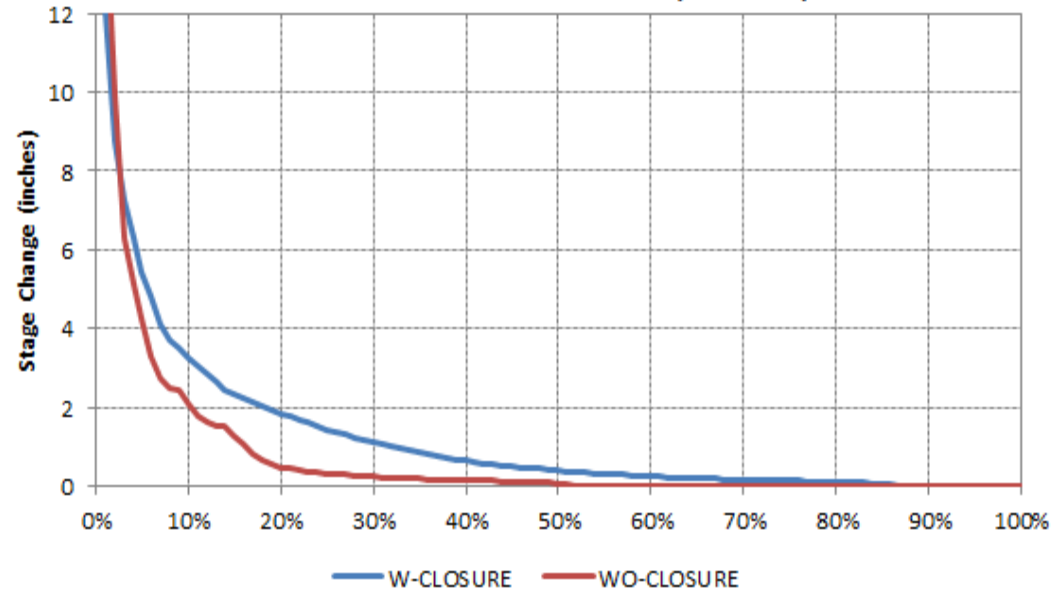
Frequency and Magnitude of Stage Changes

- Exceedance plots of absolute value of stage changes during FS staff proposed tunnel closure periods (example transects)

Middle Yuba River above Oregon Creek (Transect 12)



Middle Yuba below Our House Dam (Transect 7)



- Only difference between model runs is FS staff's proposed tunnel closure

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 6. Cost not in line with questionable benefits

Costs Not In-line with Potential Benefits (1 of 2)

- Proposed tunnel closure would occur in 7 Wet and 3 Above Normal WYs

Water Year	Water Year Type (Based on April Forecast of Smartsville Index)	Rank in POR Based on April Water Year Forecast (1970-2015) (wettest = 1)	Reduction in Water Diversion (TAF & % of WY total)	Reduction in NBB Spill Volume (TAF & % of WY total)	Reduction in Diversion Days (Days & % of WY total)	Reduction in Total Generation (GWh & % of WY total)
1983	Wet	1	154 (44%)	80 (10%)	137 (46%)	226 (4%)
1982	Wet	2	119 (45%)	97 (20%)	108 (41%)	69 (1%)
1995	Wet	3	129 (55%)	88 (19%)	123 (52%)	142 (3%)
1974	Wet	5	121 (54%)	16 (5%)	114 (53%)	257 (6%)
1986	Wet	6	78 (46%)	0 (0%)	79 (47%)	186 (6%)
2006	Wet	7	100 (50%)	109 (23%)	99 (45%)	29 (1%)
1998	Wet	10	116 (52%)	61 (30%)	128 (48%)	179 (4%)
1993	Above Normal	13	90 (50%)	12 (37%)	110 (48%)	203 (6%)
1971	Above Normal	15	103 (61%)	6 (100%)	123 (49%)	259 (7%)
1996	Above Normal	18	101 (44%)	32 (7%)	110 (45%)	203 (5%)
		10 Years	111 TAF (50%)	50 TAF (13%)	113 Days (47%)	175 GWh (4%)

Costs Not In-line with Potential Benefits (2 of 2)

- \$25,400,000 over 30 years (~\$847,000 per year over 30 years)
 - \$19.6 million related to a 1.6% reduction in annual generation
 - \$5 million to install gate and controls at Lohman Ridge Diversion Tunnel
 - \$800,000 related to O&M

Basis for YCWA Staff's Position

- Proposed tunnel closure and concurrent Log Cabin low-level outlet opening not warranted because:
 1. No evidence proposed tunnel closure needed for adequate protection of any unique reservation resources or particularly valuable resources, including special-status species
 2. No evidence proposed tunnel closure needed for adequate protection of channel morphology-related or riparian-related resources
 - Proposed tunnel closure would not change the frequency that MYR and OC bankfull and floodprone zones inundated (about the same frequency with and without the Project, based on Ops Modeling)
 - Proposed tunnel closure would not affect MYR or OC water temperatures
 3. No evidence tunnel closure would reduce invasive species
 4. Proposed tunnel closure would adversely affect fish and FYLY due to increasing frequency and magnitude of stage changes
 5. YCWA's current proposal provides a reasonable level of protection and enhancement, and a net increase in the MYR and OC reservation resources
 6. Cost not in-line with questionable benefits
 7. FS has never included a 4(e) condition to close a tunnel; nor has FERC ever proposed it

FS Tunnel Closure 4(e)

- Since 2002, FS has not included in its 4(e) conditions a tunnel closure on any project, including in California, for which it has issued 4(e) conditions
- YCWA is unaware of any hydro licenses or orders issued by FERC since 1978 that have included requirements mandating periodic tunnel closures, including in California

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 8. Less expensive options, whose costs are more in line with the effects, would provide adequate protection for the resource

Potential Options Identified by YCWA Staff

- While YCWA believes the tunnel closure is not warranted, it is willing to discuss options based on the existing information, such as:
 - Option 1. Close tunnel in wetter years only: Using the same storage trigger (775,000 ac-ft end-of-March NBB storage), close the tunnel starting 4/11, determined by April 1 forecast. This would result in tunnel closures in approximately 7 Wet WYs over modeling period (estimated annual cost – ~\$300,000)
 - Other?

Clarifying Questions

June 8, 2016

Yuba River Development Project
YCWA Presentation to Forest Service and Other Agencies

Slide 83

Thank You

June 8, 2016

Yuba River Development Project
YCWA Presentation to Forest Service and Other Agencies

Slide 84