## YAKIMA BASIN INTEGRATED PLAN



2023 DROUGHT AND 2024 WATER SUPPLY OUTLOOK SEPTEMBER 13, 2023

## OUTLINE



- Overview and Team Introduction
- Review 2023 Climactic Conditions and Water Supply
- Impacts on Agriculture/Communities
- Impacts on Fisheries/Communities
- Expected Carryover Storage, El Nino and Potential 2024 Climate and Water Supply Scenarios
- Concluding Thoughts

## 2023 CLIMATE AND WATER SUPPLY

### Washington Drought Declaration Areas



















September 2023 TWSA Comparison											
June 1 - September 30											
Parameter	"+/-/="	Jun 2023	Jul&Aug	Sep 2023							
June 1-Sep 30 Natural Flow at Parker est.	+	502	402	387							
Return Flow Estimate	+	235	235	235							
June 1, Reservoir Content	+	928	928	928							
TWSA	=	1665	1565	1550							
SEP 30 EST RESERVOIR CONTENT*	-	76	76	76							
FLOW OVER SUNNYSIDE DAM	-	161	110	110							
TWSA FOR IRRIGATION	=	1428	1379	1364							
NONPRORATABLE ENTITLEMENT	-	723	723	698							
REMAINING TWSA	=	705	656	666							
PRORATABLE ENTITLEMENT		917	917	917							
% RATIO= REMAINING TWSA/PRORATABLE ENTITLEMENT		77%	72%	73%							
TITLE XII FLOW REQUIREMENTS, cfs	January	300	300	300							
TOTAL FLOW AVAILABLE AT PARKER, cfs *#*		474	472 & 467	448							
*Values are in 1,000 ac-ft unless otherwise specified.											

## HISTORICAL PRORATIONING

	(1) Start of Proration							
Year	Period	Mar	Apr.	May	Jun	Jul	Aug	Sep
1973	1-May				80%	80%	80%	80%
1977	1-Apr		6-26%	13-50%	50%	70%	70%	70%
1979	20-Apr				75%	75-46%	46%	100%
1987	1-Jun				73%	70%	68%	68%
1988	1-Jul					82%	90%	90%
1992	16-May			85%	58%	58%	58%	58%
1993	1-Jun				56%	64%	67%	71%
1994	1-May			35%	34%	39%	39%	37%
2001	1-May	38%		29%	30%	34%	37%	37%
2005	6-Apr	34%	34%	34%	38%	40%	42%	42%
2015	15-Apr	73%	54%	47%	44%	46%	47%	47%
2019	3-Jun	90%	77%	75%	74%	67%	69%	72%
2023	1-Jun	86%	82%	86%	73%	72%	72%	73%

# KEECHELUS OUTLET WORKS



## KEECHELUS



## HYDROLOGIC SUMMARY

- Slow and short reservoir refill
- 75% Precip
- 100% snow but swift May melt off
- Storage control and prorationing started June
  1, that is early
- Title XII plus added waters: 300 + 50 to 80 cfs, lowest
- Prorationing: 72%
- Storable conservation est (Jun1-Oct15): 26 KAF
- Very low carry-over expected

# IMPACTS – AGRICULTURE & COMMUNITIES



## OUTLINE



- Impacts felt up and down the basin
- Benefits of the Integrated Plan Climate Resiliency
- Focus on:
  - Roza Irrigation District
  - Wapato Irrigation Project
  - Kittitas Reclamation District

## **ROZA IRRIGATION DISTRICT**

## ROZA IRRIGATION DISTRICT OVERVIEW

✓ 72,000 irrigated acres over 95 miles w/ 450 miles of canals.

✓ Total crop value of \$1.5 billion +/- on mostly 2<sup>nd</sup> and 3<sup>rd</sup> generation family farms.

✓ 300+ miles of canals piped since 1983

 ✓ \$85M+ in water conservation (\$50M+ Roza funded)





## YAKIMA RIVER BASIN WATER RIGHTS





#### Roza is 100% Proratable Water

## 2023...AN UNUSUAL IRRIGATION SEASON....

 ✓ Water supply forecasts have ranged from 86% in March to 72% in July.

✓ Not all 72% supply years are the same!

Sy June 1<sup>st</sup> as peak demand approaches most of the things we can do during the season do have been done.

There are hardships, but not a crisis...yet...and some effects wont be seen for months.



## ROZA DROUGHT MANAGEMENT ACTIONS

- Water delivery restrictions were imposed immediately.
- The season will end about 2 weeks early (which harms wine grapes, late apples & triticale for nitrate uptake).
- ✓ 7 Roza pump backs in operation to recover water (adds 1%-2%).
- ✓ The 2023 irrigation season will run to the very last date possible in October because growers are refilling the soil profile in case next year is also dry and to improve winter hardiness if there are arctic cold conditions this winter.
- Irrigation districts are like farms and snowflakes...no two are exactly alike!



## PUMP BACK RECOVERY OF WATER





## ON-FARM DROUGHT MANAGEMENT IN 2023

- ✓ Post-harvest fallowing of some crops
- Pooling of water between farms within the District
- ✓ Prioritization of the most valuable crops
- Leasing unused water from other water users
- Emergency well permits (90% are in Roza)



## FALLOWED HOPS...STILL NEED WATER!







### Example Roza Farm - Drought Management





### DROUGHT PREP AT ROZA <u>NEVER</u> STOPS!

Since the 2015 Drought:

✓ Piped 70+ miles of canals (\$19M Roza funds)

✓ New Re-regulation reservoir on-line in 2017 (\$31M)

✓ \$1M+ in sealant applied to concrete lined canal sections

✓ 7,000 acres of drip irrigation conversions



## WAPATO IRRIGATION PROJECT





2023 Drought Impacts on Wapato Irrigation Project Operations

### GRAYSEN SQUEOCHS, PE YAKAMA NATION ENGINEERING

## WIP Water Supply

The Wapato Irrigation Project has senior and proratable water rights.

Existing infrastructure makes it difficult to distribute shortages equitably, WIP actively works to manage flows to all units.

WIP reduces diversion down to avoid prematurely exhausting water right.

 Requires regular monitoring, most of which relies on manual measurements from ditch riders

WIP has adjusted the diversion schedule to use most of the remaining storage during the first half of September.



## Drought Impacts

### Source – WIP Conservation Plan



## Drought Impacts: Unit 2



### Water supply limitations

- System relatively stable
- Implemented conservation, flow meters and new delivery infrastructure improved conditions over past year

### Actions taken this year

- Serviced flow meters
- Increased measurement

## Drought Impacts: Satus Unit



### Water supply limitations

- Unit relies on return flows
- Current infrastructure makes it difficult to ration everyone down to a continuous rate of flow

### Actions taken this year

- District on rotation (9 Days on/3 Days off)
- Serviced flow meters on upgraded deliveries
- Supplemental shallow drought relief wells
### Ongoing and Future Conservation





#### Conservation Work

Unit 2 Pipeline



#### Satus Long Crested Wier – Flow Control



## Impact Summary

The entire project experienced shortages due to prorationing

Existing irrigation infrastructure and limited system upgrades made it difficult manage water supply impacts across the entire project

We are seeing the benefits of conservation projects in some regions

# KITTITAS RECLAMATION DISTRICT



KRD'S



#### WATER CONSERVATION OPPORTUNITIES

- Save water seepage from the canals.
- Provide for more consistent water deliveries to customers within the district.
- Create more capacity in the canal system.
- Help threatened species within the vicinity of the districts canal distribution system.

Kittitas Reclamation District - Water Conservation



Projects to be completed in the 2022 calendar year	Water Savings (CFS)	Annual Water Savings (AF)	Feet lined or piped
SB13.6 & SB13.8 Pipeline	3.50	1249.6	20,540
North Branch Lining	9.35	3337.8	17,146
South Branch Lining	4.44	1585.2	13,862
South Branch Piping	1.82	634.9	2,900
Total saved by 2022	19.21	6843.2	54,448

Improvements create the ability for the canal to have more capacity to carry water to streams that are part of the tributary supplementation program and for future surface and ground water storage sites.

Kittitas Reclamation District - Water Conservation



















#### PRIORITY

Protect our economy and protect the certainty of the water supply for the future of the farms and the ecosystem.

Kittitas Reclamation District - Water Conservation

# IMPACTS – FISHERIES & COMMUNITIES

# OUTLINE



- Yakama Nation Fisheries YBIP impacts and benefits
- Bull trout, steelhead and other fisheries impacts and climate resiliency
  - Video <u>Saving Fish from Drought at Lake Kachess YouTube</u>
  - Gold Creek and Kachess River Restoration
  - Video CEFP









#### Relationship between the water temperature and Smolt



	Average monthly water		
	temperature over the five	Steelhead	Spr.Chinook Age Y1
YEAR	months (April-August)	(Natural)	(Natural)
2015	69.1	58,611	202,153
2018	68.5	65,446	114,272
2011	57.2	338,886	452,846
2012	61.4	281,561	338,886



#### Temperature at Lower Yakima River across years with Daily Fish Counts at Prosser





#### Impacts of drought on adult salmon migration

Delayed migration and altered (i.e. protracted) migration season





#### Impacts of drought on adult salmon survival

Increased susceptibility to predation and pathology

pelican wound



infection





#### Impacts of drought on adult salmon productivity

Poorly formed gametes and pre-spawn mortality





#### Teanaway- Returning Adults

- Low water difficult for returning adults
- Access points Narrow & Unpassable
- Due to low water conditions



#### **Tribal Fishing**



- These impacts to fish life stages means less fish and less access to fish for tribal fishers
- Tribal harvest is managed conservatively to ensure fish for the future
- Tributary fisheries often set to allow brood into our programs
  - Four years cycles (e.g. Yakima and Klickitat)
- Harvest often bears the burden even if not the cause of population decline
- Mainstem Columbia Fisheries are managed to avoid impacts to ESA stocks



#### Drought effects on habitat

- River ecosystem is at a tipping point from legacy impacts
- Interaction of drought with degraded habitat and ecosystem makes a bad situation extreme
- Low flows/increased water temperature
- Riparian dieback, causing loss of shade, increased water temperature
- Increased riparian fire risk, further degrades ecosystem.
- Low water levels decrease available fish habitat (reduced volume/space for fish)
- Ratchet effect: droughts decrease ecosystem resilience, reducing recovery rate and extent, exacerbating long-term decline







- Adults often hold in lower reaches of the river between late summer & the following spring (prior to spawning) -> drought & associated high H<sub>2</sub>O temp causes water to get too warm (>21°C) for holding.
- Adults spawn in spring/summer upriver -> drought causes water to get too warm (>18°C) for spawning and for early life stage (eggs & prolarvae).
- Larvae use side channels extensively -> drought can often cause these productive side channels to dry up where larvae inadvertently get stranded.
- Juveniles (smolts) out-migrate in winter to summer -> if juveniles can't move out by the time H<sub>2</sub>O temp reaches >21°C, they die off (high flow is their cue for out-migration, so if there is a drought, they often risk waiting out till H<sub>2</sub>O temp is too warm for them to migrate).
- Larvae/Juveniles are more susceptible to predation during drought & high H<sub>2</sub>O temp conditions.



# How do we prepare for drought?



#### Habitat needs during drought

- Maximum available instream flow
- Resilient watersheds
- Store water at the watershed scale: headwaters, forests, floodplains
- Fully connected floodplains, meadows to valleys
- Healthy groundwater systems
- Complex, high-quality fish habitat: pools, cover, large wood to make the most of available water
- Complex and hydrologically "rough" channels to increase water levels
- Healthy riparian ecosystems
- Upland forest thinning to mitigate for fire and disease. Utilizing woody material for aquatic restoration.



#### Other tools in progress



- Habitat
- Groundwater storage
- Water Transfers and Instream flow protections
- Operational Changes
- Storage to support instream flows
  - Cle Elum Pool Raise
  - UYSS
- Conservation
  - Diversion reduction
  - Regulation reservoirs
  - Addressing water quality concerns





# BOX CREEK CANYON AND LAKE KACHESS



Video <u>Saving Fish from Drought at Lake Kachess - YouTube</u>

#### **Gold Creek Valley Restoration**





# CLE ELUM FISH PASSAGE



- Important to YBIP fisheries restoration efforts and climate resiliency
  - Help return salmon
  - Potential 5x increase over number returning today
  - Access to upstream habitat
- Made possible by partnership with Ecology, Yakama Nation WDFW, Reclamation, and many other partners.
- YBIP and our new way of working together made it possible



E-FISH TEST CATCH CREW



#### E-FISH CLOSER UP

#### FISH FLUME – E-FISH TEST



LOOKING UP THE HELIX

#### WHERE THE E-FISH EXITED THE RESERVOIR



### CLE ELUM FISH PASSAGE VIDEO



• Video



### EXPECTED CARRYOVER STORAGE AND 2024 OUTLOOK




### North Pacific SST Anomalies (27 Aug-2 Sep 2023)



El Nino conditions are present, and will persist into 2024. A strong event is likely.





**Central WA Precipitation during Oct-Dec** 





### Model Projections for Precipitation: Dec 2023-Feb 2024



### Ensemble Model Projection for Temperature: Jan-Mar 2024

#### **NMME**

#### Prob fcst



Projected temperature anomaly of ~1 deg C is roughly equivalent to an average rise of 500 feet in the rain/snow line



## SUMMARY

- 2023 represents the third year in a row during which the weather of late spring really mattered
- Some parts of WA state are experiencing impacts comparable to those of 2015 with its record low snowpack
- El Nino tilts the odds slightly towards a relatively dry fall in 2023
- The winter will probably be on the warm side and end with a below-normal snowpack



## YAKIMA RESERVOIR REFILL PROJECTION

	Кее	Кас	Cle	Bum	Rim
All years, % that fill Avg fill	45%	20%	42%	100%	72%
	152 KAF	194 KAF	420 KAF	34 KAF	184 KAF
El Nino years	20%	10%	17%	100%	52%
	117 KAF	160 KAF	339 KAF	34 KAF	175 KAF
Strong El Nino Years	13%	13%	13%	75%	50%
	118 KAF	161 KAF	351 KAF	34 KAF	178 KAF





# Questions?

Website: www.yakimabasinintegratedplan.org