Northwest **Power** and **Conservation** Council

July 5, 2023

MEMORANDUM

TO: **Fish and Wildlife Committee**

FROM: **Kris Homel**

SUBJECT: **Update on Columbia River DART (Data Access in Real Time)**

BACKGROUND:

Presenter: Dr. Jennifer Gosselin, Co-Director of Columbia Basin Research (University of Washington) and DART Principal Investigator; and Susannah Iltis, Web Computing Specialist for Columbia Basin Research (UW)

Summary: The Fish and Wildlife Committee will hear a presentation on the resources available to the region through the Data Access in Real Time (DART) project of the University of Washington. The presentation will include information on how DART resources relate to the Council's Fish and Wildlife Program and how they are accessed and shared, along with a discussion of emerging tools or innovations.

Relevance: Regional data and information-management projects are critical to supporting the Program's data management, analysis, access, and communication functions. As part of the Mainstem and Program Support Project Review in 2019, the Council formulated a programmatic issue to address the importance of these projects. The programmatic emphasized the need to identify which resources house information derived from Program funded projects and how those resources can be accessed by the public. Over the course of this year, the staff will invite all seven of the data management projects included in the Mainstem and Program Support Review to share similar presentations. The Committee has heard from two projects so far- the Columbia Basin Fish and Wildlife Library and the Inter-tribal Monitoring Data project. In July, the committee will hear from the third project- Data Access in Real Time (DART), which is

administered by the University of Washington under Project # 1996-019-00.

Background: A large amount of data is collected throughout the basin by many different projects and having access to that information is critical. This is the role filled by data management projects- they support the Program's data management, analysis, access, and communication functions. Each project is a little different and each fits different needs for their organizations.

The seven data management projects were reviewed in the 2019 Mainstem and Program Support Project Review. In this review, the ISRP highlighted, and the Council agreed with, the importance of supporting regional and sub-regional data management, storage, and dissemination of information necessary for Program implementation and assessment (please see Programmatic Issue #2, pages 8 and 9). In particular, intentional planning for, and dedication of funding is necessary for (1) sharing information that informs decisions and (2) keeping pace with new technologies and knowledge through workshops and other learning experiences. This requires balancing investments in data collection with investments for data processing (data management, analysis, data steward expertise/support) and communication of information.

In an effort to address the Council recommendation and to advance the Council's efforts in the assessment of program performance, there is a need to better understand the information and data sharing resources in the basin, which provide the Council and region with critical Program data and information. In the decision document from the 2019 review, the Council recommended that a subcommittee of the Regional Coordination Forum be convened. The tasks of this subcommittee would be to (1) communicate the role of the regional and sub-regional databases/ repositories in providing public access to information derived from Program funded projects, (2) identify the primary regional databases/ repositories that house information supporting the Program, and (3) address efficient flow of information between regional and subregional databases/repositories, and projects collecting and analyzing data.

Toward this end, the Council has organized a series of presentations on data and information management projects for this and upcoming Fish and Wildlife Committee meetings. The Council developed a series of questions to better understand the specific work each data management project is doing, how they relate to each other, and how they relate to the Council's Program. Some of these questions are asked of every project during their presentation, and others are specific to individual projects. The presentation on DART will provide answers to questions 1-3, 5, and 7.

The required questions are:

1. Describe the data and resources that you provide to the region.
2. How do these data and resources relate to the Council's Fish and Wildlife Program?
3. How are these resources accessed and/ or shared among organizations?

The additional questions are:

4. What kind of collaborations or relationships exist between your data/repositories/organization, and other data management projects/organizations in the basin (not just within the Program)?
5. As the basin and program continue changing and other information needs arise or change, what opportunities do you have to adapt to these different needs?
6. What do we need to be aware of in the future to continue providing data management for the full suite of work implemented under the program?
7. Are there emerging tools or technologies we should be aware of? New data management needs? Innovations to share?

Through these presentations, we hope to highlight the resources that are available from these projects as they relate to the Program both to better understand the accomplishments of the Program, and to inform the region. Following the series of presentations, the Council will develop a summary of the answers each project provided to their specific questions.

More Info: https://www.cbr.washington.edu/dart

Columbia River DART

(Data Access in Real Time)

Presenters: Jennifer L. Gosselin & Susannah Iltis

Present/Past Team Members: Matthew Carter, Chris Van Holmes (retired)

James J. Anderson (founder, retired)

School of Aquatic and Fishery Sciences

College of the Environment
University of Washington

Columbia Basin Research

Bonneville Power Administration

Outline

RAISING AWARENESS OF DATA RESOURCES AVAILABLE

- DART available for public access through www.cbr.washington.edu/dart
  - Interactive query tools to access data downloads, summaries, visualizations

HELPING ADDRESS REGIONAL GOALS

- DART helps answer questions related to regional goals with data
  - Relevance to the NPCC Fish & Wildlife Program

IMPROVING OUR DART TOOLS & SERVICES

- DART has revised processes in the last 3 decades
  - Now guided by FAIR & CARE principles


“The most exciting breakthroughs of the twenty-first century will not occur because of technology, but because of an expanding concept of what it means to be human.”
— John Naisbitt
American author and public speaker
in the area of futures studies

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An evolving vision of DART:

- Why? How? For Whom? With Whom?
- Human-centered design in communication of information
  - Data to knowledge
  - Human-computer interactions
  - Audience with diverse values & needs

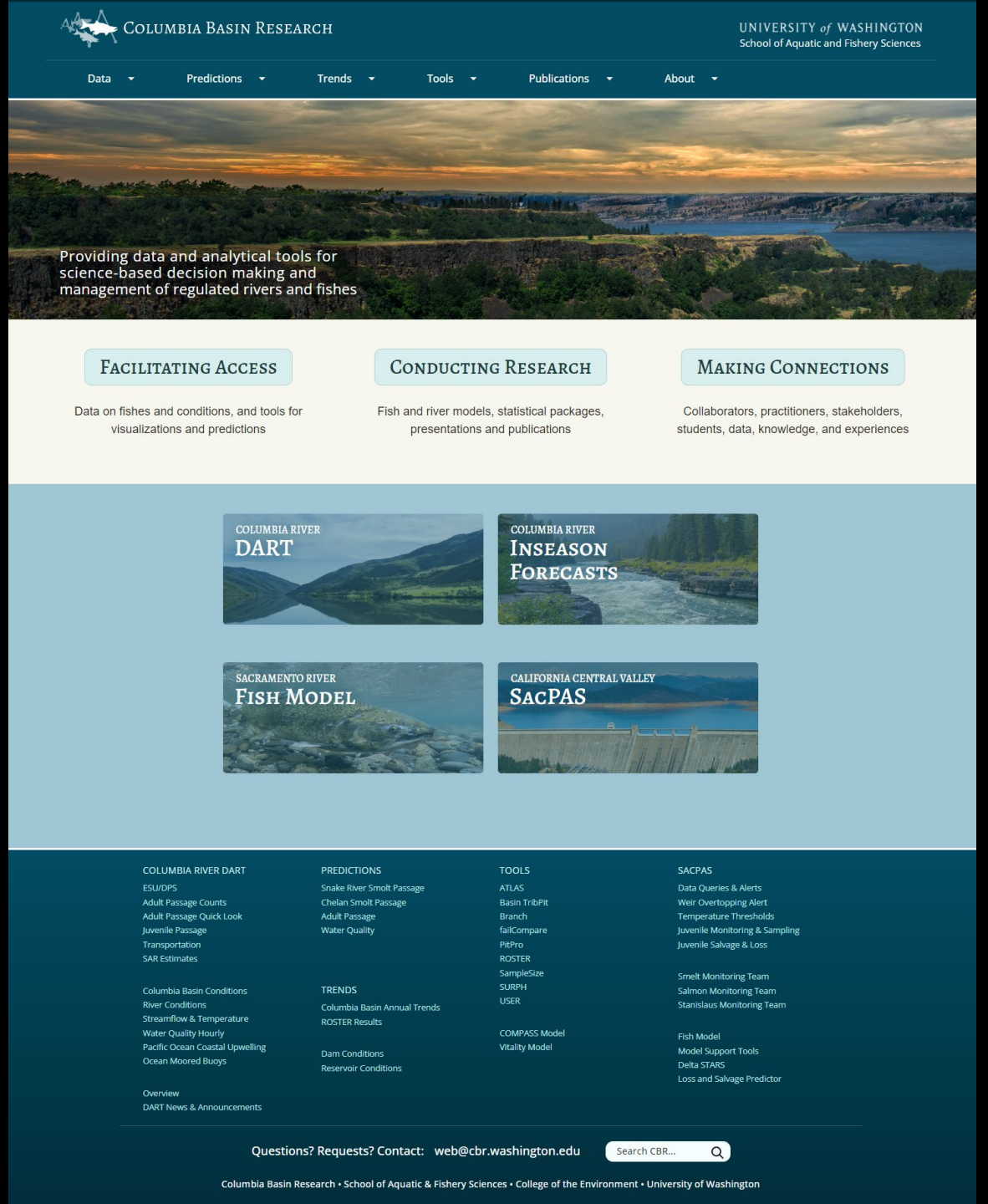
The vision 3 decades ago

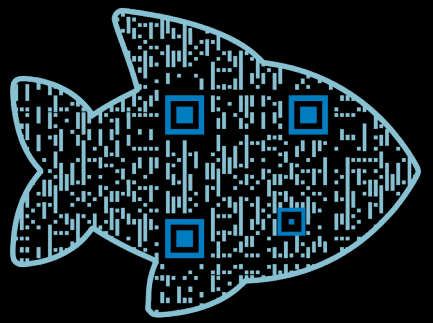
- **Professor Anderson had a vision…**
- **Providing managers access to data for in-season meetings**

- **First inklings of a CBR website started in early 1990s**
- **DART started in 1996**

To put this into context:

- The World Wide Web (WWW) was invented in 1989, Tim Berners-Lee, a British scientist at CERN.
- Near the end of 1992, there were approximately 50-60 websites.
- CBR training workshops included showing folks how to use a mouse





https://www.cbr.washington.edu/

OUTLINE

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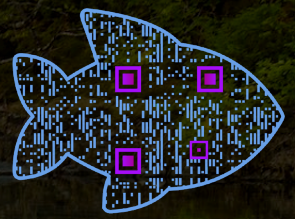

HELPING ADDRESS REGIONAL GOALS

- DART helps answer questions related to regional goals with data
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IMPROVING OUR DART TOOLS & SERVICES

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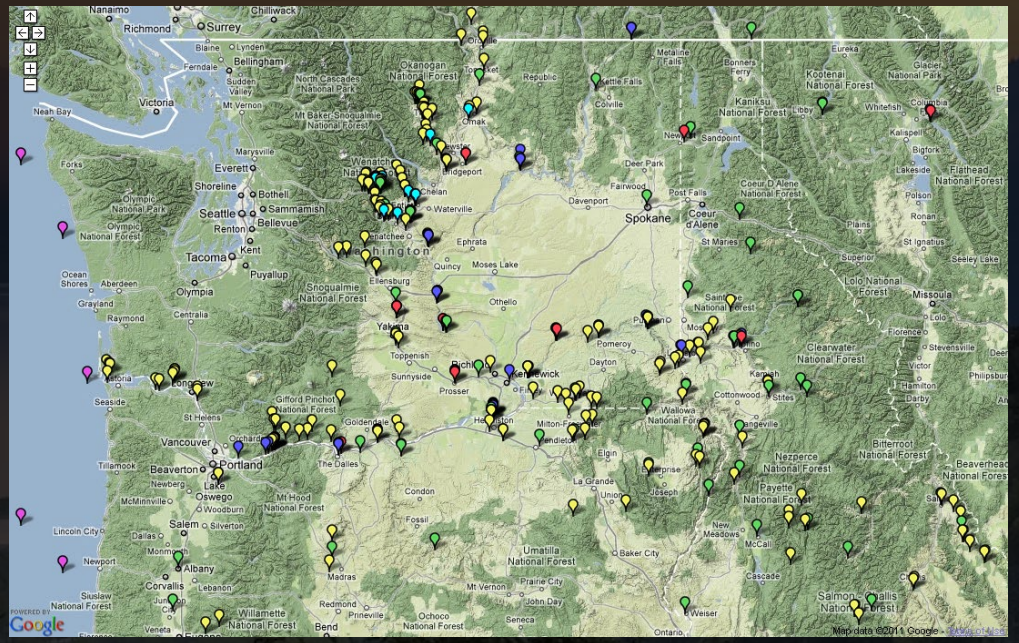
Broad categories of data on DART

Fish species:

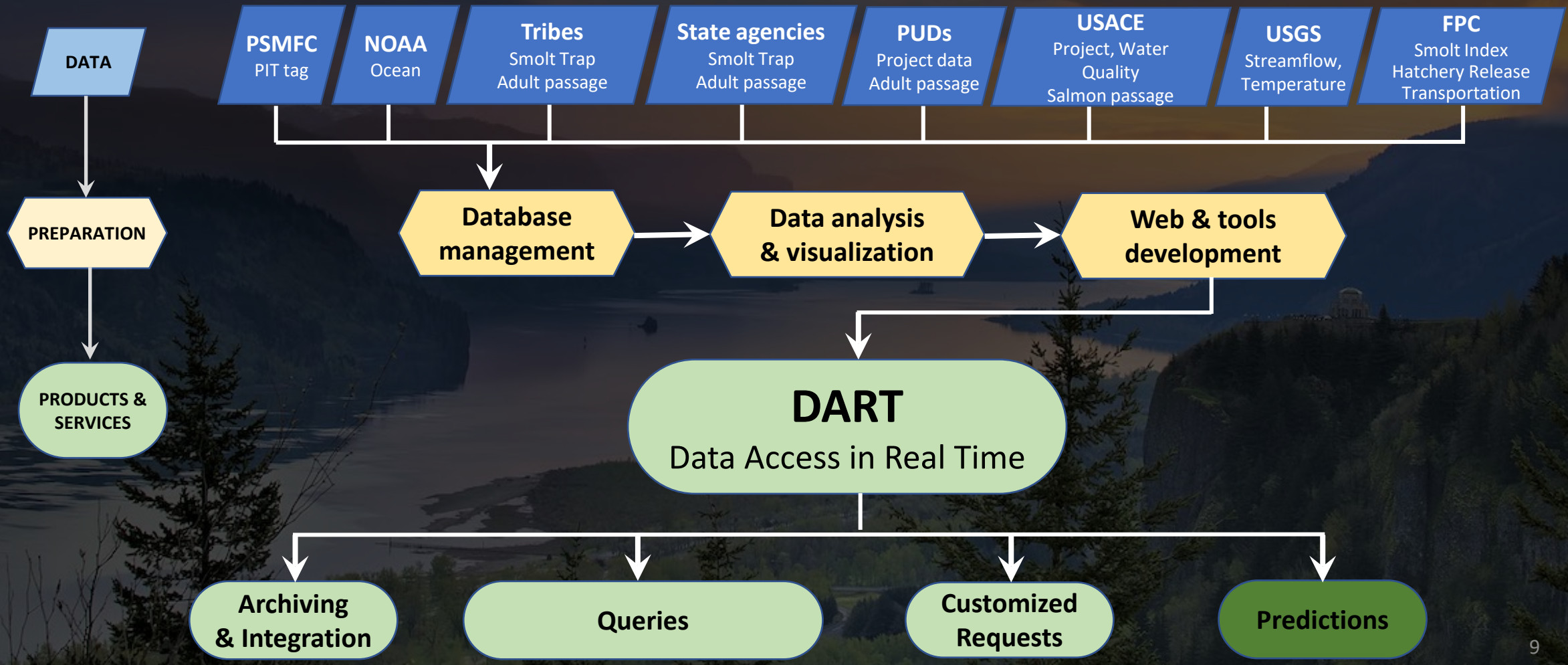
- Juvenile Salmonids
- Adult Salmonids
- Resident species

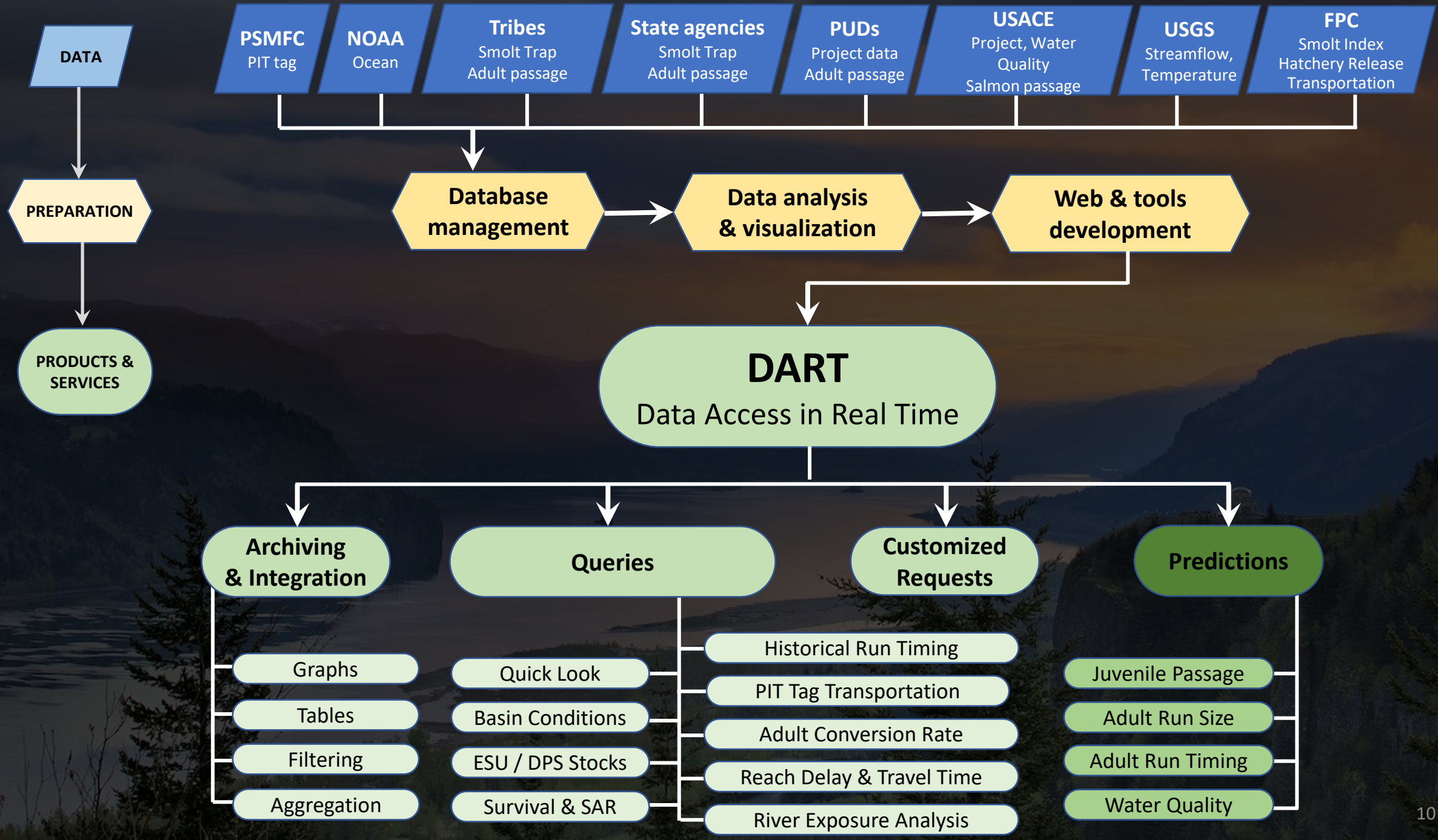
Environment:

- River conditions
- Ocean/climate conditions

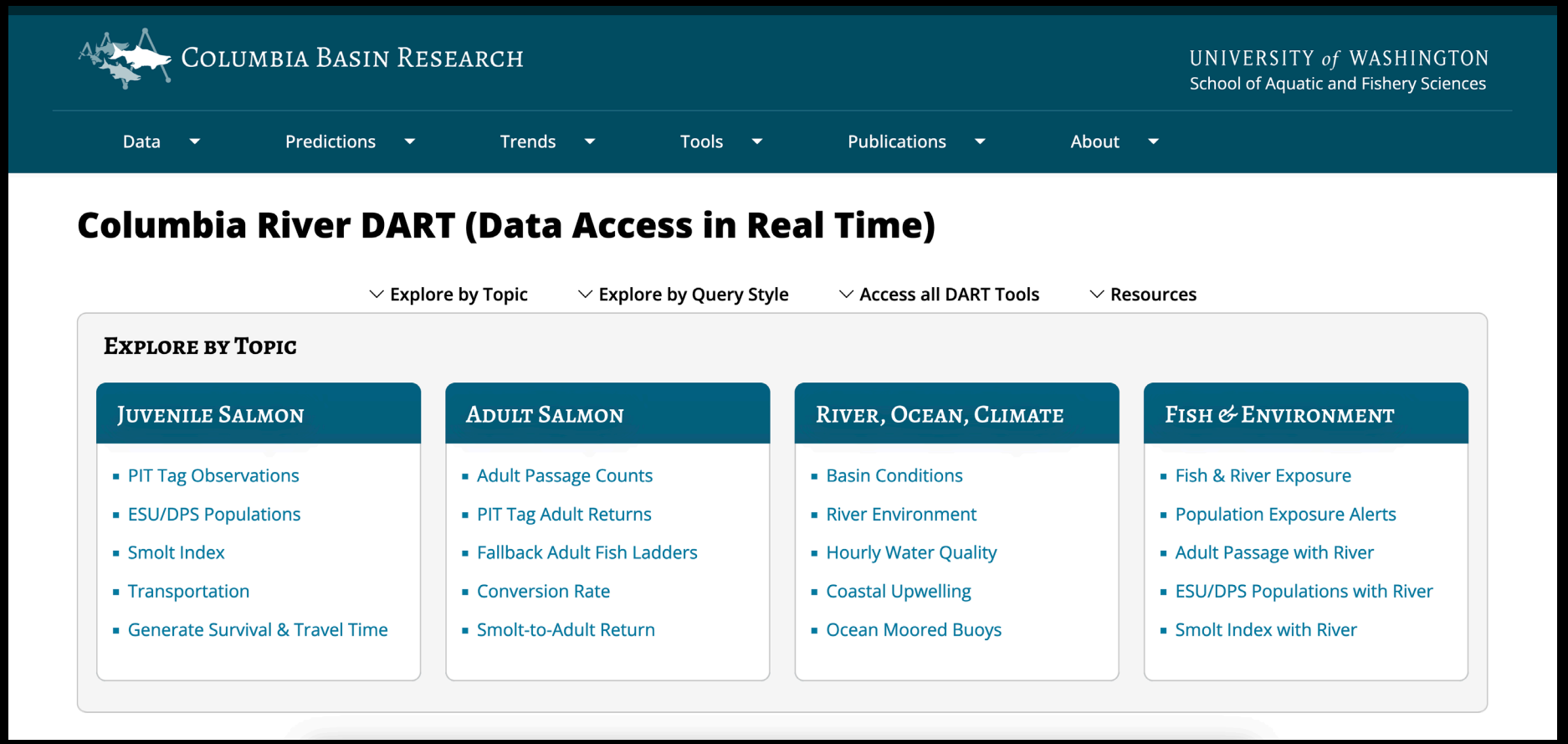


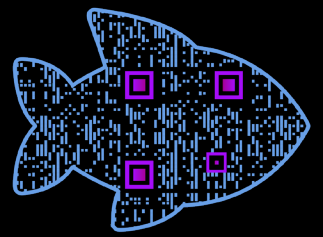
DART: SECONDARY DATA REPOSITORY, CENTRALIZED AND INTEGRATED DATA SETS



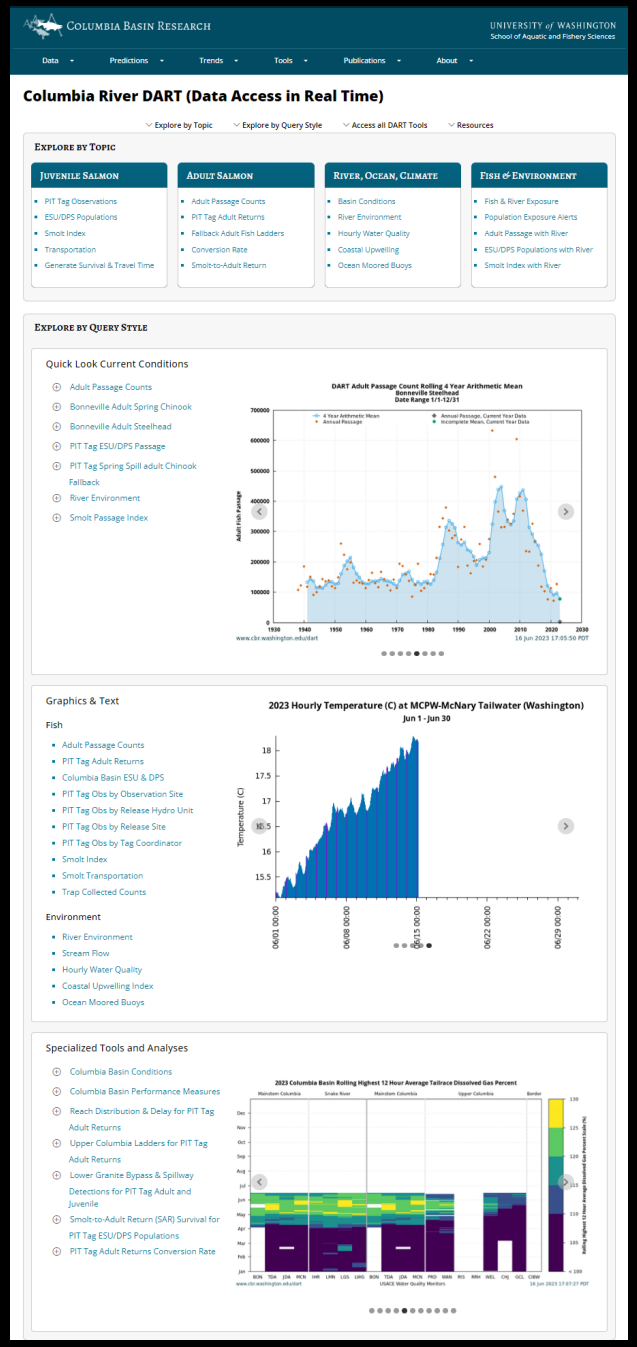

DATA
PSMFC
PIT tag
NOAA
Ocean
Tribes
Smolt Trap
Adult passage
State agencies
Smolt Trap
Adult passage
PUDs
Project data
Adult passage
USACE
Project, Water Quality
Salmon passage
USGS
Streamflow, Temperature
FPC
Smolt Index
Hatchery Release
Transportation
PREPARATION
Database management
Data analysis & visualization
Web & tools development
PRODUCTS & SERVICES
DART
Data Access in Real Time
Archiving & Integration
Queries
Customized Requests
Predictions
Graphs
Tables
Filtering
Aggregation
Quick Look
Basin Conditions
ESU / DPS Stocks
Survival & SAR
Historical Run Timing
PIT Tag Transportation
Adult Conversion Rate
Reach Delay & Travel Time
River Exposure Analysis
Juvenile Passage
Adult Run Size
Adult Run Timing
Water Quality

New look to DART website recently released





https://www.cbr.washington.edu/dart

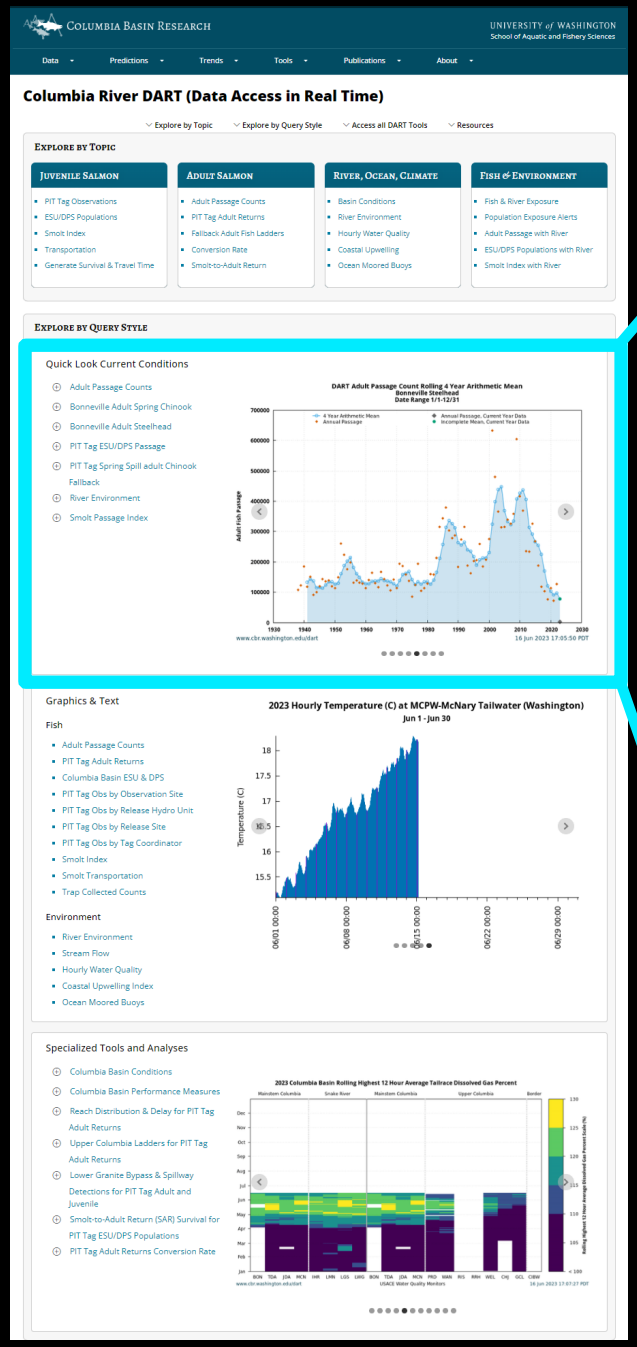


Scrolling further down the webpage

https://www.cbr.washington.edu/dart

- Query Style -

Quick Look

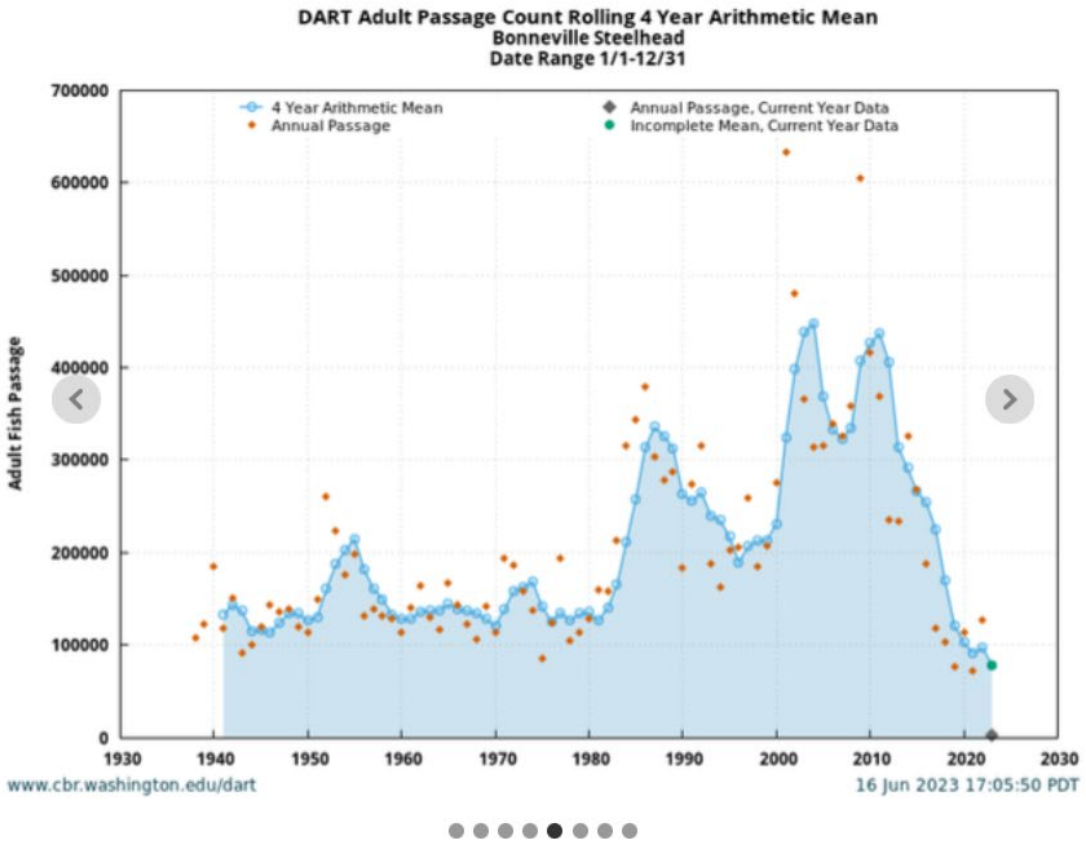


Quick Look Current Conditions

- Adult Passage Counts
- Bonneville Adult Spring Chinook
- Bonneville Adult Steelhead

Presents current Bonneville Adult Steelhead passage with River Environment and Historical Run Timing. Updated daily. Carousel figures 5 and 6.

- PIT Tag ESU/DPS Passage
- PIT Tag Spring Spill adult Chinook Fallback
- River Environment
- Smolt Passage Index



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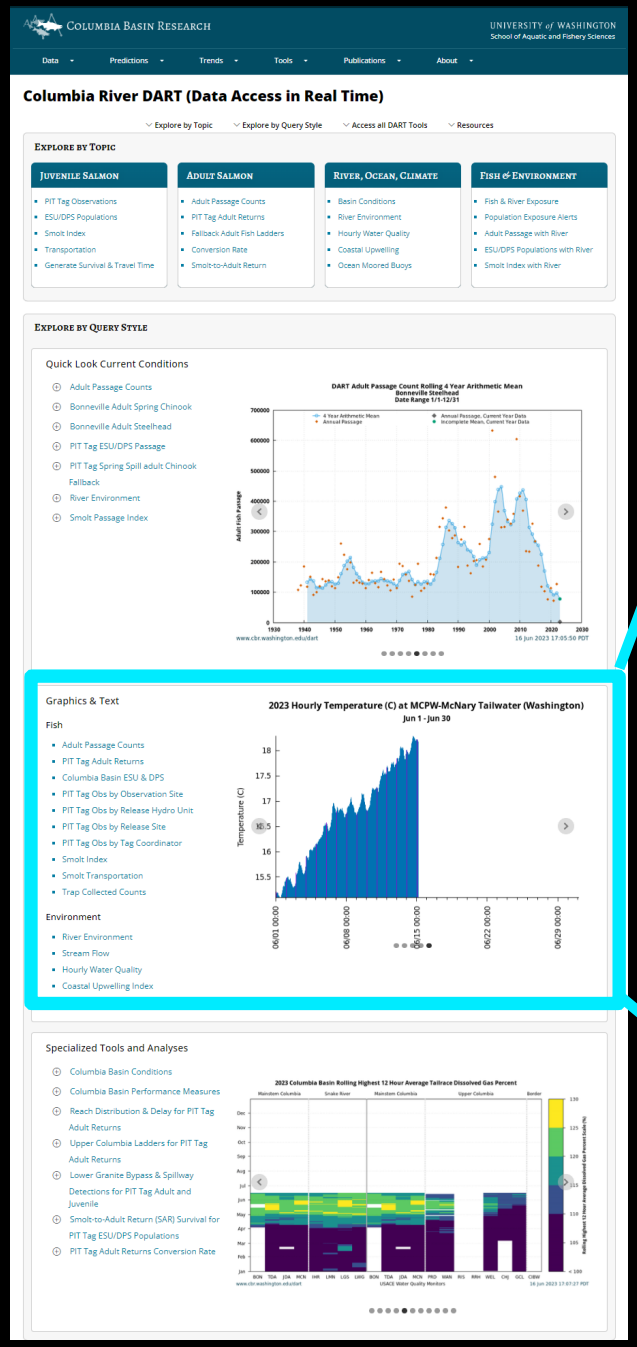
- Query Style -

Graphics & Text



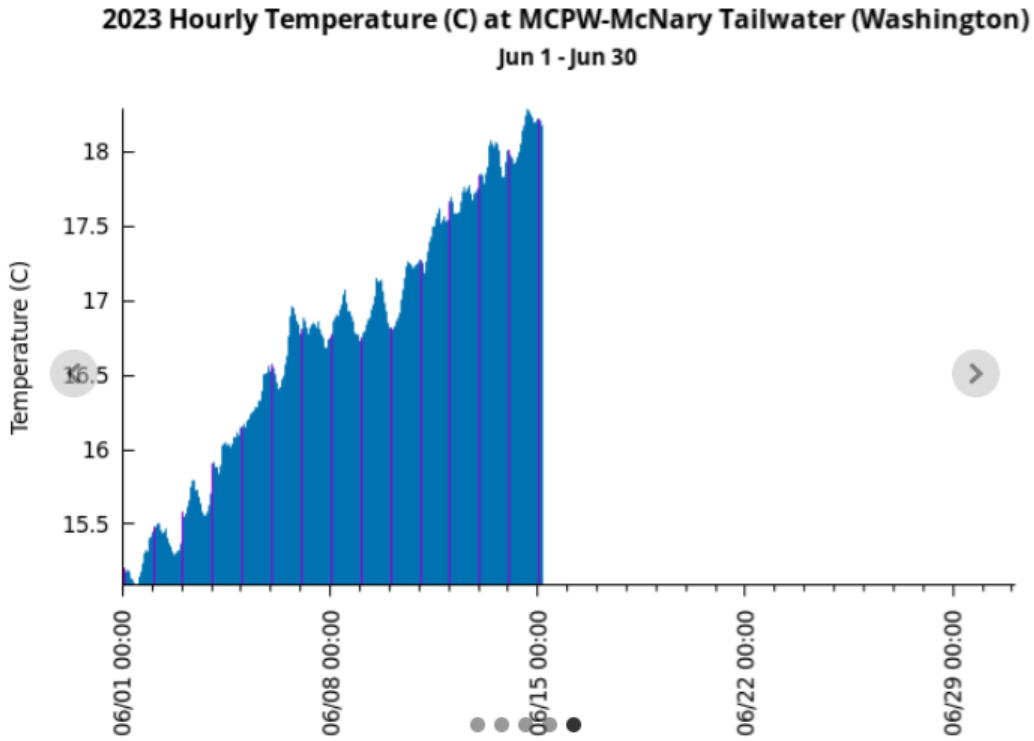
Graphics & Text

Fish

- Adult Passage Counts
- PIT Tag Adult Returns
- Columbia Basin ESU & DPS
- PIT Tag Obs by Observation Site
- PIT Tag Obs by Release Hydro Unit
- PIT Tag Obs by Release Site
- PIT Tag Obs by Tag Coordinator
- Smolt Index
- Smolt Transportation
- Trap Collected Counts

Environment

- River Environment
- Stream Flow
- Hourly Water Quality
- Coastal Upwelling Index
- Ocean Moored Buoys



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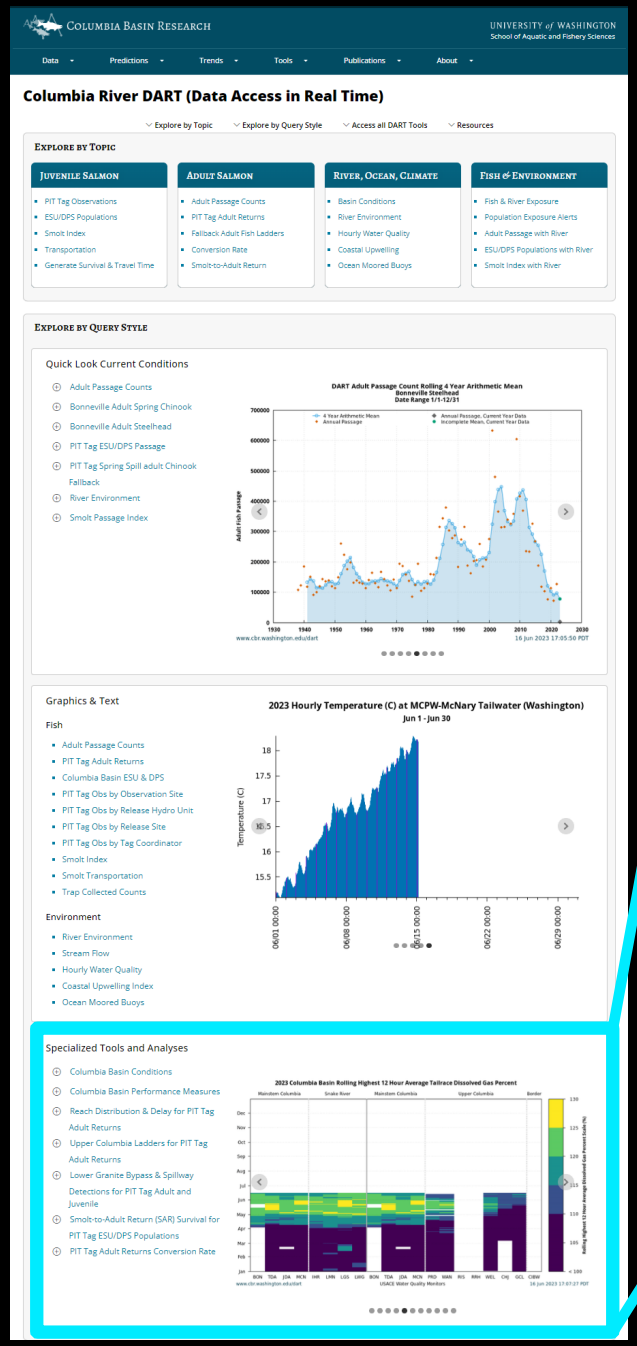
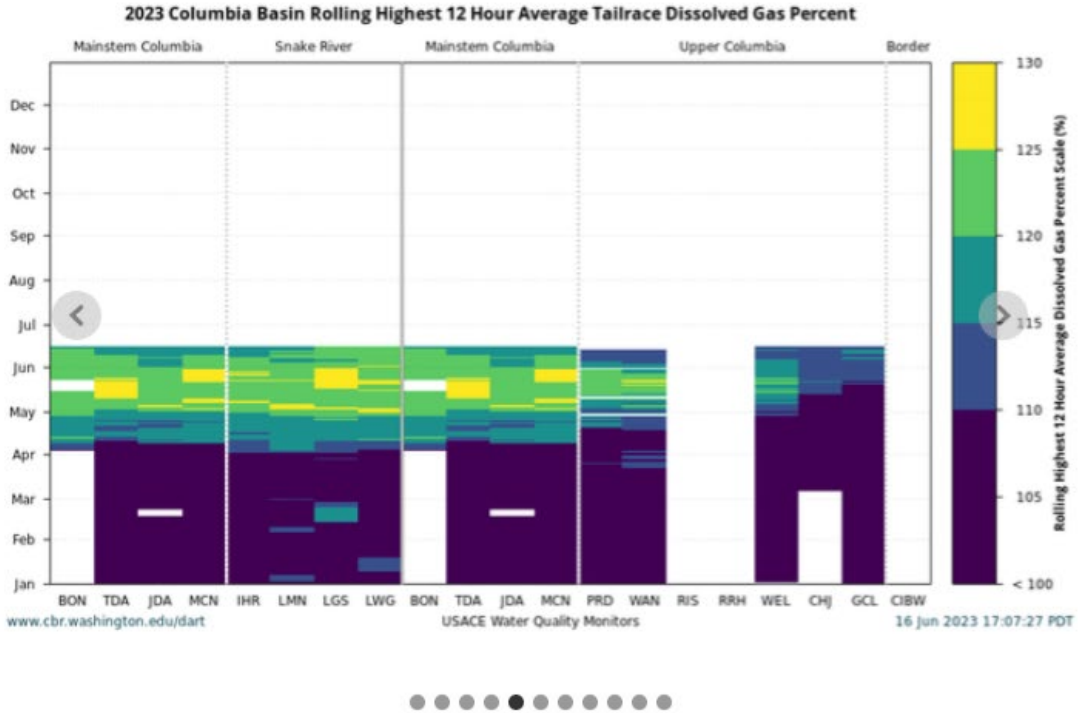
- Query Style -

Specialized Tools & Analyses



Specialized Tools and Analyses

- Columbia Basin Conditions
- Columbia Basin Performance Measures
- Reach Distribution & Delay for PIT Tag Adult Returns
- Upper Columbia Ladders for PIT Tag Adult Returns
- Lower Granite Bypass & Spillway Detections for PIT Tag Adult and Juvenile
- Smolt-to-Adult Return (SAR) Survival for PIT Tag ESU/DPS Populations
- PIT Tag Adult Returns Conversion Rate



https://www.cbr.washington.edu/dart

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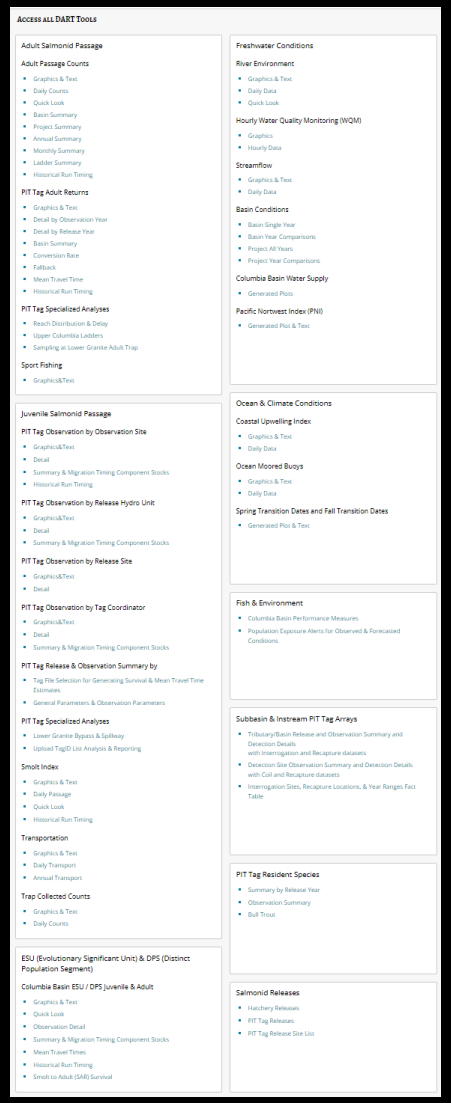
All DART Tools

Adult Salmonids →

Juvenile Salmonids →

ESU/DPS Populations →



← **Freshwater Conditions**

← **Ocean/Climate Conditions**

← **Fish & Environment**

← **Subbasin & Instream Arrays**

← **Salmonid Releases**

← **Resident Species**

https://www.cbr.washington.edu/dart

Juvenile Salmonids

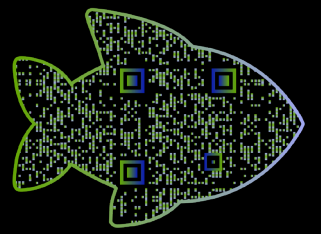
Juvenile Salmonid Passage

Data and metrics:

- Passage timing
- Travel time
- Abundance
- Survival
- PIT tag data sets

Data types and sources:

- Smolt Index
  (FPC)
- PIT tag detections
  (PSMFC)
- Transportation
  (FPC)
- Trap Collected Counts
  (WDFW, Colville Tribes Fish & Wildlife (OBMEP), Chelan County PUD, Douglas County PUD, USFWS, Yakama Nation)



https://www.cbr.washington.edu/dart#alldart_juv

PIT-TAGGED ESU/DPS POPULATIONS

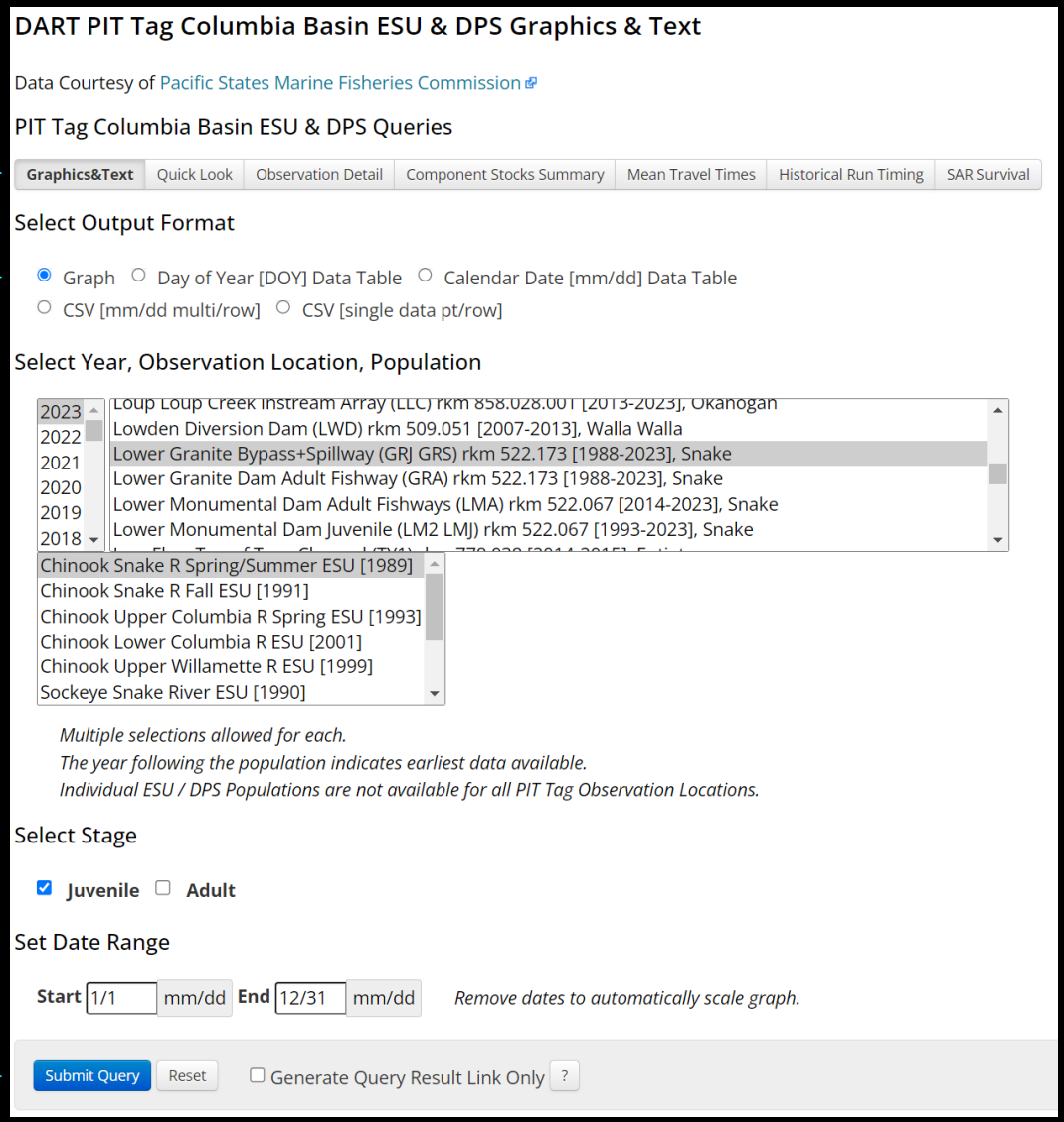
Data Source →

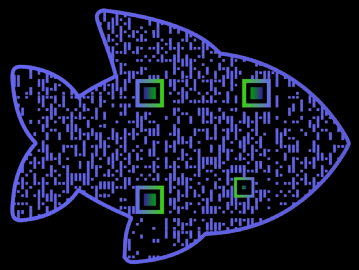
Graphics & Text Query Style →

Graph or table output format →

Year, Location, ESU/DPS Population, Life History Stage

Submit button →





https://www.cbr.washington.edu/dart/query/esu_graph_text

Additional features of query: customization & transparency

Submit, generate query link

Integrate with river data

Customize data output

Customize graph

Transparency of data sources and methods

Submit Query | Reset | Generate Query Result Link Only ?

Optional Include River Environment

Select River Site, Data

No Selection	No Selection
BON-Bonneville	Barometric Pressure
IHR-Ice Harbor	Dissolved Gas
LWG-Lower Granite	Dissolved Gas Percent
MCN-McNary	Elevation
PRD-Priest Rapids	Inflow

Multiple selections allowed for each.
River Data are not available for all PIT Tag Observation Locations.

Customize Data

Cumulate Counts Normalize Cumulated Counts

Customize Graph

Combine like Data Types Graph Nulls Grid Monochrome w/Symbols Plot Symbols

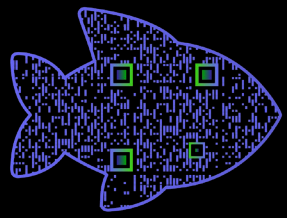
First Y-Axis Min 0 Max

Second Y-Axis Min Max

Graph Size Large (800 x 600)

Query Notes

- ESU (Evolutionarily Significant Unit) and DPS (Distinct Population Segment) Glossary, DART PIT Tag and ESU Metadata & Glossary
- River Environment parameters are not available at all locations. DART River Environment Metadata & Glossary
- To generate the Data Link for querying results directly from scripts and automated processes: make all selections, check "Generate Query Result Link Only" next to the "Submit Query" button, and click "Submit Query".



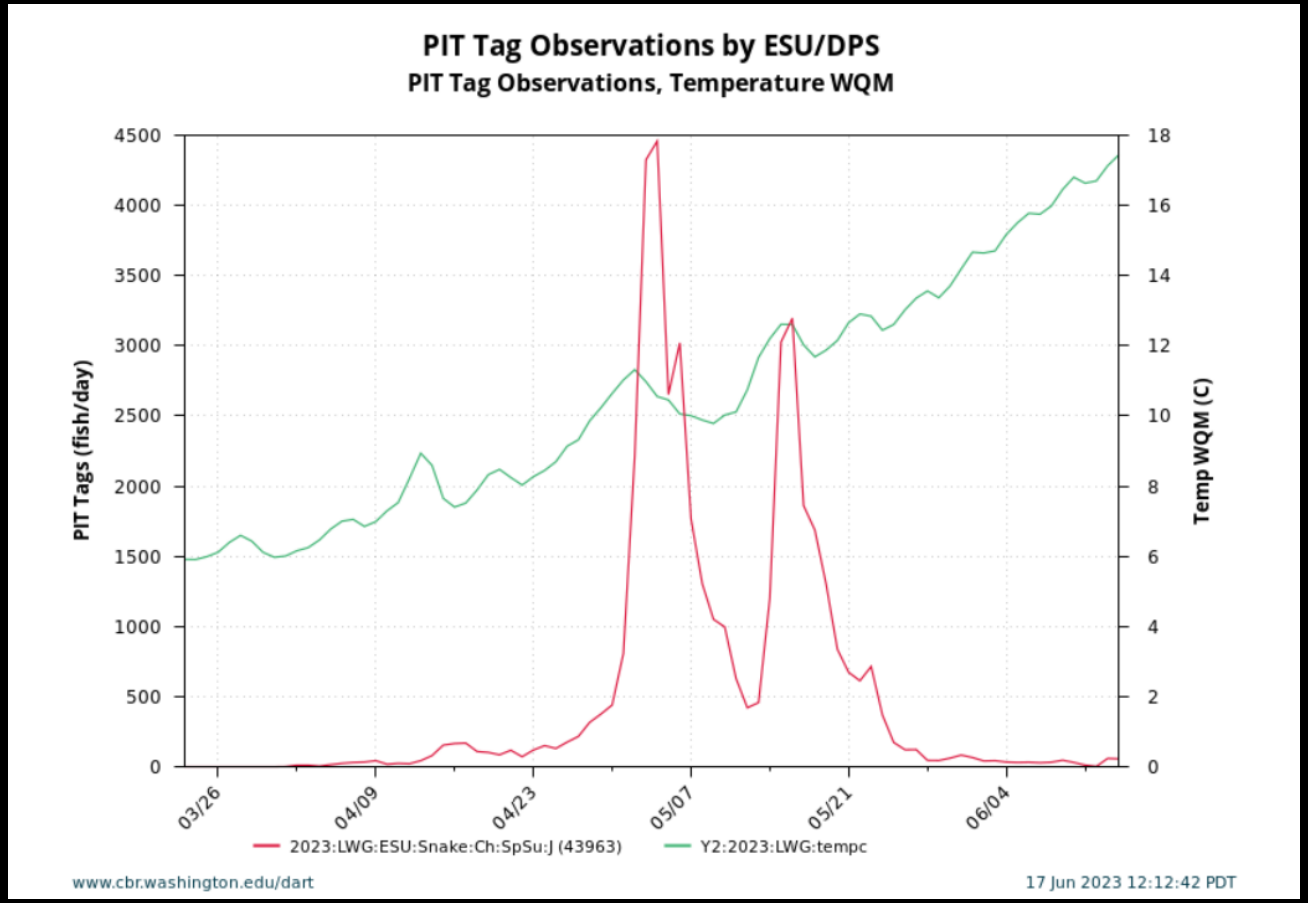
https://www.cbr.washington.edu/dart/query/esu_graph_text

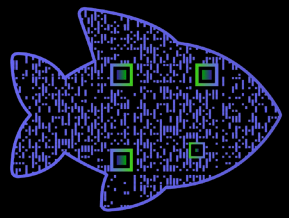
PIT-TAGGED ESU/DPS POPULATIONS

Data Courtesy of Pacific States Marine Fisheries Commission

PIT Tag Columbia Basin ESU & DPS Queries

Graphics&Text | Quick Look | Observation Detail | Component Stocks Summary | Mean Travel Times | Historical Run Timing | SAR Survival





https://www.cbr.washington.edu/dart/query/esu_graph_text

Adult Salmonids

Adult Salmonids

Data and metrics

- Passage timing
- Travel time
- Daily Counts
- Summary Counts
  (Basin, Project, Ladder, Annual, Monthly)
- Survival
- PIT tag data set files
- Fallback
- Conversion rates
- Reach Distribution & Delay

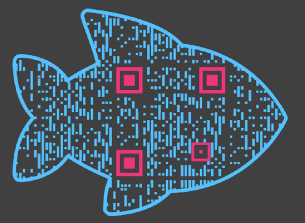
Data types and sources

- Video or live counts

  (USACE, ODFW, WDFW, Yakima Klickitat Fisheries Project, Colville Tribes Fish & Wildlife (OBMEP), Chelan County PUD, Douglas County PUD, Grant County PUD)

- PIT tag detections

  (PSMFC)



https://www.cbr.washington.edu/dart#alldart_adult

SAR Survival Estimates

DART Columbia Basin ESU & DPS Smolt-to-Adult Return (SAR) Estimates

Data Courtesy of Pacific States Marine Fisheries Commission

Columbia Basin ESU & DPS Passage Queries

Graphics&Text | Quick Look | Observation Detail | Summary & Migration Timing Component Stocks | Mean Travel Times | Historical Run Timing | SAR Estimates

Select SAR Category, ESU/DPS, Rear Type

Bonneville (All) to Bonneville Adult	Chinook Snake R Spring/Summer ESU	All
McNary (All) to McNary Adult	Chinook Snake R Fall ESU	W-Wild Only
Lower Granite (All) to Lower Granite Adult	Chinook Upper Columbia R Spring ESU	H-Hatchery Only
Lower Granite (In-river Only) to Lower Granite Adult	Chinook Upper Columbia R Summer/Fall (focal population)	
Lower Granite (Transport Only) to Lower Granite Adult	Coho Middle Columbia R Restoration Program (Wenatchee+Methow)	
Lower Granite (All) to Bonneville Adult	Sockeye Snake River ESU	

Select Adult Detections

(•) All Detections ( ) Exclude 0-Year Adult Detections ( ) Exclude 0,1-Year Adult Detections **most relevant for Chinook populations*

Year is the difference in calendar year between juvenile detection and adult detection at the locations selected. For example, 0-Year are adult detections within the same calendar year as juvenile detection.

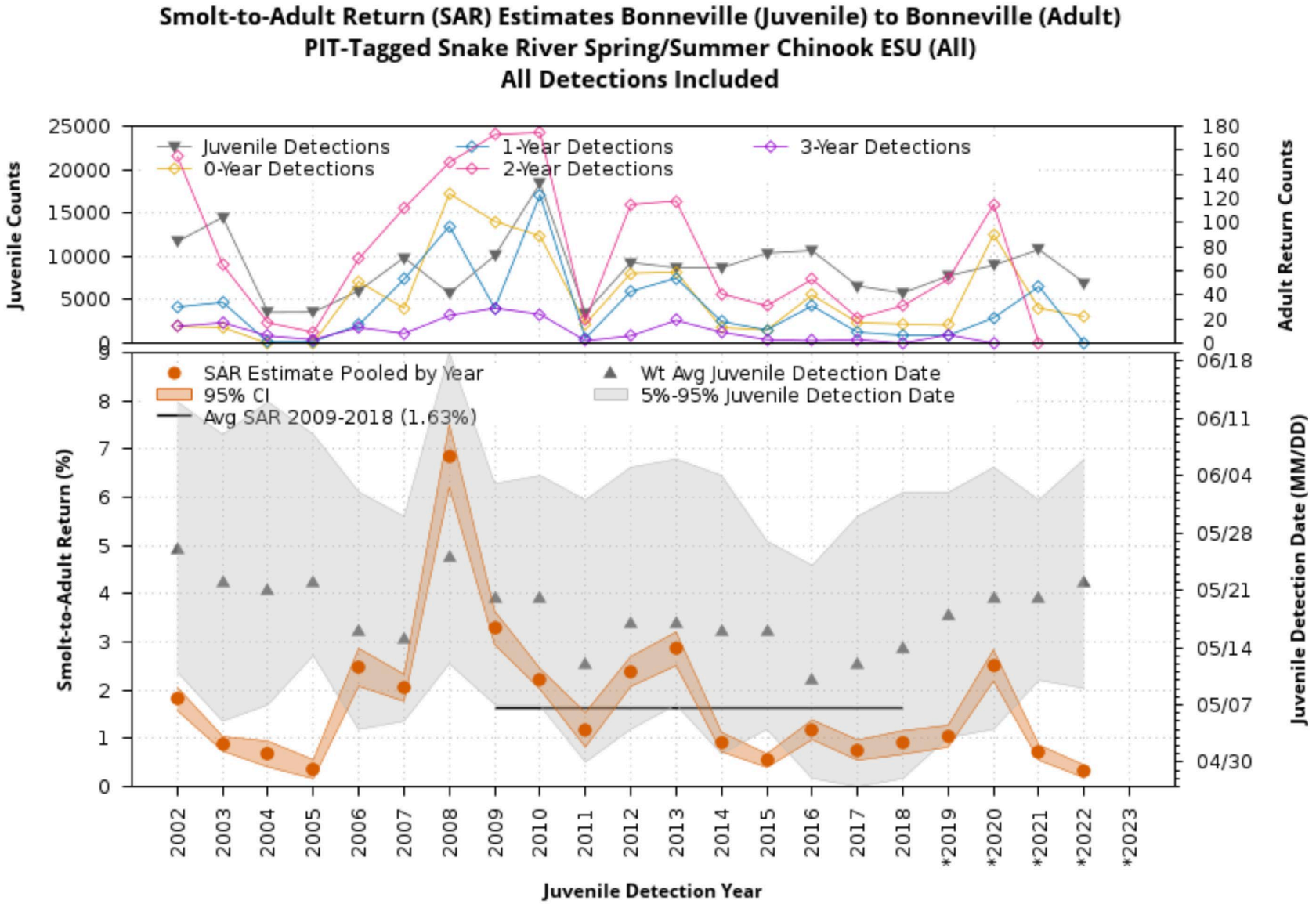
Set Annual Summary Table Group Type

(•) by Release Basin ( ) by Release Site

Submit Query | Reset | This is a complex report and may take 1-2 minutes to complete.

www.cbr.washington.edu/dart/query/pit_sar_esu

SAR Survival Estimates



www.cbr.washington.edu/dart/query/pit_sar_esu

REACH DISTRIBUTION & DELAY

DART PIT Tag Adult Reach Distribution and Delay

Data Courtesy of Pacific States Marine Fisheries Commission

Select Year, Release Group

2023	Spring/Summer Chinook, juveniles released at/above Lower Granite
2022	Spring/Summer Chinook, juveniles released at/above McNary
2021	Fall Chinook, juveniles released at/above Lower Granite

Selection for Release Group controls options available for Reach and Period.
Release Group:

- *"Sp/Su Chinook juveniles released at/above Lower Granite" includes Unknown-run tagged at LWG in April and May in same year as release*
- *"Fall Chinook juveniles released at/above Lower Granite" includes Unknown-run tagged at LWG after June in same year as release and Unknown-run tagged by coord_id "WPC"*

Select Reach, Date Period

Lower Monunmental to Little Goose [2014]	Spring Spill Dates (April-June)
Lower Monumental to Lower Granite (double reach) [2014]	Visual Count Sp/Su Dates (April-August)
Little Goose to Lower Granite [2014]	

Year in brackets following the Reach indicates earliest analysis year available.

Set Summary

Summarize Migration Stats by: ◉ Release Site ○ Release HydroUnit

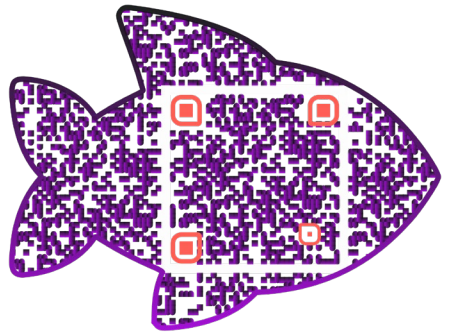
Optional: Set Historical Date

Use Historical Date ◉ No ○ Yes

Historical Date 06/04 mm/dd

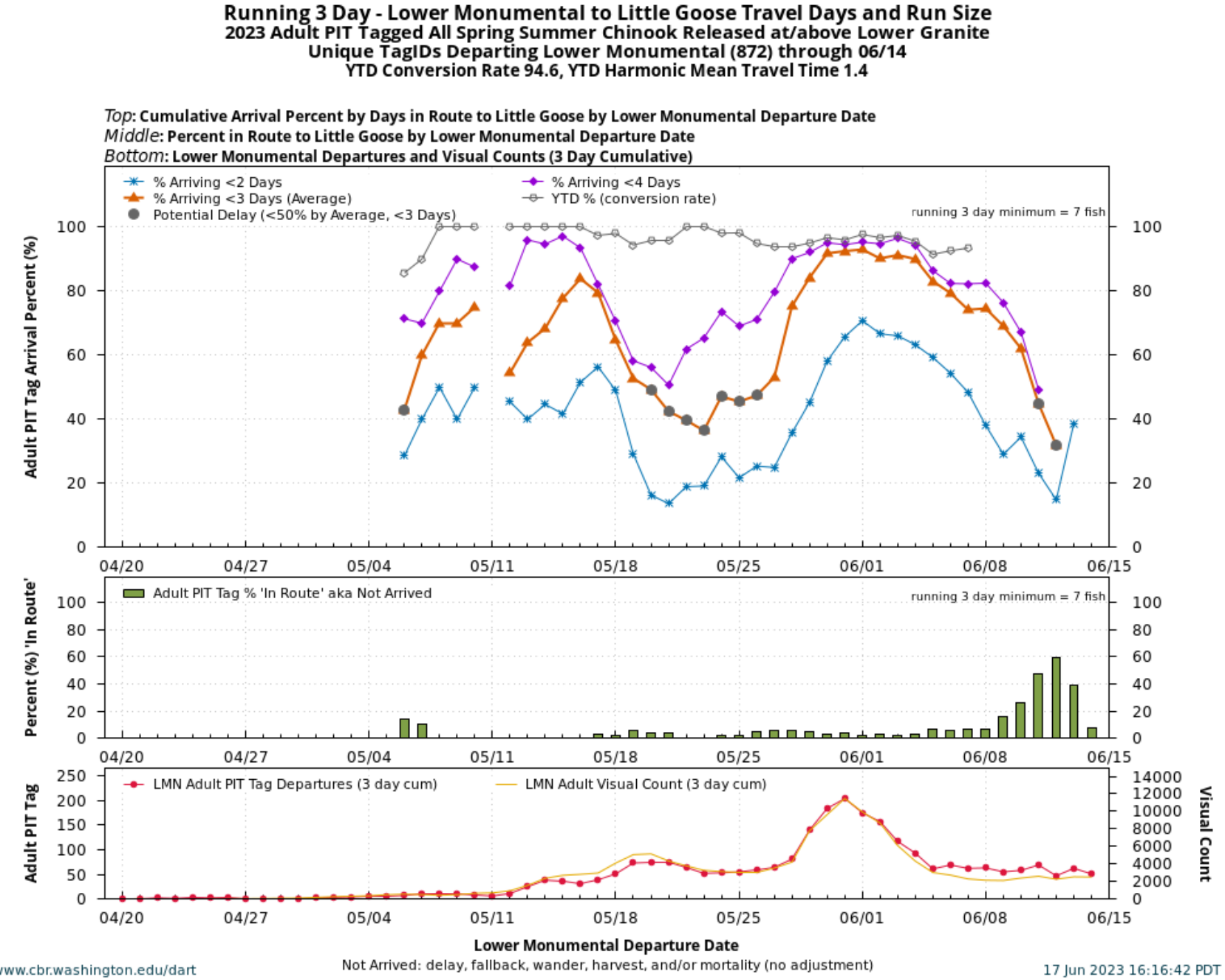
Note: Click "Yes" radio button to activate "Use Historical Date" option. The purpose of this option is to examine results for a particular historical date (a.k.a. moving back in time). Activating "Use Historical Date" option will cut off all input data at that date. This option does not expand the range of analyzed data outside of designated spill period.

Submit Query Reset



https://www.cbr.washington.edu/dart/query/pitadult_reachdist

– ADULT SALMONIDS - SPECIALIZED TOOL –



https://www.cbr.washington.edu/dart/query/pitadult_reachdist

Environmental Conditions

Freshwater, Ocean, Climate

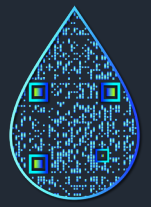
Data and metrics

- Freshwater
  - Discharge
  - Temperature
  - Spill
  - Total dissolved gas
  - Etc.

- Ocean/Climate
  - Coastal upwelling indices
  - Sea surface temperature
  - Etc.

Data types and sources

- Project Data
  (USACE, Grant County PUD, ODFW)
- Water quality monitors
  (USACE)
- Stream gages
  (USGS)
- Ocean moored buoys
  (NOAA)



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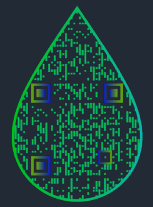
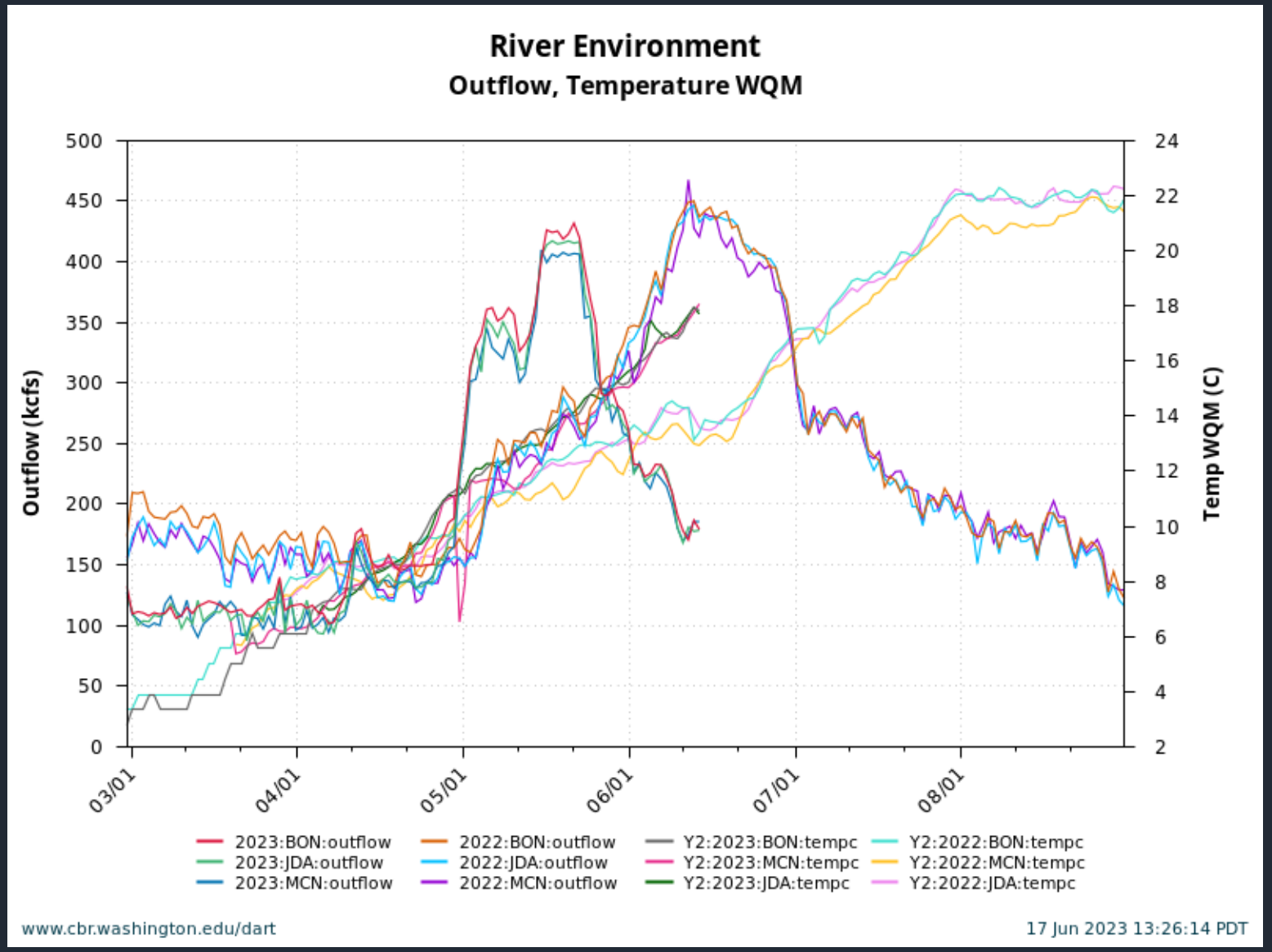


https://www.cbr.washington.edu/dart#alldart_ocean

RIVER CONDITIONS



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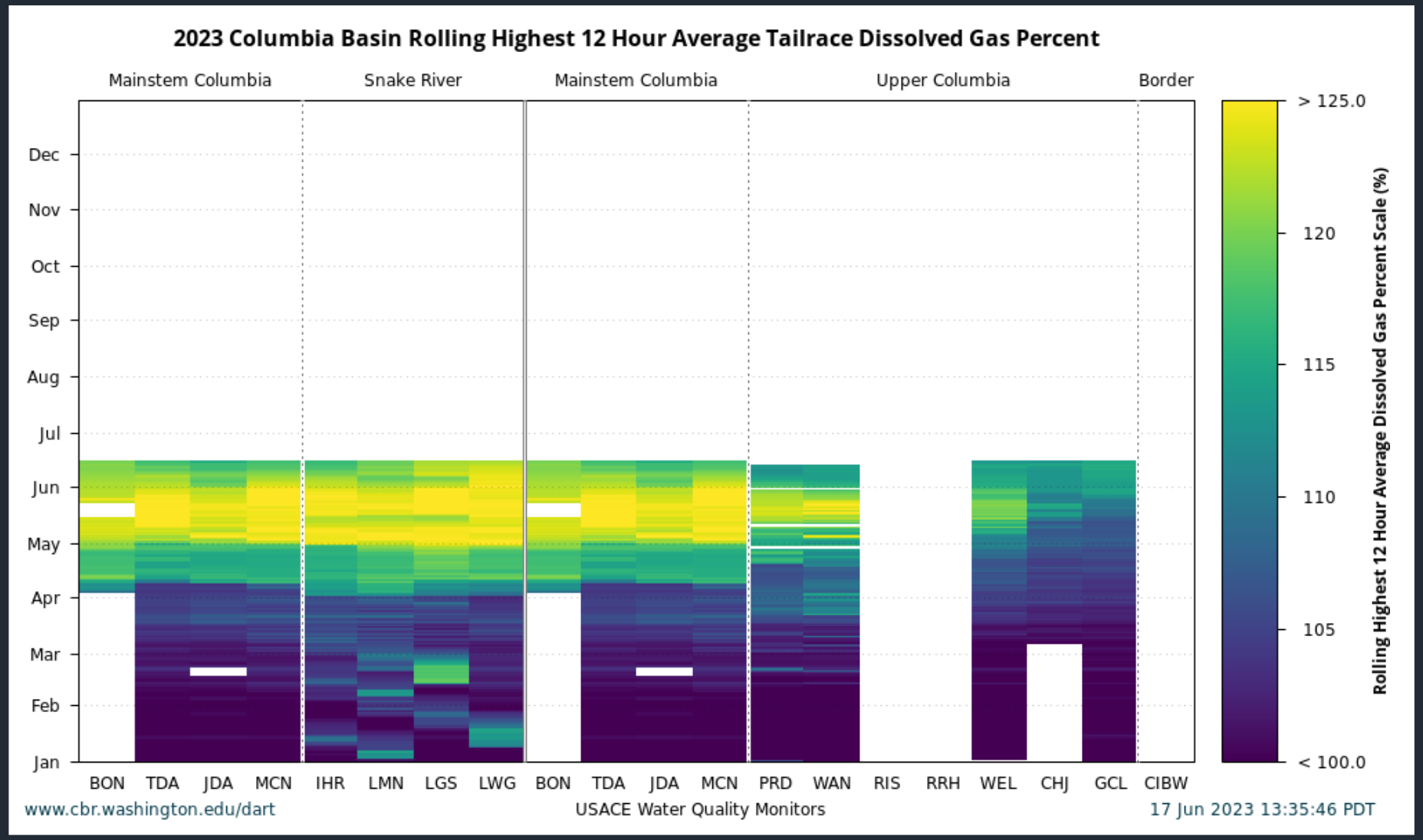
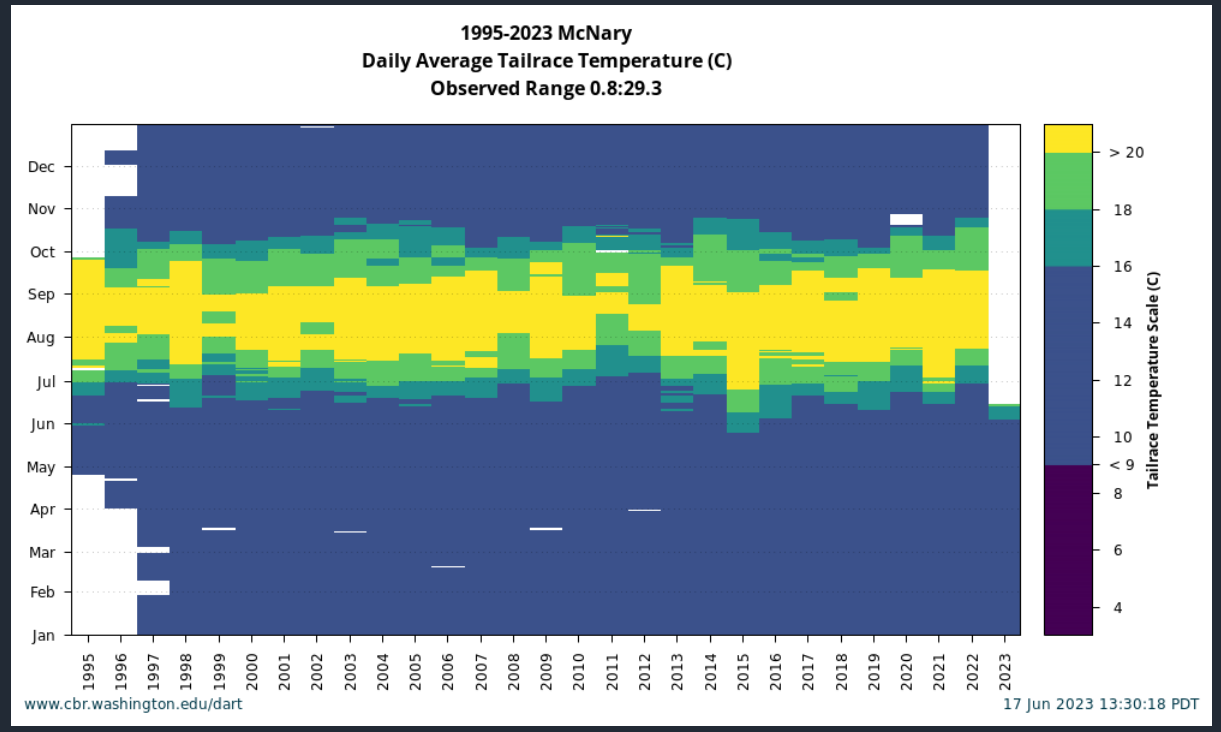
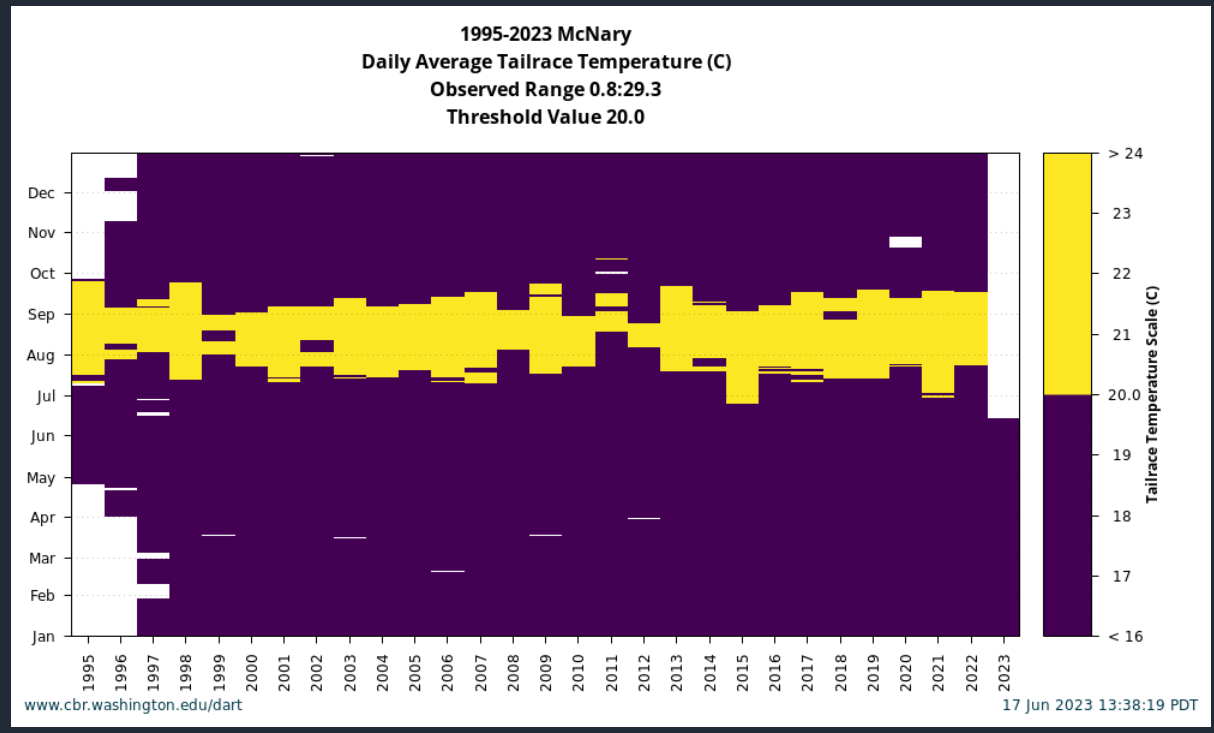
BASIN CONDITIONS



https://www.cbr.washington.edu/dart/query/basin_conditions

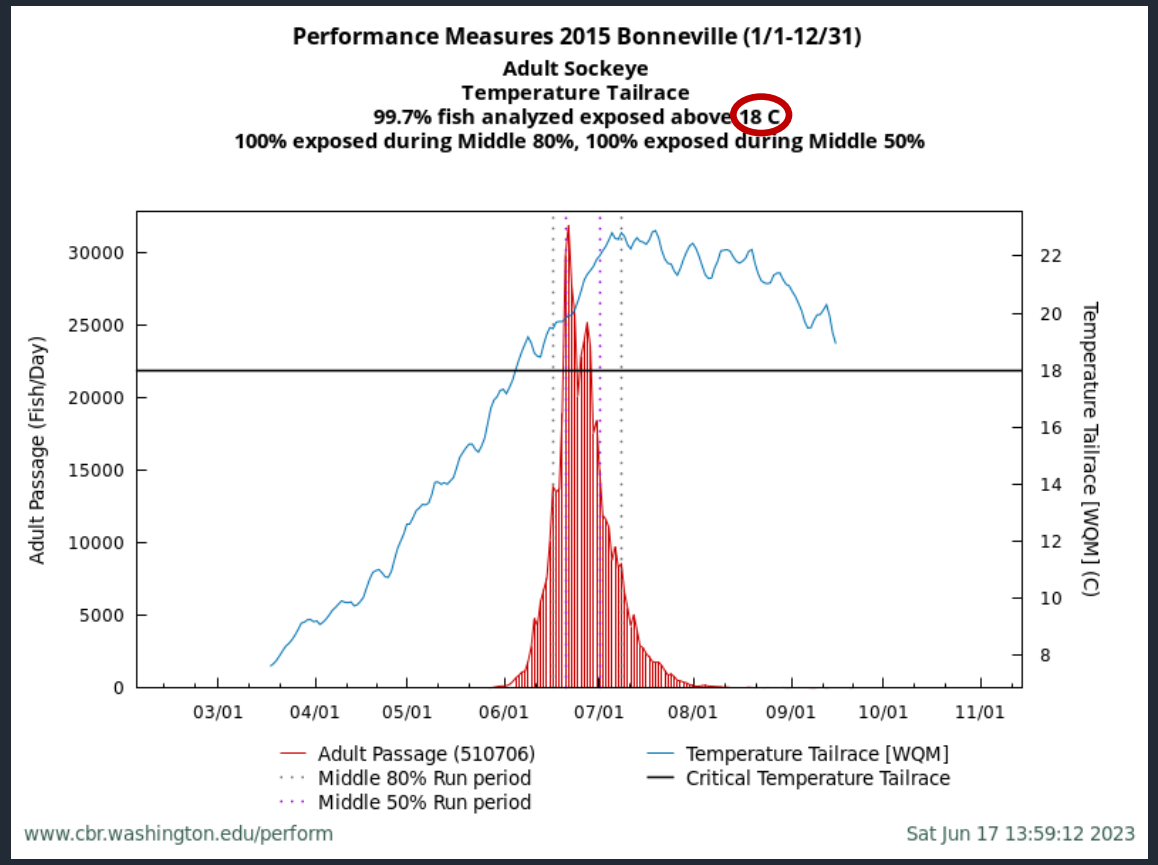
BASIN CONDITIONS

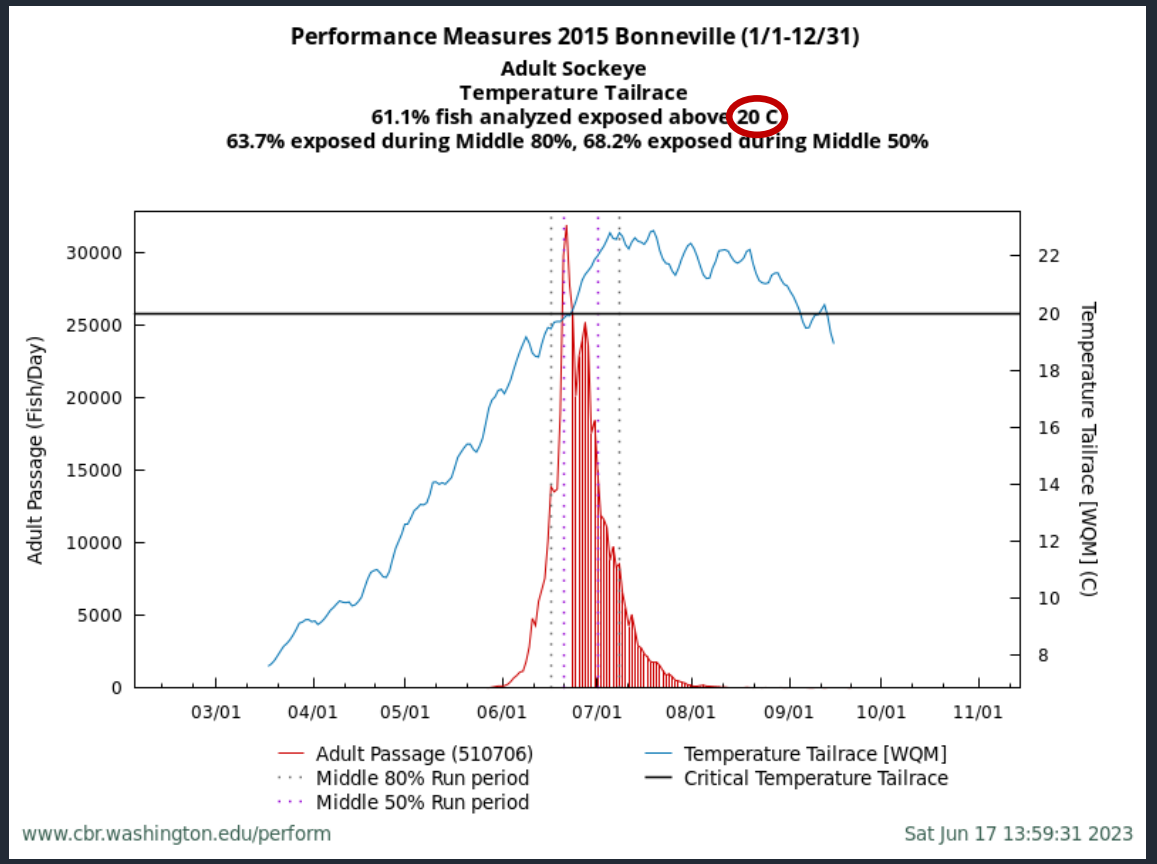




https://www.cbr.washington.edu/dart/query/basin_conditions_hist

PERFORMANCE MEASURES





https://www.cbr.washington.edu/perform/

OUTLINE

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IMRPOVING OUR DART TOOLS & SERVICES

- DART has revised processes in the last 3 decades
  - Now guided by FAIR & CARE principles

Council's Fish and Wild Program

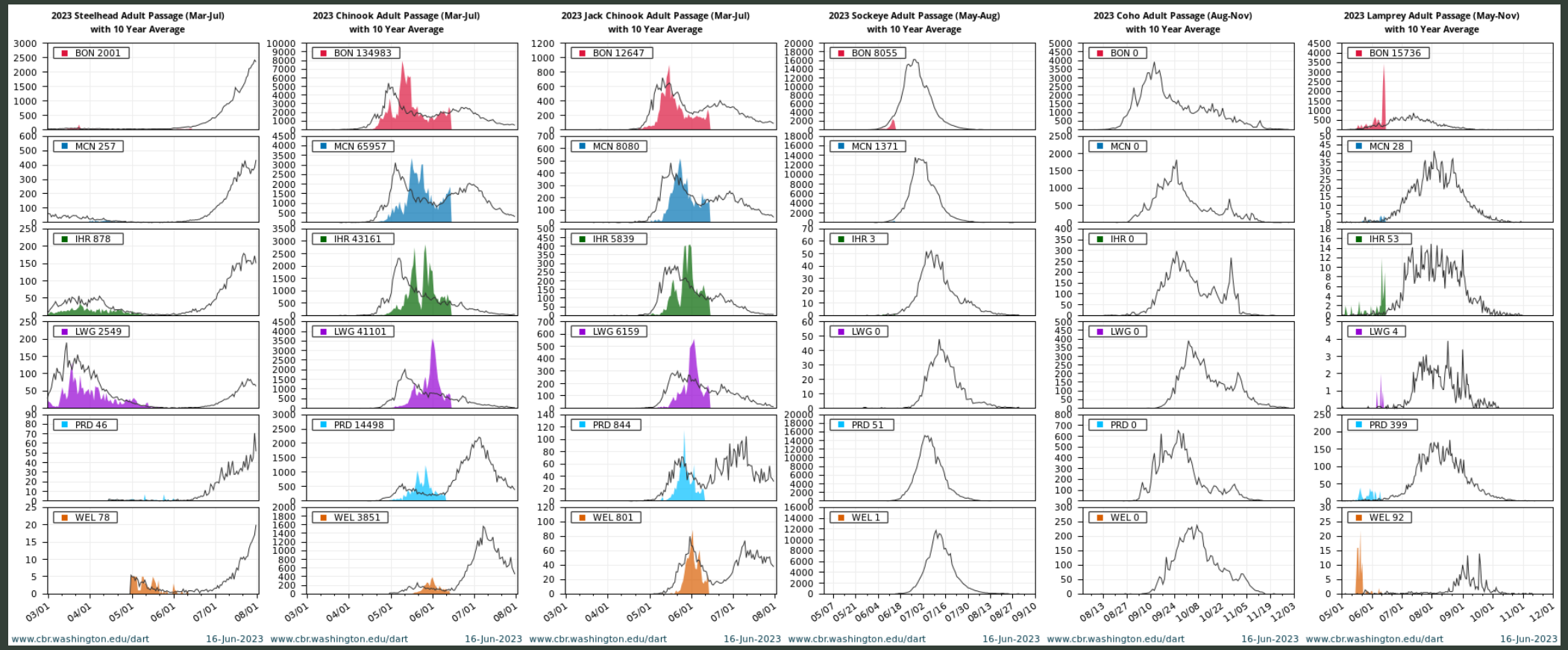
- DART provides data, summaries, graphs of focal species and habitat:
  - Fish Passage
  - Hatcheries
  - Fresh Water Quality
  - Estuary, Plume, Ocean

- DART provides access to metrics related to:
  - Biological Performance Measures
  - Environmental Conditions

Daily Counts & 10-year Average

Data Courtesy of U.S. Army Corps of Engineers, NWD and Chelan, Douglas, and Grant County PUDs, Yakima Klickitat Fisheries Project, Colville Tribes Fish & Wildlife (OBMEP), Oregon Department of Fish & Wildlife, Washington Department of Fish & Wildlife

Graphics&Text | Daily Counts | **Quick Look** | Basin Summary | Project Summary | Annual Summary | Monthly Summary | Ladder Summary | Historical Run Timing



https://www.cbr.washington.edu/dart/quick_look/adult

Adult Abundances & Migration Timing

PIT-tag data, Basin summary

Columbia River DART
PIT Tag Adult Returns Basin Summary for Observation Year 2023

Obs Year	Species	Run	Rear Type	Adult Fishways Detections												River Basin Fishways & Instream Detections																								
				Bonneville	The Dalles	John Day	McNary	Ice Harbor	Lower Monumental	Little Goose	Lower Granite	Priest Rapids	Rock Island	Rocky Reach	Wells	Lewis	Willamette	Wind	Little White Salmon	Hood	Klickitat	Deschutes	John Day	Rock Creek	Umatilla	Walla Walla	Yakima	Wenatchee	Entiat	Methow	Okanogan	Sanpoil	Tucannon	Asotin	Grande Ronde	Imnaha	Clearwater	Salmon
2023	Chinook	Spring	Hatchery	1837	1327	1079	1033	576	599	557	862	269	2030	813	752	1	1	16	20	36	12	214	0	0	3	5	273	2363	6	437	59	0	51	0	50	42	308	2
2023	Chinook	Spring	Unknown	4	4	4	4	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0
2023	Chinook	Spring	Wild	382	336	305	223	131	134	125	1060	82	217	100	80	1	0	0	0	1	14	6	12	0	0	2	24	132	27	26	9	0	6	1	71	33	275	80
2023	Chinook	Summer	Hatchery	601	483	404	328	149	147	129	120	145	28	8	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	7	0	0	0	0	2	10	40
2023	Chinook	Summer	Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2023	Chinook	Summer	Wild	73	65	53	51	40	40	34	30	16	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	3	9	0	3	0	0	0	0	22	0	52
2023	Chinook	Fall	Hatchery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
2023	Chinook	Fall	Wild	2	2	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
2023	Chinook	Unknown	Hatchery	17	12	12	11	10	11	9	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	1
2023	Chinook	Unknown	Unknown	1538	1161	1021	920	537	516	480	447	86	159	63	54	0	0	22	21	5	3	46	8	0	14	6	37	144	0	27	4	0	12	0	3	9	79	9
2023	Chinook	Unknown	Wild	19	19	17	15	12	11	12	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	2	5	0
2023	Coho	Fall	Hatchery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
2023	Coho	Unknown	Hatchery	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	141	0	0	0	0	0	3	78	1	40	0	0	0	0	1	0	8	0
2023	Coho	Unknown	Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	0	43	1	0	0	0	0	0	0	0
2023	Coho	Unknown	Wild	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
2023	Steelhead	Resident	Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2023	Steelhead	Resident	Wild	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	1	14	0	0	0	0	0	0
2023	Steelhead	Summer	Hatchery	13	6	15	23	31	36	36	94	0	15	24	20	0	0	0	0	0	133	44	0	1	8	134	0	127	31	409	128	0	189	5	47	277	822	29
2023	Steelhead	Summer	Unknown	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	1	4	11	2	0	0	0	0	0	0	1
2023	Steelhead	Summer	Wild	6	4	16	29	42	43	47	296	0	6	7	6	0	0	3	0	4	84	58	41	0	96	178	70	163	63	303	39	0	234	242	367	616	956	330
2023	Steelhead	Winter	Hatchery	72	3	0	0	0	0	0	0	0	0	0	0	1	0	0	0	26	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2023	Steelhead	Winter	Wild	12	0	0	0	0	0	0	0	0	0	0	0	114	0	0	0	33	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2023	Steelhead	Unknown	Unknown	19	6	8	10	11	13	11	21	0	1	2	1	0	0	3	0	0	10	7	5	0	10	33	13	10	3	8	6	0	12	0	31	23	110	17
2023	Steelhead	Unknown	Wild	28	0	0	0	0	0	0	0	0	0	0	0	0	0	71	0	1	0	16	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2023	Sockeye	Summer	Hatchery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2023	Sockeye	Summer	Wild	3	3	2	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
2023	Sockeye	Unknown	Hatchery	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
2023	Sockeye	Unknown	Unknown	117	64	44	29	1	1	0	0	8	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	3	0	0	0	0	0	0	0
2023	Sockeye	Unknown	Wild	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Obs Year	All Ages, Species, Run, Rear Type			Bonneville	The Dalles	John Day	McNary	Ice Harbor	Lower Monumental	Little Goose	Lower Granite	Priest Rapids	Rock Island	Rocky Reach	Wells	Lewis	Willamette	Wind	Little White Salmon	Hood	Klickitat	Deschutes	John Day	Rock Creek	Umatilla	Walla Walla	Yakima	Wenatchee	Entiat	Methow	Okanogan	Sanpoil	Tucannon	Asotin	Grande Ronde	Imnaha	Clearwater	Salmon
2023	Total Adult Detections			4745	3496	2983	2679	1541	1552	1441	2949	607	2466	1019	915	118	1	115	41	107	431	393	66	3	132	358	458	3062	149	1309	262	14	504	248	570	1026	2574	563

1. Click on a particular Species, Run, and Rear Type Adult Detections total (designated in blue) to view the detection histories for fish detected at that site/basin in 2023.

Mainstem Columbia & Lower Snake | Upper Columbia 1702 | Yakima 1703 | Upper Snake 1704+1705 | Clearwater 170603 | Salmon 170602 | Lower Snake 170601 | Middle Columbia 1707 | Lower Columbia 1708 | Willamette 1709 | Other

https://www.cbr.washington.edu/dart/query/pitadult_basin_sum

Adult Abundances – Project Summaries

Columbia River DART
2021 Adult Passage Project Summary for Bonneville
12/31/2021 Last Possible Data Date

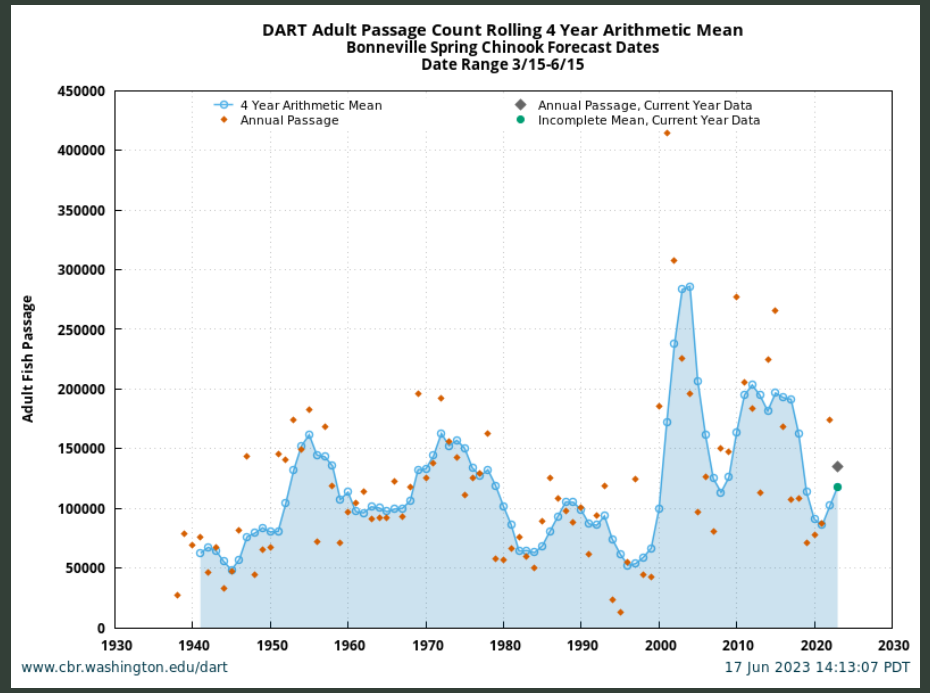
Species	Date Range[1]	2021 Total Passage	2020 Total Passage	Percent of Total 2020	2017 - 2020 Total 4 Year Avg	Percent of Total 4 Year Avg	2011 - 2020 Total 10 Year Avg	Percent of Total 10 Year Avg	Run Complete[2]	Historical Run Timing	Cumulative Passage with 4 Year Avg and 10 Year Av	4 Years Rolling Mean All Years
Chinook	Jan - Dec	489523	535746	91 %	438162	111 %	734143	66 %	2021-12-28	Graph	Graph	Run Size Arithmetic | 50% Passage Geometric
Spring Chinook	3/15 - 5/31	66777	54449	122 %	70424	94 %	123574	54 %	2021-05-31	Graph	Graph	Run Size Arithmetic | 50% Passage Geometric
Spring Chinook Forecast Dates	3/15 - 6/15	87232	77458	112 %	91466	95 %	153406	56 %	2021-06-15	Graph	Graph	Run Size Arithmetic | 50% Passage Geometric
Spring/Summer Chinook	3/15 - 7/31	141721	143248	98 %	142467	99 %	219817	64 %	2021-07-31	Graph	Graph	Run Size Arithmetic | 50% Passage Geometric
Summer Chinook	6/1 - 7/31	74944	88799	84 %	73159	102 %	97823	76 %	2021-07-31	Graph	Graph	Run Size Arithmetic | 50% Passage Geometric
Fall Chinook	8/1 - 11/15	347578	392323	88 %	295833	117 %	514517	67 %	2021-11-15	Graph	Graph	Run Size Arithmetic | 50% Passage Geometric
Jack Chinook	Apr - Dec	80758	75185	107 %	61657	130 %	112495	71 %	2021-12-15	Graph	Graph	Run Size Arithmetic | 50% Passage Geometric
Spring Jack Chinook	3/15 - 5/31	11787	4957	237 %	9111	129 %	17930	65 %	2021-05-31	Graph	Graph	Run Size Arithmetic | 50% Passage Geometric
Spring Jack Chinook Forecast Dates	3/15 - 6/15	15595	7624	204 %	11539	135 %	23091	67 %	2021-06-15	Graph	Graph	Run Size Arithmetic | 50% Passage Geometric
Spring/Summer Jack Chinook	3/15 - 7/31	25281	16759	150 %	17996	140 %	35868	70 %	2021-07-31	Graph	Graph	Run Size Arithmetic | 50% Passage Geometric
Summer Jack Chinook	6/1 - 7/31	13494	11802	114 %	9050	149 %	18312	73 %	2021-07-31	Graph	Graph	Run Size Arithmetic | 50% Passage Geometric
Fall Jack Chinook	8/1 - 11/15	55442	58396	94 %	43692	126 %	76696	72 %	2021-11-15	Graph	Graph	Run Size Arithmetic | 50% Passage Geometric
Coho	Jan - Dec	243603	121624	200 %	78551	310 %	93373	260 %	2021-12-23	Graph	Graph	Run Size Arithmetic | 50% Passage Geometric
Jack Coho	Jan - Nov	19734	25080	78 %	11288	174 %	8690	227 %	2021-12-21	Graph	Graph	Run Size Arithmetic | 50% Passage Geometric
Sockeye	May - Aug	151765	341739	44 %	171573	88 %	304065	49 %	2021-09-21	Graph	Graph	Run Size Arithmetic | 50% Passage Geometric
Steelhead	Jan - Dec	71967	114433	62 %	103532	69 %	203638	35 %	2021-12-28	Graph	Graph	Run Size Arithmetic | 50% Passage Geometric
Wild Steelhead	Jan - Dec	25591	45775	55 %	37801	67 %	74582	34 %	2021-12-28	Graph	Graph	Run Size Arithmetic | 50% Passage Geometric
Shad	Apr - Aug	5589759	5796156	96 %	5612658	99 %	3577104	156 %	2021-08-31	Graph	Graph	Run Size Arithmetic | 50% Passage Geometric
Lamprey [3]	May - Nov	21102	11889	177 %	39315	53 %	35179	59 %	2021-11-12	Graph	Graph	Run Size Arithmetic | 50% Passage Geometric
Chum	Oct - Nov	333	193	172 %	177	187 %	133	249 %	2021-12-05	Graph	Graph	Run Size Arithmetic | 50% Passage Geometric

https://www.cbr.washington.edu/dart/query/adult_proj_sum

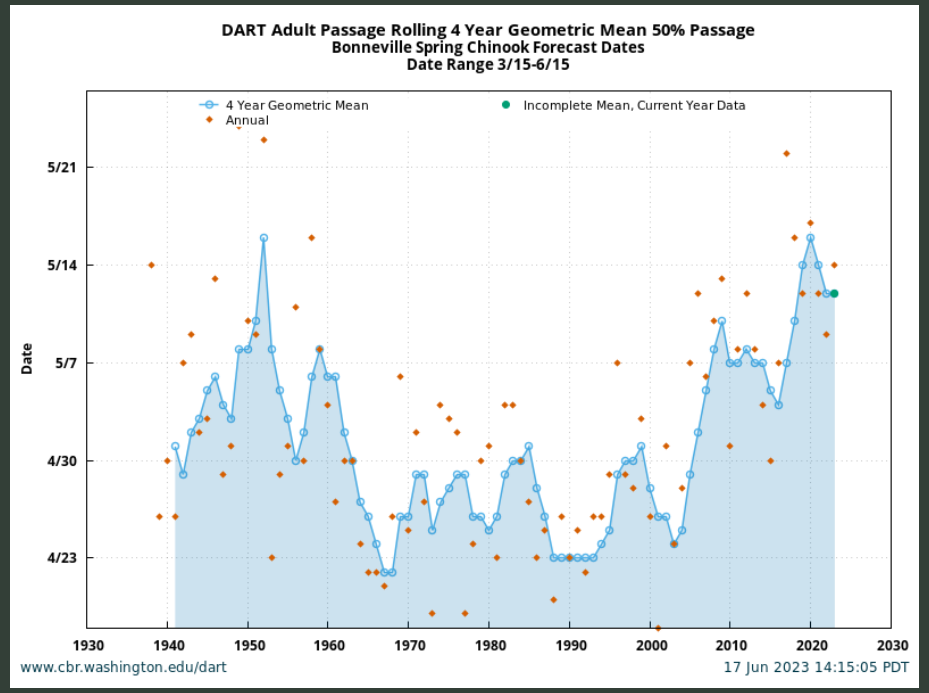
Adult Abundances & Passage Timing

1938-present, including 4-year rolling mean

Annual Run Size

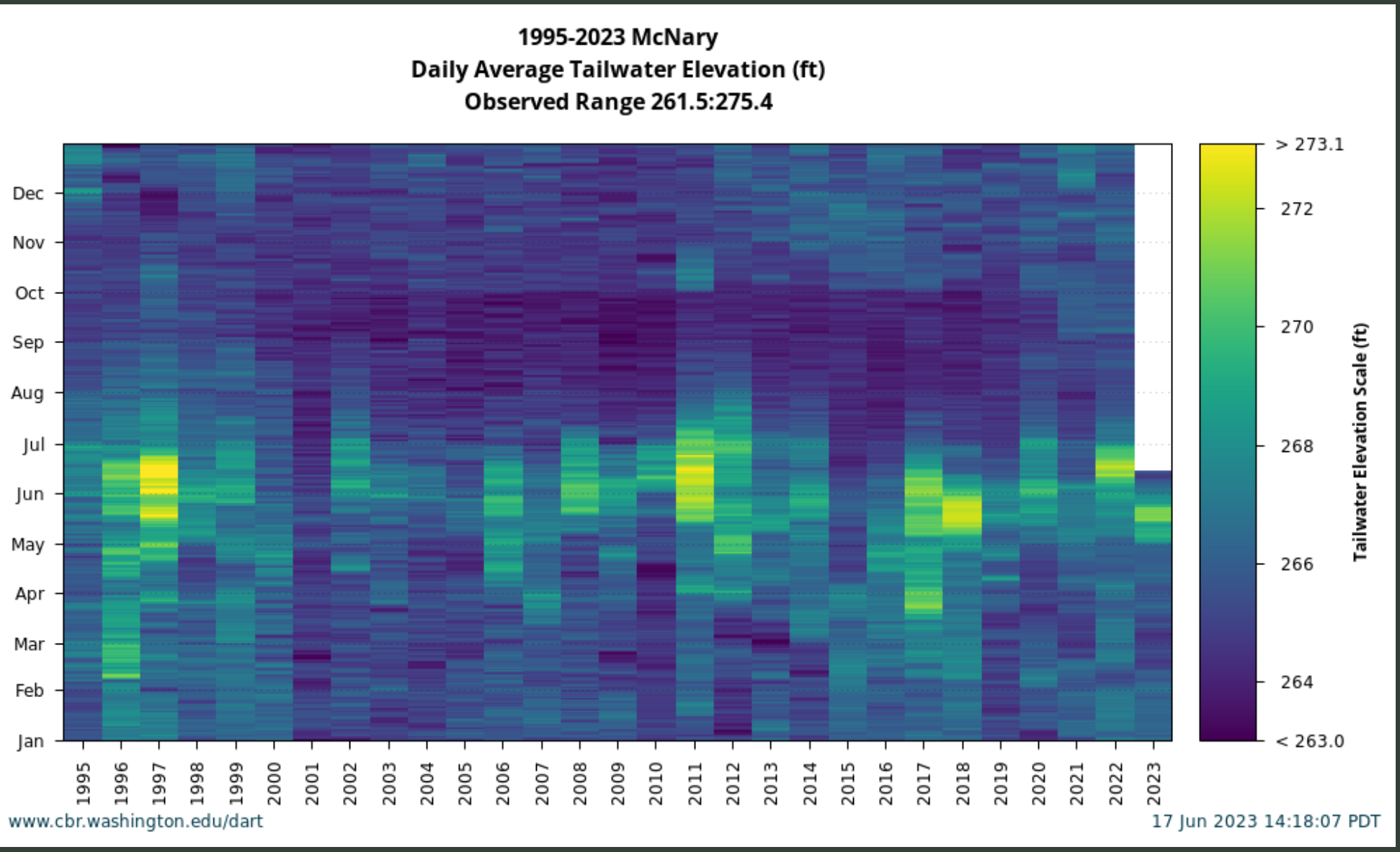


Annual Median Passage Day



https://www.cbr.washington.edu/dart/query/adult_proj_sum

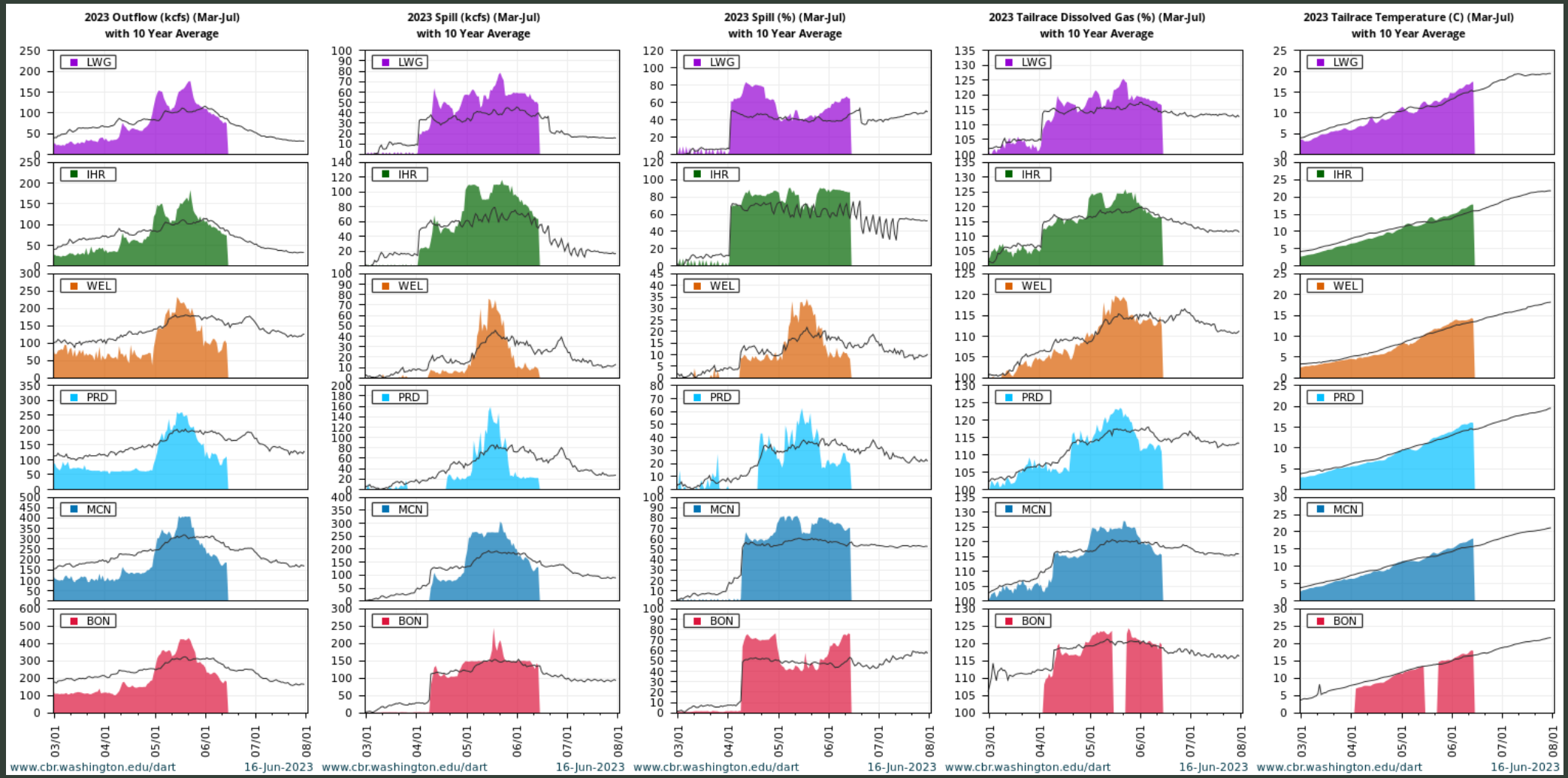
Reservoir Elevation



https://www.cbr.washington.edu/dart/query/basin_conditions_hist

RIVER CONDITIONS

Outflow (kcfs) Spill (kcfs) Spill (%) TDG (%) Temperature (°C)



https://www.cbr.washington.edu/dart/quick_look/river

Council's Fish and Wild Program

- **Adaptive Management**
  - Real-time data, in comparison to historical and forecasted
  - Relevant Summary Metrics, through collaboration

- **Ecosystem-based Management**
  (an area where DART can expand products & services)
  - Resident species: Bull Trout, Lamprey, Sturgeon
  - Predators: N. Pikeminnow, etc.

Council's Fish and Wildlife Program

Data management

(Excerpts from p. 105 of NPCC Fish & Wildlife Plan 2014)

Important aspects:

- public accessibility, search-ability, usability
- all monitoring and research data collected under the program
- readily accessible in regionally consistent formats to all interested parties in a timely manner
- preserved beyond the longevity of a project
- program reporting relies on coordinated data sharing
- facilitated using regional data systems that provide access to data
- data from federal and state agencies and tribes, and other data gathering entities in the Columbia Basin

- Refinement of coordinated data management systems should be guided by program evaluation and reporting needs.

- Collaboration among agencies, tribes, and other monitoring entities in the Basin is essential to prioritize regional data coordination efforts to support program indicators and objectives, and this prioritization should be informed by the goals and objectives identification and refinement process and program guidance.

- The region should work collaboratively through established forums to continue to refine metrics, methods, and indicators which can be used consistently to evaluate and report on program progress, focal species, and their habitats.

ISRP Review 2019-2
Final Report: Mainstem and Program Support Review

(Excerpts from pages 17-18)

- Communication, information sharing, and public engagement are critical to building the social, institutional, and scientific fabric needed for successful habitat mitigation and restoration in the Basin. As noted in ISRP 2018-8 (page 14), "Information sharing is identified as a vital element of the current Fish and Wildlife Program and as a cornerstone of adaptive management.
- The ISRP is concerned that many proposals lack elements that focus on communication and sharing of information at a range of scales (i.e., local, regional, and Basin-wide).
- In addition, none of the proposals in the current review describes an approach that could be used to evaluate the efficacy of its information sharing activities, as previously recommended in the Resident Fish, Data Management, and Regional Coordination Category Review (ISRP 2012-6). Such an approach should include evaluation of user satisfaction and the impact of information and databases on restoration design and decision-making, identification of new user needs, and assessment of the extent of actual application of new approaches and techniques.
- Encourage and support work-shops, webinars, and other web-based learning experiences on contemporary topics emerging at both sub-regional and Basin-wide scales. The culture associated with the Fish and Wildlife Program and the proponents conducting the restoration activities are evolving at an ever-increasing pace with the emergence of new technologies, knowledge, and environmental perspectives. The Program has an obligation to lead and assist in shaping the course of that evolution.

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  - Interactive query tools to access data downloads, summaries, visualizations

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  - Now guided by FAIR & CARE principles

Emergent Technologies & Approaches

FAIR principles

- **F**indability
- **A**ccessibility
- **I**nteroperability
- **R**eproducibility

(Wilkinson et al. 2016)

- **New website**
  - MegaMenu for organized navigation
  - Webpages with general background
  - Quick access to specialized tools for expert users
- **Data products & services**
  - Ongoing updates, refinement, customization
- **Maintenance of databases**
  - Remain interoperable *within our* systems
  - Remain interoperable *with other* systems
- **Reproducible processes and code**

Emergent Technologies & Approaches

CARE principles

- **C**ollective Benefit
- **A**uthority to control
- **R**esponsibility
- Indigenous Peoples' **E**thics

(Carroll et al. 2021)

"…responsibility to engage respectfully with those communities to ensure the use of Indigenous data supports capacity development, increasing community data capabilities, and the strengthening of Indigenous languages and cultures."

- Do we know how?

  Without unintentionally causing harm?

- Self-education, individually and as a team

  (DART & research modeling teams, CBR)

Emergent Technologies & Approaches

Human-centered design

- Data to applied knowledge to action
  - Different approaches to producing actionable science
- Human-computer interaction
  - Information Architecture
- Audience with diverse values and needs
  - Connection, Connection, Connection (concept of fractals)

Emergent Technologies & Approaches

Human-centered design

- **Data to applied knowledge to action**
  - **Different approaches to producing actionable science**
- Human-computer interaction
  - Information Architecture
- Audience with diverse values and needs
  - Connection, Connection, Connection (concept of fractals)

Five types of approaches, with profiles of:

1. **Discloser**
2. **Educator**
3. **Networker**
4. **Collaborator**
5. **Pluralist**

(Carr Kelman et al. 2022)

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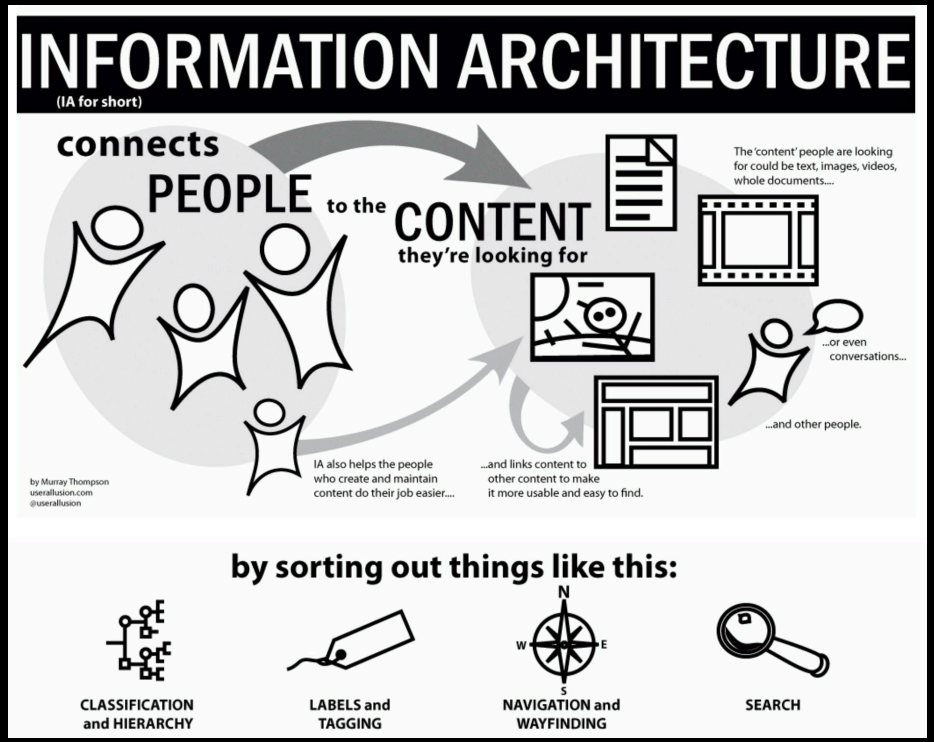

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  - **Connection within**
  - **Connection to others**
  - **Connection to something greater than us**

  (connections in context of fractals; ideas drawn from D. Hicks and A. M. Brown)

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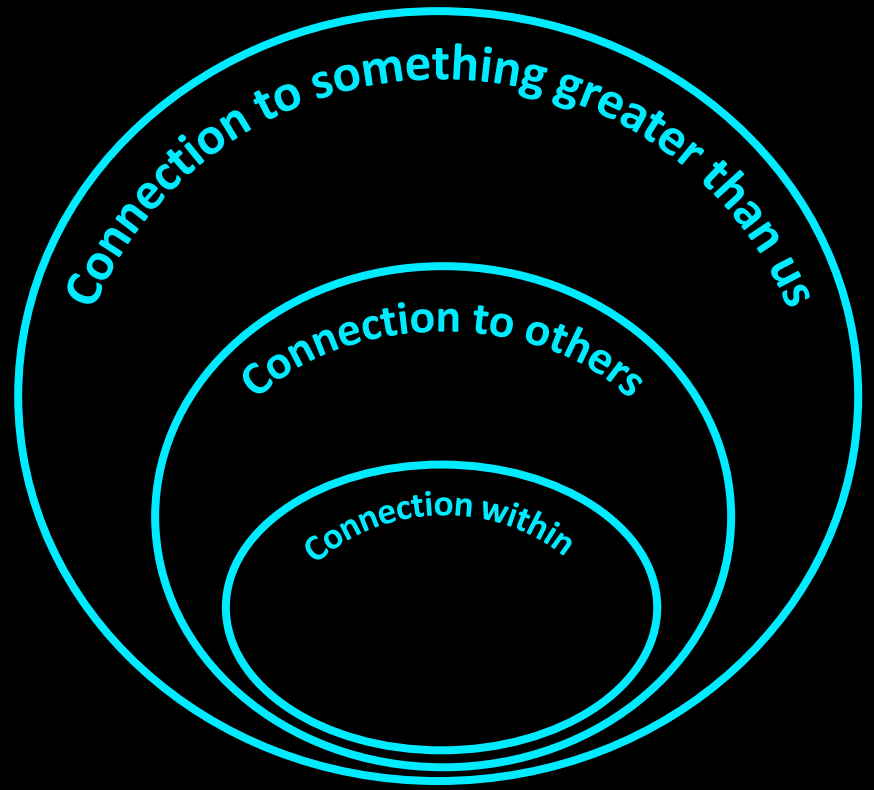

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Adapting our approach

- **At the start, 3 decades ago…**
  - Access to data
- **…through the decades**
  - Integrated data products
  - Relevant metrics
  - Guided by BiOps,
    Fish & Wildlife plans, etc.
  - User input & feedback
- **Today, tomorrow, years from now**
  - Better application of
    FAIR and CARE principles

- **Anticipated information needs**
  - Extreme events:
    real-time, forecasted, climate-ready
  - Predicting effects on fish:
    forecasts, scenarios
  - Estimates of risk and uncertainty:
    relevant and understandable

Why? How? For whom? With whom?

Emergent Technologies & Approaches

CARE principles

- **C**ollective Benefit
- **A**uthority to control
- **R**esponsibility
- Indigenous Peoples' **E**thics

(Carroll et al. 2021)

- Greater awareness through self-education, learning individually and as a team (DART & research modeling teams, CBR)

- Responsibility to engage respectfully, act ethically (e.g., in context of Data Sovereignty)

Outline → Summary & Discussion

RAISING AWARENESS OF DATA RESOURCES AVAILABLE

- DART available for public access through www.cbr.washington.edu/dart
  - Interactive query tools to access data downloads, summaries, visualizations

HELPING ADDRESS REGIONAL GOALS

- DART helps answer questions related to regional goals
  - Relevance to the NPCC Fish & Wildlife Program

IMPROVING OUR DART TOOLS & SERVICES

- DART has revised processes in the last 3 decades
  - Now guided by FAIR & CARE principles

An evolving vision of DART:

- Why? How? For Whom? With Whom?
- Human-centered design in communication of information
  - Data to knowledge
  - Human-computer interactions
  - Audience with diverse values & needs

Summary & Discussion

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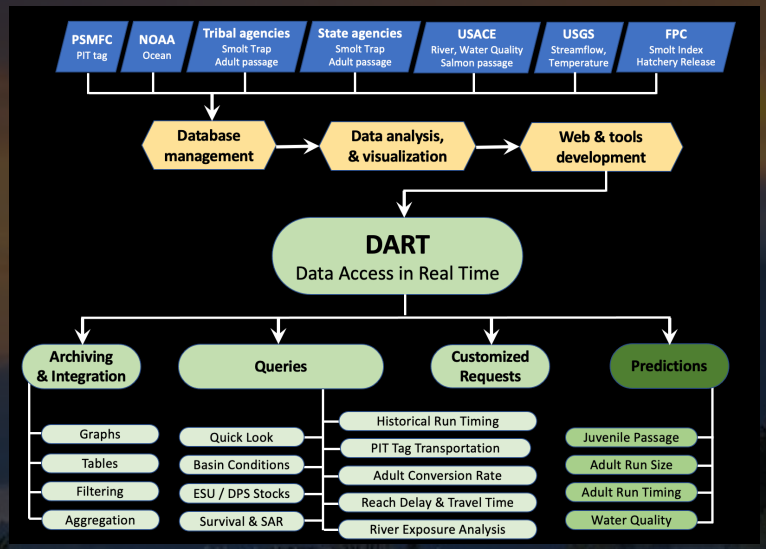


- Data collection
- Data Access → Knowledge
- Actions
- Goals

Summary & Discussion

HELPING ADDRESS REGIONAL GOALS

- DART helps answer questions related to regional goals
  - Relevance to the NPCC Fish & Wildlife Program

Data Management

- Addressed many important aspects in the Council's 2014/2020 Fish & Wildlife Plan

Adaptive Management

- Provided real-time data with historical context and relevant metrics (for dynamic management too)

Ecosystem-Based Management

- An area where DART can develop more, but in part dependent on data availability

Summary & Discussion

IMPROVING OUR DART TOOLS & SERVICES

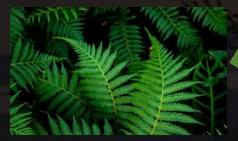
- DART has revised processes in the last 3 decades
  - Now guided by FAIR & CARE principles

Previously focused: Data access & User feedback

- "A" (accessibility) in FAIR; "A" (Authority to control) in CARE
- a bit of "c" (Collective benefit) in CARE

Expanding our adoption of CARE:

- Five approaches to conservation and actionable science
- Information architecture (user experience)
- Connection, connection, connection (fractals)



- Responsibility to engage respectfully and act ethically
- Self-education and learning as a community/team

An evolving vision of DART:

- Why? How? For Whom? With Whom?
- Human-centered design in communication of information
  - Data to knowledge
  - Human-computer interactions
  - Audience with diverse values & needs

• Data Access  • Knowledge

Acknowledgments

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- Data providers
- Data and product collaborators
- Regional liaisons and champions
- Users
- Faculty, staff, students, volunteers who have worked on DART over the 3 decades

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POWER ADMINISTRATION