



Managing Sediment at Willwood Dam to Protect Downstream Fisheries

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Willwood Work Group 2 Partners

WDEQ, WG&F, WWDO, WSEO, USGS, USBR, CDs

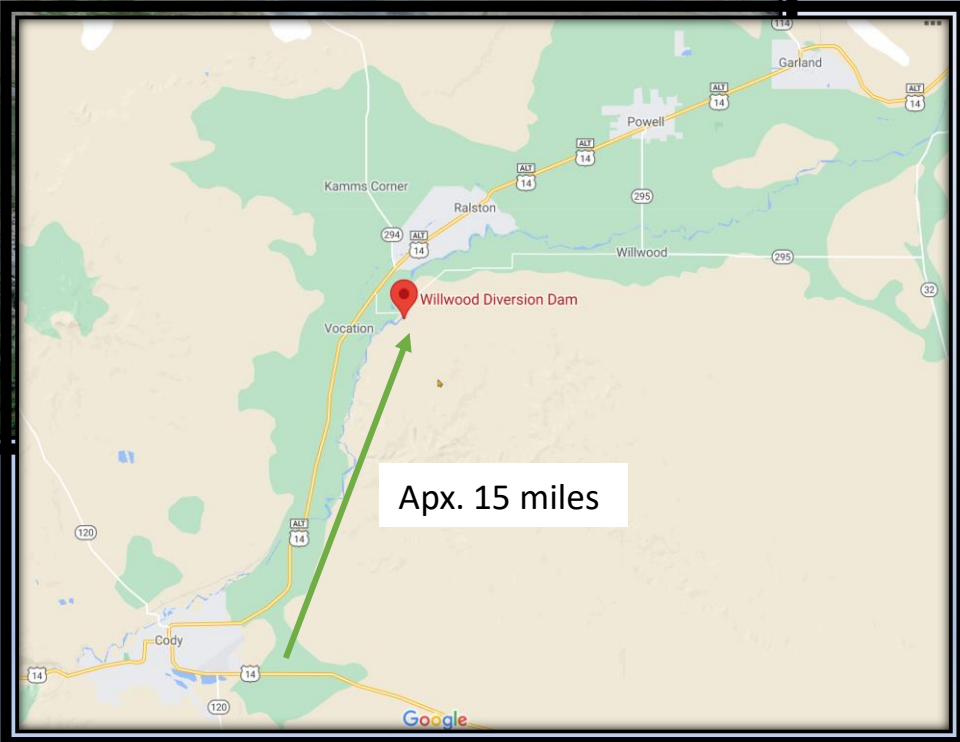
June 21, 2021





Willwood Dam on the Shoshone River

- USBR construction: 1924
 - Total crest length – 476 feet
 - Height – 70 feet
 - Design total discharge – 25,000 cfs
 - Three sluice gates – 3.6' x 4.5' (~600 cfs ea), two operational
 - two canal gate – 5.5' x 7.0' ea. (~ 400 cfs total)
- Operation and maintenance transferred to WID: 1949
 - Service area - 11,500 acres, ~200 users
 - Main canal 25 miles, 53 miles of distribution laterals
- Most recent operating criteria (USBR, DEQ, WID): 1982
 - Turbidity criteria – not to exceed 10 Nephelometric Turbidity Units increase from above to below the dam



Recurring Sediment Management Challenges and Releases

- Dam operations
 - Pre and Post 1982 sediment management
- Uncontrolled sediment releases
 - December 2010: financial restitution for fish loss, corrective action plan to remedy future risks.
 - October 2016: (12/16) development of stakeholder work groups and Executive Committee
 - Work Group 1: address release of sediment and debris: clean-up days, WID contract with UW for determination of flushing flows, conduct flushing flows with USBR coordination
 - Work Group 2: develop long term strategy for sediment management and reductions at Willwood Dam, evaluate alternatives
 - Work Group 3: address NPS contributions of sediment into the Shoshone River





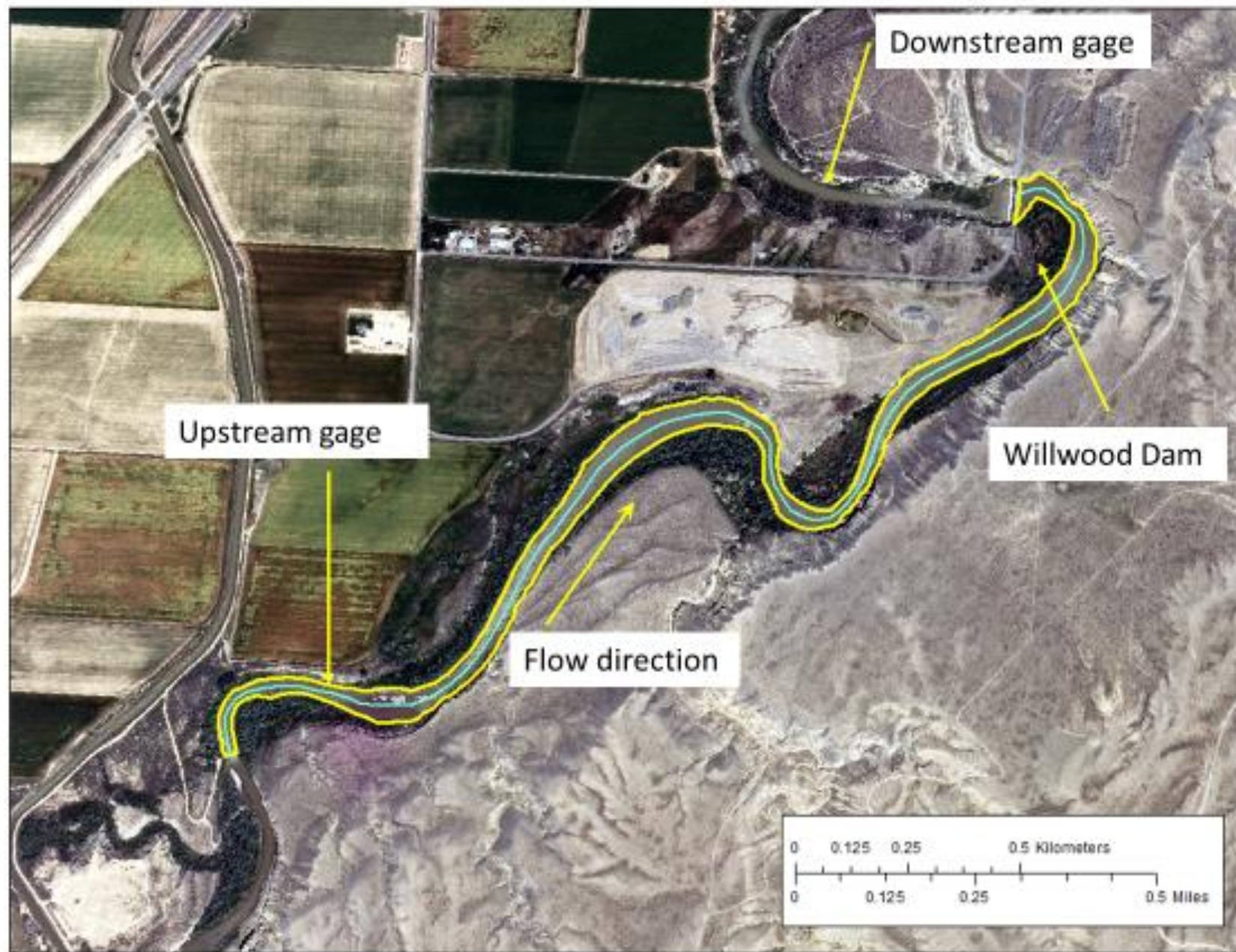
View looking at Shoshone River just upstream from Willowood dam. Photo taken from bluff on right bank.

Gullies in legacy sediments on left bank

Mouth of small, steep tributary

Understanding Sediment Dynamics

- Work Group 2 – WDEQ, WID, WG&F, WWDO, SEO, USGS, USBR also CDs & TU
 - USGS Contract: instrumentation upstream and downstream
 - UW contract: evaluation of scientific literature for protective turbidity (sediment) limits/recommendations, evaluation of sediment deposition on trout spawning beds
 - Bathymetric study upstream of dam and within dam pool
 - Sediment release experiments – fall and spring
 - Subwork groups: 1) alternative water delivery methods & sediment mobilization methods, 2) optimal sediment mobilization and conveyance of sediment
 - Culmination of understandings into “Operating Recommendations for Willwood Dam”
- Final products:
 - USGS study report describing annual and event driven sediment loads
 - White paper - alternative methods for sediment mobilization and water delivery
 - White paper – optimal sediment mobilization and conveyance strategy
 - Final dam operating recommendations informed with annual sediment budget,

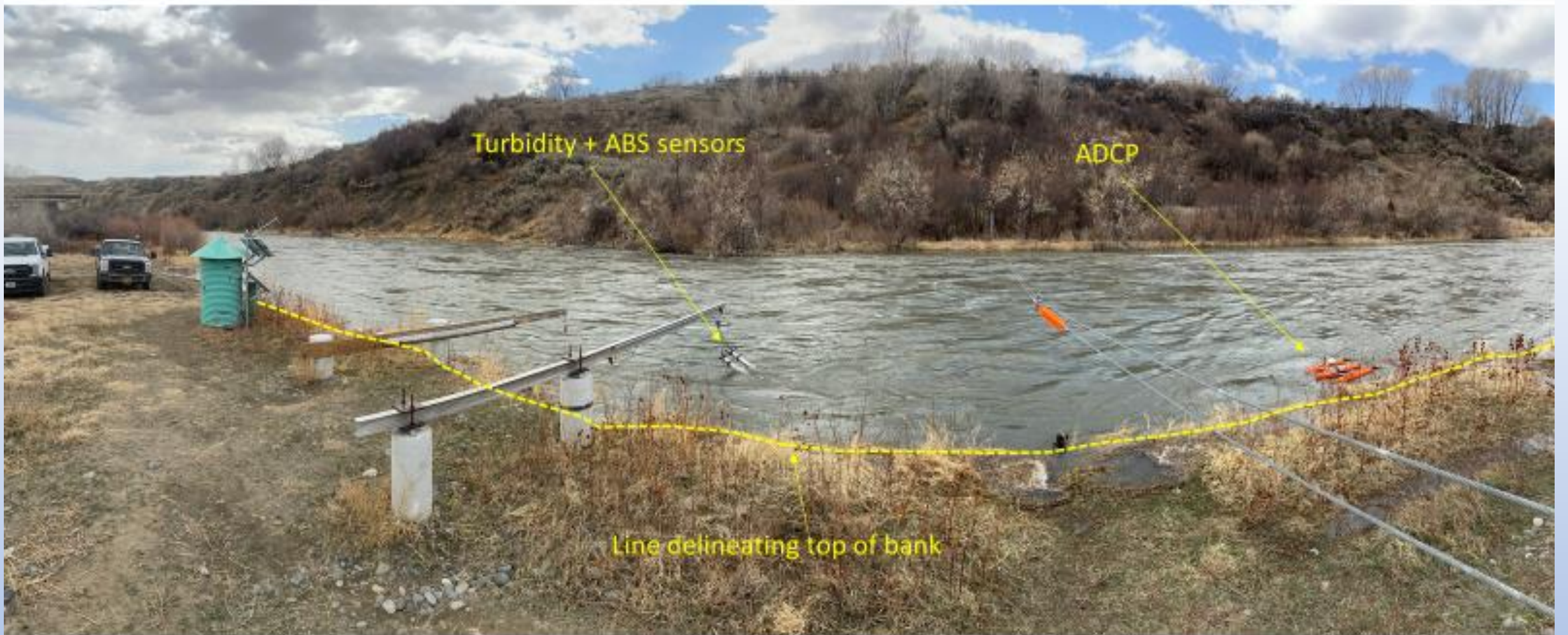


Upstream deployment



Downstream deployment





April 8th, 12:10 pm; ~4,100 cfs – Panoramic view of downstream gage. Flow is left to right.

Testing Sediment Mobilization

- Observations / Requirements

- Lowering pool elevation – dewateres and destabilizes exposed sediment, primary mechanism for inducing sediment mobilization
- Prominent opportunities for mobilization:
 - Fall: shortly after completion of water delivery to customers
 - USBR begins reducing flows from Buffalo Bill reservoir
 - Capable of reducing pool below canal gates
 - Precaution: nearing Brown Trout spawning season
 - Precaution : popular recreation fishing and migratory bird hunting (water elevation/flow)
 - Precaution : reduced flows for transporting sediment
 - Method: low intensity longer duration sediment release
 - Spring: timed to occur immediately before water delivery to customers
 - USBR begins increased releases – dependent on predicted storage and delivery needs
 - Pool elevation lowered for sediment mobilization before flows are increased
 - Precaution : end of Brown Trout spawning season – emergent and juvenile fish
 - Precaution : popular recreation fishing
 - Benefit: increasing river flow capable of reliable sediment transport
 - Method: high intensity short duration sediment release

April 7th, 18:45; 4,060 cfs
(day of experiment)

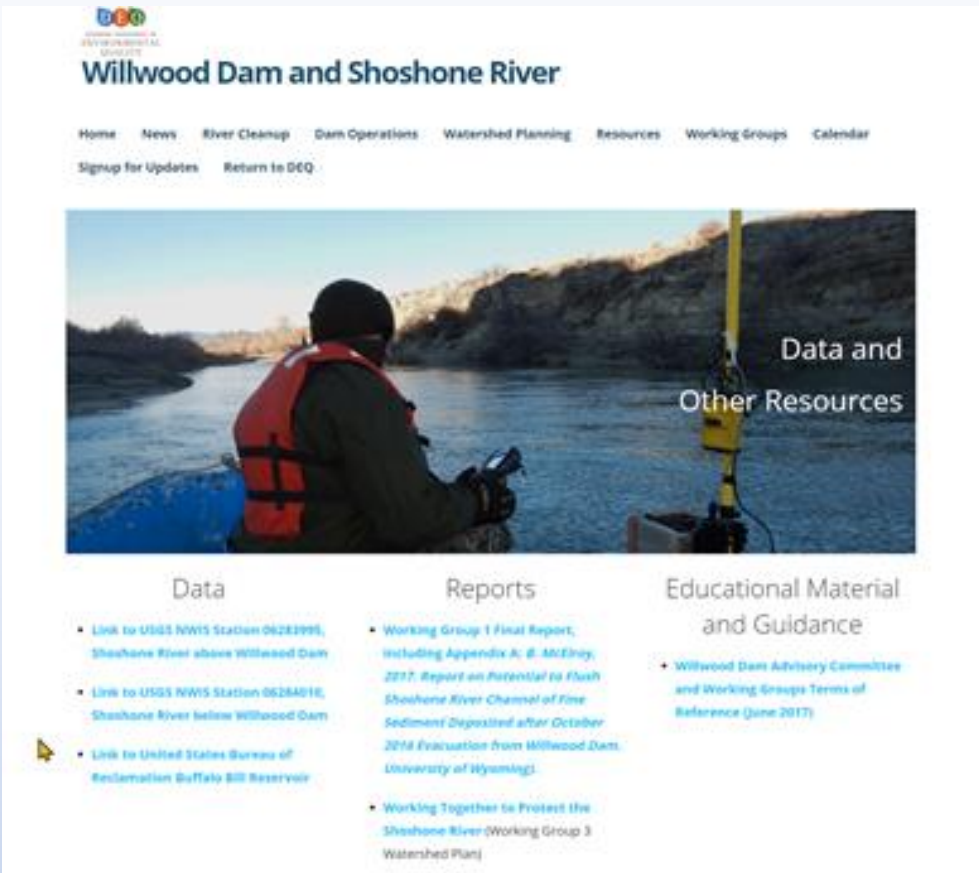


April 8th, 12:00 pm; 4,180 cfs
(day after experiment)



Next Steps

- Provide sub-workgroup white papers to Executive Committee for consideration
- Complete evaluation of UW report findings
- Instrumented monitoring completed in October, 2021
- Complete contract for USGS study report
- Develop updated “Operating Recommendations for Willwood Dam”
- Upon USGS study report completion, evaluate opportunities for long term sediment reduction and annual sediment load conveyance



Willwood Dam and Shoshone River

Home News River Cleanup Dam Operations Watershed Planning Resources Working Groups Calendar

Signup for Updates Return to DEQ

Data and Other Resources

Data

- [Link to USGS NWS Station 062E1995, Shoshone River above Willwood Dam](#)
- [Link to USGS NWS Station 0628A01E, Shoshone River below Willwood Dam](#)
- [Link to United States Bureau of Reclamation Buffalo Bill Reservoir](#)

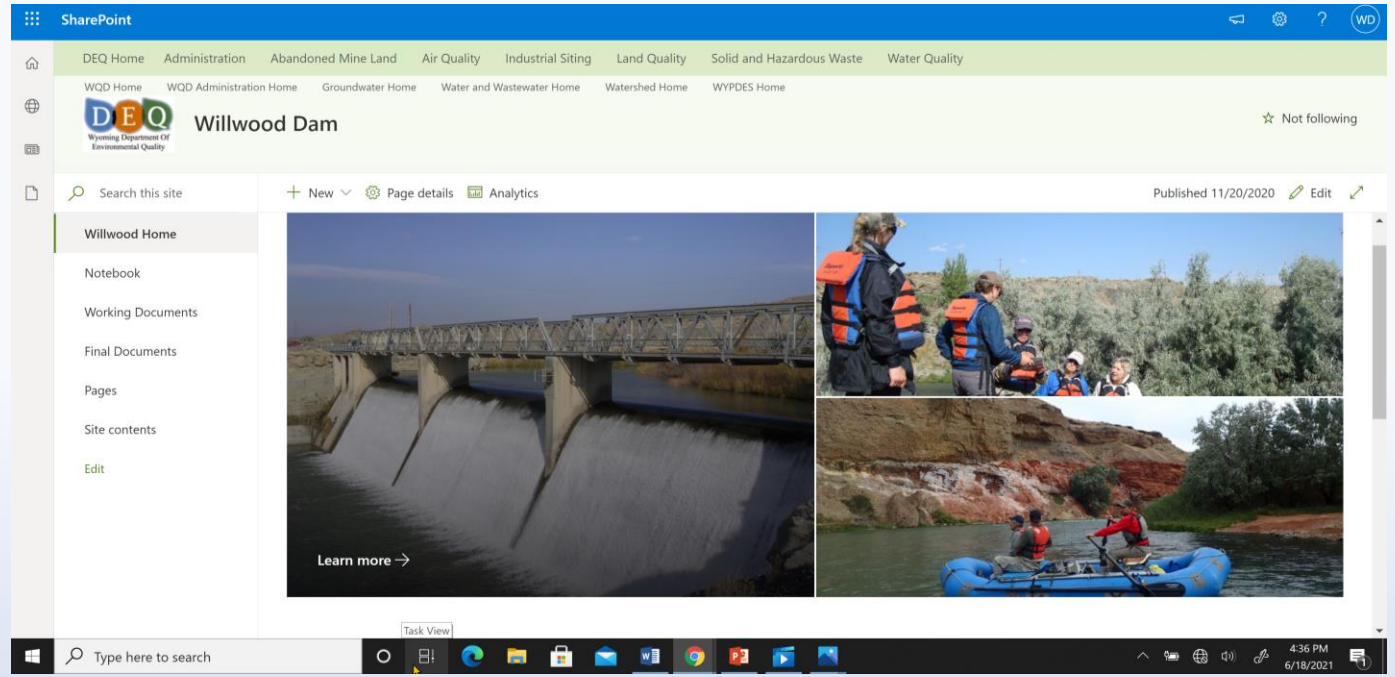
Reports

- [Working Group 1 Final Report, including Appendix A, B, & C/Eny, 2017. Report on Potential to Flush Shoshone River Channel of Fine Sediment Deposited after October 2018 Evacuation from Willwood Dam, University of Wyoming.](#)
- [Working Together to Protect the Shoshone River \(Working Group 3 Watershed Plan\)](#)

Educational Material and Guidance

- [Willwood Dam Advisory Committee and Working Groups Terms of Reference \(June 2017\)](#)

<https://wyowillwood.org/data-and-other-resources/>



SharePoint

DEQ Wyoming Department of Environmental Quality

Willwood Dam

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