Debris Ideas for NOAA from McNary:

First thing that comes to my mind is a log boom. Ops has thought a floating boom across the units with a chain link curtain hanging below the surface, with a cable along the top and bottom. It could be pulled upstream, with the log bronc, from Unit one towards the pump station on the Washington shore until it was perpendicular to the Dam at Unit 14.

Design a longer reach on the Aux Hoist for the new Crane 5, which would enable a grappling trash rake to grab surface debris up to 20 feet in front of the intake slots. I believe this would be most feasible option.

<https://www.wateronline.com/doc/removing-floating-debris-from-the-worlds-wate-0001>

Do regulations really allow us to spill or remove the debris. Per Mat.

So it looks like booms and skimmers are what the project came up with.

I would only add that the debris needs to go somewhere. A debris TSW to spill it or have it removed by a contractor.

Debris mitigation ideas for LGS:

- Build a barge that had some sort of conveyer on it to collect floating debris in the forbay (Norm)

- Install water jets in front of turbine units to push debris towards the ASW, away from the turbine unit (Lee)

- Re-engineer the current debris boom and the metal frame that connects the boom to the powerhouse.

- Install an automated orifice backflush system paired with a camera system or flow alarm system for continuous monitoring of orifice condition

- Utilize a contractor or project personnel to remove debris at Lower Granite and alleviate some of the downstream impact from debris spills

- Reevaluate MOP elevation. Very preliminary idea, but when conducting drawdowns we have found that LGS only has about 2 feet of water above the orifice (gatewell water elevation-orifice elevation) while other projects could have as much as 4-5 feet. Historically, individuals who have worked at LGS for many years described the gatewells full of floating debris. This is not the case anymore. We are now dealing with more debris in orifices and very little is seen in the gatewell. This is probably due to the fact that the orifice is close enough to the water surface that floating debris is sucked down through the orifice. On the contrary, LoMo deals with a lot of debris in their gatewell, but not as many orifice issues. I do not have their exact data, but from some of my guesswork and utilizing engineering prints, they would typically see about 4 feet of water above their orifice. I realize this may be a crazy idea, but it would be worth some further discussion.

Debris Mitigation Ideas for Lower Monumental

Find an effective way to move the debris pile from in front of the units and push it south towards the RSW. This would probably require some sort of barge or log bronc to physically push it after it settles there. Another option, although it would be very expensive, is to put a debris barrier downstream of the boat barrier in front of the intakes, leading the debris towards the surface weir.

The north ladder could also use a debris barrier to stop the logs from collecting in the corner right at the exit. Sarah and I did a little research and spoke to Ben at Bonneville and I think a floating debris boom similar to what they use would work for the ladder exit. Sarah was in the process of pricing one out for our needs.

Was expense/budget the reason they stopped removing debris from the river upstream of Lower Granite? We have a few smaller tribs between Ice Harbor and Granite but nothing significant. My thoughts are the most effective way of reducing debris for the whole system is to trap and remove it above Granite. I have been told this has been tried in the past, but I don't know many of the details or if it was successful or not.

Debris Mitigation ideas for Lower Granite

1. Replace the logs on the end of the Shear Boom and repair the leaking floats. We are getting a lot of debris in front of the trash racks and the ladder exit because of this.

2. Tool up and gather debris out of the river like the Project used to. LWG has not done this since the RSW was installed in 2001, the crane and equipment used were excessed back then. This would be and expensive investment and labor intensive but would take care of a lot of problems down river.

3. Upgrade our Trash Crane because it is slow and out dated resulting in O&M to keep it limping along.

4. Give the Project more flexibility to spill trash as needed and dip trash more often.

5. Other projects could purchase a log bronc (approx. $250k each) to handle debris jambs easier.

6. Other projects could install a shear boom to help guide debris toward their spillway weirs. This would be very expensive up front and maintenance wise down the road.

Debris Comments specific to Ice Harbor

As you are aware, forebay debris at Ice Harbor tends to be less of a problem at Ice Harbor than at some of the other projects. It is mainly during higher water years when we get a significant accumulation of debris. Depending on flow conditions and wind patterns, debris may continuously go over the RSW, or it may accumulate in front of the units or adjacent spill bays to the RSW. Through FPOM coordination, units can be started and stopped in sequence to move accumulated debris in front of the units over to the spillway, then the appropriate spill gate(s) opened up to spill the debris. This process has worked well to pass the debris, and other methods have not been necessary.

During higher debris years, winds can push significant debris over or under the log booms that are at the north and south fish ladder exits. Often the wind changes direction within a few days and pushes the debris back out. If the debris stays within the log booms for an extended period, there is an increased probability of debris going into the ladder or clogging up the ladder exit trash rack. The air bubbler at the south fish ladder exit does a good job of keeping the debris away from the exit. If needed, the project has a boat that they attach a plate to the front, which is used to push debris to the outside of the exit debris booms.