

Water Operation and Maintenance Bulletin

Why do we inspect?

How do we inspect?

inspect

Go from the recommendation to the solution

Major Rehabilitation and Repair

Unlock blocked recommendations



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About this Bulletin

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Thank you.

On the Covers:

Front: Reclamation's Science and Technology Program.

Back: Partnering with Reclamation's Researchers.

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Message from Office of Policy

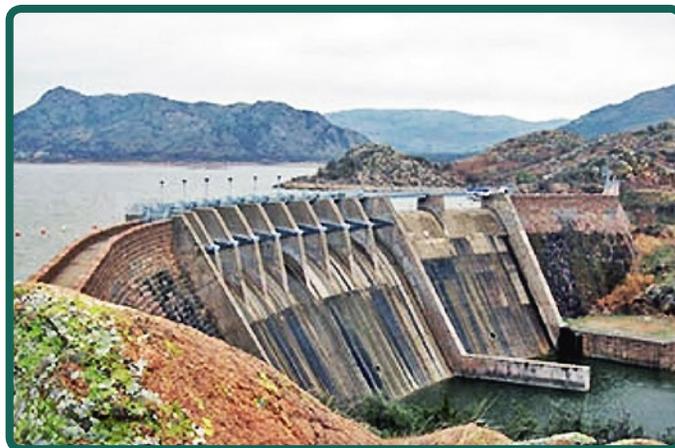
The Bureau of Reclamation owns nearly 4,000 buildings and structures, which includes almost 500 dams and over 8,000 miles of canals. Our stewardship responsibilities ensure the Federal facilities are appropriately operated and maintained. Reclamation's infrastructure continues to provide reliable service, delivering water and power to meet multiple demands and changing public needs. Most of Reclamation's facilities are more than 50 years old, and some of our dams are more than 100 years old.

Reclamation is committed to keeping our infrastructure resilient through preventive maintenance programs and significant investment in major repair and replacement activities. Continued strategic investments by Reclamation and its water and power partners will keep our water and power infrastructure operating safely—even as additional demands are placed on it.

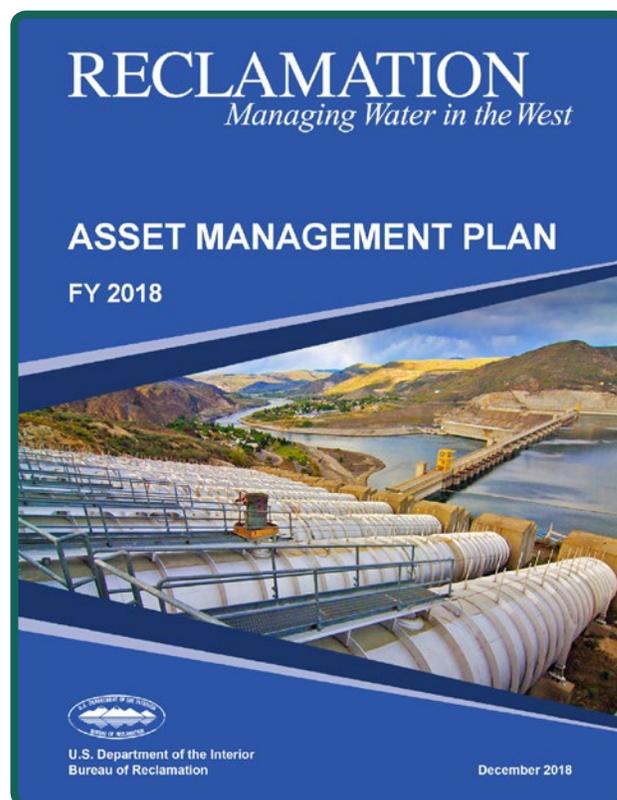
Sustaining efficient and effective operation and maintenance requires constant vigilance and dedication by Reclamation and its non-Federal partners. Reclamation continuously works internally, and with its partners, to inspect facilities on a regular basis, and recommend actions to ensure Reclamation facilities continue to reliably and safely deliver water and power. Reclamation's partners and its Area Offices are the eyes and ears on the ground: helping Reclamation identify needs at both Reclamation reserved and transferred works facilities. We collect and document significant needs at Reclamation's facilities in Reclamation's Major Rehabilitation and Replacement (MR&R) Program. Reclamation uses the MR&R to prioritize investment needs and help find ways to fund solutions to identified issues.

Contact your local Area Office MR&R representative, listed in this bulletin (on page 5). Together, we can continue to reliably and safely deliver water and power in the Western United States.

*Chris Vick,
Manager, Asset Management Division,
Policy and Administration*



Altus Dam of the W. C. Austin Project.



The Asset Management Plan Report to Congress provides more information on Reclamation's vision, priorities, funding, and activities for our infrastructure.

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Major Rehabilitation and Replacement

Reclamation uses its Major Rehabilitation and Replacement (MR&R) Program to identify Bureau-wide extraordinary maintenance, deferred maintenance, and safety of dams modifications on a project facility or facility component. We work with districts and operating entities to ensure the continued safe, dependable and reliable delivery of authorized Project benefits. MR&R includes:

- **Extraordinary Maintenance (XM).** Major, non-recurring maintenance to Reclamation-owned facilities, or facility components. Major repairs include significant maintenance work to restore a damaged, broken, or worn out facility, facility component, or item of equipment to normal operating conditions. Major repairs require separate or additional budgeting. Major repairs are usually smaller in scope and more specific in nature than a rehabilitation, which corresponds more to a comprehensive renovation effort on an entire (or significant portion) of a facility or system.
- **Deferred Maintenance (DM).** Maintenance and repairs that were scheduled to be completed but were delayed for a future period. Deferred maintenance includes repair, replacements, and rehabilitation, such as the process of replacing equipment and facility components or renovating a facility where performance is failing to meet the original objectives and needs of the project.
- **Safety of Dams (SOD).** Modifications to Reclamation dams to reduce unreasonable risks to public safety, property, and/or the environment.

A Collaborative Effort

To strengthen and continuously improve our capital improvement programs, Reclamation promotes a collaborative organizational culture by involving all relevant stakeholders early on and using shared information in all aspects of the MR&R process (i.e., identifying, funding, prioritizing and completing MR&R activities).

How to Participate?

Operating entities assist Reclamation in this process by actively contributing information on their repair needs. Reclamation maintains a database containing comprehensive information on completed, ongoing and future MR&R activities. The database is populated with information provided from multiple sources and contains cost information, anticipated funding source, condition and risk assessments, and other useful information for all Reclamation's MR&R activities. Collecting and sharing complete and quality information is essential to Reclamation in responding to identified repair needs and aiding external stakeholders in the process.

Benefits to Operating Entities

Communicating information and knowledge across traditional boundaries benefits both Reclamation and facilities' operating entities. Reclamation shares information and knowledge with operating entities to help with:

- Identifying, planning, and prioritizing potential MR&R activities;
- Adequately assessing the condition and risks of facilities and components; and
- Obtaining funding to effectively and efficiently complete future MR&R repairs and needs.

Please contact your regional coordinators for more information on the MR&R Program.

For more information contact:

MR&R Coordinators

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Why Reclamation Conducts Review of Operation and Maintenance Exams

Reclamation conducts Review of Operation and Maintenance (RO&M) examinations to lengthen service life, avoid failures, and reduce breakdown maintenance by:

- Evaluating the adequacy of the operations, maintenance, and replacement (OM&R) program at the facility;
- Disclosing conditions that might cause disruption or failure of operation;
- Determining the adequacy of the structures and facilities to serve their intended purpose;
- Noting the extent of deterioration as the basis for planning maintenance, repair, or rehabilitation;
- Reviewing current operating practices;
- Determining the degree of operational safety at the facility; and
- Obtaining data for improvement of design, construction, maintenance, and operating practices.



How Reclamation Conducts Exams

Reclamation conducts periodic exams and makes recommendations to ensure safe and effective operation and maintenance of our facilities. During examinations, examiners and operating staff work together to use all observations and information available to identify issues and to recommend the most effective approach to correct issues. To conduct any kind of exam effectively, examiners need the right mindset and approach to:

How to be a great examiner:



Communicate and coordinate.

Working with operating staff, district managers, subject matter experts, planners, and others is imperative for determining problems and working together to address issues.

Be systematic. Prepare, conduct, and follow up on the exam in an organized manner to ensure that all features are inspected and viewed from multiple perspectives (close up, far away, etc.). Inspectors make sure information and observations from previous exams is noted effectively. Inspection teams are consistent in their approach and record observations and recommendations in the examination report.

Be a detective. Look for clues and surrounding circumstances to determine potential issues that stem from these changes. If possible, trace these symptoms to their causes.

Ask for advice. Just as you examine the ground and features from all perspectives to identify issues, get input from a variety of experts. Make

this a team effort. Project staff are the most familiar with the conditions day in and day out and can pinpoint patterns.

Document for future inspections. Make sure that your photos, notes, and conclusions are organized and good enough for the next examiners or operator to understand the conditions that existed during your initial inspection so they can easily recognize any changes.

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Addressing Recurring Problems in Canals

During examinations, Reclamation staff and operating entities work together to determine the cause of impacts to facilities. Historic recommendations often indicate a pattern, which we can use to determine the root cause or determine if there is a systemic issue for specific assets. For example, in 2016, Reclamation’s regional and office staff examined past recommendations to determine root causes and solutions for systemic issues in canal recommendations. This article explains what the team came up with in 2016 and some potential solutions.

What Should We Do?

Limited information in some cases lead to “a lack of education”—not understanding the seriousness of the problem for new operators or how to address these issues systematically to solve underlying issues. To address this opportunity to transfer knowledge to new operators, Reclamation created a series of O&M Manuals for vegetation, animals, concrete, embankment seepage, and mechanical equipment issues. We are working on a coatings and corrosion manual as well. Download these from www.usbr.gov/assetmanagement/OMG.html. Reclamation offers training for local operators as well as annual workshops.

Why Bother?

Not understanding why seemingly minor issues such as vegetation or animal burrows could lead to failure might lead to deferring recommendations and maintenance to address these problems. Reclamation has stressed the seriousness of these issues (see our previous issue on Lessons Learned from Failures).

—continued

RECLAMATION
Managing Water in the West

Issue No. 241

Water Operation and Maintenance Bulletin

WHAT WE LEARNED!

Lesson Learned:
Obstructions (fences, vegetation, etc.) restricting access and visibility must be removed where possible

Inspection Obstructions

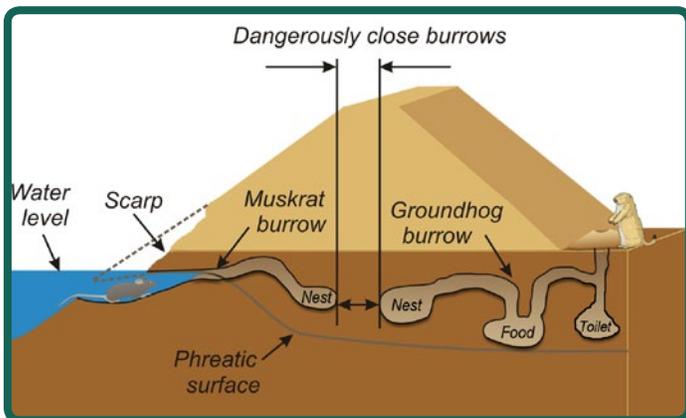
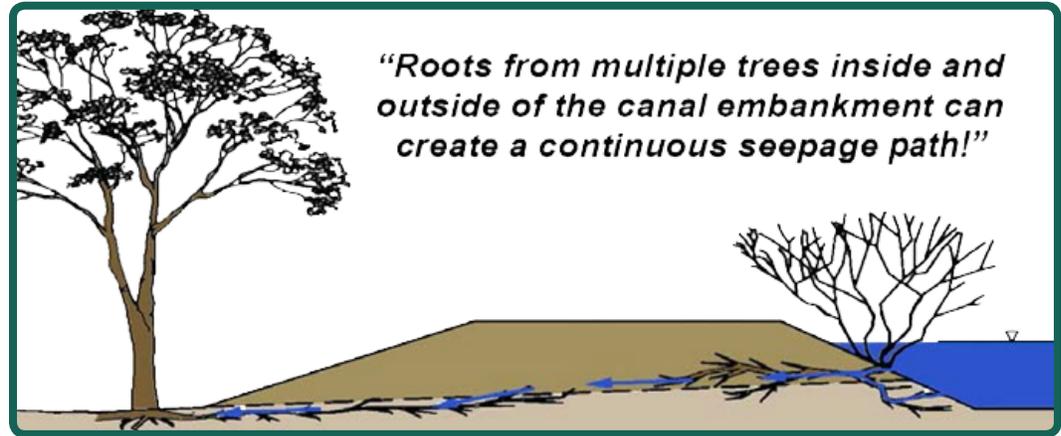
In this issue:	Review Responsibilities and Relationships (V-Line Canal) . . .page 3	Monitor, Inspect, and Repair (Kutz Siphon) . . .page 9	Have an Emergency Plan (Strawberry Canal) . . .page 11
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Reviewing failures can help us be alert to minor issues that can cause failures, as noted in our previous Water O&M Bulletin.

— "Why Bother?" continued

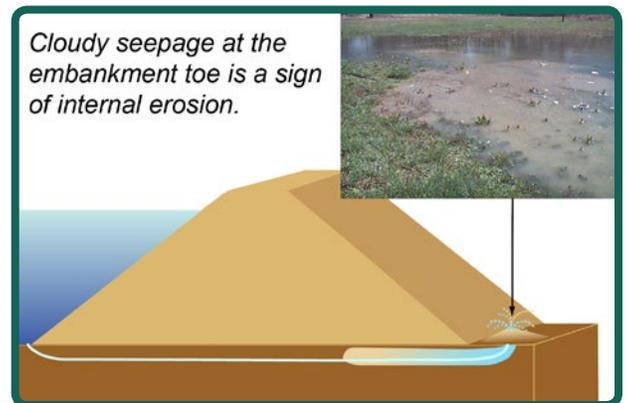
Concerns include:

- **Vegetation:** Root systems can decay, causing seepage paths that can lead to embankment failure or roots can heave and crack structures. These types of issues can be costly or can contribute to a failure.



- **Rodents:** Burrows in the canal prism and on the embankment can lead to embankment failure.

- **Seepage and Erosion:** Seepage can affect efficiency and water deliveries. Seeps that exit within a localized area, appear to be discolored and carrying sediment, or express themselves as sand boils are of most concern and should be addressed immediately.



- **Concrete:** Damaged concrete could affect the facility's integrity or function.
- **Operating with little freeboard:** Could lead to overtopping in storms or mis-operations.
- **Plugged drains:** Plugs can deform walls, damage drains, or impair operations.

Emergency Management Plans

Emergencies

Is this why Reclamation told us to make an EMP?

Meet basic EMP requirements :

- Response Levels
- Shutdown Procedures
- Communication Directory
- Material Availability

Got your Emergency Management Plan (EMP)?

RECLAMATION

Thinking that you “have a plan” in your head and you “know what to do” if there is a failure is asking for trouble—what if you are not there? What if you have just a few seconds to react? Although the general concept is simple, taking effective action during an emergency without warning is no accident. For this reason, Emergency Management Plans (EMP) are required for all Urban Canal Reaches. The intent is simple—protect lives and property.

EMPs are more than just paperwork—they are a potentially lifesaving document. To promote their adoption by operating entities, Reclamation is developing an EMP template and guidance document to be released this year. Our objective is to create effective and consistent plans across Reclamation. Participating in a culture of safety not only protects the public, but also our managing partners.

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How to Write Effective Recommendations

Ensure recommendations at your facility are clear and achievable. Use the steps below to identify what needs to be done to address an issue, explain why actions need to be taken, plan and set appropriate priorities for completion, and develop a schedule.



Actions: Understand what to do. Use clear, concise language. Avoid recommendations, which are vague and ensure actions are clearly understood. What exactly needs to happen? How will the solution function?

Consider recommending designs, planning, and contracting. You can not drive a truck without first starting the engine. Likewise, you may need to back up and determine what needs to happen before actions can be taken. What plans and designs are needed? How would the work be done and what contracting and specification assistance is needed for that work?

Coordinate to obtain the technical assistance needed. If personnel, materials, and/or equipment is not available to accomplish the work, then coordinate with your local office to obtain technical assistance needed. What expertise and resources are needed to the underlying problems that caused this issue and the best solution? Where can we get these resources?

Resources: Explain why we should do this.

Recommendations require resources to accomplish. Clearly indicate the need for pursuing a recommended action.

Explain why the work needs to be done. Clearly demonstrate what will happen if the work is not completed (e.g., how the canal could breach, the dam could fail, other stressed components could break).

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Showcase the benefits of completing the work (e.g., less maintenance, more accurate water deliveries, fewer risks of failure).

Recommend incremental or programmatic approaches if possible. Work with managers to determine possible ways to accomplish the work with the limited resources available. Could the work be done incrementally? Could a priority fix address most of the problem?

Importance: Evaluate and explain the priority.

To be accomplished, recommendations need to be viewed as priorities.

Ensure recommendations focus on ensuring the facilities' functionality and safety. Discuss the need for recommendations with project and operating staff.

Determine if this is a priority and monitor conditions. If the condition has not worsened since the previous inspection or observation was made, a recommendation may be given a lower priority. In certain cases, consider recommending monitoring or investigating the consequences of not fixing the condition or alternative approaches to mitigate issues.

Discuss priorities and work with project staff. Work with those who do not see the action as a priority to determine why not. Explain why the work is needed, and work together to agree on overall priorities.

Schedule: Get the action done effectively.

Coordinate to provide a schedule. If the action is not included in the maintenance management plan, work orders, or work schedule, it probably won't happen.

Plan ahead to reduce outage time and match maintenance to appropriate conditions. Water and/or weather conditions may not be conducive to allow access or quality repairs to be performed, so consider these aspects when planning maintenance.

Consider incorporating recommendations into future projects. Work may be scheduled under a future major rehabilitation program or Safety of Dams modifications. If so, coordinate with other recommendations to specify when the work would take place.

Follow up. Note the date that the action should take place and follow up to determine if the action is complete—and if not, what needs to happen to complete the action.

Please contact your regional facilities O&M team leader.

For more information contact:

Facility O&M Team

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Going Beyond the Recommendation to the Solution

Hyatt Dam Modification

Noting a problem is just the first step in solving the issue. “Once you see an issue, you need to collect all the available information and additional data if needed, evaluate the extent and cause of the problem, and identify potential consequences if nothing is done. Then you develop alternatives and recommend the best option to fix the problem,” advises Elizabeth Ouellette, a Technical Service Center engineer.



Reclamation’s Dam Safety, Urban Canal, and other programs have processes to move from sighting the problem to solving the problem. In general, this involves:

- Determining the extent and cause of the problem
- Examining alternatives to find the best solution
- Getting funding for the solution
- Constructing the solution
- Following up to ensure the solution works

Hyatt Dam in Oregon recently went through this process. An inspection determined that seepage exiting at the downstream toe of the embankment could be internally eroding the embankment or foundation materials. Engineers recommended further studies to determine the cause of the seepage and develop alternatives to minimize the potential for internal erosion.

Engineers collected available design and construction information, conducted subsurface investigations of the embankment and foundation, and installed instrumentation to evaluate the seepage conditions and potential for internal erosion. In addition, a risk analysis concluded that the risk of dam failure was high if nothing was done—without modification, Hyatt Dam would continue to experience episodic internal erosion, which could progress to dam failure. This built the case to justify that Hyatt Dam remediation was an urgent priority.

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Designers developed alternatives and selected the preferred alternative that meets the following objectives to reduce the high static risks:

- Provides a downstream filter and drainage system to prevent internal erosion of embankment and foundation materials
- Collects seepage flow through the embankment and foundation for measurement and monitoring for sediment
- Provides monitoring enhancements to improve the ability to detect internal erosion and intervene early in the process.

Staff worked with district, regional, and area offices to work through the Dam Safety corrective action processes for the \$9 million needed for construction. Authorization for construction was given through a written Notice of Expenditure by the Dam Safety office to the Commissioner of Reclamation in accordance with Public Law 114-113 Reclamation Safety of Dams Act, as amended. Construction was scheduled to minimize impacts to irrigation deliveries and was mostly completed in November 2017.

The dam now sports the following new features:

- Filter and drainage system
- Toe drain with inspection wells and cleanouts
- Berm to cover the filter and drainage system
- Outlet works retaining structure to accommodate the new berm

Of course, the process did not stop there. The design team and construction staff reconvened in early 2018 to verify that internal erosion-related risks had been reduced below Reclamation’s public protection guidelines with the construction of the new features described above. Based on the performance to date, the team judged that the risks have been successfully reduced to below Reclamation’s public protection guidelines. “It is an on-going cycle, as we continue to monitor, follow the Reclamation processes for inspecting and evaluating our facilities, recommend any new actions, determine priorities, and solve problems every day” notes Tara Schenk McFarland Program Manager, PN Region.

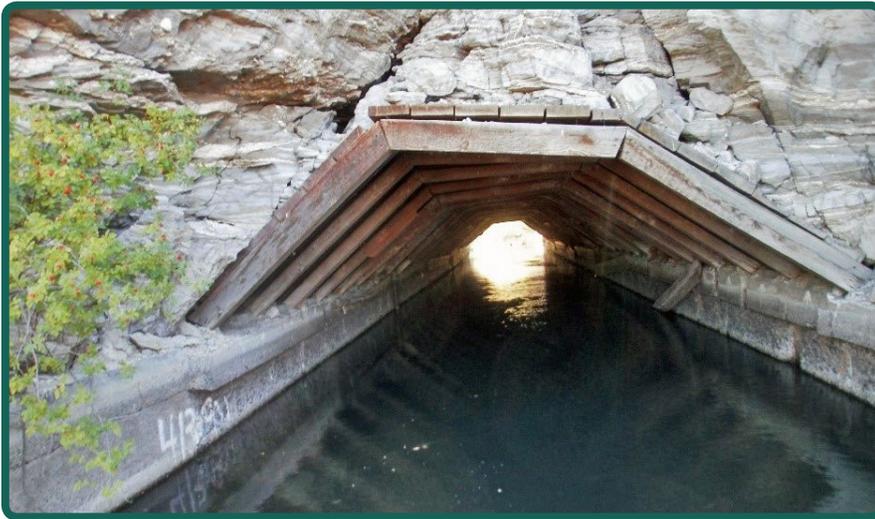
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Wapatox Canal

The Wapatox Canal, Yakima Project, in Washington State had an old tunnel, constructed between 1907 and 1911, to pass water under the finger of a hill.

When this was built, cutting through the overhead rock would have had to have been done by hand, so it was easier to build a tunnel—and avoid breaking up and excavating all the soil and rock in the area needed for an open-cut channel.



Originally, this tunnel was supported with timber bents. During the early 1990s, signs of support displacement became visible. Inspections noted the open timber joints and displacement of the beams (shown in the photographs). Examiners and operating staff recommended addressing this problem promptly to avoid the possible collapse of the tunnel—and resulting inability to deliver flows through the Wapatox Canal.

Reclamation conducted a series of short studies and determined that the best option would be to remove the tunnel and make this section of the canal an open-cut excavation.

In 2013, the design for replacing the tunnel with an open cut was completed. These designs included removing the soil and rock over-burden as well as the tunnel and relining the canal with an O&M access ramp, excavation face/slope support, and reinforced shotcrete lining of the exposed slope.



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Connections

Safety: Irrigation Leader Interviews Irrigation Districts

March 2018 Irrigation Leader's Safety Issue has some great interviews with urban canal districts and how they work with publics to ensure safety. Salt River Project makes canals a community asset. Along with regular system reviews, employees look for and report safety concerns during their daily operations. Nampa & Meridian Irrigation District reaches out to the public to inform them about the dangers of irrigation districts, and Elephant Butte Irrigation District emphasizes employee safety.

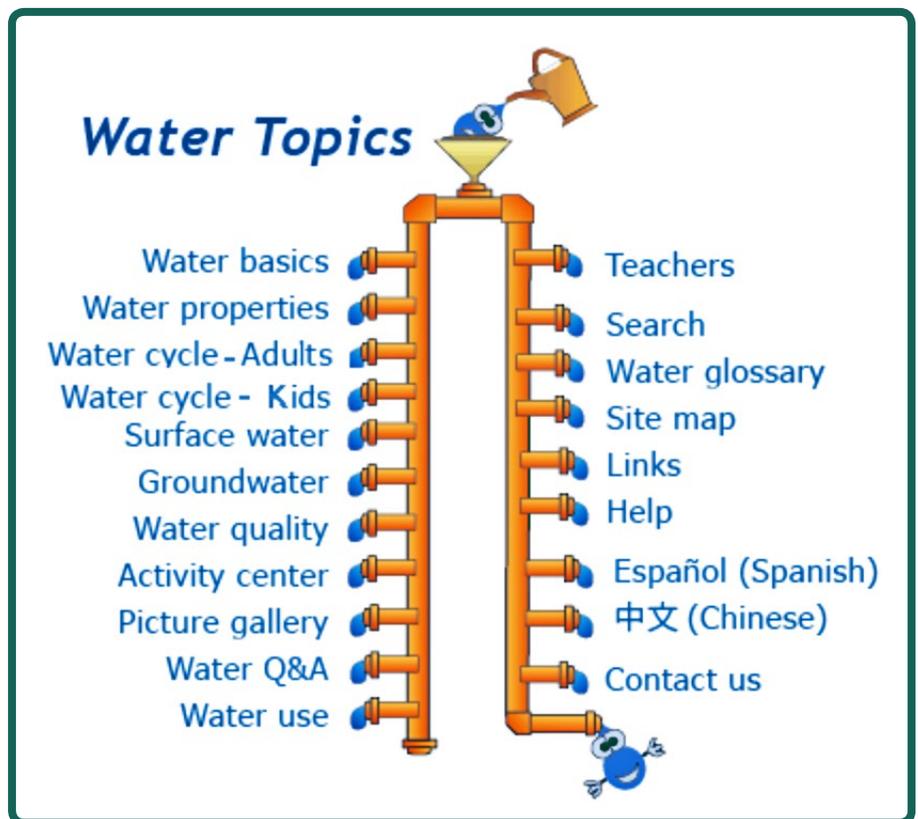


USGS Water School!

USGS's website offers information on many aspects of water, along with pictures, data, maps, and an interactive center where you can give opinions and test your water knowledge.

Call 1-888-ASK-USGS
(1-888-275-8747)

<https://water.usgs.gov/edu/>



Make your recommendations work



Focused and Relevant
Action is needed for intake to work.

Woody debris could cause plugging of the trashracks and prevent the outlet works from properly functioning; this would become a dam safety concern if outlet works releases are necessary to draw down the reservoir during a storm event.

Justified
Gives a reason for the action.

Remove all woody debris (including fallen trees) from the upstream face of the dam, from the outlet works' trashracked intakes, and from the upstream groin areas.

Completeable
Action is clear and measurable.

Update the SOP to include a maintenance item for removing debris from the outlet works trashracked intakes, from the upstream face of the dam, and from both upstream groins.

Specific
Spells out exactly what and where.

Trackable
Easy to check if this is done.

Persistent
Action to avoid this problem in the future.

Objective
No one is being blamed.

Deliverable
Provides a clear way to address the problem.

Active and Clear
Can be copied into a work order.