

Water Operations and Maintenance Bulletin

Effective Planning



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Ensuring your district is well managed and prepared to thrive in the next 50+ years all starts with good planning. In this issue, we will detail a few different types of plans: from an operations and maintenance management plan to standing operating procedures and planning for sedimentation and pest management.

Proper planning allows present and future staff to understand the intricacies of your system, the age and condition of equipment, and potential necessary modifications to meet future demands. Additionally, in the long-term, these plans can support a cost-effective and efficient system. Basic questions you should answer include:

- What are your expenses and income? What is the plan for future budgets, including reserves for emergencies?
- What are your operational requirements, losses, and flows?
- What is the status of pest populations? When will treatment be most effective in suppressing the pests and the least hazardous to human health and the environment?
- What equipment needs to be repaired or replaced? When?

However, as we all know, nothing ever goes according to the original plan, so you need to be continually monitoring and assessing, and be prepared to make updates.

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About this Bulletin

The Water Operation and Maintenance Bulletin and subject index is available at: www.usbr.gov/assetmanagement/WaterBulletins

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On the Cover:

The canal spillway at Ochoco Dam in Oregon.



The New York Canal as it flows to Lake Lowell in Idaho.

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More information

World Bank Technical Paper No. 389, "Planning the Management, Operation, and Maintenance of Irrigation and Drainage Systems – A Guide for the Preparation of Strategies and Manuals" is a reference document to help organizations develop their strategies and prepare plans and manuals for operation and maintenance of irrigation and drainage systems.

Operations and Maintenance Management Plan Template

Don't know where to start with an operations and maintenance management plan? You might use these titles and content to fit your particular situation.

Chapter 1: Organization, Management, and Responsibilities. Why does your district exist? What is your district responsible for—and where does your district's responsibility end? What is your district's relationship with other public and private organizations? What is the organization and management structure and who in the organization is responsible for what?

Chapter 2: Project Description. Describe the general project features and service areas. Who owns what asset—and who maintains that asset? Using a GIS system is a great way to maintain a master map of all relevant project features along with maintaining database information associated with each feature.

Chapter 3: System Operation. Provide specific, concise but detailed instructions for operating the irrigation system for field staff and their supervisors and managers. Include the Standing Operating Procedures (SOP), water allocations, emergency procedures, and communication.

Chapter 4: System Maintenance. Document the policies, workflows, and procedures for maintaining facilities and equipment. Include monitoring as part of an effective maintenance program. If proper data is collected on operations and efficiencies, maintenance decisions can be targeted to the proper needs. When juggling maintenance budgets, determine the criteria and rationales for prioritizing what to focus on and what to neglect/defer. How long until what you have neglected/deferred becomes an issue?

Chapter 5: Administration. Effective project management depends on the quality of staff, adequacy of facilities, equipment and funds, the institutional arrangements, and the timely flow of management information. Document management processes, roles and responsibilities, and workflows for procuring parts and contracts, budget and financial procedures, and administrative support.

Chapter 6: Water Users. Cooperation of users is essential to the successful operation and management of an irrigation project. Explain the relationships between the water users and the district. Clarify the rights and obligations of each party, including services provided to water users and penalties for offenses such as unauthorized deliveries. This part of the plan should be distributed to all users.

Chapter 7: Budget Development and Programming. Budget documents provide a forecast and express the commitment in financial terms for the programs, work, and activities the district intends to carry out. Include annual, future, and emergency budgets. Consider changes in the future that may cost more, for example assets nearing the end of their useful life and the need for higher replacement, labor, and materials costs. While no one wants to raise rates, rates must be high enough to ensure good maintenance and to address emergency situations.

Chapter 8: Monitoring and Evaluation. How is your organization performing over time (water use, budgets, system reliability)? Use this monitoring to determine what needs to change to adapt to changing conditions and ensure future success.

Update your operations and maintenance plan every year. Determine who will be in charge of modifying the plan to adapt to changes in water allocations, operations, machinery, safety, etc. Plan on how you will communicate these modifications to the district staff and water users—in other words, plan to plan!

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More information

Operating Practices and Procedures
for High- and Significant-Hazard
Dams (and other facilities, as
applicable)

While Reclamation's Directives and
Standards for Standing Operating
Procedures focus on high and
significant hazard dams, the guidance
can help ensure the operational
reliability, structural integrity, and safe
operation of all facilities.

Update and Following your SOPs

Reading and understanding your Standing Operations Procedures (SOP) are critical to successfully operating your facility under all conditions. Your SOPs should include all the instructions you need to adequately, safely, securely, and reliably operate the facilities, distribution system, and equipment. They cover:

- Emergency actions and communication
- Safety requirements
- Structural, mechanical, and electrical descriptions
- Operating, maintaining, and testing instructions

SOPs link to other, more detailed documents, like manufacturer instructions. These should be considered a part of the SOP.

Everyone who operates and maintains the facility should read the SOP to understand how to keep equipment and systems running smoothly – this includes back-up operators. First-line supervisors and water district managers need to make sure the SOPs are being followed every hour of every day.

Consult the SOP when changing operations, maintaining or testing equipment, or performing examinations, and whenever equipment is replaced, upgraded, or changed, or if the facility or operations are modified, these changes must be noted in the SOP.

Develop a process in your office to ensure that:

- everyone can suggest changes in the SOP,
- the supervisor notes the need for the change,
- the correct experts make and verify the change,
- the SOP are updated, and
- operating staff know about and follow the updated SOP.

Remember:

You keep your facilities running and secure. Your SOPs are your roadmap to success.



The spillway at Choke Canyon Dam in Texas.

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United States Society on Dams' Resolution on Reservoir Sedimentation and Sustainability

The USSD encourages all Federal agencies to develop long-term reservoir sediment-management plans for the reservoirs that they own or manage by 2030. These management plans should include either the implementation of sustainable sediment-management practices or eventual retirement of the reservoir.

More information

Measuring Sediment

USGS 2016. Sediment acoustic index method for computing continuous suspended-sediment concentrations: U.S. Geological Survey Techniques and Methods, book 3, chap. C5, 63 p., <http://dx.doi.org/10.3133/tm3C5>.

Designing for Sediment

Reclamation, 2006. Erosion and Sedimentation Manual.

——, 2015. Bank Stabilization Design Guidelines

——, 2016. Rock Weir Design Guidance

Settle your Sediment

Sediment management plans are critical for managing our systems now and in the future. Sediment can accumulate in reservoirs, canals, and distribution systems, gradually reducing capacity for flow conveyance and water -storage volume and choking the system. Without a plan to manage sediment, your system could deliver less and less water.

Sediment issues in canal and distribution systems vary, but some basic principles can be applied to address sediment issues. By understanding how sediment travels through your system, you can reduce operational costs. Rivers transport sediment—either suspended in the water (suspended load) or along the streambed (bedload). Concentrations of different size sediment (clay, silt, sand, gravel, or cobbles) vary with the depth of the river channel (e.g., in deeper portions of the canal, coarser sediments are transported at higher concentrations than finer sediments).

Discover What Is in the System

If you do not look for sediment, you may not know you have a problem until it poses an immediate threat to water deliveries. Determine how much sediment enters your system. Acoustic backscatter measurement devices can be put into canals to measure the concentration of sediment being transported. These measurements can be a one-time snapshot or can be conducted continuously to provide real-time data for operators.

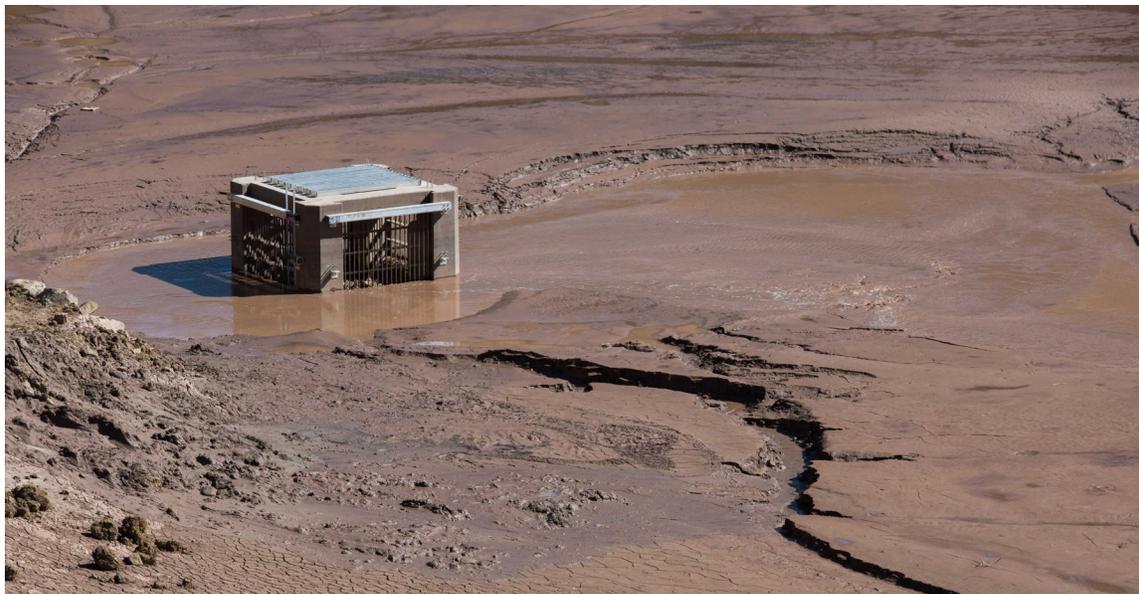
Incorporate sediment deposition into all inspections. Choose a few representative canal sections, laterals, or other places where sediment accumulation can pose problems. Document and check to see how sediment might be accumulating.

Sediment hides out in reservoirs as well, which can reduce the reservoir storage capacity. As reservoirs continue to fill with sediment, the water storage capacity will reduce over time, even if there is no monitoring. Ideally, reservoirs should have a new bathymetry survey about every decade to document the actual storage capacity, determine sedimentation trends, and to provide important information for sustainability planning. Survey methods have dramatically improved in the last decades and surveys can be more thoroughly conducted and less much expense than ever before.

Prevent Sediment from Entering the System

Preventing sediment from entering transmission facilities in the first place is always the best alternative. Leaving sediment loads in the rivers rather than facilities not only saves operations and maintenance hassles, but also helps keep river systems healthy.

If there is a lot of sediment, consider redesigning your diversion structures and settling basins upstream to reduce the sediment diverted into the canal. Modern designs use physical and numerical models to determine effective solutions. Look for ways to reduced sediment inputs from wind erosion, canal bank erosion, and rill and gully erosion during overland flow. Wind fences, canal bank protection, and cross drainage structures can help prevent sediment from entering a canal.



The outlet works surrounded by sediment at Paonia Reservoir.

Manage Sediment in the System

Check your sediment prevention measures that are already in place:

- Regularly operate the sluice gate on diversion dams, which are designed to pass sediment down the river and keep it out of the distribution system. Don't create large and sudden downstream sediment releases to avoid impacts like fish kills.
- Clean out settling basins. These wider and deeper areas have slower velocities, so sediment drops out. But if you do not clean these out regularly, they will no longer trap sediment.

If sediment cannot be removed from the system, then systems may need to adapt. Focus on ways to get the most out of a more limited storage volume such as:

- Optimizing operating rules. Now with real-time data collection and hydrologic and hydraulic modeling, new techniques such as improved runoff forecasts and predictive models may enable reservoir benefits to be maintained, despite a decrease in reservoir volume, without any structural changes. This will often be the least-cost strategy for partially offsetting or delaying the impacts of sedimentation.
- Increasing water use efficiency. When reservoir storage capacity is reduced by reservoir sedimentation, users may increase their water use efficiency by implementing conservation measures or by moving away from water-intensive or low-economic value activities.
- Manage reservoir sediment for sustainability. Sediment management strategies can be grouped into the following categories: watershed management to reduced sediment yield, passing sediment through or around the reservoir without deposition, and removing previously deposited sediments. The costs of these strategies need to be compared to the eventual costs of lost project benefits, dam decommissioning, and possibly building a new dam and reservoir to replace lost benefits.

Sediment problems usually occur out of sight, so they can be put out of mind too easily as well. Planning to address this silent problem will save you time and money in the long run.



Employees from Reclamation's Technical Service Center pull and process sediment from Paonia Reservoir in Colorado.

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Integrated Pest Management

Weeds and rodents have plagued water conveyance systems since the first canal. Roots and burrows can threaten canal integrity and need to be addressed. Combatting these threats without a plan is like going to war without an overall strategy. Before doing anything, ask yourself:

- Is it a pest? Just because the plant or animal lives in the system does not make it a pest. Is it causing a problem that threatens the safety and functions of facilities and systems? Could it cause a human health or fire hazard, increase maintenance costs, or other problems? Look at the damage done. Get help in identifying the species to determine what damage it could do, and how it could be managed to avoid damaging your system.
- What is it doing? Always monitor the situation—at the onset of a problem through to actions and afterwards. Keep track of the problem populations, how the weed or pest is growing, what effects your actions have on it, and what damage needs to be addressed. Also examine what effects your actions have on other, non-target species.

Plan Your Strategy—Use Integrated Pest Management

Once you've assessed the situation, plan your strategy. Integrated Pest Management (IPM) is an approach to controlling pests that takes the entire system into account. It is a decision-making process that helps determine if management actions are required, and when, where, and how they should be initiated. A well-planned and executed IPM plan will benefit your system in many ways:

- Prevents damage to infrastructure
- Identifies the most cost-efficient methods to control pests and ensure worker and public safety
- Reduces pesticide residues and worker exposure to pesticides
- Maintains natural resources

The IPM plan should be a written, comprehensive document that establishes conditions and strategies for conducting a safe, effective, and environmentally sound program. Plans should be dynamic, forward-looking documents with lifespans of about 5 to 7 years. Discuss historic data and current status of the program as well as present and future plans, and new actions necessary to meet the objectives and goals.

Work with local communities, decision makers, and technical experts to determine the overall strategy and to coordinate actions. Monitor the effectiveness and environmental impacts of treatments and identify any changes needed to your pest management practices and programs based on the inventory and monitoring.

Carefully planning actions over the entire district and over years will make the most of your limited resources. Once a pest species and actions have been identified, answer several critical questions:

- How do we get the most out of that budget?
- Which pests are the most critical in terms of depredation to my management objectives?
- Where will I receive the most benefit in the long-term?
- What methods and strategies should I use?
- How will monitoring be conducted?
- How will monitoring data be used and considered for the next management action?

Become an Expert and Work With Experts

Today's environmental issues are complex, and the amount of knowledge required to adequately evaluate a single management situation is growing. You may need specialists such as environmental specialists, toxicologists, agronomists, biologists, water quality specialists, surface water hydrologists, surficial geologists, and more. But they will also need your knowledge as well. Part of the job of well-qualified operations managers is to understand IPM and to determine when to take actions, what type of actions to take, and how to coordinate these actions throughout the project area.

Make learning how to develop, implement, and monitor an IPM plan a priority in your district. Local resources include local county extension offices, universities (internships or resources from local agricultural universities). Reclamation also offers training, and guidance.

Where to Get Help

Reclamation is developing new guidance on Integrated Pest Management that covers the approach to integrated pest management, how to create and execute a plan, and specific information on pests and pest control tools. Two of Reclamation's Canal Operation and Maintenance Guides also focus on pests and give more overall guidance for addressing vegetation and animal issues in canal systems at: <https://www.usbr.gov/assetmanagement/OMG.html>. Reclamation Manual Directives and Standards, ENV 01-01, sets out the requirements for preparing and approving a written IPM plan:

Programs for the control of undesirable plants on Department of Interior lands, waters, and facilities will incorporate integrated pest management (IPM) concepts and practices. They shall include a systematic and environmentally compatible program developed by a team of individuals with appropriately diverse technical backgrounds (biology, endangered species, soil and water, pesticides, agronomy, information management, etc.) and adequate understanding of weed biology. IPM involves the use of suitable control techniques, including biological, chemical, physical (mechanical and manual), and cultural measures (environmental manipulation) and public awareness programs.

<https://www.usbr.gov/recman/env/env01-01.pdf>

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Hot Topics: Title Transfers

An Easier Title Transfer Process

A new Categorical Exclusion under the National Environmental Policy Act (NEPA), a new title transfer authority, and an update to Reclamation's operating manual procedures now help streamline the title transfer process. These actions make it easier for water users to take title—ownership—to qualifying Reclamation facilities by expediting the process following direction from the Administration and Congress. Streamlining the title transfer process incentivizes new non-Federal investment in water infrastructure and allows for more efficient management of water and water-related facilities.

“Reclamation and non-Federal entities have worked together for many years on specific title transfers that can become time-consuming and costly,” said Reclamation Commissioner Brenda Burman. “This new streamlined title transfer process—including the new Categorical Exclusion and the new authority provided by Congress—will allow for appropriate transfers to take place without congressional legislation in a more timely and cost-effective manner.”

The new Categorical Exclusion (the first new exclusion in decades) lists criteria that will determine if simple, non-controversial or uncomplicated facility transfers can be expedited under NEPA. Title VIII of the John D. Dingell, Jr. Conservation, Management and Recreation Act (P.L. 116-9) was enacted in March 2019, and no longer requires authorizing legislation at the end of the title transfer process for qualifying entities and Reclamation facilities. Reclamation has updated its operating manual to implement the law and the new Categorical Exclusion. Each title transfer will be reviewed on a case-by-case basis to determine if the new Categorical Exclusion and the new authority would apply.

The new categorical exclusion and the title transfer process is available on Reclamation's Title Transfer website.