

Executive Summary

Asset Management Framework for Forested and Natural Assets (project 4727)

Natural assets—including forested watersheds, aquifer systems, wetlands, and other natural features associated with the quantity, quality, and/or timing of water—provide a wide range of valuable services to water utilities. The high-value services provided by natural assets include contributions to source water quality, moderating runoff and floods, and groundwater recharge. Degradation of natural assets can reduce the level of service (LOS) provided, which in turn may pose significant risks for a utility. These risks include impaired water quality, reservoir sedimentation, stormwater flooding, and others that may adversely impact utility costs and the quality of the services provided to their customers. Ultimately, the condition and performance of natural assets are essential to supporting a water utility's ability to meet its strategic objectives of cost-effectively and reliably delivering safe drinking water to its customers.

ES.1 Background

The water sector is recognized as amongst the most capital-intensive sectors in developed economies, and yet this distinction only reflects built assets – primarily a utility's inventory of water mains, transmission lines, and treatment plants. At the same time, many essential inputs to the goods and services that water utilities deliver to their customers are provided by nature – namely the water itself, as well as the forested and other watersheds, aquifer systems, and other natural assets that convey, store, and protect the quality of source waters, and deliver other valuable water supply services. These natural assets also often generate important values for the greater community by providing wildlife habitat, recreational opportunities, commercial products (e.g., timber), carbon sequestration, visual aesthetics, and so forth.

Sustainability and efficiency require that water utilities recognize and prudently manage all of their critical assets—including natural capital—as well as built infrastructure and human capital. This research project developed a framework and guidance to strengthen water utilities' capacity to account for, invest in, and better manage their natural assets, by:

- Enhancing recognition, quantification, and valuation of the important goods and services provided by forested and other natural assets;
- Developing a framework for including forests and other natural assets within water utility asset management (AM) programs, and;
- Recognizing and addressing the numerous barriers and challenges to placing natural assets on equal footing with built infrastructure within water utility planning and AM programs.

Natural assets typically include source waters and associated watersheds, as well as green infrastructure and other natural systems that utilities may (or may not) own, and that utilities aim to manage (often in partnership with landowners and other entities) to generate value, reduce costs, protect water quality, enhance water supply, improve resiliency, and enrich the quality of life for their broader communities. The research approach examines the challenges and opportunities for including natural assets alongside built infrastructure in how water utilities:

- Develop and apply business case evaluations (BCEs);
- Assess and manage risks, and plan for robustness and resiliency;
- Value and leverage their assets;



- Prioritize and manage their capital improvement programs, and operation and management (O&M) budgets;
- Gain access to financing;
- Recover costs through rates and other potential revenue sources; and
- Communicate and collaborate with outside parties (including watershed partners and other stakeholders).

ES.2 Assessing and Managing Natural Asset Risks to Utilities

Natural assets, along with the utility's other key assets, are subject to potential changes in condition that adversely impact the LOS the assets provide and, thereby, pose business risks to the utility. These business risks are important to recognize and mindfully manage, regardless of whether the asset is an engineered system (e.g., a treatment plant or pipeline) or a natural system (e.g., a forested watershed or natural reservoir).

Managing these risks enables the natural asset to sustainably generate value, reduce costs, protect water quality, enhance water supply, improve resiliency, sustain critical LOS, and enrich the quality of life for the broader community. Utilities thus will find value in developing an understanding of the risks posed by potential changes in a natural asset's condition, and the associated risks to the important flow of goods and services provided by that natural system.

For example, watershed lands may be subject to development, wildfires, flooding, and other events that would significantly alter the level and/or quality of services that flow from those assets. Utilities need to recognize these risks, and they need to apply the same principles and practices of risk management as they would for a built system. This entails understanding both the likelihood and consequences of a risk event.

One example of a risk event is a high-intensity wildfire in a forested watershed area. A utility supplied by a forested watershed needs to

recognize the risks and consider how to try to reduce the likelihood and/or consequences of such risk event. Active risk management might thus entail actively supporting efforts to better manage forest lands in ways that reduce the likelihood, intensity, and spatial extent of potential wildfires, and that manage the sediment and debris loads that result after such events. The objective for the utility is to establish the level and quality of the services to be provided by the forested watershed, then monitor and manage performance in the face of the risks that apply to that asset.

ES.3 Drawing on the Practice of Asset Management

The research approach applied in this document draws from the rich field of asset management (AM) as increasingly applied by water utilities to their built systems (such as pipelines and treatment plants). The objective is to draw on the same principles and practices that are gaining maturity and broader sector-wide application for built systems, and to apply them to natural assets so that a water utility can manage all of its assets on equal footing.

Asset management, as described and applied in the AM literature and in this project, is a systematic and comprehensive approach for:

- Creating a useful inventory of assets, and assessing their condition;
- Defining the desired levels of service from the assets to meet utility strategic objectives;
- Assessing the risk that the asset may degrade, or fail, and thus not deliver the target LOS required to meet the utility's higher-order strategic objectives;
- Applying a risk management-based approach to identifying potential capital investments and/or maintenance expenditures for at-risk assets, to mitigate risks to the asset's ability to meet target LOS;



- Conducting business case evaluations of the risk mitigation options to ensure they warrant investment of utility resources;
- Implementing the selected risk mitigation options;
- Monitoring asset conditions and performance periodically to ensure the mitigation investment is performing as planned; and
- Adjusting the risk mitigation approach if/as needed to ensure desired asset conditions are attained and performance is meeting target LOS (and continuing the periodic review process to promote continuous improvement).

Because natural assets can be managed through capital investment and maintenance activities, the principles and methods of asset management can be applied to natural assets. In other words, natural assets can be integrated into asset management so that they are managed alongside (and on equal footing with)

built assets to best meet utility business goals and strategic objectives.

The framework and guidance provided in this document offer a systematic, step-by-step approach for incorporating natural assets into an asset management program, building on standard asset management principles and practices. The framework and guidance also identify and address specific challenges of natural assets that may require unique approaches.

Some of the unique characteristics of natural assets may require an iterative approach to condition and risk assessment, setting of levels of services, and planning investments. In addition, natural assets are rarely owned by a utility, thereby often requiring different approaches to fund, finance, and execute management actions to preserve, protect, or enhance these assets.

Related WRF Research	
Project Title	Research Focus
Advancing and Optimizing Forested Watershed Protection (project 4595)	The objective of this project was to conduct a literature review and workshop on the science of forested watershed protection. The project assessed the state of the science regarding forest management impacts on drinking water utility costs and integrating land use decisions with water management and planning.
Evaluation of Risk Management Frameworks and Tools and their Application for Managing Source Water Risks in the United States (project 4748)	Under the Safe Drinking Water Act Amendments of 1996, states were required to develop Source Water Assessment Programs (SWAPs) to identify existing and potential sources of contamination in drinking source waters. This research project advances the SWAP process toward effective and practical risk management by moving beyond risk identification to the risk assessment and risk management phases of public health protection. The research combined a thorough and systematic investigation of risk management frameworks and tools in use by the water sector with utility pilot testing to develop and evaluate a suggested methodology for managing source water risks in the United States.
Practitioner's Guide to Economic Decision Making in Asset Management (projects 1725 and 1726)	This practitioner's guide for water service providers includes information on approaches to economic decisions and promotes the use of core economic principles at each stage of asset management. The guidelines consist of two parts. Part I includes background discussions on concepts, frameworks, and tools. Part II contains the



Related WRF Research

Project Title	Research Focus
	actual guidelines. The guidelines include case studies developed with industry partners, and summarize a range of tools and approaches that can be used in support of economic decision making.
Quantifying the Potential Benefits of Land Conservation on Water Supply to Optimize Return on Investments (project 4702)	The objective of this project was to supply the utilities in the Catawba-Wateree Water Management Group with the information needed to cost-effectively mitigate potential changes in water quantity and quality through targeted conservation efforts in watershed hot spots.
Source Catchments as Water Quality Treatment Assets: Industry Best Practices and Triple Bottom Line Cost Evaluation of Catchment Management Practices (project 4570)	This project provides guidance on the key ingredients of a successful catchment management program for water providers, in the context of their specific institutional settings, regulatory requirements, and efficiency and effectiveness criteria. The research included an examination of how each catchment management water quality treatment asset affects water quality outcomes, as well as how all the elements of catchment management interact and work together to produce effective outcomes at a scale that makes a difference during rainfall events.
Sustainable Infrastructure Management Program Learning Environment (SIMPLE), Version 1.1 (project 4013)	The objective of SIMPLE is to provide a web-based asset management learning environment that will assist organizations in implementing best appropriate practice life-cycle asset management programs.

Principal Investigator:

Robert Raucher
Corona Environmental Consulting, LLC and Raucher LLC

Project Team:

Robert Raucher
Corona Environmental Consulting, LLC and Raucher LLC
Kurt Vause
StreamlineAM, LLC
Mark Lorie
Corona Environmental Consulting

Todd Helgeson
StreamlineAM, LLC

Jan Cassin
Forest Trends

Technical Reviewers:

Roy Brooke
Municipal Natural Assets Initiative
Christina Burri
Denver Water
Seth Doull
Tacoma Water

Paul Hunt
Portland Water District

Peter Stangel
US Endowment for Forestry and Communities

Nancy Toth
Eugene Water and Electric Board
David Warne
New York City Department of Environmental Protection

For more information, contact:

Maureen Hodgins,
mhodgins@waterrf.org

www.waterrf.org

The Water Research Foundation

1199 N. Fairfax St., Ste 900 | 6666 W. Quincy Ave.
Alexandria, VA 22314-1445 | Denver, CO 80235-3098

Project 4727

October 2020