SECTION 03

MAKING DECISIONS

There are many reasons a decision may need to be made about the future of a dam. A dam may have received a letter of deficiency and require repair. Community members may wish to restore fish passage to the river. A dam owner may no longer be able to maintain the structure. Or there may be growing concerns about water quality, which can be compromised by the presence of a dam.

Many factors influence how a final decision is made. Depending on the ownership, use, and location of the dam—as well as the nature of the community—each decision-making process will look different. The extent to which a community can participate depends largely on whether the dam is privately or publicly owned. In either case, reaching a decision can take time and almost always requires patience. This is why it is important to consider community priorities before a deadline or crisis forces a decision—whether that is applying for a grant or responding to a storm that threatens the integrity of a dam.

This section of the Dam Atlas presents a method developed by a team of researchers at the Rhode Island School of Design (RISD) in collaboration with colleagues from the National Science Foundation funded Future of Dams project. The approach combines elements of design charrettes with Structured Decision Making (SDM) to support inclusive and transparent decision processes.

The following materials are open source and are made available for public use in the hope of improving how communities are engaged in decisions about dams. Our goal is to strengthen communities' ability to work together to find creative solutions that address the often competing needs of rivers and dams. There are many ways to involve communities in conversations about dams, and this document and website are intended to encourage the sharing of methods. Others are invited to use, test, and adapt these tools—and to share their own methods and experiences in return.

INTRODUCTION TO THE APPROACH

Decisions about aging dams in New England can be contentious. While removing legacy dams may make sense from an ecological, economic, or safety perspective, a 2016 study found that more than 50 dams identified for potential removal in the region had been stalled or delayed due to community opposition[1]. In many cases, this resistance is rooted in a perceived threat to a cherished local landscape—a favorite swimming hole, a familiar landmark, an element of the town's history and identity. In others, disagreement arises from differing views of which version of "nature"—the upland wetlands formed by an impoundment or the free-flowing river and restored aquatic connectivity—should be preserved or prioritized.

Too often, the decision-making process itself has been flawed—driven by what community members perceive as a top-down approach—and has resulted in more divisive discussions about the future of a dam. Researchers have found that when outside "experts" from state agencies or nonprofits play a leading role, community members often feel ignored or excluded from decisions about their own local resources[2]. In some circumstances, local residents have expressed the belief that outside agencies arrived with the intent and resources to remove a dam regardless of community perspectives. These power dynamics have been identified as one of the key factors undermining community-engaged restoration efforts.

Limitations of Current Methods

Town hall–style meetings and public hearings remain the most common form of public engagement around dams. These meetings are intended to share information and provide opportunities for the public to express their views. Sometimes they are run by a trained, neutral facilitator; more often, they are organized and led by local officials, conservation commissions, engineers, or environmental organizations that already favor dam removal.

Depending on the level of local interest or apathy, such meetings can easily be driven by strong voices on either side of the debate. The microphone often is dominated by those most comfortable speaking in public—leaving quieter or more moderate participants unheard. This dynamic discourages dialogue and can result in discussions that are less balanced, or even misleadingly one-sided.

Stakeholders today have access to a growing number of decision-support tools designed to guide choices about the future of dams. However, most of these tools are intended for town officials, agency staff, or others operating in an "official" capacity rather than for community members. While they can be effective at prioritizing projects based on scientific data and analysis, they often fail to integrate the social values and lived experiences that matter most to local residents—such as history, sense of place, and aesthetic or spiritual relationships to the river.

EXPLORING NEW METHODS

One of the most effective ways to incorporate social and cultural dimensions into a river restoration project is by facilitating direct community participation throughout the planning process. Community-engaged restoration can provide multiple benefits, including:

- Sharing insights into local social, ethical, and political values
- Creating shared opportunities for social learning
- Building broader acceptance, legitimacy, and long-term support for the planning process and its outcomes

Although there is growing consensus on the importance of involving citizens early in restoration planning, there remains little clarity about how this should happen or what form it should take.

Our work draws on landscape architecture, a field increasingly committed to creating meaningful opportunities for public participation in design decisions. By combining methods from Structured Decision Making (SDM) and collaborative design charrettes, we developed an interdisciplinary, workshop-based approach to support more inclusive and creative community engagement around dams.

STRUCTURED DECISION MAKING

Structured Decision Making (SDM) provides a systematic and collaborative framework for making complex environmental decisions—one that incorporates both values and facts[3]. This approach is grounded in the idea that there are no single "right" decisions. Rather than prescribing an outcome, SDM helps participants make informed, transparent choices through shared understanding. It provides a structure for talking, learning, and reasoning together about the facts and values that shape a decision.

Below is an outline of the key steps in the SDM process. However, in practice, the process is rarely linear. New information or perspectives may emerge at any stage, prompting participants to revisit earlier phases, such as re-framing the problem, refining objectives, or reconsidering alternatives.

The methods described here are adapted from *Structured Decision Making: A Practical Guide to Environmental Management Choices*, an excellent resource for anyone interested in applying this approach to community or environmental projects.

STEPS IN PROCESS	UNDERLYING QUESTION	EXAMPLE in the context of dam decisions
1. Problem Framing	What is the context for (scope and bounds of) the decision?	• Single dam • Whole river approach
2. Determining Objectives	What objectives and performance measures will be used to identify and evaluate the alternatives?	• Improve fish passage • Increase recreational opportunities • Reduce flooding
3. Identifying Alternatives	What are the alternative actions or strategies under consideration?	• Do nothing • Remove dam • Nature-like fishway • Technical fishway
4. Estimating Consequences	What are the expected consequences of these actions or strategies?	• 50% improved fish passage • 80 summer days when the river would be passable by canoe
5. Evaluating Trade-offs	What are the key trade-offs?	• Trade-off between fish passage and hydropower
6. Deciding And Taking Actions	Who are the decision makers? How can the decision be implemented in a way that promotes learning over time?	• Citizen science • Ongoing stewardship

TABLE 1: Steps in the Structured Decision Making framework (Modified from Gregory et al. 2012)

DESIGN CHARRETTES

Design charrettes are collaborative workshops commonly used in architecture, landscape architecture, and urban planning to involve community members directly in the design process. Like environmental decision-making, design fields continue to grapple with questions of inclusion and power. Charrettes aim to democratize design by inviting the public to help shape ideas, envision alternatives, and contribute local knowledge[4].

Designers use a range of visual and graphic tools—maps, renderings, models, diagrams, and plans—to communicate ideas and test possible futures. These tools make abstract decisions more tangible and help participants visualize the physical and ecological consequences of different choices. Before a charrette, facilitators prepare interactive materials and exercises that encourage participation and creative thinking, ensuring that community members are not simply responding to finished proposals but actively contributing to the envisioning of a site.

HYBRID APPROACH

While SDM provides a robust framework for environmental decision-making, it was originally designed for small groups of 5–25 stakeholders—such as representatives from agencies, tribes, NGOs, and utility companies—rather than for large public audiences. Design charrettes, by contrast, offer valuable guidance on how to organize large public meetings and how to use visual tools that help participants understand and discuss alternatives. However, they provide little direction on how to evaluate trade-offs or reach a final decision.

By merging SDM with the participatory methods of design charrettes, the strengths of each address the limitations of the other. By integrating these two frameworks, the approach outlined in this document provides both a clear process for decision-making and practical guidance for engaging the public, enabling communities to work collaboratively toward decisions that reflect both ecological and cultural values.

APPROACH	BENEFITS	LIMITS
STRUCTURED DECISION MAKING	• Clearly defined process for coming to a decision • Transparent, systematic process for evaluating alternatives and trade-offs based on shared objectives and performance measures.	• Limited guidance on how to engage the public in decision making
CHARRETTES	• Provide effective models for organizing and facilitating large public workshops • Use of visual tools to help participants understand complexity of dam and to visualize alternatives	• Often more open-ended design process without clear guidance on how to evaluate alternatives and make a final decision.

TABLE 2: Benefits and limitations to the Structured Decision Making process and Charrettes that lend themselves to a hybrid approach

REFERENCES and ADDITIONAL RESOURCES

1. Fox, C. A., F. J. Magilligan, and C. S. Sneddon. 2016. “You kill the dam, you are killing a part of me”: dam removal and the environmental politics of river restoration. Geoforum 70:93–104.

2. Johnson, S. and Graber, B.E. 2002. Enlisting the Social Sciences in Decisions about Dam Removal. Bioscience 52 (8), 731–738.

REFERENCES and ADDITIONAL RESOURCES

3. Gregory, R., Failing, L., Harstone, M., Long, G., McDaniels, T.L., & Ohlson, D.W. 2012. *Structured Decision Making: A Practical Guide to Environmental Management Choices.* Wiley-Blackwell, Chichester, U.K.

4.Lennertz, B., Lutzenhiser, A., & Duany, A. (2017). The Charrette HANDBOOK: The Essential Guide to Design-Based Public Involvement (2nd ed.). Routledge. https://doi.org/10.4324/9781351179263

UNDERLYING PRINCIPLES

These principles are drawn from lessons learned through running workshops and are intended to foster more inclusive, transparent, and collaborative decision-making. Even if the Structured Decision Making (SDM) framework outlined in this document is not used, these principles can still help guide the development of a more effective and equitable process—one that balances technical, ecological, and social considerations.

Respect Local Values and Perspectives
Scientific information can inform decisions, but it cannot be their sole basis. Community preferences are shaped by scientific, moral, and ethical values. Many dam projects have failed when proponents ignored social concerns that mattered most to residents. Successful processes acknowledge and honor local values, ensuring participants feel heard. Value-based objectives may not be quantifiable but should be documented and considered alongside scientific objectives.

Neutral Facilitation and Structured Dialogue
Creating space for dialogue and shared understanding requires neutral facilitation. A third-party facilitator helps balance power dynamics and guides participants through a transparent exploration of alternatives rather than steering toward a single outcome. Small-group discussions allow all voices to be heard, encourage mutual respect, and promote negotiation grounded in listening and learning.

Shift from Positions to Interests
Positions center outcomes—such as "keep" or "remove" the dam—while interests represent the motivations behind them, like safety, habitat, or heritage. Focusing on interests instead of fixed positions fosters collaboration and problem-solving. By framing discussions around shared interests, communities can uncover creative solutions that satisfy multiple objectives rather than reinforcing polarized debate.

Build Shared Objectives
Developing shared objectives is foundational to collaboration. Participants can often agree on common goals even when personal priorities differ. Agreement doesn't require everyone to hold or value each objective equally—it requires recognizing them as legitimate. Establishing shared objectives builds trust, empathy, and understanding, enabling groups to move from small agreements toward resolving complex, value-driven decisions.

Explore a Range of Alternatives
Smaller dams often offer multiple potential solutions that achieve overlapping objectives. Options such as partial removal or nature-like fishways may cost more but can help broaden conversations beyond what might be perceived as binary options of keeping or removing a dam. Exploring a range of alternatives encourages creative problem-solving and helps participants balance ecological, historical, and aesthetic trade-offs through collaborative negotiation.

Foster Learning through Accessible and Visual Information
An informed public is essential to sound decision-making. Complex technical studies should be translated into clear, accessible language and visuals. Maps, diagrams, and renderings help participants see relationships and trade-offs that numbers alone cannot convey, building shared understanding and supporting inclusive dialogue.

Ensure Transparent Evaluation of Alternatives
The SDM framework enables a transparent comparison of alternatives based on how well each meets the project objectives. Participants may weigh objectives differently, but the decision matrix allows those differences to be seen and discussed openly. Transparency about values and trade-offs supports trust and accountability in the final decision.

WHO SHOULD BE INVOLVED?

Who participates in decision-making about a dam will vary depending on ownership, geography, funding, and the motivation for action. When a dam is owned by a local, state, or federal agency, there is both a greater obligation and increased opportunity for community input. For privately owned dams, the extent of community involvement will depend on the specific context and the owner's willingness to collaborate and to consider community concerns.

We suggest that four key groups participate in this work. Their involvement can inform one another at various stages of the decision-making process:

PROJECT TEAM

The project team consists of the consultants and professionals supporting the decision-making process. This may include engineers conducting hydrology and hydraulics (H&H) studies to assess the effects of dam removal on flow, or feasibility studies exploring design alternatives. Ecologists may analyze the impacts of alternatives on migratory fish and wetland habitats. Landscape architects can study how proposed changes affect the recreational, spatial, and aesthetic landscape, and help the public visualize how access and use might evolve if the dam is removed. The team may also include local environmental planning agencies helping to manage the project. A neutral third-party facilitator is strongly recommended—someone who does not have a stake in the outcome and can remain impartial throughout the process.

STEERING COMMITTEE

The steering committee should include key local stakeholders who represent diverse interests in the project. Members might include representatives from local, state, and federal agencies; local tribes; river advocacy organizations; nonprofits; community organizations; and historical societies. The steering committee should encompass voices able to speak to all the major dimensions of a dam decision. This group works closely with the project team to guide both the process and content, ensuring that multiple perspectives are represented and that the outcomes are grounded in community context.

PUBLIC

When planning outreach, it is helpful to distinguish between two main categories of the public:

- **The broader public**, whose interests in the dam and river may be rooted in recreation, heritage, ecology, spirituality, or civic identity but whose property will not be directly physically or financially impacted by the decision.
- **Directly affected stakeholders,** such as adjacent property owners or business owners whose properties, access, or economic interests may be directly impacted by the decision.

The level of involvement from the general public will vary widely from project to project. Contentious dam decisions—especially those involving highly visible or historically significant structures—often draw greater participation than less controversial ones. However, even well-attended public meetings typically represent only a small segment of the population, often skewed toward those with the time, resources, and confidence to participate—such as older, wealthier, or more formally educated residents.

Recognizing these limitations, the project team should make a concerted effort to reach a broader and more diverse audience. A multi pronged approach might combine structured workshops, like those described in this guide, with more accessible forms of outreach—pop-up events, local business partnerships, collaborations with schools and community groups—to ensure that a wider range of voices and values are represented in discussions about the river's future.

ADJACENT PROPERTY OWNERS

When planning outreach, it is essential to engage directly with property owners and businesses whose land or operations may be financially or physically affected by the decision. These stakeholders have a tangible connection to the dam and its surrounding landscape and are often among the most vocal and influential participants in the process. Building relationships early can prevent misunderstandings, reduce resistance, and cultivate trust.

For directly affected property owners, the project team should prioritize individual or small-group meetings early in the process, well before public workshops or hearings. Early, face-to-face conversations allow for open and transparent discussion about potential impacts, help identify specific concerns or data needs, and can prevent misinformation or mistrust from spreading later.

In past projects, when property owners have felt excluded or caught off guard, frustration has sometimes led to the formation of organized opposition groups. Taking the time to engage adjacent property owners early—listening carefully to their concerns and explaining the process clearly—can reduce conflict and build shared understanding from the outset.

Who Should Attend These Meetings

Meetings with directly affected property owners should be attended by a small team that includes:

- A project lead or facilitator familiar with the goals and process of the project.
- A technical expert (such as an engineer or hydrologist) who can speak clearly about the site conditions, potential changes, and safety concerns.
- A local liaison who understands local context and can help ensure conversations remain respectful and productive. This could be someone from the steering committee or a local municipal representative (such as a conservation agent, planner, or public works staff person).

How to Reach Out

Outreach should begin before public meetings and well before alternatives are finalized. Property owners should hear about the project directly from the team—not through rumors or media. Common approaches include:

- Personal letters or emails introducing the project and offering a meeting. Letters should include clear contact information, a short project overview, and an invitation for one-on-one discussion.
- Phone calls or door-to-door introductions can be effective in smaller communities, especially when conducted by a trusted local figure or project partner.
- In municipalities where property records are public, tax assessor databases or GIS parcel maps can be used to identify and contact owners of adjacent or upstream/downstream properties.

How to Conduct the Meeting

Meetings should be informal, ideally at the property owner's home, dam site, business, or a neutral local location. The purpose is to listen as much as to inform. Key steps include:

- Explaining the purpose of the project and the steps of the process.
- Communicate to the property owner that a range of options, including but not limited to removal, are being considered for the future of the dam
- Provide visual materials such as aerial maps, photos, or diagrams to help ground the discussion in the specific site context.
- Ask open-ended questions: "What concerns do you have about potential changes to the river and dam?" or "What do you value most about this place?"
- Take notes on concerns and values—these can help shape project objectives and communication strategies later in the process.
- If uncertainties exist (for example, about potential changes to water levels or access), acknowledge them honestly and describe how the project team plans to address them through studies or further analysis.

Follow-Up

After each conversation, send a short summary of what was discussed, along with contact information and next steps. Continue to keep these property owners informed throughout the process. Maintaining open communication helps ensure that directly affected residents feel heard and respected—even if they disagree with the final outcome.

WHO IS THE DECISION MAKER?

Ultimately, the decision about the future of a dam—whether to repair, modify, or remove it—rests with the owner of the dam. In New England, dams may be privately owned, municipally owned, owned by state or federal agencies, or by corporations, utilities, or water districts. In some cases the dam owner is unknown. While state and federal permitting agencies have regulatory authority over the environmental and engineering aspects of any proposed action, they do not determine whether a dam should stay or go; rather, they review, approve, or condition proposals put forward by the owner. Understanding who owns the dam and how that ownership structure makes decisions is essential to planning meaningful public engagement.

Publicly Owned Dams

When a dam is publicly owned—by a municipality, water district, or state agency—the final decision about its future is made through established public-governance procedures. Decisions about public infrastructure such as dams generally require both technical evaluation and formal authorization by an elected body, often following public meetings, staff recommendations, and engineering reports. In the case of municipal ownership, the governing body, such as a select board, town council, city council, or board of public works, typically make the formal decision about whether to repair, remove, or modify the structure. Once a decision is made, the municipality carries out the necessary next steps, including securing funding, contracting, and completing required permit filings.

Common practices and constraints:

Governance Body Authority: In many New England municipalities, a select board (in towns) or city council (in cities) has authority over municipal property decisions, including infrastructure. They may vote to authorize a dam project (repair, removal, or modification), allocate funding, or delegate the task to a department (of public works or engineering, for example).

Charter or Bylaw Dependence: The municipal charter, bylaws, or town meeting structure can influence who has authority—some municipalities require town meeting votes (in addition to a select board vote) for large capital projects.

Department and Staff Role: Before the governing vote, the municipal public works, engineering, or conservation departments typically develop or contract out assessments, feasibility studies, cost estimates, and proposals to present to the governing body.

Public Input: Municipal governing bodies often hold public hearings or solicit public comments before approving significant infrastructure changes, especially for controversial or costly projects like dam removal. This may be mandated by local laws or expected by practice. Some past municipal projects have been subject to town meeting votes or appropriations votes to approve removal, modification, or maintenance funding for a dam.

Privately Owned Dams

For privately owned dams, the owner ultimately decides whether to pursue removal, modification, or repair. That decision can only proceed if all required local, state, and federal permits are obtained. These permitting steps create formal opportunities for public input, which can influence the design, conditions, or even the feasibility of the proposed action. In some cases, private dam owners actively seek public involvement. In others, owners may prefer to move forward with their chosen course of action regardless of public concerns or preferences.

Although private owners are not legally required to engage the public in discussions about the dam's future, there are still several key points in the permitting process where public participation is built into regulatory review. These include public notices, comment periods, and hearings associated with wetlands, water quality, and federal permitting processes, each offering opportunities for community members to voice concerns or provide input that can shape final outcomes. Early, well-documented participation is most effective, particularly during scoping, wetlands hearings, and environmental review windows. See the permitting section later in the document for more information about the permitting process.

Key Public Input Opportunities — Massachusetts

- Massachusetts Wetlands Protection Act (WPA): Local Conservation Commission holds a public hearing on the Notice of Intent (NOI).
- Massachusetts Environmental Policy Act (MEPA): If triggered, public comments are accepted on the Environmental Notification Form (ENF) and/or Environmental Impact Report (EIR).
- 401 Water Quality Certification (Massachusetts Department of Environmental Protection – MassDEP): Requires public notice and a defined comment period.
- Massachusetts Public Waterfront Act (Chapter 91 Waterways): Public notice and, where applicable, a hearing for work in tidelands or Great Ponds.
- United States Army Corps of Engineers (USACE) – Clean Water Act Section 404 / Rivers and Harbors Act Section 10: Public Notice and approximately 30-day comment period for Individual Permits.
- Section 106 of the National Historic Preservation Act (Historic/Cultural Review): Public participation occurs when a federal project may affect historic or cultural properties.

Key Public Input Opportunities — Rhode Island

- Rhode Island Department of Environmental Management (RIDEM) – Freshwater Wetlands: Public notice and comment period.
- Rhode Island Coastal Resources Management Council (CRMC) – Assent: Public notice issued; formal objections can trigger a public hearing before the Council or a subcommittee.

- 401 Water Quality Certification (Rhode Island Department of Environmental Management – RIDEM): Public notice and comment period when required.
- United States Army Corps of Engineers (USACE) – Clean Water Act Section 404 / Rivers and Harbors Act Section 10: Public Notice and approximately 30-day comment period for Individual Permits.
- Dam Safety Program (RIDEM): Constituent reports or public concerns can prompt inspections or enforcement actions relevant to project decisions.

Federally Licensed Hydropower Dams

The Federal Energy Regulatory Commission (FERC) is the federal agency responsible for licensing and overseeing non-federal hydropower projects in the United States. These licenses typically apply to privately owned, utility-owned, or municipally owned dams that generate electricity and are connected to interstate waters or the power grid. FERC's authority covers the construction, operation, and safety of these hydropower facilities, as well as their environmental performance.

Licenses are generally issued for a term of 30 to 50 years, after which the dam owner must undergo a relicensing process to continue operation. Relicensing provides one of the most comprehensive opportunities to revisit how a hydropower project affects the river ecosystem and surrounding communities. It is a moment when decisions can be made about flow management, fish passage, recreation access, cultural resources, and overall river health.

Key Public Input Moments in FERC Relicensing

The FERC relicensing process includes several formal and informal opportunities for public participation. These occur across multiple stages of the Integrated Licensing Process, as outlined below:

1. Pre-Application Stage:
   The process begins when the dam owner files a Notice of Intent and Pre-Application Document (PAD). FERC then holds public scoping meetings and invites written comments to identify key issues and studies needed to evaluate project impacts.

2. Study Plan Development:
   The applicant drafts a Study Plan describing how project impacts will be analyzed. Public agencies and stakeholders can comment, propose modifications, or dispute methods before FERC approves the plan.

3. Draft License Application:
   Once studies are complete, the Draft License Application is circulated for public and agency review. Feedback at this stage can shape proposed operations and mitigation measures.

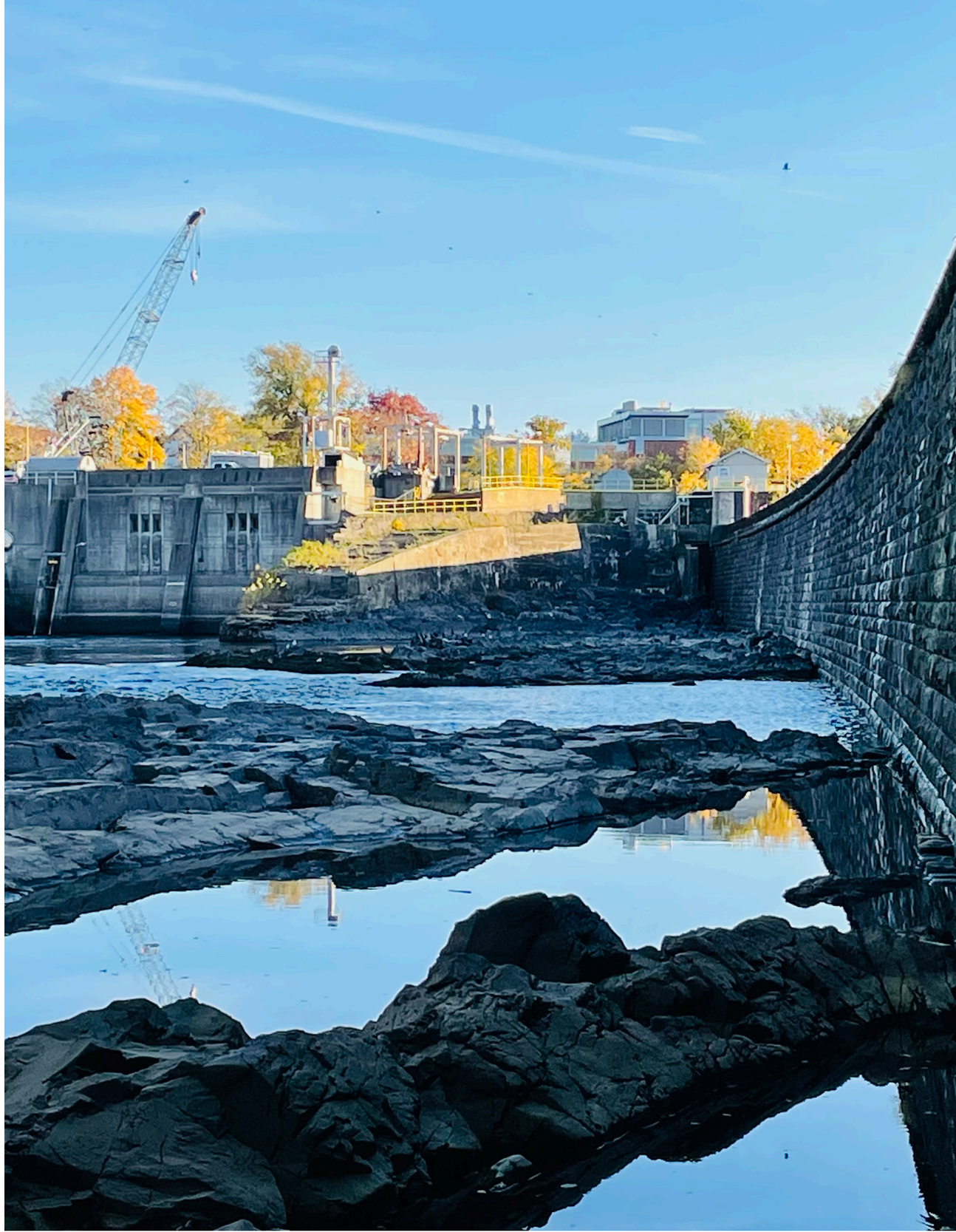
4. Environmental Review (NEPA):
FERC releases a Draft Environmental Assessment (EA) or Environmental Impact Statement (EIS) for a formal public comment period (typically 30–45 days), often with public meetings or hearings.

5. Final License and Rehearing:
After considering all input, FERC issues a Final License Order. Stakeholders may request a rehearing if they believe key issues were not adequately addressed.

6. Settlement Agreements (Throughout):
At any stage, stakeholders may negotiate settlement agreements outlining restoration, mitigation, or monitoring commitments. FERC may incorporate these agreements into the final license if they serve the public interest.

Summary

Across ownership types, the owner makes the final decision about a dam's future. For publicly owned dams there will be a greater opportunity for public input. For privately owned dams, permitting and licensing processes create structured opportunities for public input and regulatory review—moments when communities can help shape outcomes, add conditions, and improve designs.



HOW TO USE THESE TOOLS

In this section, we share a range of tools designed to support different stages of the decision-making process. Some tools are intended for the project team, others for a steering committee, and others for the general public. Not all tools or steps will apply to every project, and the process will rarely unfold in a perfectly linear way. We offer several possible sequences for how these tools might be used together; however, the exact structure and interaction between the project team, steering committee, and public will vary with each context.

This is a workshop-based approach, which differs from a conventional meeting in both purpose and format. Whereas meetings often focus on sharing updates, making announcements, or obtaining approvals, workshops are designed for collaboration, learning, and problem-solving. Workshops invite participants to engage directly with materials, exchange perspectives, and collectively explore alternatives. They create space for dialogue and reflection—building understanding and trust among participants. Workshops can be structured around specific activities such as identifying objectives, brainstorming alternatives, or evaluating trade-offs, each using tools from this guide to support structured participation and transparent discussion.

For this reason, the toolkit is meant to be flexible. Practitioners and community members are encouraged to take whichever components are most useful and adapt them to their own process. Some may find value in the objective cards to help clarify community values; others may use the decision matrix to evaluate alternatives or employ the visualization methods to communicate potential outcomes. The tools can be used individually or in combination, depending on the scale, timeline, and goals of the project. We encourage practitioners, educators, and community members to share their adaptations, improvements, and lessons learned so that this toolkit can continue to evolve as an open, collaborative resource.

OVERVIEW OF STEPS AND TOOLS

1. PROBLEM FRAMING:

This first step defines the context and scope of the dam decision. It involves clarifying what decision needs to be made, who will be involved, and what the timeline and boundaries are. The goal is to ensure that everyone understands the challenge and what is at stake before moving forward.

1.1	Roll-playing Exercise	Steering Committee + Project Team
1.2	Data Collection	Project Team
1.3	Problem Sketch	Steering Committee
1.4	Paddle The River!	Public + Steering Committee + Project Team

2. DETERMINING OBJECTIVES:

Here, the group identifies what matters and may be impacted by the decision—ecological health, public safety, recreation, cultural heritage, or other priorities. These objectives guide the evaluation of different options and help make sure the process reflects the values and interests of the community.

2.1	Brainstorming Objectives	Steering Committee + Project Team
2.2	Objective Cards	Public
2.3	Developing Performance Measures	Steering Committee + Project Team

3. IDENTIFYING ALTERNATIVES:

This step involves brainstorming a full range of possible actions—from complete removal to repair or modification. The goal is to encourage creative, open-ended, site-specific thinking without locking into any single solution.

3.1	Case Studies	Project Team + Steering Committee
3.2	Brainstorming Alternatives	Public + Steering Committee + Project Team
3.3	Site Visit	Public + Steering Committee + Project Team

4. ESTIMATING CONSEQUENCES:

Each alternative is analyzed for its likely impacts—ecological, social, economic, and safety-related. This might involve engineering or scientific studies, visualizations, and/or expert input to help everyone understand the potential outcomes of each alternative.

4.1	Feasibility Studies	Project Team + Steering Committee
4.2	Visualizing the Alternatives	Project Team
4.3	Filling in the Decision Matrix	Project Team + Steering Committee

5. EVALUATING TRADE-OFFS:

The group compares the alternatives using a decision matrix, weighing how well each option meets the objectives. This step makes the pros and cons visible, supporting transparent, informed discussion and helping the group see where compromises might be possible.

5.1	Decision Matrix	Public + Steering Committee

6. DECIDING AND TAKING ACTION:

The outcome of the public process is communicated to the decision maker(s) and a final decision is made. This includes documenting the process, securing permits, developing final design and construction documents, and setting up a long-term adaptive management and stewardship plan.

6.1	Final Report	Project Team
6.2	Permitting	Project Team
6.3	Implementation	Project Team
6.4	Stewardship	Public + Steering Committee

SINGLE WORKSHOP

In some cases, it may make sense to combine all steps of the decision-making process into a single meeting. This format works well as an early exploratory workshop when the goal is to identify community interests and determine which alternatives should advance to a feasibility study, or when it is unlikely that participants will attend multiple sessions. Hosting several such workshops—at different times or locations—can also broaden participation.

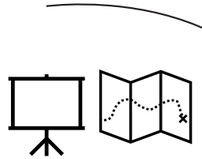
A single exploratory workshop can serve as an early step in a longer public process. Introducing discussion about the future of the dam in this setting helps communities begin to discuss potential changes without immediately triggering resistance to dam removal. The exploratory workshop model can jump-start dialogue, clarify community priorities, and identify which alternatives warrant further study. At this stage, consequence estimates will likely be general, and that is okay—the process helps determine what data will be needed in subsequent feasibility studies. Results from those studies can then inform a second round of workshops with more detailed and quantitative performance measures using the same decision-making framework.

For single-session workshops, the objectives and alternatives are typically determined in advance by the project team and steering committee. However, leaving blank objective cards and empty alternative columns in the matrix can invite participants to share ideas that may have been overlooked. Facilitators might ask, "What's missing from this list?" to encourage reflection and ensure that all community perspectives are represented.

WORKSHOP PLAN

1. Introduction (Problem Framing)

- Presentation- what is known about the dam.
- Discuss the process and timeline.



2.Discuss Objectives

- Participants select objective cards.
- Participants use the objective cards to share their interests and concerns about the future of the dam.

3. Present Alternatives

- Present case studies and alternatives.
- Explain matrix.

4.Group Discussion of Alternatives

- Discuss case studies and alternatives.
- Brainstorm other alternatives.
- Review Matrix.

5.Evaluate Tradeoffs

- Participants rank alternatives.
  GREEN = Preferred option
  YELLOW = Acceptable option
  RED = Oppose

6. Conclusion

- Report out.
- Closing remarks.

MULTIPLE WORKSHOPS

If a dam is publicly owned, highly visible, or strongly tied to community identity, it will likely require a more extensive public process that provides meaningful opportunities for public involvement. In these cases, the decision-making process should be designed as a series of workshops and check-ins that allow for ongoing exchange between the project team, the steering committee, and the public.

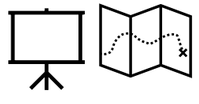
We recommend engaging the public at a minimum of four key points during the process:

- An initial workshop where participants discuss the project scope and provide input on project objectives
- A second workshop where participants provide input on project alternatives
- A third workshop where participants evaluate the alternatives
- A final meeting when the project team or decision makers present the final report and final decision

The process is iterative, with ongoing communication between the project team, steering committee, and public. The team may first refine materials internally, review them with the steering committee for initial feedback, and then share them more broadly with the public for input. This cycle—of refinement, feedback, and revision—may occur several times over the course of one or more years, depending on project complexity, funding, and permitting timelines.

On the following page is an example timeline of how this process might unfold over the course of a couple years. Sample agendas for each workshop are provided in the appendix and editable google doc versions are available on the website- www.thedamatlas.org

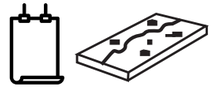
FIRST WORKSHOP



DISCUSS PROJECT FRAMING + DETERMINE OBJECTIVES

- Presentation of what is known about the dam.
- Discuss the process and timeline.
- Participants select objective cards and use the cards to share their interests and concerns about the future of the dam.

SECOND WORKSHOP



BRAINSTORM ALTERNATIVES

- Overview of charrette and presentation of case studies.
- Participants select objective cards to introduce themselves.
- Charrette to develop alternatives.

THIRD WORKSHOP

EVALUATE ALTERNATIVES

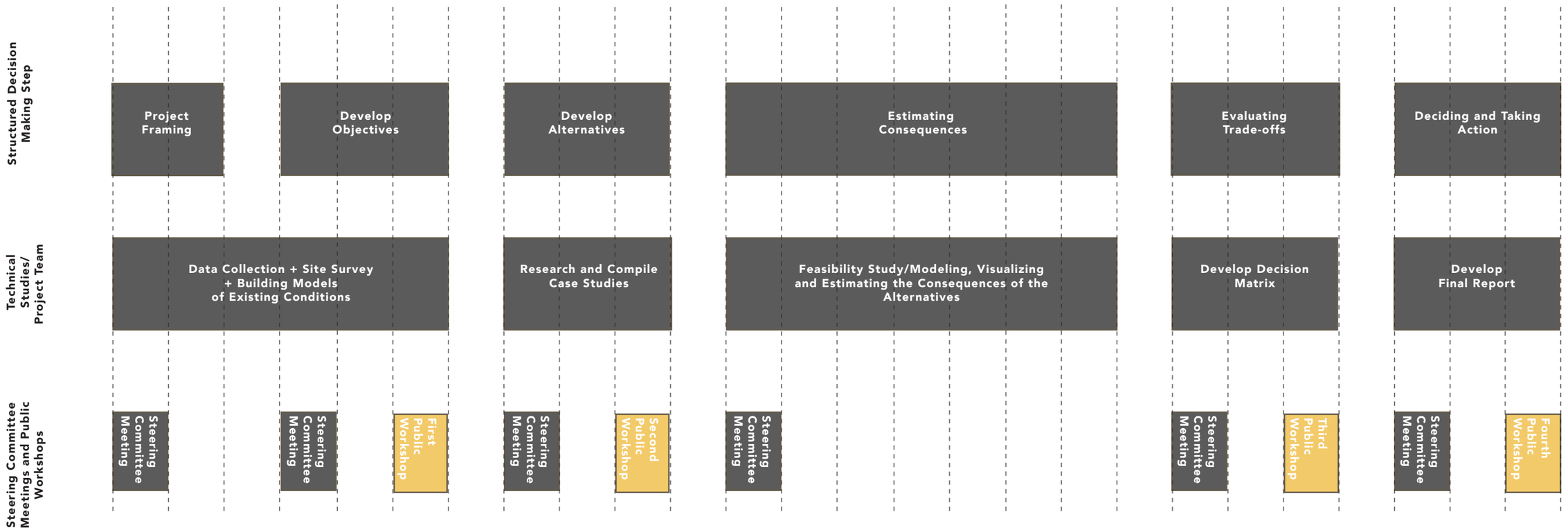
- Overview of matrix.
- Participants select objective cards to introduce themselves.
- Rank alternatives on the matrix.

FOURTH WORKSHOP

FINAL REPORT

- Presentation of outcome of public process and the final decision.
- Discuss next steps.
- Discuss opportunities for adaptive management and stewardship.

SAMPLE TIMELINE



Example of Project Timeline

WORKSHOP SETUP

Whether you are hosting a public meeting as part of a single exploratory workshop or as the first in a series, it is important to think carefully about how to create the conditions for a productive and inclusive conversation.

VENUE

Choose a neutral venue that feels accessible and welcoming to all community members. Public spaces such as libraries, gymnasiums, or community centers often provide suitable rooms that can be used free of charge. The neutrality of the space helps reinforce the openness of the process.

SIGN-IN AND PARTICIPANT DISTRIBUTION

As community members arrive, ask them to sign in. This allows for follow-up communication and continuity if multiple meetings are planned.

After sign-in, distribute participants randomly among tables of five to ten people to ensure a mix of perspectives at each table. Randomization helps prevent clustering of participants who already share similar viewpoints. To achieve this, assign each attendee a color or number at registration that corresponds to a designated table.

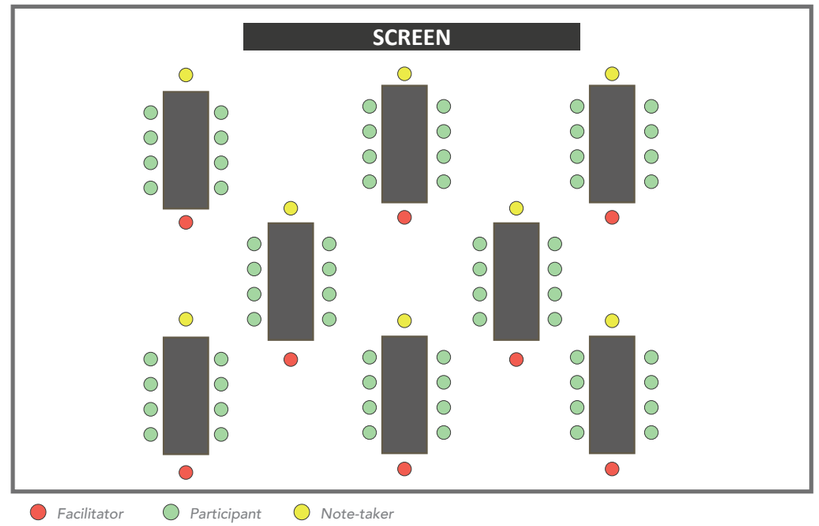
GROUP TABLES

Breakout tables are essential because dialogue is at the heart of community-engaged decision-making. Small-group discussions allow participants to listen to different perspectives, ask questions, and engage in civil exchange with fellow community members. Facilitated discussions ensure that everyone has the opportunity to participate, build understanding of others' viewpoints, and open the space for negotiation and collaboration.

ROLES

Each table should have a facilitator and a note-taker.

- The facilitator guides the discussion, introduces decision-making tools, and helps keep the conversation focused and inclusive.
- The note-taker records comments and key points so they can be included in meeting summaries, reviewed by the project team, and factored into the decision-making process. Because not everyone will hear all comments, detailed note-taking is essential to ensure that ideas raised in small groups are captured and represented in subsequent discussions.



POP-UP EVENTS

In addition to more formal workshops, pop-up events can be a useful tool in community engagement around dams. Pop-up events—sometimes called pop-up offices or mobile engagement booths—are temporary, informal spaces set up in public locations where community members naturally gather, such as downtown sidewalks, libraries, grocery stores, festivals, parks, or farmers' markets. Designed to be approachable and visible, pop-ups invite residents to stop by casually, ask questions, and share thoughts without the formality or time commitment of a public meeting.

Pop-ups bring the conversation about river and dam projects to the community, rather than expecting the community to come to a meeting. They can take the form of a staffed table, small tent, or even a vacant storefront transformed into a short-term information hub. By meeting people where they are, pop-ups lower barriers to participation and help reach a broader cross-section of the public—including residents who might not normally attend a workshop or hearing.

WHY POP-UPS?

Pop-ups can be especially valuable for projects involving dams, where decisions are often complex, technical, and emotionally charged. By creating an informal space for dialogue, they:

Lower barriers to engagement. People can stop by for a brief conversation without needing to attend a scheduled meeting. This encourages participation from a wider demographic, including younger residents, parents, and those with limited availability.

Increase visibility and awareness. Pop-ups are highly visible and serve as a public reminder that a decision-making process is underway. For example, the Ipswich River Watershed Association (IRWA) opened a downtown pop-up office ahead of a town vote on dam removal to increase visibility and invite informal, drop-in conversations about the future of the river.

Encourage informal feedback and social learning. Visitors can ask questions, look at visual materials, and share local knowledge or concerns in a relaxed setting. This helps project teams understand public perceptions and refine messaging before formal workshops.

Build trust and transparency. Having project representatives available in person demonstrates accessibility and openness. It helps humanize technical processes and allows residents to see that their perspectives are being heard.

PRACTICAL TIPS FOR ORGANIZING POP-UPS

Choose visible, accessible locations. such as libraries, town greens, community events, or local markets. Schedule times when foot traffic is highest.

Design engaging displays. Use large maps, before-and-after renderings, and simple diagrams. Avoid jargon and keep text concise.

Make it interactive. Provide sticky notes, comment cards, or tablets for participants to record their priorities, memories, or concerns. Consider displaying objective cards and asking people to fill out the decision matrix.

Staff with care. Make sure the pop-up is staffed with a project representative who can explain the technical aspects of the project and be there to listen, answer questions, and document input.

Promote and document. Announce events through town newsletters, local news, and social media. Take notes or photos to record common questions and themes. Share a short summary afterward so participants can see how their input is being used.

Pop-ups work best when integrated with other engagement strategies, forming part of a multilayered process that builds awareness, dialogue, and trust over time.

1

PROBLEM FRAMING

One of the first steps in any decision-making process is to define the problem, clarify the decision context, and establish the project's scope. This typically occurs early with the project team and steering committee to ensure a shared understanding of what the process will address.

Key questions to clarify include:

- What is the decision to be made?
- Should the focus be on a single dam, a river reach, or the entire watershed?
- Who are the final decision-makers, and how will public input be incorporated?
- How does this decision relate to others in the region?
- What is the timeline?

Determining the appropriate spatial scale of a project is a critical early step that shapes both analysis and engagement. Focusing on a single dam may be appropriate when the structure presents immediate safety concerns, clear ecological opportunities, or strong community interest. However, rivers rarely function as isolated systems—decisions about one dam often affect and are influenced by conditions upstream and downstream. Taking a reach-scale or whole-river perspective can help reveal cumulative impacts, interdependencies among structures, and broader opportunities for restoration, access, and recreation. In some cases, beginning with one dam can serve as a pilot that informs or catalyzes future projects within the same watershed.

At this stage, it is also critical to identify who the ultimate decision-makers are and how public input will be incorporated into the final decision. Clarifying this early helps manage expectations, ensures transparency, and avoids confusion later in the process. It also enables the project team to design engagement strategies that align with how and when decisions will actually be made. By making the decision pathway explicit from the start, participants can better understand how their voices contribute to the outcome and where influence is most meaningful along the way.

1.1

MAKING DECISION - PROBLEM FRAMING

ROLE PLAYING EXERCISE

WHO:
Project Team and Steering Committee

TIME:
2 hours

PURPOSE:
Roll playing can be a valuable way for people to understand issues from another persons perspective.

MATERIALS:
Printed character cards
Printed objective cards
Printed alternative cards
Printed matrix
Green red and yellow dots

OVERVIEW

Given that many dam decisions unfold over multiple years, it is important to take time at the beginning of the process for members of the steering committee to get to know one another. It is also valuable to create opportunities for participants to consider the decision from other members' perspectives.

Role playing provides a forum for engaging participants in a hypothetical yet realistic decision-making scenario. By assuming roles different from their own, participants gain insight into other stakeholders' perspectives, interests, and constraints.

We developed a role-playing scenario to help members of the steering committee better understand one another's viewpoints and priorities, while also introducing them to the decision-support tools that will later be used in public meetings.

In a typical exercise, participants are assigned stakeholder roles—such as dam owner, fisheries biologist, local historian, business owner, or resident living downstream—and are presented with a fictional but realistic dam decision case. Working in small groups, they review background materials, articulate their stakeholder's objectives, and discuss trade-offs using a simplified decision matrix. The session usually lasts two hours and concludes with a group reflection on insights gained, how perspectives shifted, and how the process might inform real-world collaboration.

HOW TO PLAY

Randomly assign five to ten participants and a facilitator to each table. Each participant receives a character card describing their role.

1:OVERVIEW + AGENDA

Main Organizer: Read the scenario aloud and review the workshop agenda with participants.

2: GROUP INTRODUCTIONS + OBJECTIVE CARDS

Facilitators: Place the objective cards in a row at the center of each table.

Ask participants to select five cards that represent their assigned character's interests and concerns about the dam, and to rank them from highest to lowest priority—from left to right

If participants feel their interests are not represented, encourage them to write a new objective on a blank card.

Next, ask participants to use the cards to introduce themselves and share their interests and concerns about the dam with the group.

3: CASE STUDIES + ALTERNATIVES + MATRIX

Main Organizer: Present several case studies that illustrate the alternatives being considered for the dam.

4: GROUP DISCUSSION OF ALTERNATIVES

Facilitators: Place the printed case studies in the middle of each table.

Ask participants which aspects of the case studies seem relevant to the Sabin Town Dam and encourage them to reference specific case study sheets when they speak.

Invite participants to suggest additional alternatives that should be added to the list under consideration.

Pause for questions and ensure that all participants understand the range of alternatives being discussed.

5: EVALUATING ALTERNATIVES + RANKING MATRIX

Facilitators : Hand out a matrix to each participant and place stacks of green, yellow, and red dots in the center of the table.

Ask participants to review the alternatives, then use the matrix to rank each option according to their level of support:

GREEN = Preferred option – "This is a great solution."
YELLOW = Acceptable option – "Not the best, but I could support it."
RED = Opposed – "I cannot support this option."

All participants must use one green and one yellow sticker.

Go around the circle and have participants share their rankings and explain their reasoning.

As participants present, compile the results on the facilitator's master copy of the matrix.

6: REPORT OUT and DISCUSSION

Facilitators: Share your group's final rankings and offer a brief reflection on the process.

Main Organizer: Open a full-group discussion by asking:

- What was your experience participating in the role-playing exercise?
- What perspectives or challenges did you notice?
- How might this exercise help prepare you for future discussions about the dam?

REFERENCES and ADDITIONAL RESOURCES

Song, Cuihong, Natallia Leuchanka Diessner, Catherine M. Ashcraft, and Weiwei Mo. 2021. "Can Science-Informed, Consensus-Based Stakeholder Negotiations Achieve Optimal Dam Decision Outcomes?" Environmental Development 37 (March): 100602. https://doi.org/10.1016/j.envdev.2020.100602.

Rumore, D., Schenk, T., & Susskind, L. (2016). Role-play simulations for climate change adaptation education and engagement. Nature Climate Change, 6(8), 745–750. https://doi.org/10.1038/nclimate3084

DATA COLLECTION

WHO:
Project Team with support of Steering Committee

TIME:
May take weeks or months to gather all the relevant data and make it into a clear presentation.

PURPOSE:
Compile everything that is know about the dam

MATERIALS:
Historic documents, studies, planning documents, town records, etc.

OVERVIEW

One of the initial steps for the project team is to collect and synthesize all available existing data on the dam, the river, and the surrounding landscape. These could include archival records of existing maps and plans, past dam inspection reports, FEMA flood mapping, aerial photos, historic maps and photographs, fisheries data, planning department reports, and utilities mapping. The initial reconnaissance phase is intended to determine the overall breadth of the project and the likely project challenges. The materials are best compiled into a presentation, document, and/or website that can be shared with the public and steering committee and kept for future reference.

DAM AND LAND OWNERSHIP:
Determine the date of construction and history of repairs and modifications of the dam through research and consultation with a civil engineer, expert consultants, and historical engineering drawings. Determine the dam owner and, if necessary, a point of contact for the dam owner. It may also be helpful to do a preliminary assessment of land ownership for the area around the impoundment and the dam structure.

DAM USES:
Determine if the dam and impoundment are currently serving any purpose that will necessitate replacement of the use. Many dams no longer serve the purpose for which they were designed, but many do provide important functions. Dams that provide water supply, hydropower, flood control, or road, rail, or other utility crossings may have more complex trade-offs than those structures that do not provide any services. In some cases, these purposes can be replaced by other means.

INFRASTRUCTURE:
Identify any potential infrastructure that could be impacted by dam removal. For example, if bridges cross any portion of the impoundment or cross the river downstream of the dam, an assessment of potential erosion will need to be made during the feasibility study. In some places, water and sewer pipes or telecommunication cables are routed through dams or impoundments, and alternatives for protecting or moving them will need to be assessed. Some dams are attached to mill buildings or retaining walls, requiring a stability assessment during the feasibility phase.

RARE SPECIES:
Determine if the dam, impoundment, and/or adjacent land are located in priority or estimated habitats for state or federally listed species. If these habitats are present, projects can only proceed through close consultation with state and federal biologists.

SEDIMENT QUALITY:
Preliminarily assess the potential for contaminants trapped behind the dam by considering current and past upstream land uses. Was there industrial activity upstream? Was there also industrial activity downstream that would lead to contaminants along the whole river corridor? Are there known contaminates in the area? Information on water and sediment quality in the river may also be available from past environmental studies. If studies are insufficient to determine potential contamination, a sediment sample may be needed. Sediment screening standards are available from state agencies.

COMMUNITY CONCERNS:
Preliminarily assess potential community interests and concerns. Is the impoundment currently used for recreation? Is there an opportunity for the construction of a park or canoe access following dam removal? Is the dam structure considered a historic resource for the site, neighborhood, or town?

SAFETY:
Preliminarily assess any safety concerns related to the dam. Review any past dam inspections and Emergency Action Plans. Is there currently any flooding in the area surrounding the dam? Are there communities that live downstream of the dam that could be impacted by a potential breech?

FUNDING POSSIBILITIES:
Determine potential "hooks" for funding possibilities. Foundations and agencies that provide grants for river restoration and dam removal have different interests. Some provide funds for projects that help anadromous fish, such as herring or salmon, or for sport fish, such as trout. Others will provide funds for climate resilience or public safety.

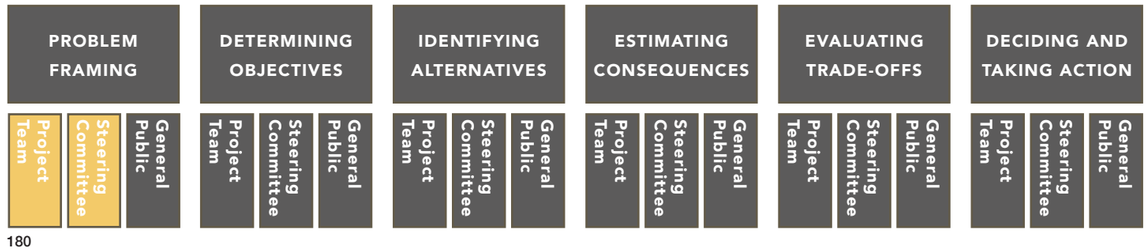
SITE SURVEY:
Contract a professional site survey. The site survey will create a scaled topographic base map showing existing conditions and will provide information necessary to assess engineering conditions and deficiencies, hydraulics, and sediment management. In order to completely survey the site, the surveying team must get in the water! The survey should include:

1 Topographic plans and cross-section drawings of the river and adjacent land upstream and downstream of the dam, including cultural infrastructure (buildings, roadways, utilities) as well as geographic features in and around the impoundment.

2. A survey of the deepest part of the stream downstream, upstream, and through the impoundment.

3. A survey of the impoundment bottom and the depth of soft sediment throughout the impoundment (bathymetry and depth to refusal).

4. A delineation and survey of the resource areas that will be affected as required in the Wetlands Protection Act and Army Corps of Engineers regulations.



REFERENCES and ADDITIONAL RESOURCES

Executive Office of Energy and Environmental Affairs (2007). *DAM REMOVAL in MASSACHUSETTS: A Basic Guide for Project Proponents.*

Historical Topographic Maps available here: https://www.usgs.gov/faqs/how-do-i-find-download-or-order-topographic-maps

1.3

MAKING DECISION - PROBLEM FRAMING

PROBLEM SKETCH

WHO:
Project Team and Steering Committee

TIME:
2-3 hours

PURPOSE:
Build understanding of key elements of the decision and get group familiar with SDM process.

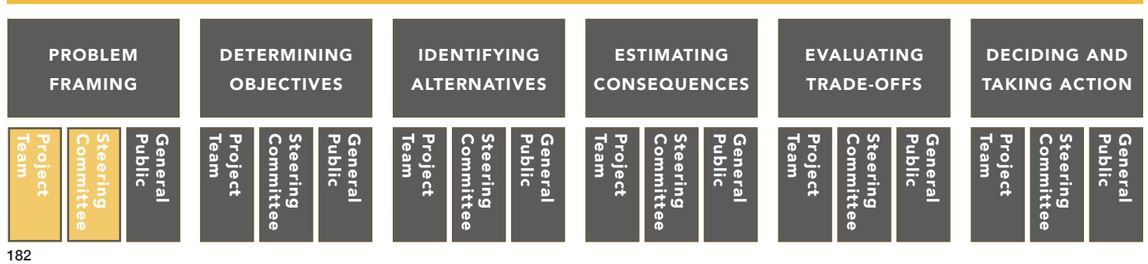
MATERIALS:
Printed blank decision matrix and/or a chalkboard or flip chart and writing materials.

OVERVIEW

During the early stages of problem framing, it can be helpful to conduct a brief problem sketch with the project team. The problem sketch walks quickly through the first steps of the Structured Decision-Making (SDM) process: framing the decision, identifying preliminary objectives, and outlining a range of possible alternatives. This exercise helps participants understand the SDM framework, build a shared understanding of key decision elements, and clarify what studies or data may be needed to evaluate the alternatives.

As part of this exercise, the group can begin drafting a preliminary consequence table that links objectives, performance measures, and alternatives. Developing this table early provides insight into potential information gaps, trade-offs, and uncertainties, helping the team determine what additional expertise, studies, or consultation may be needed to fully evaluate the alternatives.

It is important to remember that SDM—and the creation of a consequence table—is an iterative process. The goal of this early problem sketch is simply to better understand the decision and to test potential objectives and alternatives. The consequence table will evolve as the public becomes engaged and the decision context becomes clearer; objectives or alternatives may be added or removed, and their descriptions refined as the process moves forward.



PRE-WORKSHOP PREPARATION

Ensure that the room is equipped with a large chalkboard, whiteboard, projector, or another surface where the consequence table can be drawn. It should be clearly visible to the entire group as it is being filled in. You may also wish to print a draft consequence table for each participant so they can take notes and brainstorm individually during the discussion.

SETTING UP THE EXERCISE

Begin by asking participants what matters most to them regarding the issue or decision at hand. This question helps the project team identify and articulate preliminary objectives, which can then be added to the consequence table.

Encourage brainstorming and discussion, but avoid letting the group become overly focused on wording at this stage. The goal is to capture the main trade-offs and relationships among objectives and alternatives—not to finalize language or structure.

Once the group has completed the problem sketch consequence table, review it together. Ask:

"If this table were filled in, would it summarize the essential information needed to make a decision?"

This reflection helps assess whether the group has defined a clear and complete framework for moving forward.

SKETCH Consequence Table	Performance Measure	SCENARIO 1	SCENARIO 2	SCENARIO 3
OBJECTIVE 1				
OBJECTIVE 2				
OBJECTIVE 3				
OBJECTIVE 4				
OBJECTIVE 5				
OBJECTIVE 6				
OBJECTIVE 7				
OBJECTIVE 8				
OBJECTIVE 9				
OBJECTIVE 10				

REFERENCES and ADDITIONAL RESOURCES

Gregory, R., Failing, L., Harstone, M., Long, G., McDaniels, T.L., & Ohlson, D.W. 2012. *Structured Decision Making: A Practical Guide to Environmental Management Choices*. Wiley-Blackwell, Chichester, U.K.

See exercises:
2.1 for guidance on brainstorming objectives
2.3 for guidance on brainstorming performance measures
3.2 for guidance on brainstorming alternatives.

1.4

MAKING DECISION - PROBLEM FRAMING

PADDLE THE RIVER!

WHO:
Project Team, Steering Committee and General Public

TIME:
3-5 hours

PURPOSE:
Familiarize the Project Team, Steering Committee and public with the river and the dam site

MATERIALS:
Canoes/kayaks, maps, life jackets, insurance, water, snacks

OVERVIEW

Early in the process, it is helpful to get the steering committee, project team, and community members out on the river. When discussions take place only in meetings, it can be easy to lose sight of the river's physical realities. Getting out on boats and exploring the river—both upstream and downstream of the dam—helps everyone gain a clearer understanding of the dam within its context and of the key issues affecting the river.

Being on the water is one of the best ways to get to know a river. Participants can observe wildlife and vegetation, experience recreational opportunities firsthand, and better appreciate the river's ecological, cultural, and aesthetic significance. Direct experience also helps participants connect emotionally to the landscape, which can foster more thoughtful and grounded discussions later in the process.

If getting on the water is not feasible due to limited access, rapids, river scale, or accessibility challenges, consider at least organizing a site visit or walk along the riverbank. Even a short visit can help participants visualize the setting and understand how the river functions in relation to surrounding land uses. See Section 3.3 for more information about site visits.

PREPARATION

Determine a route that is reasonable given the group's time, experience, and comfort level. Ideally, begin upstream of the dam or series of dams under discussion and paddle downstream. Canoes are ideal for this activity, as they allow an experienced paddler to steer from the back while accommodating one or two less experienced participants in the front.

Take all necessary safety precautions to ensure the group's well-being, or partner with a local kayak or canoe outfitter that can assist with logistics and safety support. All participants must wear life jackets at all times.

DAY OF PADDLE

Before getting on the water, use an aerial or topographic map to orient the group to the area they will explore. Bring the maps along on the trip and, depending on the route length, pause periodically to reference them. This helps participants connect what they observe in the landscape to the mapped features and gain spatial understanding of the river system.

Ideally, include someone on the paddle who can speak to the ecological conditions that are observed along the route—such as plant and animal species, invasive species, and flow dynamics.

From the water, participants can observe upstream properties that may be affected by dam removal, note existing recreational uses of impoundments, and experience firsthand what it means to portage a dam.

Be sure to document the trip with photos or short videos to share with participants who were unable to attend.

REFERENCES and ADDITIONAL RESOURCES

To access topographic maps: https://www.usgs.gov/faqs/how-do-i-find-download-or-order-topographic-maps

For information on insurance contact the American Canoe Association Insurance: https://americancanoe.org/insurance/for-event-organizers/

2

DETERMINING OBJECTIVES

Project objectives represent the social, ecological, and economic attributes that are important to both the public and decision-makers. These objectives are used to evaluate and understand the consequences of the alternatives. The wording of each objective typically includes the thing that matters and a verb that indicates the desired direction of change. Clearly defining objectives helps translate important values into concrete terms relevant to the specific decision and can help participants shift their focus from positions to interests.

Example of possible objectives in dam decision-making include:

- Increase fish populations
- Maintain views of the historic dam structure
- Minimize negative impacts on hydropower production
- Reduce costs

Agreeing on objectives does not require that everyone assign the same level of importance to each one, or even that they personally hold that value. It only requires that participants recognize these as legitimate objectives—things that someone within the decision context cares about. This act of building shared objectives serves as both a practical and relational foundation. It allows participants to see the full range of community values represented and fosters empathy and curiosity toward perspectives different from their own. Research in both negotiation theory and Structured Decision-Making suggests that when groups can reach agreement on small, concrete matters—such as how to frame objectives—they build the trust and mutual understanding necessary to work through more complex and value-laden decisions.

After an initial list of project objectives are developed, performance measures will need to be assigned to the objectives. Performance measures are specific metrics linked to each objective that help compare and report how well each alternative performs. While scientific and economic metrics (e.g., water temperature, cost) may be easier to quantify, social and cultural considerations—such as sense of place or aesthetics—are equally important and should not be excluded simply because they are difficult to measure.

2.1

MAKING DECISION - DETERMINING OBJECTIVES

BRAINSTORMING OBJECTIVES

WHO:
Project Team and Steering Committee

TIME:
1-2 hours

PURPOSE:
Clarify project objectives

MATERIALS:
Paper for individual steering committee members + flip chart or blackboard for taking notes.

OVERVIEW

Good objectives help decision-makers focus on what matters most and what information will be needed to evaluate the alternatives. The process of developing objectives also helps participants identify shared values and build common ground early in the decision-making process.

During this activity, the goal is to create a list of objectives that:

- Capture all the things that matter when evaluating proposed alternatives
- Are concise and easily understandable
- Are influenced or impacted by the alternatives under consideration
- Are independent from one another

It is also important to begin distinguishing between means and ends objectives..

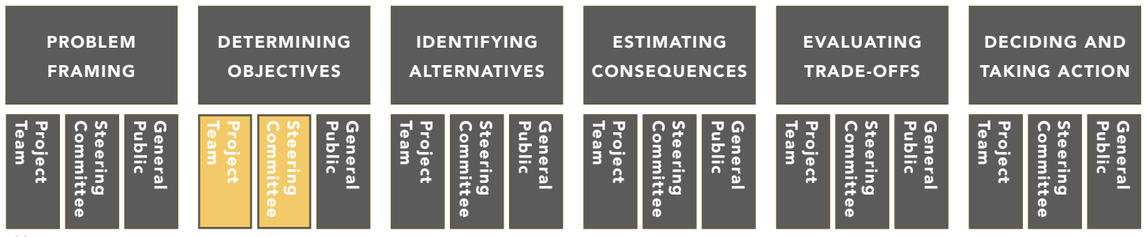
Fundamental objectives (ends) represent the outcomes you ultimately want to achieve.

Means objectives describe the actions or steps that help achieve those ends.

To move from means to ends, ask the question: "Why is that important?"

Just because an objective is difficult to measure does not mean it should be excluded. At this point, all factors that might influence the evaluation of alternatives should be included. Determining how to measure or account for them will come in a later stage of the process.

A simple means-ends diagram adapted from Gregory et al.



BRAINSTORMING

Begin by asking participants the following questions (write them on a flip chart or project them on a slide):

- What are we trying to achieve by making this decision?
- What specific issues or concerns would you like to see addressed?
- What specific issues or concerns might others want to see addressed through this process?

Ask members of the steering committee to take 5–10 minutes to write down their own ideas independently before sharing them with the group. If participants are strongly attached to supporting or opposing a particular solution, ask them to list what they see as positive or negative about that solution. This helps uncover the underlying values behind their positions.

SHARING

Once everyone has completed their lists, begin structuring the issues and concerns into a clear set of objectives. Ask participants to share their notes. Depending on the group size, it may be most efficient to have each person share three to four objectives in a first round, then invite additional ideas afterward.

As participants share, record the objectives on a flip chart or whiteboard so they are visible to everyone. Consider organizing them into broad categories such as ecological, social and cultural, infrastructural, or economic.

FUNDAMENTAL OBJECTIVES

The goal at this stage is to identify the fundamental objectives from the means objectives. One effective way to do this is by asking:"Why is that important?" A fundamental objective is one for which the answer to that question is simply, "because it is."

As participants share objectives, ask clarifying questions to help reveal the underlying purpose and meaning. It may also be useful to sketch a means–ends network to show how various objectives relate to one another. If participants mention process or strategic objectives, list these separately but adjacent to the fundamental objectives so their relationships can be understood and revisited later in the process.

HIERARCHICIZING

Once the group has agreed on a set of fundamental objectives, begin to organize them into an objective hierarchy that identifies subcomponents or sub-objectives. This structure will help clarify how broader goals relate to more specific outcomes. For Example:

Ecological Objectives: Increase fish passage, improve water quality

Social/Cultural Objectives: Maintain views of historic structures, enhance recreation access

Economic Objectives: Minimize costs, sustain hydropower generation

TESTING

Once an initial list of project objectives has been developed, it is important to test whether they are useful and sufficient for evaluating the alternatives. Creating another iteration of the consequence table is a valuable way to do this.

As a group, review the sketch consequence table and imagine it filled in with data. Ask:

- Does this list capture the issues that are most important?
- Is anything missing?
- Would these objectives allow us to fairly evaluate all alternatives?

This review helps ensure that the objectives are comprehensive, balanced, and measurable before the process moves forward.

REFERENCES and ADDITIONAL RESOURCES

Gregory, R., Failing, L., Harstone, M., Long, G., McDaniels, T.L., & Ohlson, D.W. 2012. Structured Decision Making: A Practical Guide to Environmental Management Choices. Wiley-Blackwell, Chichester, U.K.

OBJECTIVE CARDS

WHO:
General Public

TIME:
1 hour

PURPOSE:
Clarify project objectives and help people focus on interests not positions.

MATERIALS:
Objective cards

OVERVIEW

The deck of Objective Cards consists of 6" x 4" physical cards. On one side, each card lists a project objective; on the other, it includes a diagram and brief explanatory text that illustrate or expand on the issue.

Many people come to a public meeting about a dam with a clear position—for example, "keep the dam" or "remove the dam." One of the primary goals of using Objective Cards is to help shift the conversation from positions to interests—for instance, from "remove the dam" to "improve fish passage," or from "keep the dam" to "preserve the town's history." This shift is essential, because while positions lock participants into advocating for a single alternative, many of their underlying interests can often be achieved through multiple options.

Using the Objective Cards early in the public process helps participants begin from a place of common ground. For example, many may agree that maintaining a healthy river system is important. Such early agreement allows the group to discuss and evaluate options collectively, focusing on shared goals rather than opposing positions.

This process enables the public to define what matters most and identify what should be assessed in comparing alternatives. Conducting this activity in a public setting ensures that both ecological and social considerations are recognized and incorporated into the decision-making process. Ultimately, one of the goals of using Objective Cards is to actively involve the public in determining the project objectives themselves.

By providing a shared language and format, the cards allow people to negotiate meaning and connect scientific, technical, and cultural dimensions of dam decisions. This process helps participants articulate what matters most and identify what should be evaluated when comparing alternatives.

GOAL OF THE EXERCISE

1. Provide participants with a structured way to introduce themselves that encourages dialogue.
2. Help participants clarify the issues and values they feel most strongly about.
3. Invite participants to select five cards to broaden the discussion beyond a single issue or position.
4. Encourage a shift from positions to interests
5. Reinforce that both scientific facts and social values are being considered in discussions about the dam's future.

PRE-WORKSHOP PREPARATION

Begin by identifying the key objectives for the project through discussions with the steering committee and by reviewing existing studies, local histories, and records of community involvement. Ensure that the objective cards represent the full range of ecological, social, and economic considerations.

Once you have identified these key objectives, select and print the most relevant cards from the Objective Card deck. Be sure to include a supply of blank cards so that participants can contribute additional objectives or concerns during the session.

SETTING UP THE EXERCISE

After an introductory presentation outlining the decision context and goals of the workshop, place the Objective Cards face down in a row in the center of each table.

Ask participants to select five cards that best represent their interests and concerns about the dam. They should then arrange the cards in ranked order—from highest to lowest priority, left to right—and use them as prompts to introduce themselves and share their perspectives with the group.

Facilitators can help guide conversation by asking follow-up questions, such as:

- "Why is this issue important to you?"
- "How might this objective be affected by different alternatives?"

If printing a full set of cards for each participant is not feasible, ask participants to record their top five objectives on paper instead. When it is their turn, they can select the corresponding cards from the table and return them afterward.

Continue until everyone at the table has had a chance to share. This activity helps participants remain focused during introductions, recognize shared priorities, and begin developing a collective understanding of what matters most.


Fish Migration
Upstream Habitat
Long-Term Cha

2.3

MAKING DECISION - DETERMINING OBJECTIVES

DEVELOPING PERFORMANCE MEASURES

WHO:
Steering Committee

TIME:
2 hours

PURPOSE:
Clarify performance measures

MATERIALS:
Paper for individual steering committee members + flip chart or blackboard for taking notes.

OVERVIEW

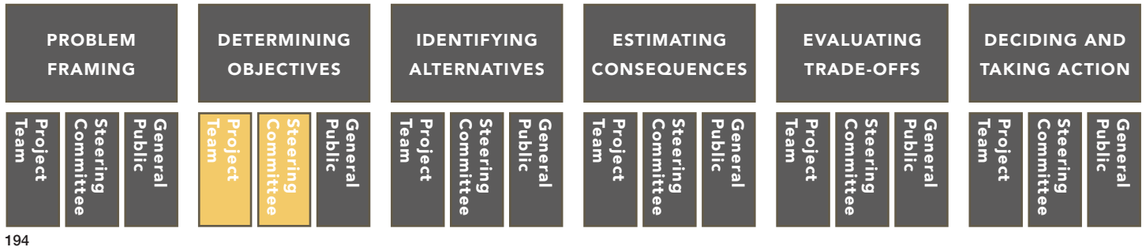
Once an initial draft of objectives has been developed, the next step is to identify performance measures that can be used to compare how different alternatives affect those objectives. The goal is to select measures that highlight meaningful differences in the impacts of management alternatives across social, ecological, and economic dimensions. Identifying performance measures often reveals the need for additional data collection or modeling. If it is not feasible to collect the required data or build models within the project's time, budget, or staffing constraints, alternative measures such as constructed scales and relative impacts will need to be identified.

Effective performance measures should be:

- **Unambiguous –** Clearly linked to the fundamental objective being evaluated.
- **Direct –** Directly related to the consequence or outcome of interest.
- **Comprehensive –** Cover the full range of possible outcomes.
- **Operational –** Supported by data that are available or can be feasibly collected.
- **Understandable –** Easily interpreted and communicated to both technical and non-technical audiences.

Types of Attributes

- **Natural Attributes:** Natural criteria directly measure the attribute itself—such as dollars for financial impacts or hectares for habitat area. Use natural criteria whenever possible; they provide the most direct and transparent basis for comparison.
- **Constructed Attributes**: Constructed scales are developed specifically for the decision context, often using relative or sliding scales (e.g., 1–5 or low–medium–high). They are useful for assessing complex or qualitative factors but can be ambiguous and open to interpretation. Use them carefully and explain their basis clearly.
- **Proxy Attributes:** A proxy is a measurable attribute strongly correlated with the objective but not directly measuring it—for example, habitat area as a proxy for species welfare. Use proxies only when natural or constructed attributes are unavailable, and make their limitations explicit, as they can obscure uncertainty or value judgments.



SETTING UP THE EXERCISE

Display the draft list of objectives so the entire group can see them clearly. This can be done using a flip chart, projector, blackboard or screenshare. Make sure there is enough space below each objective to record notes about potential performance measures.

BRAINSTORMING

Go through the objectives one by one, asking the steering committee:

"What specific information would you need in order to evaluate the impact of these alternatives?"

As committee members respond, record all proposed ideas for each objective on the board or flip chart.

Before moving on to the next objective, ask participants to consider the possible data sources or models that could be used:

"For each of these possible performance measures, what are potential sources of information for estimating this measure?"

Encourage discussion to evaluate and select the most useful performance measures for each objective. In some cases, time or funding constraints may prevent the use of the most ideal measure. Adjustments can be made later if it becomes clear that certain data or models are unavailable.

As with all aspects of the Structured Decision Making (SDM) process, identifying and refining performance measures is iterative—expect to revisit and improve these choices as new information becomes available and understanding deepens.

REFERENCES and ADDITIONAL RESOURCES

Gregory, R., Failing, L., Harstone, M., Long, G., McDaniels, T.L., & Ohlson, D.W. 2012. Structured Decision Making: A Practical Guide to Environmental Management Choices. Wiley-Blackwell, Chichester, U.K.

3

IDENTIFYING ALTERNATIVES

Within the Narragansett Bay and Rhode Island coastal watersheds, many aging dams are in poor condition, in need of repair, and no longer serve a purpose. Each dam is unique, with distinct ecological, social, physical, and economic factors that must be considered when exploring alternatives. Because most dams in New England are relatively small, there is often a range of feasible alternatives that can achieve multiple objectives.

Dam removal is frequently the most cost-effective approach to managing aging dams. It restores natural river functions and ecological connectivity, eliminates the risk of structural failure, and avoids long-term maintenance and repair costs. However, the social, cultural, and economic dimensions of local communities often warrant exploring additional options.

In some cases, conventional or nature-like fishways may be used in combination with partial dam removal. In others, historic canal infrastructure can be repurposed for fish passage structures. And sometimes full river connectivity can be restored while preserving all or a portion of the historic dam or spillway.

This diversity of potential outcomes underscores the need for a transparent, structured decision-making process—one that integrates technical studies with community values to support balanced, informed, and durable solutions for rivers and the communities that depend on them.

3.1

MAKING DECISION - IDENTIFYING ALTERNATIVES

CASE STUDIES

WHO:
Steering Committee and/or General Public

TIME:
1 hour

PURPOSE:
Review case studies of other similar projects to help understand possible alternatives

MATERIALS:
Case Study Cards

OVERVIEW

Each dam is unique, and its ecological, social, physical, and economic context must be carefully considered when exploring future scenarios. Unlike large dams—where few options exist beyond removal—small dams often present a wider range of feasible alternatives. While dam removal may be the most effective means of restoring river functions and ecological connectivity, the social, physical, and economic dimensions of a community may justify exploring additional options.

While typical design charrettes are open-ended and generative, dam-related planning processes benefit from a structured exploration of known alternatives—such as dam removal, partial removal, nature-like fishways, or rehabilitation—while still leaving space for creative, site-specific solutions that may emerge from the community.

Case studies are an effective way for both the steering committee and the general public to learn how other communities have addressed aging dam infrastructure. They familiarize participants with common alternatives and provide a shared foundation for discussion about possible solutions for the project at hand. Seeing examples of completed projects—such as photographs of restored river reaches—can help participants visualize future conditions and reduce uncertainty or fear of change. Case studies also help illustrate the types of technical, financial, and regulatory support needed to advance projects and highlight potential funding opportunities and constraints relevant to local decision-making.

PRE-WORKSHOP PREPARATION

Meeting organizers should select case studies that match the scale, type, and context of the dam being discussed. This resource includes downloadable PDFs of sample case studies, as well as editable Microsoft Word and Google Doc templates for creating new ones.

Prior to the workshop, print enough copies so that each table has at least one of each case study. If you plan to run multiple workshops, consider printing on card stock for durability and reuse.

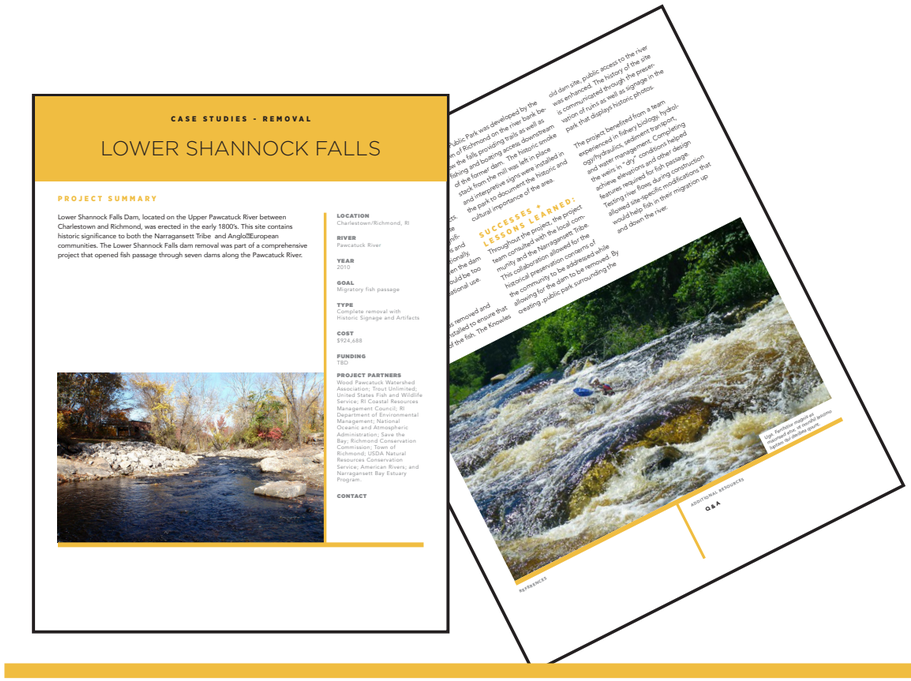
THE EXERCISE

During the presentation, the facilitator should introduce the case studies, highlighting key project details and outcomes. Using before-and-after photographs is especially effective for helping participants visualize the impact of different alternatives.

After the presentation, distribute the printed case studies to each table and ask participants to review them together.

Once everyone has had time to read and discuss, invite the group to reflect on the following questions:

- Are there any questions about the case studies?
- What aspects of each case study seem most relevant to the decision at hand?
- Given what we learned from these examples, what alternatives might be appropriate to consider for this project?



REFERENCES and ADDITIONAL RESOURCES

BRAINSTORMING ALTERNATIVES

WHO:
Steering Committee

TIME:
2-5 Hours

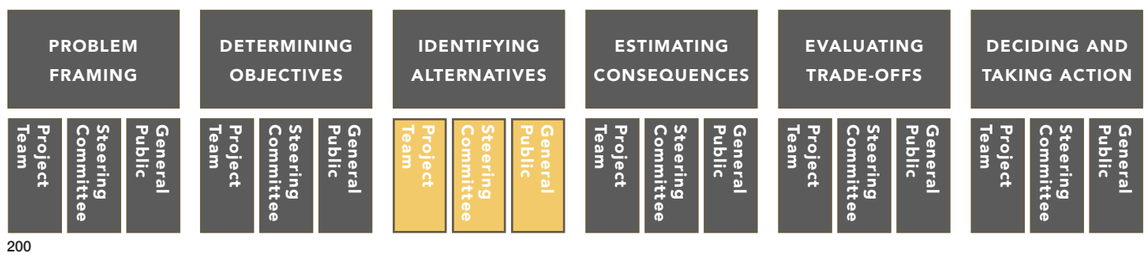
PURPOSE:
Brainstorm alternatives

MATERIALS:
Aerial and topographic survey printed at the same scale, photographs, trace paper, architectural or engineer scale, pens, pencils, markers

OVERVIEW

Community sentiment around a dam often varies depending on its location, structure, history, and use. If a dam is in the middle of the woods and is no longer serving a purpose, removal may be the best and only alternative worth pursuing. However, if there is community attachment to the dammed landscape, a range of alternatives may need to be considered. The nature of local attachment—whether to the dam itself or to the impoundment—can shape which future scenarios are most acceptable. For instance, a nature-like fishway can maintain the impoundment while significantly improving fish passage, though the dam structure may no longer be visible. Where space allows, a bypass channel can preserve the visual presence of the dam while enhancing fish passage and habitat connectivity. Even when a dam is removed, thoughtful design can help retain the site's sense of place and aesthetic character. A growing number of case studies illustrate these types of hybrid and adaptive solutions and can be shared with communities to help them visualize alternatives and understand how different approaches balance ecological restoration with cultural and social values.

This exercise engages the steering committee and general public in brainstorming creative alternatives for the river in a charrette style workshop. While dam modification alternatives may be more costly, require long-term maintenance, and not be as effective for improving river connectivity, exploring a full range of options allows discussions to move beyond the often perceived binary of keeping or removing the dam. The goal of the charrette is to encourage creative, open-ended, site-specific thinking to get as many possible alternatives on the table. Participants are encouraged to think broadly and defer evaluation until later. At this stage, the goal is to explore "what if" possibilities. Critiquing ideas too early can hinder creativity and discourage participation. The emphasis of this exercise is on creative exploration, not on feasibility. The ideas generated here can serve as a foundation for later evaluation and refinement within the Structured Decision Making (SDM) framework. Community members often respond positively to this approach, recognizing the project team's efforts to address local concerns and pursue solutions that meet multiple objectives.



SETTING UP THE EXERCISE

Depending on the size of the group, it may be helpful to divide participants into small groups of about five, seated comfortably around tables. Each table should have aerial images topographic maps at multiple scales, as well as and photographs of the dam and surrounding landscape. Each table should also be equipped with trace paper, scales, pens, and markers to support brainstorming and quick sketching of ideas.

If one of the goals of the project is to improve fish passage, it can be helpful to have an engineer at the charrette that specializes in the design of fish passage structures. The engineer can provide an overview of the design and constraints that need to be considered to make fish passage structures work for target species.

BRAINSTORMING

Begin by asking participants to individually write down their ideas for possible alternatives. Once everyone has had time to think, go around the table and invite each person to share their ideas. This approach encourages participation, reduces groupthink, and fosters creativity.

As participants describe their ideas—especially spatial ones—ask them to sketch on the trace paper. The facilitator can also help by sketching for the participant as they explain, confirming and adjusting as needed.

To help guide discussion, consider brainstorming around individual objectives. The facilitators can ask the participants:
"If you were focusing only on the objective of [insert objective], what alternatives might you consider?"

Challenge assumed constraints. Some may be real—others imagined. If an alternative seems compelling, ask:
"What would need to change to make this possible?"

Encourage participants to consider diverse perspectives by asking:
"If we presented this alternative to others, what concerns might they have? How could we address those concerns?"

Once an initial set of alternatives have been developed, the group can determine which are worth perusing into the next stages of work.

ALTERNATIVE PACKAGES

When analyzing a stretch of river, it may be helpful to begin by separating out the different components of the project and developing alternatives for each component separately. For example, you may start by brainstorming alternatives for each individual dam, then explore alternatives for the river channel, and lastly the entire watershed.

Keeping these components separate at first enables the project team to assess the consequences of each alternative on the project objectives before combining them into comprehensive alternative packages. These packages can then be adjusted and refined to test how different configurations or combinations of actions influence the objectives and overall project outcomes.

CHARACTERISTICS OF "GOOD" ALTERNATIVES

Value-Focused- Directly address the core values and objectives of the decision—the "things that matter" as defined by the objectives and evaluation criteria.

Technically Sound - Based on the best available data and understanding of cause-and-effect relationships, reflecting both creativity and rigor.

Clearly and Consistently Defined- Described at a consistent level of detail with coherent assumptions, including a clear base case for comparison.

Small in number and high in quality- Redundant or weak options are eliminated, leaving a focused set refined through iteration and collaboration.

Comprehensive and mutually exclusive- Composed of complete, internally consistent packages that can be directly compared to one another.

Able to expose fundamental trade-offs- Highlights, rather than hides, the key value-based trade-offs, offering meaningful choices for decision-makers.

REFERENCES and ADDITIONAL RESOURCES

Gregory, R., Failing, L., Harstone, M., Long, G., McDaniels, T.L., & Ohlson, D.W. 2012. Structured Decision Making: A Practical Guide to Environmental Management Choices. Wiley-Blackwell, Chichester, U.K.

Franklin Regional Council of Governments. 2025. River Restoration Design and Permitting in Massachusetts: A Guide for Inland Rivers, Greenfield, Massachusetts, 164 pp.

SITE VISIT

WHO:
Project Team, Steering Committee and General Public

TIME:
2-5 Hours

PURPOSE:
Gain familiarity with the site and help brainstorm possible alternatives

MATERIALS:
Aerial and topographic survey printed at the same scale

OVERVIEW

While discussing and developing a list of possible alternatives, it can be valuable to conduct a site visit with the project team and steering committee. Visiting the site helps ground discussions in the specific physical context and ensures that the alternatives being considered are informed by on-the-ground realities. Ideally if the public meeting is held close to the dam site, the alternatives brainstorming charrette can begin with the site visit and then participants can transition directly into the charrette.

Each potential alternative will have site-specific constraints that affect its feasibility. For example, understanding downstream conditions can determine whether a river-wide nature-like fishway is possible. Observing the available space around the dam and nearby infrastructure—such as bridges, utilities, or buildings—can clarify whether a bypass channel or partial removal is viable. Similarly, identifying which portions of the dam are visible from nearby roads may inspire design strategies that preserve elements of the structure while improving habitat connectivity.

A site visit encourages participants to think creatively within real-world constraints, helping the group identify opportunities to balance ecological restoration, cultural heritage, and physical feasibility in the design of alternatives.

PRE-SITE VISIT PREPARATION

Prior to the site visit, the project team should develop and print scaled aerial and topographic maps that can be brought on the site visit. Having the plans there can help participants connect what they see on-site with the project plans, supporting later discussions about site conditions.

DURING THE SITE VISIT

As a group, walk around the dam and the areas upstream and downstream, noting any missing data that could be gathered during the visit. Observations about height, slope, and adjacent infrastructure can help assess the feasibility of alternatives such as bypass channels, nature-like fishways, or removal, and inform what additional data may be needed.

If the dam is located in a developed or populated area, walk the surrounding streets to understand how the dam fits into the built and social fabric of the community. Consider questions such as: *Is the dam visible from nearby roads? Is the sound of the water audible? Are there homes or businesses adjacent to the structure?*

These observations can reveal how the dam contributes to the community's sense of place and how designs can respond to those conditions.

REFERENCES and ADDITIONAL RESOURCES

To access topographic maps: https://www.usgs.gov/faqs/how-do-i-find-download-or-order-topographic-maps

4

ESTIMATING CONSEQUENCES

Once the objectives and alternatives have been identified and agreed upon, the next step is to estimate the consequences of each alternative with respect to the evaluation criteria, using available knowledge and predictive tools. This step is primarily an analytical task, typically undertaken by scientists, engineers, economists, landscape architects, and specialists in traditional ecological knowledge.

Some of these specialists may be part of the core project team, while others may be external consultants engaged to provide specific expertise. For example, a fish biologist may be needed to estimate impacts on anadromous fish populations; engineers may conduct hydrology and hydraulics analyses to understand flood risk or flow changes; and landscape architects can help visualize aesthetic and spatial impacts, including how different alternatives may affect the community's sense of place.

The information gathered during this stage should be relevant to the decision context and developed according to best practices for avoiding bias, addressing uncertainty, and maintaining transparent documentation.

Once the data has been collected, it is essential to consider how this information will be communicated to the steering committee and the broader public. Technical results must often be translated into accessible, decision-relevant formats so that participants without disciplinary expertise can meaningfully engage with the material.

We recommend using visualizations and well-designed graphics—such as maps, diagrams, or before-and-after renderings—to facilitate dialogue and develop shared understanding. These visual tools can reveal relationships and insights that may not emerge through verbal or quantitative explanations alone, helping participants build a more holistic picture of the potential consequences of each alternative.

FEASIBILITY STUDIES

WHO:
Project Team and Consultants

TIME:
Months

PURPOSE:
To gather information that will help estimate consequences of the alternatives on the objectives.

MATERIALS:
Engineering and design software and programs.

OVERVIEW

The feasibility study provides concept-level plans and quantitative information on the environmental and engineering feasibility necessary to make final decisions about the project approach. Typically, this study includes analyses to evaluate how various alternatives would affect the structure itself, protect surrounding infrastructure, restore in-stream and riparian habitat, and manage sediment. This data can be used to populate and refine the consequence table, supporting a transparent evaluation of trade-offs among alternatives.

While every project is site-specific, the following components are commonly included in a feasibility study scope of work:

CONCEPTUAL DRAWINGS

Develop concept-level drawings for the full range of design alternatives, including options for repairing, modifying, or removing the structure and restoring the surrounding landscape.

HYDROLOGIC AND HYDRAULIC (H&H) MODELING

H&H modeling is a fundamental tool for engineering analysis and for evaluating how different alternatives affect water flow and flood risk.

- **Hydrology** examines the quantity of water (runoff) generated from a given watershed.
- **Hydraulics** evaluates how that water moves—its velocity, depth, and behavior in channels, pipes, or floodplains.

Combined H&H modeling allows for the simulation of various scenarios, helping to assess how each alternative could influence flood levels, flow regimes, and downstream impacts.

SEDIMENT MANAGEMENT PLAN

Quantitatively assess both sediment quality and quantity, and develop a conceptual plan for managing sediment under each alternative. A key part of this analysis is determining whether sediments are contaminated, how that compares to conditions downstream of the dam, and determining how much sediment would mobilize downstream with the alternatives.

PRELIMINARY STRUCTURAL STUDY AND PLAN

While final removal or modification methods will be determined during the engineering design phase, several key considerations should be addressed during the feasibility phase, including:

Dam condition: Assess structural stability, safety risks, potential demolition methods.

Access and staging: Identify access routes, staging areas, and potential constraints for construction equipment.

Site limitations: Note utilities, easements, or topographic features that could affect construction.

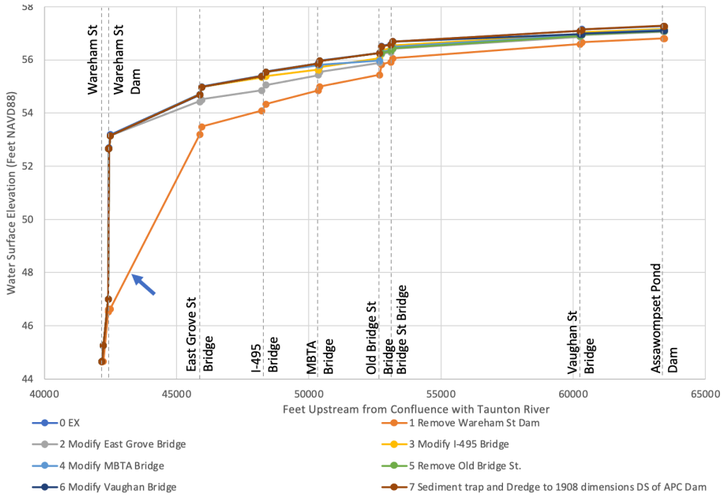
Material disposal: Determine suitable locations for disposal or reuse of dam debris and sediment.

COST ESTIMATES

Develop preliminary cost estimates for the preferred and alternative approaches, including anticipated costs for final design, permitting, construction, and oversight. At this stage, these should be considered probable costs—informed by the consulting team's professional judgment and relevant past projects.

RIPARIAN RESTORATION PLAN

Evaluate potential restoration approaches for both in-stream and riparian habitats within and around the former impoundment area. This analysis should identify opportunities for fish passage, native vegetation establishment, bank stabilization, and habitat enhancement.



Results of H&H Model conducted by Horsley Witten Group for the Upper Nemasket River Enhancement Plan

FISHERIES

Early coordination with state and federal fisheries agencies is essential to ensure that proposed alternatives support aquatic habitat restoration and comply with regulatory requirements.

In Massachusetts, coordination should include:

- **The Division of Marine Fisheries (DMF)** for projects involving anadromous or catadromous fish runs.
- **MassWildlife (Division of Fisheries and Wildlife)** for projects involving cold-water fisheries resources or waterfowl breeding and feeding habitats.

In Rhode Island, coordination should include:

- **The Rhode Island Department of Environmental Management (RIDEM) Division of Fish and Wildlife**, which oversees anadromous fish restoration, freshwater fisheries, and wetland and habitat protection.
- **RIDEM's Office of Water Resources,** which administers dam safety and freshwater wetlands permitting, and can help ensure that proposed modifications align with both habitat and regulatory goals.

Engaging these agencies early allows the project team to clarify design criteria for fish passage, understand species-specific timing or migration considerations, and identify potential funding or partnership opportunities.

PROBLEM FRAMING — Project Team, Steering Committee, General Public
DETERMINING OBJECTIVES — Project Team, Steering Committee, General Public
IDENTIFYING ALTERNATIVES — Project Team, Steering Committee, General Public
ESTIMATING CONSEQUENCES — Project Team, Steering Committee, General Public
EVALUATING TRADE-OFFS — Project Team, Steering Committee, General Public
DECIDING AND TAKING ACTION — Project Team, Steering Committee, General Public

REFERENCES and ADDITIONAL RESOURCES

https://civiltechinc.com/the-benefits-of-hydrologic-hydraulic-modeling-a-case-study/

Executive Office of Energy and Environmental Affairs (2007). *DAM REMOVAL in MASSACHUSETTS: A Basic Guide for Project Proponents.*

VISUALIZING THE ALTERNATIVES

WHO:
Project team

TIME:
Weeks

PURPOSE:
Help visualize the alternatives to understand the impact to the surrounding landscape

MATERIALS:
Graphics programs such as Photoshop and 3-D modeling program such as Auto CAD and RHINO

OVERVIEW

One of the most visible consequences of the proposed alternatives will be the aesthetic and physical impact on the dam site and its upstream and downstream environments. For sites with high public visibility or cultural value, these visual and spatial changes can be a critical factor in decision-making. In other locations—where the dam is less visible or socially significant—these effects may be less consequential.

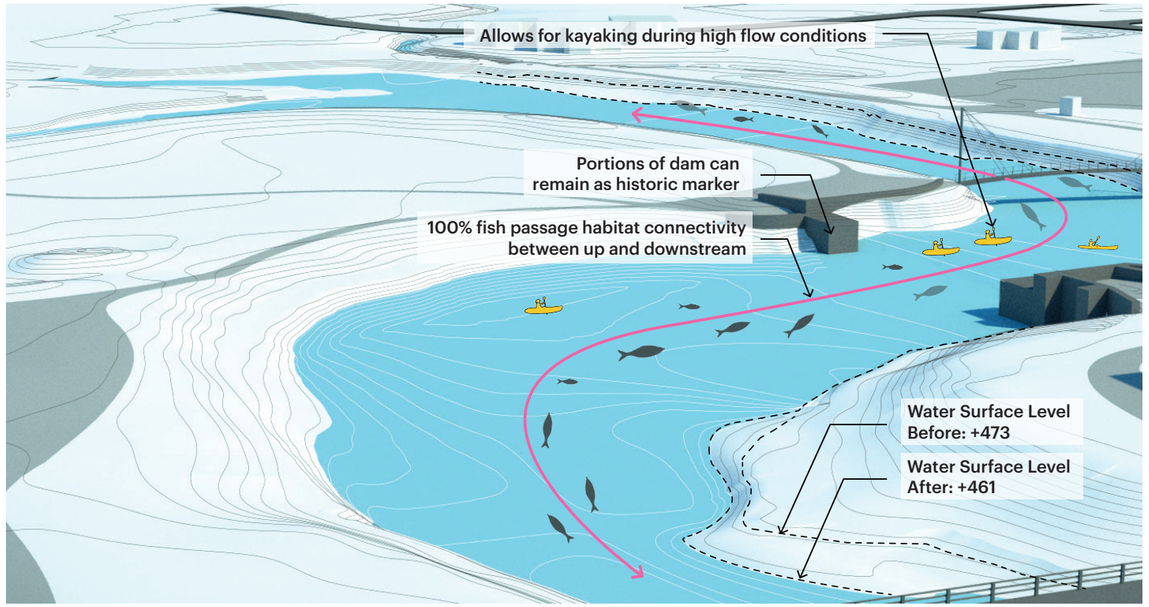
Visualizations play an essential role in helping both decision-makers and the general public imagine and understand the physical transformations that each alternative would produce.

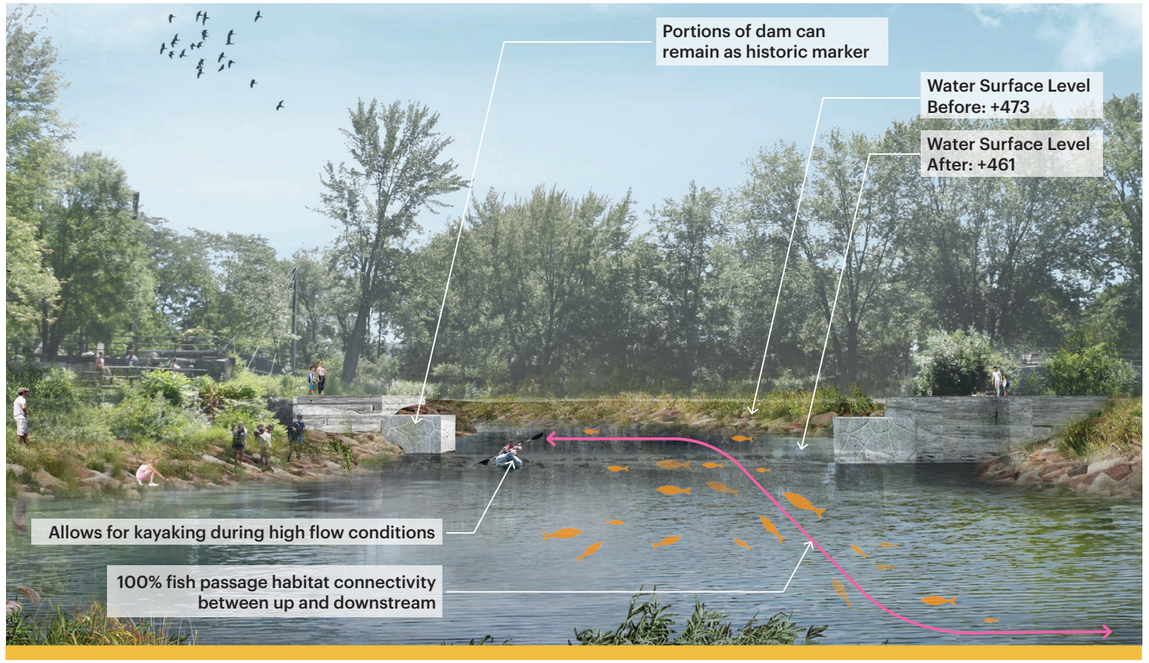
Different types of visualizations can be used depending on what needs to be communicated:

- **Bird's-eye views** (such as the upper image at right) illustrate the broader spatial context, including upstream and downstream effects, landform changes, and floodplain relationships.
- **Eye-level renderings** (such as the lower image at right) convey the aesthetic and perceptual changes at the human scale, helping participants understand how the site might look and feel after implementation.

Because these visualizations will inform decision-making, it is crucial that they accurately communicate technical information. Close coordination between the engineering team and the visualization designer is recommended to ensure that water levels, topography, structures, hydrology, and vegetation are represented as accurately as possible.

In the example shown at right, both existing conditions and design alternatives were modeled in Rhinoceros, allowing for accurate representation of topographic surfaces and water level changes. The model views were then composited with site photographs in Adobe Photoshop, and annotations were added to highlight key changes in site conditions. This workflow enables both precision and clarity, producing visuals that are technically grounded yet accessible to non-specialist audiences.





REFERENCES and ADDITIONAL RESOURCES

FILLING IN THE DECISION MATRIX

WHO:
Project team

TIME:
Weeks

PURPOSE:
Identity and communicate how the alternatives impact the project objectives.

MATERIALS:
Feasibility studies.
blank matrix.

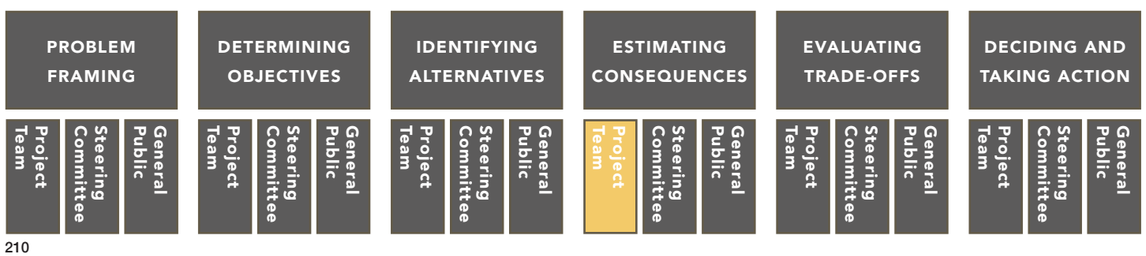
OVERVIEW

Once the feasibility studies have been completed, the decision matrix can be filled in to reflect the results of those studies. The matrix serves as a summary table, linking each alternative to its expected performance on the project objectives. It helps both the project team and the community visualize trade-offs and understand how different choices align with shared goals.

If the matrix is being used as part of an early exploratory round, the feasibility studies may not yet be complete—and that's okay. At this stage, the goal is not precision but understanding. The matrix can be filled in using constructed or qualitative scales to reflect general relationships rather than detailed quantitative data. For example, an early matrix might simply indicate "greater fish passage" versus "less fish passage," "higher cost" versus "lower cost," or "water levels will be lower" versus "water levels remain the same."

As studies progress, the decision matrix can be refined and updated with more detailed, quantitative information drawn from hydrologic modeling, ecological assessments, cost estimates, and engineering analyses. The matrix is designed to be iterative—evolving alongside the project as new information emerges and as participants deepen their understanding of values, trade-offs, and consequences.

Facilitators can use this evolving table to guide discussion and highlight how new data may shift perceptions of alternatives. Whether qualitative or quantitative, the key is to ensure the matrix remains transparent, understandable, and relevant to the decision at hand—supporting informed dialogue and helping the group move toward a clear, shared understanding of the choices before them.



DEVELOPMENT OF THE MATRIX

To create the matrix, list the alternatives along the top of the sheet and the objectives or trade-offs along the left side. Within each cell, indicate the impact of each alternative on the corresponding objective.

GUIDANCE FOR TECHNICAL SPECIALISTS

For engineers, scientists, and technical consultants contributing to the matrix, the goal is not to provide every data point, but to translate complex findings into decision-relevant insights. Each performance measure should distill how an alternative performs relative to an objective, using units or indicators that can be compared across options. Where possible, simplify or normalize results so they can be understood at a glance—for example, converting habitat models into "percent improvement," or expressing cost as "relative order of magnitude."

Technical experts should collaborate with the facilitator or design team to agree on thresholds or visual conventions (e.g., high/medium/low, increase/decrease, or positive/negative effect). When data are uncertain, note assumptions and ranges clearly. The intent is not to eliminate complexity, and uncertainty but to make it legible and useful for decision-making, ensuring that scientific rigor supports, rather than overwhelms, the collaborative process.

For public workshops, consider using visual formats to make the matrix more accessible. Icons, color coding, or directional arrows can help participants quickly grasp relative impacts—for instance, green arrows pointing upward for positive outcomes and red arrows downward for negative ones. Such visual cues make complex data easier to interpret, support dialogue across technical and non-technical audiences, and reinforce transparency in the evaluation process.

		Keep and Repair Dam	Denil Fish Ladder	Nature Like Fishway	ByPass Channel	Remove Dam
ECOLOGICAL TRADE-OFFS	Fish Passage up and downstream	0% Passage	30%-50% Passage	60%-70% Passage	30%-50% Passage	100% Passage
	Conservation of upstream wetlands	Upstream Wetlands Conserved	Upstream Wetlands Conserved	Upstream Wetlands Conserved	Upstream Wetlands Conserved	Potential Loss of Wetlands
CULTURAL AND AESTHETIC TRADE-OFFS	Recreational Opportunities on the impoundment	Recreation Maintained	Recreation Maintained	Recreation Maintained	Recreation Maintained	No recreation on impoundment
	Visibility of Historic Dam	Dam visible	Dam visible	Dam no longer visible	Dam visible	Dam no longer visible
	Impact to existing park	Remove vegetation from berm	Remove vegetation from berm + Denil fish ladder	Remove vegetation from berm + downstream channel elevated	Remove vegetation from berm + new bypass channel construction	Keep vegetation on berm + dam removed + water elevation lowered
ECONOMIC TRADE-OFFS	Up-Front costs	$	$$	$$	$$$	$$
	Long-Term costs and maintenance	$	$$	$$	$$$	0
	Likelihood of external funds to offset upfront cost	NOT LIKELY	LESS LIKELY	LESS LIKELY	LESS LIKELY	MORE LIKELY

Example of a Matrix Used for an Exploratory Workshop

REFERENCES and ADDITIONAL RESOURCES

5

EVALUATING TRADE-OFFS

The Structured Decision-Making (SDM) process provides a transparent framework for evaluating how well each alternative meets the project objectives. Individual participants may assign different levels of importance—or weights—to each objective, influencing how they rank their preferred alternatives.

By clearly organizing objectives and alternatives within a consequence matrix, the process makes subjective values visible and open for discussion. The matrix encourages participants to focus on their interests—the underlying reasons behind their positions—and to recognize that multiple alternatives may satisfy those interests in different ways.

Given the complexity of dam decisions and the number of often competing objectives, the consequence matrix serves as a visual tool for organizing and comparing information. It helps participants track the implications of each alternative, preventing discussions from reverting to entrenched positions or relying on quick cognitive shortcuts.

5.1

MAKING DECISION - EVALUATING TRADE-OFFS

DECISION MATRIX

WHO:
Steering Committee + General Public

TIME:
2-5 Hours

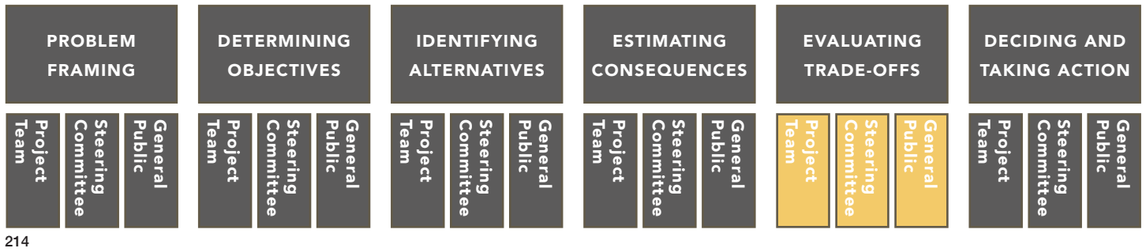
PURPOSE:
Gain understanding of how the alternatives meet the project objectives and indicate preferences

MATERIALS:
Printed matrix, Red, green, and yellow stickers

OVERVIEW

A consequence table is a summary matrix that illustrates how each alternative performs relative to each project objective. It provides concise estimates of the predicted outcomes, highlighting the trade-offs among objectives across the different alternatives under consideration. By clearly organizing this information, the consequence table makes subjective values visible, discussable, and comparable.

Although the matrix is often a new tool for participants, it has proven effective in helping stakeholders understand the options and recognize how their priorities may shift when seeing trade-offs side by side.



PRE-WORKSHOP PREPARATION

Before the workshop, organizers should have prepared a decision matrix. See Step 4.3 for guidance on filling out the matrix. Prior to the wokshop, print enough matrices for each participant to have one.

SETTING UP THE EXERCISE

Hand out a copy of the decision matrix to each participant. Display the matrix using a projector or screen share, and take time to walk through the evaluation of how each alternative performs relative to the objectives.

RANKING

Provide each participant with red, yellow, and green stickers, and ask them to rank the alternatives using the following system:

GREEN = Preferred option – "This is a great solution."
YELLOW = Acceptable option – "Not the best, but I could support it."
RED = Opposed – "I cannot support this option."

Each participant must use at least one green and one yellow sticker. The yellow "acceptable" category helps participants identify areas of potential negotiation or compromise.

Once participants have placed their stickers, go around the group and ask them to briefly explain their reasoning—why they support or oppose specific alternatives. As participants speak, the note taker should compile the rankings into a master sheet, recording the number of preferred, acceptable, and opposed votes for each alternative.

After the discussion, participants may re-rank the alternatives to reflect any shifts in perspective that occurred during dialogue. Provide each participant with a new set of stickers (one green, one red, two yellow, and one optional color).

Ask participants to share their final rankings and reasoning. As before, the facilitator should record the results on the master sheet to document how the group's preferences evolved through discussion.

REFERENCES and ADDITIONAL RESOURCES

Gregory, R., Failing, L., Harstone, M., Long, G., McDaniels, T.L., & Ohlson, D.W. 2012. Structured Decision Making: A Practical Guide to Environmental Management Choices. Wiley-Blackwell, Chichester, U.K.

RIVER ALTERNATIVES SUMMARY TABLE			**No Action Alternative**	**Sediment Trap**	**Remove Wareham St Dam**	**Full River Restoration** Remove Wareham St Dam Naturalized channel Widen 3 bridges
ECOLOGICAL OBJECTIVES	**Fish Passage up and downstream**		**NO CHANGE**	**MINOR IMPROVEMENT**	**IMPROVED**	**GREATLY IMPROVED**
	Improve Water quality + Habitat		— Disolved Oxygen — Water Temperature — Sediment Transport	— Disolved Oxygen — Water Temperature ↓ Sediment Transport	↑ Disolved Oxygen ↓ Water Temperature ↓ Sediment Transport	↑ Disolved Oxygen ↓ Water Temperature ↓ Sediment Transport
	Improve low-flow aquatic connectivity	Points along river where challenging for Herring to pass	**7** potential low points	**7** potential low points	**5** potential low points	**4** potential low points
INFRASTRUCTURAL AND OPERATIONAL OBJECTIVES	**Minimize flood damage to infrastructure and property downstream of APC.**	Flooded Area (100 Year storm)	**723** Acres	**723** Acres NO Reduction	**680** Acres 6% Reduction	**653** Acres 10% Reduction
		Impacted buildings	**27** Buildings	**27** Buildings	**23** Buildings	**19** Buildings
	Reduce ongoing maintenance by working with river morphology		**Works against river morphology**	**Works against river morphology. Requires ongoing maintenance**	**Works with river morphology**	**Works with river morphology**
	Permitting		**N/A**	**VERY CHALLENGING**	**CHALLENGING**	**CHALLENGING**
RECREATIONAL OBJECTIVES	**Maximize quality and quantity of recreation on the river**	Boating Opportunities Expanding fishery habitat diversity	**FLAT WATER RIVER RECREATION** Maintains Existing "flat water" recreation on river + ease of round trips	**FLAT WATER RIVER RECREATION** Maintains Existing "flat water" recreation on river + ease of round trips	**FREE FLOWING RIVER RECREATION** No portage at Wareham st and fewer low flow areas	**FREE FLOWING RIVER RECREATION** No portage at Wareham st and fewer low flow areas
ECONOMIC OBJECTIVES		Cost	**N/A**	**$**	**$$**	**$$$**
		Availability of Funding	**N/A**	**UNLIKELY**	**LIKELY**	**LIKELY**
	GREEN = Preferred YELLOW = Acceptable RED = Oppose You must use at least one green and one yellow sticker					

Example of a Matrix Used for the Upper Nemasket River Enhancement Plan with data from Horsley Witten Group Hydrology and Hydraulics Study


NOT LIKELY
LESS LIKELY
MORE LIKELY
ECONOMIC TRADE-OFFS
CULTURAL AND AESTHETIC TRADE-OFFS
ECOLOGICAL TRADE-OFFS
FISHWAY
FISH LADDER
AIR DAM

6

DECIDING AND TAKING ACTION

While the Structured Decision-Making (SDM) process does not itself make a decision, it provides a transparent way to communicate trade-offs among alternatives and to convey the preferences of the steering committee and community to decision-makers. The ultimate goal is to support an informed and actionable decision about the future of the dam.

In contentious projects, full consensus may be unlikely, but the process helps clarify where agreement and disagreement exist and illuminates the reasoning behind different viewpoints. Using three levels of support—endorse, accept, and oppose—can reveal areas of potential compromise, highlighting alternatives that, while not ideal for everyone, may be acceptable to all parties as a foundation for moving forward.

Once the evaluation of trade-offs is complete, the project team should compile a final report summarizing both the technical analyses and the community engagement process. This report should document the alternatives considered, the objectives used for evaluation, and the range of stakeholder perspectives. A concise executive summary can then be prepared for the decision-making body—whether that is a private dam owner, select board, city council, or state agency—highlighting the preferred alternatives, areas of alignment, and key trade-offs identified through the process.

Presenting the final report to decision-makers provides an opportunity for the project team and steering committee to clearly communicate the outcomes of the process, ensuring that decisions are grounded in both community values and sound technical information. This presentation also serves as a bridge between participatory engagement and formal governance, reinforcing transparency and demonstrating that public input has been meaningfully integrated into the path forward.

FINAL REPORT

WHO:
Project Team

TIME:
Months

PURPOSE:
Summarize the technical studies and community engagement process

MATERIALS:
Final reports can be made in any word processing software including Word and Google Docs.

OVERVIEW

Once the trade-offs have been evaluated, it is important to summarize both the process and its outcomes in a clear and accessible way. This summary is best compiled into a final report that is made publicly available, ensuring transparency and accountability in the decision-making process. The report should include both the technical analyses—such as the engineering feasibility study and supporting data—and a summary of the community engagement process, documenting how local input informed the evaluation of alternatives.

Within the report, the level of support for each alternative should be summarized, along with clear documentation of the areas of agreement and disagreement among participants. This provides decision-makers with a nuanced understanding of where consensus may exist and where tensions remain. The inclusion of visuals—such as maps, diagrams, consequence tables, and photographs from workshops or site visits—can make the report more engaging and help communicate the rationale behind community preferences and trade-offs.

The final report serves multiple functions: it documents the process for transparency, provides a foundation for regulatory review or funding applications, and serves as a reference for implementation planning. The report should include recommendations for next steps, such as additional studies, permitting pathways, design milestones, or opportunities for continued community engagement during implementation.

The final report should serve as both a record of process and a decision-support tool for the next stages of implementation. It should communicate the technical, ecological, and social dimensions of the decision clearly to a broad audience—including regulatory agencies, funders, and community members. The outline below provides a recommended framework for structuring the report so that it is comprehensive, transparent, and easy to navigate, ensuring that both the methods and outcomes of the Structured Decision-Making process are clearly documented and accessible to all stakeholders.

RECOMMENDED STRUCTURE FOR THE FINAL REPORT

1. Executive Summary
A brief overview of the project, the decision context, and the main findings of the process. Summarize key outcomes, preferred alternatives, and next steps in accessible language for a broad audience.

2. Introduction and Background
Describe the dam's location, ownership, history, and condition. Include the ecological, social, and economic factors that led to the need for decision-making.

3. Project Objectives and Decision Framework
Outline the objectives developed through the Structured Decision-Making (SDM) process. Describe how these objectives guided the evaluation of alternatives and how performance measures were selected.

4. Alternatives Considered
Provide a concise description of each alternative that was evaluated, including design concepts, assumptions, and relevant technical data. Illustrate with diagrams or maps where possible.

5. Evaluation and Trade-Offs
Present the results of the consequence table or decision matrix. Summarize how each alternative performed relative to the objectives, highlighting key trade-offs, uncertainties, and sensitivities.

6. Community Engagement Summary
Document the methods used for community participation—workshops, surveys, public meetings, or site visits—and summarize the feedback received. Identify areas of alignment and disagreement, and show how input was incorporated into the final evaluation.

7. Preferred Alternative and Rationale
If there is a clear preferred alternative that emerged from the process, it can be identified in the report. Explain the rationale for its selection based on both technical feasibility and community input.

8. Recommendations and Next Steps
Outline the recommended actions including further studies, permitting, design milestones, funding opportunities, and plans for continued community engagement.

9. Appendices
Include supporting materials such as workshop notes, raw data, detailed modeling results, case study summaries, and full versions of the feasibility and engineering reports.

REFERENCES and ADDITIONAL RESOURCES

PERMITTING

WHO:
Dam owner, consultant

TIME:
Months to years

PURPOSE:
Obtain necessary permits

MATERIALS:
Each agency will specify documents need to be submitted.

OVERVIEW

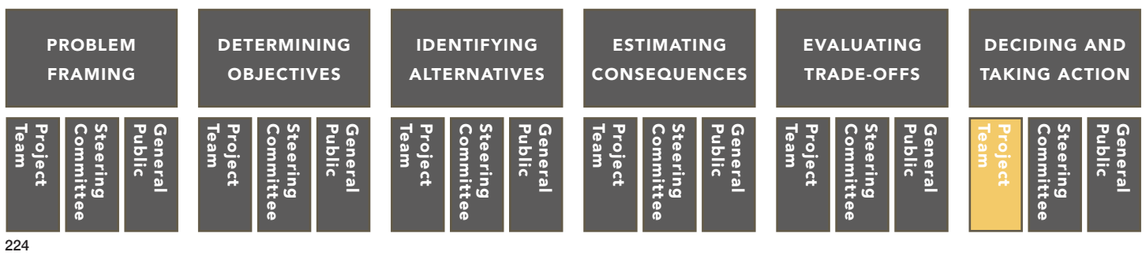
Local, state, and federal agencies all have regulatory authority over dams. The permitting process can be complex, often involving multiple agencies and overlapping review timelines. The specific permits required will vary depending on the type, size, and condition of the dam, the scope of proposed work, and the sensitivity of the surrounding environment.

PROCESS AND TIMING

Depending on the project, several permits may be required, such as wetland or water quality permits, dam safety approvals, and federal authorizations under the Clean Water Act or Endangered Species Act. Each permit has its own review timeline—some taking up to 90 days after submission for agency review and comment. The more thoroughly prepared the feasibility analysis and permit application, the more efficiently the process will proceed. Regulators may request additional information or revisions during their review, so project teams should plan adequate time for back-and-forth communication.

COSTS AND RESPONSIBILITIES

Permit preparation costs can vary widely depending on project complexity. If all filings, forms, and agency coordination are completed by consultants, permitting may cost anywhere from a few thousand to over one hundred thousand dollars. In some cases, municipalities or state agencies may qualify for fee waivers, and proponents can reduce costs by managing filings and attending hearings directly.



RECOMMENDATIONS FOR SUCCESSFUL PERMITTING

Effective communication and collaboration with regulatory agencies can streamline the permitting process and reduce delays. The following best practices are recommended:

- **Consult early and often** with relevant agencies to identify all necessary permits and requirements.
- **Invite agency personnel for a site visit** before beginning the permitting process to ensure shared understanding of site conditions.
- **Maintain regular communication** with agency staff throughout the process and respond completely and accurately to questions or requests for information.
- **Document all correspondence** and submissions, keeping clear records of agency feedback and response dates.
- **Allow sufficient time** in the project schedule for consultation, public comment periods, and formal review processes.
- **Coordinate across agencies** to align timelines and avoid redundant studies or conflicting permit conditions.

PERMITTING AS PART OF THE DECISION-MAKING PROCESS

Permitting should not be viewed solely as a compliance step at the end of a project. It is an opportunity to build trust and transparency with regulatory partners and the public.

Early coordination helps ensure that permitting agencies are aware of the decision-making framework, the alternatives considered, and the rationale for the selected approach. Integrating permitting considerations into the feasibility and design phases can prevent costly revisions later and strengthen the credibility of the overall process.

REFERENCES and ADDITIONAL RESOURCES

PERMITTING- RHODE ISLAND

WHO:
Dam owner, consultant

TIME:
Months to years

PURPOSE:
Obtain necessary permits

MATERIALS:
Each agency will specify documents need to be submitted.

OVERVIEW

The following section outlines the permitting process for dam removal in Rhode Island. Because there are relatively few licensed hydropower dams in the state, Federal Energy Regulatory Commission (FERC) requirements—though occasionally relevant—are not fully integrated into this overview.

WHEN IS A PERMIT REQUIRED?

In nearly all cases, dam removal in Rhode Island requires formal permitting. In compliance with the federal Clean Water Act (CWA) and state regulations, the removal, repair, or alteration of a dam typically triggers multiple permit applications. Exceptions are rare and may apply only to very small structures or to dams that have already been breached.

In such limited cases, applicants can submit a Request for a Preliminary Determination to the Rhode Island Department of Environmental Management (RIDEM). RIDEM will assess whether the proposed removal would significantly alter the functions and values of the wetland.

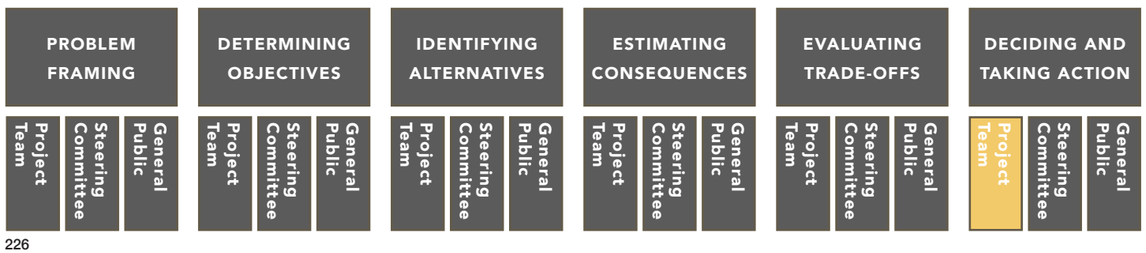
- If no changes are expected, a permit may not be required.
- If minor changes are anticipated, RIDEM may issue a permit with conditions.
- If significant changes are likely, a full permitting process will be necessary.

WHO ISSUES THE PERMITS?

In Rhode Island, dam removal permits are issued primarily by:

- Rhode Island Department of Environmental Management (RIDEM), or
- Rhode Island Coastal Resources Management Council (RICRMC), and
- U.S. Army Corps of Engineers (USACE)

Projects often involve multiple agencies across local, state, and federal levels, especially if they require federal funding or technical assistance. Because of this complexity, it is highly advisable to involve permitting agencies early in project planning.



WHAT FEDERAL AGENCY MUST ISSUE A PERMIT?

At the federal level, the U.S. Army Corps of Engineers must issue a Section 404 permit under the Clean Water Act for any project involving the placement of fill or dredged material in U.S. waters.
Before the Corps can issue this permit:

The state (RIDEM) must provide or waive a Section 401 Water Quality Certification, ensuring that the project will not violate Rhode Island water quality standards.

If the project is located within, or may affect, the coastal zone, the RICRMC must issue a Coastal Zone Management (CZM) Consistency Determination under the Coastal Zone Management Act (16 U.S.C. §1451 et seq.), certifying that the project aligns with Rhode Island's approved coastal management program.

WHAT RI AGENCY ISSUES THE CERTIFICATE?

Jurisdiction depends on whether the dam is located within the coastal zone. Ask the following questions:

- Does the dam lie within tidal waters or within 200 feet inland of a coastal feature (e.g., coastal beach, dune, barrier island, cliff, bluff, rocky shore, or manmade shoreline)?
- Would the removal affect activities within the watershed of a poorly flushed estuary?
- Does the project influence industrial or utility infrastructure, such as power plants, petroleum facilities, wastewater treatment, or solid waste sites?

If you answered yes to any of these, the project generally falls under RICRMC jurisdiction—with the exception of wetlands historically used for agriculture, which remain under RIDEM authority.

If no, or if the site includes agricultural wetlands, RIDEM will typically hold jurisdiction.

In cases where jurisdiction is unclear—such as when wetlands span both sides of a boundary—either agency can issue a joint determination upon written request. Factors considered include the extent and location of wetlands, potential land disturbance, and watershed planning guidance. In rare cases, both agencies may share jurisdiction.

IS THERE PERMITTING ASSISTANCE AVAILABLE?

Because of the complexity of the permitting process, applicants are encouraged to seek early guidance.

If under RICRMC jurisdiction:

- Request a Pre-Application Meeting with CRMC professional staff
- Submit a Preliminary Determination Report for written feedback on the project's merits relative to the CRMC management program.

If under RIDEM jurisdiction:

- Contact the RIDEM Office of Customer and Technical Assistance for pre-application support.
- Review previously submitted dam removal applications—RIDEM maintains public records accessible by appointment.
- Schedule a meeting with the RIDEM Watershed Quality and Wetland Restoration Team, which assists proponents in identifying required permits and clarifying data and design requirements.

GENERAL BEST PRACTICES FOR APPLICANTS

- Engage with permitting agencies early and often.
- Invite agency staff to site visits before formal applications are submitted.
- Provide complete, accurate responses to agency questions and information requests.
- Allocate ample time for consultations and regulatory reviews—some permits may take 60–90 days after submission, and additional information requests can extend this timeline.
- Track submissions using certified mail or other documented methods to ensure compliance with agency review deadlines.

REFERENCES and ADDITIONAL RESOURCES

www.crmc.ri.gov/applicationforms/PreAppMeeting.pdf

http://www.dem.ri.gov/ .

Dam Removal Process (Rhode Island)

Who do I notify?
What permits do I need?

Preapplication assistance is available from RICRMC and RIDEM. (Applications can't be submitted for state permits until 60 % of design drawings are completed).
Initial contacts will need to be made to the following entities.

1. USACE

Contact meeting with New England Branch to determine if application for Individual Permit , Programmatic General Permit (PGP), or Regional General Permit (RPG) will be submitted. An Individual Permit is issued when projects have more than minimal individual or cumulative impacts, are evaluated using additional environmental criteria, and involve a more comprehensive public interest review procedure. PGP's & RPG's are designed to avoid duplication of existing state, local, or other federal programs.

or

CRMC or RIDEM Jurisdiction?

CRMC

- Programmatic General Permit
- Regional General Permit

RIDEM

- Regional General Permit
- Individual permit:
  - 30-day public comment period is required

no

RIDEM will coordinate, no further info submitted to USACE.

Coordinate directly with USACE: submit required materials as requested; usually drawings, significant findings of wetland impact

2. FERC

Does the dam have an active FERC License?

yes

Follow FERC's license surrender process (See below link)

no

No FERC involvement needed

3. Determine CRMC or RIDEM Jurisdiction:

- Does the dam lie within tidal waters or within two hundred (200) feet inland from any coastal feature?
- Will the dam removal or alteration affect activities which occur within watersheds of poorly flushed estuaries?
- Does the dam affect power-generating plants; petroleum storage facilities; chemical or petroleum processing; minerals extraction;sewage treatment and disposal plants; solid waste disposal facilities; and, desalination plants?

yes

CRMC

Contact CRMC submit preapplication form; set up meeting with staff assigned to the town/city where dam resides.

Determine what type of Council Assent is required.

Category **A** or **B**?

or

Category A - Usually includes smaller alterations or activities within the coastal zone that have less significant environmental impact.

Category B - Includes larger projects/activities with substantial impact on the coastal environment, requiring a comprehensive review process, a 30 day public notice, and a possible public hearing.

RIDEM - Office of Water Quality

Contact RIDEM Office of Water Resources Water Quality Certification (WQC) Program for requirements for a WQC application. (Generally required even in CRMC jurisdiction).

- 30 day public notice is required for this permit and a possible public hearing.

no

RIDEM - Office of Customer Technical Assistance

Contact RIDEM Office of Customer Technical Assistance for preapplication assistance.

Determine if permit is necessary.

Will there be significant changes to wetland?

yes

RIDEM Application to Alter A Freshwater Wetland must be submitted. (60 percent of drawings must be complete before submission.)

- A 45 day public notice is required
- Public hearing may be required
- If water level will decrease by 6", adjacent landowners must be notified of intent and solicited for comment as part of public notice.

yes

Request for Preliminary Determination. Significant Changes?

no

No permit needed.
Owner can proceed.

no

4. RIDEM - Office of Dam Safety

Inform them of status of meetings/permits. Although there are no guidelines for dam removal in RIDEM, RIDEM will help in determining if further action is necessary dependent upon whether the dam is being substantially altered or removed.

5. RIHPHC

Contact to determine if the project could affect historic properties at the site. (If the project is being undertaken by a federal agency, must comply with Section 106 of the National Historic Preservation Act of 1966 (NHPA)

6. Local Governance

Obtain Local excavation permits from building/zoning or planning department

- US Army Corps of Engineers (USACE)
- Federal Energy Regulatory Commission (FERC)
- Rhode Island Department of Environmental Management (RIDEM)
- Coastal Resources Management Council (CRMC)
- Rhode Island Historic Preservation & Heritage Commission (RIHPHC)
- Local Offices

REFERENCES and ADDITIONAL RESOURCES

1. **Rhode Island General Permit** - https://www.nae.usace.army.mil/Portals/74/docs/regulatory/StateGeneralPermits/RI/Rhode-Island-General-Permit.pdf
2. **Ferc License Surrender Process** - https://www.ferc.gov/administration-and-compliance/how-surrender-license-or-exemption
3. **CRMC Assent Application** - http://www.crmc.ri.gov/applicationforms/Assentapp.pdf

PERMITTING- MASSACHUSETTS

WHO:
Dam owner, consultant

TIME:
Months to years

PURPOSE:
Obtain necessary permits

MATERIALS:
Each agency will specify documents need to be submitted.

OVERVIEW

This section outlines the permitting and regulatory framework for dam removal in Massachusetts, with emphasis on key state and federal authorities. Because Massachusetts has a denser institutional environment around rivers, wetlands, and dam safety, projects often involve more layers of review and more stringent standards than some other states.

WHEN IS A PERMIT REQUIRED?

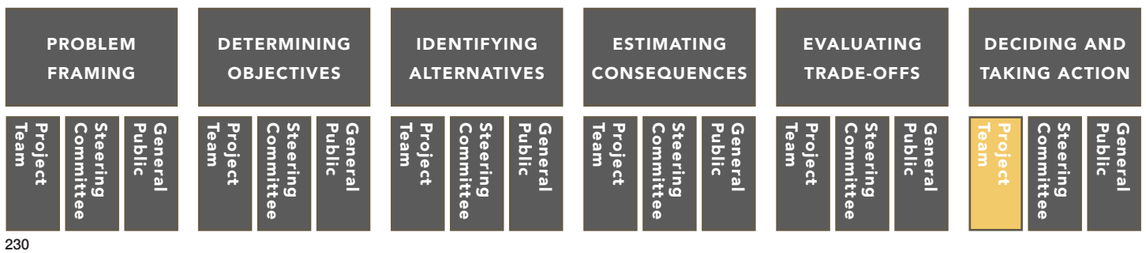
Permits are generally required for most dam removal, modification, or repair projects in Massachusetts. The project typically triggers multiple regulatory acts—such as the Clean Water Act, Massachusetts Wetlands Protection Act, River Protection Act, and dam safety statutes. Exemptions are rare and might only apply in very limited cases where the structure is extremely small or already compromised. In those exceptional situations, local permitting bodies or state agencies may issue preliminary determinations, but a full review is more common.

WHICH AGENCIES ISSUE PERMITS?

In Massachusetts, dam-related permits and reviews are issued by a mixture of local, state, and federal agencies. Typical major institutions include:

- Massachusetts Department of Environmental Protection (MassDEP)
- Massachusetts Office of Dam Safety
- Massachusetts Division of Fisheries & Wildlife / Division of Marine Fisheries
- Municipal Conservation Commissions (under the Wetlands Protection Act)
- U.S. Army Corps of Engineers (USACE)
- Massachusetts Historical Commission (MHC)
- NOAA Fisheries / U.S. Fish & Wildlife Service, when migratory fish or wildlife habitat is involved

Projects must navigate overlapping jurisdiction among these agencies—especially for wetlands, fish passage, cultural resources, and dam safety. Early coordination and interagency consultation are critical to avoid delays or conflicting conditions.



FEDERAL PERMITTING IN MASSACHUSETTS

Any dam removal that involves altering or placing material in waters of the U.S. generally requires a Section 404 permit from USACE, and prior to that, a Section 401 Water Quality Certification from MassDEP, to ensure state water quality standards are maintained. Additionally, if the project affects tidal areas or coastal waters, consultation under the Coastal Zone Management (CZM) Act may be needed through the Massachusetts Office of Coastal Zone Management (CZM).

STATE & LOCAL JURISDICTION IN MASSACHUSETTS

Permitting jurisdiction in Massachusetts depends on the location of the dam, the presence of wetlands or riparian zones, and local municipal bylaws. Key permitting processes include:

- Wetlands Protection Act (WPA) (through local Conservation Commissions)
- River Protection Act, for buffer zones along streams
- Dam Safety (via Office of Dam Safety)
- Historic/Cultural Resource Review (through MHC)
- Endangered Species / Habitat Review, if applicable

If a dam lies within protected or resource-sensitive zones (e.g. in core river corridors or near wetlands), local and state agencies may require Notice of Intent (NOI), Order of Conditions, and coordination with multiple divisions.

PERMITTING ASSISTANCE & PRE-APPLICATION COORDINATION

Given the varied regulatory paths, applicants are encouraged to pursue early coordination and assistance:

- Request pre-application meetings with MassDEP, Office of Dam Safety, and local Conservation Commissions to clarify required permits, review timelines, and submittal expectations.
- Visit prior project files—MassDEP or local conservation offices often retain past permit records for dam removals; reviewing them can provide templates or insights.
- Engage with agency staff early, invite them to site visits, and build shared understanding of project context.
- Prepare a preliminary environmental review package (maps, hydrologic data, baseline conditions) to help agencies assess feasibility and comment early.

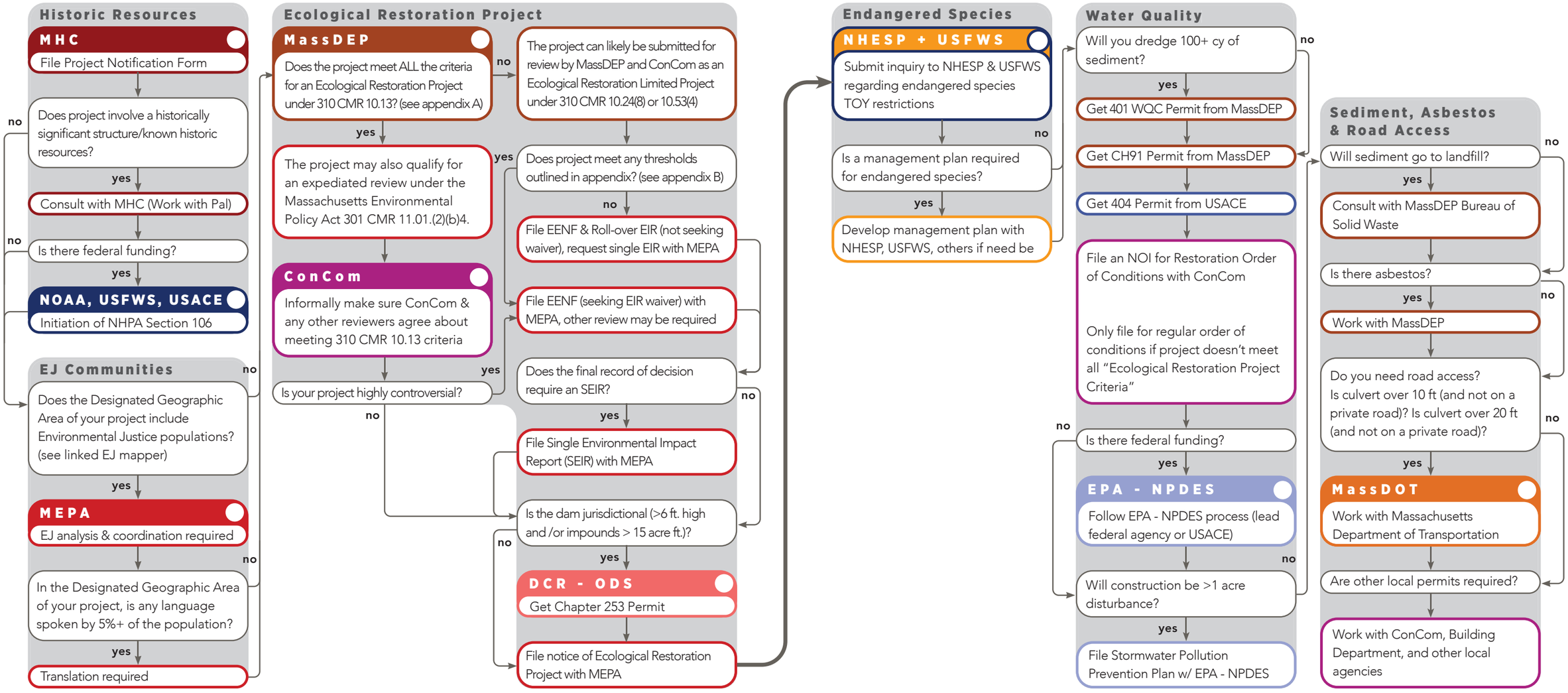
REFERENCES and ADDITIONAL RESOURCES

Franklin Regional Council of Governments. 2025. River Restoration Design and Permitting in Massachusetts: A Guide for Inland Rivers, Greenfield, Massachusetts, 164 pp.

www.crmc.ri.gov/applicationforms/PreAppMeeting.pdf

http://www.dem.ri.gov/

Dam Removal Process (Massachusetts)



Federal Agencies
- National Oceanic and Atmospheric Administration (NOAA)
- U.S. Fish & Wildlife Service (USFWS)
- US Army Corps of Engineers (USACE)
- Federal Energy Regulatory Commission (FERC)
- Environmental Protection Agency (EPA)
  + National Pollutant Discharge Elimination System (NPDES)

Local Agencies
- Conservation Commissions (ConCom)

State Agencies
- Massachusetts Historical Commission (MHC)
- Massachusetts Environmental Policy Act Office (MEPA)
- Department of Conservation & Recreation (DCR)
  + Office of Dam Safety (ODS)
- Mass. Department of Environmental Protection (MassDEP)
- Massachusetts Department of Transportation (MassDOT)
- Massachusetts Department of Fish & Game (DFG)
  + Natural Heritage & Endangered Species Program (NHESP)
- Massachusetts Office of Coastal Zone Managment (CZM)

List of Abbreviations
- **NHPA** - National Historic Preservation Act
- **EJ** - Environmental Justice
- **CMR** - Code of Massachusetts Regulations
- **ENF** - Environmental Notification Form
- **EENF** - Extended Environmental Notification Form
- **EIR** - Environmental Imapct Report
- **SEIR** - Single Environmental Impact Report
- **TOY** - Time of Year
- **WQC** - Water Quality Certification
- **NOI** - Notice of Intent

Dam Removal Process (Massachusetts)

Appendix A

Ecological Restoration Project Criteria

- Not intended to mitigate alteration of a Resource Area (except through in-lieu fee)
- No short or long-term adverse effect on specified habitat sites of Rare Species
- No significant adverse effects on flood control and storm damage prevention
- Will not reduce capacity of Resource Area to serve habitat functions
- If includes a stream crossing, crossing is designated for work in coastal and inland resource areas
- No discharge of dredged or fill material into Class A surface water
- No discharge of dredged/fill material to vernal pool
- No point source discharge to ORW

For Dams:

- Dam is not managed for flood control by municipal, state or federal agency
- No adverse impacts to public or private wells or withdrawals
- No FERC licensing involved

For daylighting:

- Meets performance standards for Bank and Land Under Water Bodies and Waterways.
- Includes revegetation with natives

For tidal:

- No new or relocated tidal inlet/breach through Barrier Beach or armoring of a Barrier Beach
- No new water control devices or a change in management of existing devices, if for flood/storm damage prevention

Appendix B

Does your project meet any of these thresholds:

- Direct alteration of 25+ acres of land, unless consistent with conservation farm, forest cutting or other similar plan.
- Disposition or change in use of land/interest in land
- Conversion of active agricultural use to nonagricultural use
- Alteration of designated significant habitat (per MESA)
- >2 acres disturbance of designated priority habitat
- Alteration of coastal dune, barrier beach or coastal bank
- Alteration of 500+ ft of bank along fish run or inland bank
- Alteration of 1,000+ sf of salt marsh or ORW
- Alteration of 5,000+ sf of BVW or IVW
- New fill or structure or expansion of existing fill or structure
- Alteration of ½+ acres of any other wetlands
- Dredging of 10,000+ cy of material
- Disposal of 10,000+ cy of dredged material
- Construction, reconstruction or expansion of an existing solid fill structure of 1,000+ sf base area or of a pile-supported or bottom-anchored structure of 2,000+ sf base area, provided the structure occupies flowed tidelands or other waterways.
- Cut 5+ living public shade trees of 14 or more inches in DBH (Transportation)
- Eliminate 300+ ft of stone wall (Transportation)
- Unless the Project is subject to a Determination of No Adverse Effect by the MHC or is consistent with a MoA with the MHC:
  - Demolition of all or any exterior part of listed Historic Structure
  - Destruction of all or any part of listed Archaeological Site
  - ½+ acres within a designated ACEC
- Direct alteration of 50+ acres of land, unless consistent with conservation farm, forest cutting or other similar plan.
- Alteration of 1+ acres of salt marsh or BVW
- Alteration of 10+ acres of any other wetlands
- Alteration requiring a variance in accordance with the WPA
- Structural alteration of an existing dam that causes an expansion of 20% or any decrease in impoundment Capacity

REFERENCES and ADDITIONAL RESOURCES

1. MHC Project Notification Form
2. Section 106 Tutorial
3. Environmental Justice Mapper
4. Ecological Restoration Project 310 CMR 10.13
5. MEPA EENF & Single EIR request form
6. MEPA Single Environmental Impact Report (SEIR)
7. DCR - ODS Chapter 253 Permit
8. MEPA Notice of Intent Ecologial Restoration Project
9. MassDEP ePLACE Portal - 401 WQC Forms
10. MassDEP CH91 Forms
11. USACE 404 Forms
12. EPA - NPDES Stormwater Pollution Prevention Plan (SWPPP)

6.3

MAKING DECISION - DECIDING AND TAKING ACTION

IMPLEMENTATION

WHO:
Project team, consultant, construction crew

TIME:
Years

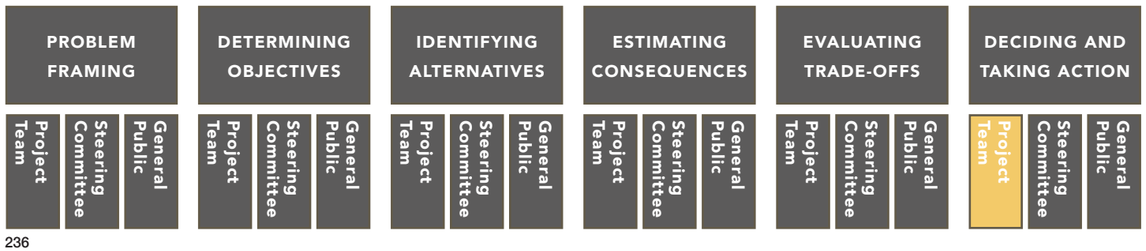
PURPOSE:
Implement chosen path of action for a dam site

MATERIALS:
Will depend on implementation plan

OVERVIEW

Following the completion of feasibility studies, the selection of a preferred alternative, and the necessary permitting and final design phases, the project moves into implementation. Implementation is the stage where the design becomes reality—requiring careful coordination among the design team, contractors, permitting agencies, and community partners. Successful implementation depends not only on the quality of the design but also on thoughtful sequencing, clear communication, and adaptive management during construction.

Implementation can extend over multiple seasons or years, depending on the complexity of the site, funding cycles, and environmental conditions. The construction process often includes site preparation, dam removal or modification, sediment and water management, habitat restoration, and long-term monitoring. Each of these steps must be undertaken with precision to ensure that ecological and safety objectives are achieved and that the work complies with approved permits and design specifications.



CONSTRUCTION OVERSIGHT

It is critical that the design engineer or an authorized representative be present during all key phases of construction to ensure that the project is implemented as designed and to address any field conditions that may require adjustments. Field oversight should include verifying construction methods, confirming material specifications, documenting daily progress, and coordinating with regulatory inspectors. Regular site meetings between the contractor, engineer, and client are recommended to review progress, resolve issues, and approve any design modifications.

CONTRACTOR COORDINATION

A pre-construction meeting should be held to review the design, specifications, staging, safety protocols, and permit conditions with all contractors and subcontractors. The meeting provides an opportunity to clarify sequencing, roles, and lines of communication. Clear documentation of expectations and field decisions—through meeting minutes, inspection logs, and daily reports—helps maintain transparency and accountability throughout the process.

ADAPTIVE MANAGEMENT DURING CONSTRUCTION

Despite thorough planning, site conditions during construction are often unpredictable—exposing buried infrastructure, unexpected sediment deposits, or previously undocumented habitat features. The implementation phase should therefore include flexibility for adaptive management. This may involve adjusting dewatering plans, modifying grading or stabilization approaches, or refining habitat treatments in response to observed site conditions. Any adjustments should be documented and communicated to both the regulatory agencies and the project team.

SITE STABILIZATION AND HABITAT RESTORATION

Once the structural components of removal or modification are completed, stabilization and restoration activities can begin. These may include streambank grading, soil stabilization, re-vegetation with native species, and installation of in-stream habitat features such as woody debris, boulder clusters, or riffle-pool sequences. Restoration should be tailored to the site's hydrology, sediment dynamics, and ecological goals. The design team should inspect these features after major flow events during the first year to assess stability and performance.

POST-CONSTRUCTION MONITORING AND MAINTENANCE

Monitoring is essential to evaluate whether the project objectives are being met and to identify any maintenance needs. Post-construction monitoring should track hydrologic performance, sediment movement, vegetation establishment, and ecological responses (e.g., fish passage, habitat connectivity). Data from monitoring can inform adaptive management and serve as a valuable resource for future dam removal or modification projects. Maintenance activities—such as invasive species management, erosion control repairs, or replacement of plantings—are often necessary during the early years of site recovery.

FINAL DOCUMENTATION AND REPORTING

At project completion, the design team should compile a construction completion report summarizing as-built conditions, permit compliance, and lessons learned. The report should include final drawings, photographs, and monitoring data. This documentation not only fulfills regulatory requirements but also provides a record for future projects, supporting broader learning and capacity-building around dam removal and river restoration efforts in the region.

REFERENCES and ADDITIONAL RESOURCES

Executive Office of Energy and Environmental Affairs (2007). *DAM REMOVAL in MASSACHUSETTS: A Basic Guide for Project Proponents.*

STEWARDSHIP

WHO:
Steering Committee + General Public

TIME:
Long-Term

PURPOSE:
Build a community of stewards for the river

MATERIALS:
Will depend on stewardship activities

OVERVIEW

Rivers and oceans are some of the last remaining resources that are still held in common by the people. These are some of the most ecologically dynamic and diverse landscapes, and they will be the most likely to experience the impacts of climate change. We all depend on rivers for drinking water, flood control, recreation, and sustenance and the more-than-human-species depend on the rivers as habitat and migratory corridors.

One of the goals of the decision making process outlined in this document is to build community and develop shared social practices that help care for the river. The community involvement that is initiated through the decision making around the dam can continue and evolve into other forms of community stewardship of the river over time. There may be opportunities for community members to participate in community restoration projects, or help advocate for the river, or just spend time paddling the river which ensures that there are "eyes on the river." If there is not an existing watershed management plan for the river or access plan, the discussion of a dam can help initiate larger discussions about the health of the river and how communities can "turn back" to the rivers and support the human and more than human communities that surround them.

The Structured Decision-Making and community engagement processes described in this guide are designed not only to support informed, transparent decisions about infrastructure but also to build a foundation for ongoing stewardship. As communities engage in dialogue about the future of a dam, they begin to rebuild their connections to the river itself—connections that can evolve into sustained, local forms of care and governance long after the formal project ends.

FROM DECISION-MAKING TO LONG-TERM CARE

Community involvement initiated through dam decision processes can continue as stewardship in many forms. Some communities may organize volunteer stream clean-ups, monitoring programs, or citizen science initiatives that track water quality, habitat, or migratory fish. Others may focus on cultural and recreational programming—such as paddling events, educational tours, or art installations—that encourage ongoing engagement and awareness.

Partnerships with schools, local nonprofits, watershed associations, and tribal nations can help institutionalize this stewardship. By embedding river education and participation in community life, the sense of collective ownership deepens. Over time, this can lead to the establishment of river stewardship committees, watershed councils, or "friends of the river" groups that serve as long-term advocates and caretakers.

INTEGRATING STEWARDSHIP INTO PLANNING

If a watershed management plan, open space plan, or river access plan does not yet exist, the discussion surrounding a dam project can become the catalyst for creating one. These plans can help coordinate restoration priorities, identify access points, establish water quality and habitat goals, and build partnerships among municipalities, conservation districts, and residents. The planning process also provides an opportunity to integrate equity and access—ensuring that all community members, including those historically excluded from decision-making, have the ability to connect with and benefit from the river.

DESIGNING FOR STEWARDSHIP

Physical design can also foster stewardship. Providing safe and visible public access to rivers—through trails, overlooks, boat launches, or restored riparian parks—helps keep people connected to the water. Interpretive signage, community art, and storytelling can celebrate the river's cultural history while conveying ecological processes and restoration goals. When people have the opportunity to interact with and learn from the river, they are more likely to feel a sense of responsibility toward its ongoing care.

A LIVING RELATIONSHIP

Ultimately, stewardship is an ongoing, adaptive relationship rather than a fixed outcome. Rivers will continue to change—through natural dynamics, climate shifts, and evolving community needs. By cultivating networks of stewards who are attentive to those changes, communities can ensure that their rivers remain resilient and life-supporting for generations to come. The process of deciding the future of a dam, then, becomes not an endpoint but a beginning: the renewal of a shared commitment to the river as a living commons.

REFERENCES and ADDITIONAL RESOURCES

PROBLEM FRAMING	DETERMINING OBJECTIVES	IDENTIFYING ALTERNATIVES	ESTIMATING CONSEQUENCES	EVALUATING TRADE-OFFS	DECIDING AND TAKING ACTION
Project Team	Project Team	Project Team	Project Team	Project Team	Project Team
Steering Committee	Steering Committee	Steering Committee	Steering Committee	Steering Committee	**Steering Committee**
General Public	General Public	General Public	General Public	General Public	**General Public**

Fish Passage Parade and Gathering on the Blackstone River. May 2023. Source: Andy Moran

CONCLUSION

Given that there are more than 14,000 dams in New England—many of them aging and nearing the end of their functional lifespan—there will be thousands of decisions to be made in the coming years. These decisions are critical: they will shape how we protect downstream communities, restore ecological connectivity, and build resilience to climate change. They also represent an opportunity to reimagine our collective relationship with rivers as living systems.

Our goal with this work is to offer a structured, transparent, and inclusive method for engaging communities in decision-making around dams. By providing clear frameworks and accessible tools, we hope to reduce the number of projects that are stalled or delayed due to community resistance—often the result of misunderstanding, lack of trust, or limited opportunity for participation.

The materials presented in this document are available as open-source resources on the web (www.damatlas.org). We invite others to use, test, adapt, and evolve these methods in their own contexts. While every dam and every community is unique, we believe that openly sharing tools, lessons, and outcomes can help build a growing "library of approaches" for collaborative water governance and landscape restoration.

We also hope that this spirit of collaboration extends beyond practitioners to the communities themselves—empowering residents and local leaders in shaping resilient and thriving river systems.

ACKNOWLEDGMENTS

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