Monitoring Framework for Durable Freshwater Protection

Updated on July 20th 2025

Introduction

Purpose & audience

The purpose of this document is to provide broad conceptual guidance to staff directly supporting the implementation of durable freshwater protection (DFP) projects. Our primary focus is on describing key concepts and principles behind DFP Monitoring, Evaluation, and Learning (MEL)—ensuring that we don't "lose the forest for the trees" of MEL's purpose. Our emphasis is on the common, generalizable, and essential.

Our target audience or end user is TNC staff who are directly managing and supporting DFP projects. This includes staff directly developing and implementing MEL, as well as staff responsible for ensuring the right personnel and processes are in place for DFP MEL. Our hope is that this guide can serve these readers as a benchmark for prioritizing the most essential components of DFP MEL—particularly for monitoring that supports adaptive management.

How to use this guide

This guide is intended to inform the development of the essential core components of MEL for DFP. This document alone is not sufficient for development and implementation of a comprehensive monitoring plan. This guide should initiate—or serve as a critical reference point for—the iterative process of monitoring plan development.

We acknowledge at the outset that this guide is a work in progress. By leaning heavily on existing conservation guidance materials, we expect that this guide represents a sound starting point for DFP MEL. However, we also expect that this guide can and will be improved with input from readers like you. Please reach out to Nick Miller (nmiller@tnc.org) or Nathan Karres (nkarres@tnc.org) with your feedback.

DFP and MEL

What is Durable Freshwater Protection?

All DFP projects are intended to "safeguard **freshwater ecosystem integrity** and **associated biodiversity** and **social values** over the **long-term** through **legal or other effective means**, **sustainable funding**, and **social support**." This definition highlights essential features of all DFP projects:

- Holistic vision of **freshwater ecosystem integrity** as a primary outcome

- Inclusive of **associated biodiversity** including terrestrial and marine
- Contribution to **social values** through ecosystem services and related DFP activities
- Investment and impact over the **long-term**
- Protection through **legal or other effective means**
- Financed through **sustainable funding** for lasting results
- Grounded in strong **social support** including Indigenous peoples and local communities

We utilize these characteristics (elaborated here and here) as the basis for identifying the key principles & components of DFP MEL described in this guide.

What is monitoring, evaluation, and learning?

Defining MEL

'Monitoring' can refer solely to data collection or serve as a stand-in for the full cycle of monitoring, evaluation, and learning. Within this guide, we refer specifically to *MEL* and its constituent components:

- **Monitoring** – Measurement of relevant indicators.
- **Evaluation** – Analysis and interpretation of indicator measurements.
- **Learning** – Leveraging insights from evaluation to support adaptive management.

Connecting these three components within *MEL* highlights that monitoring is more than data collection alone—data are not meaningful without analysis and interpretation. *Learning* further emphasizes that a primary purpose of DFP monitoring (and this guide) is to support adaptive management.

Types of monitoring

Various monitoring typologies have been proposed to differentiate between the different purposes of conservation monitoring. Four common categories are defined in Box 1.

Box 1. Types of Monitoring

Surveillance monitoring – Assessing the condition or status of particular conservation aspects (ex. species, habitats). Also known as *reconnaissance* monitoring.

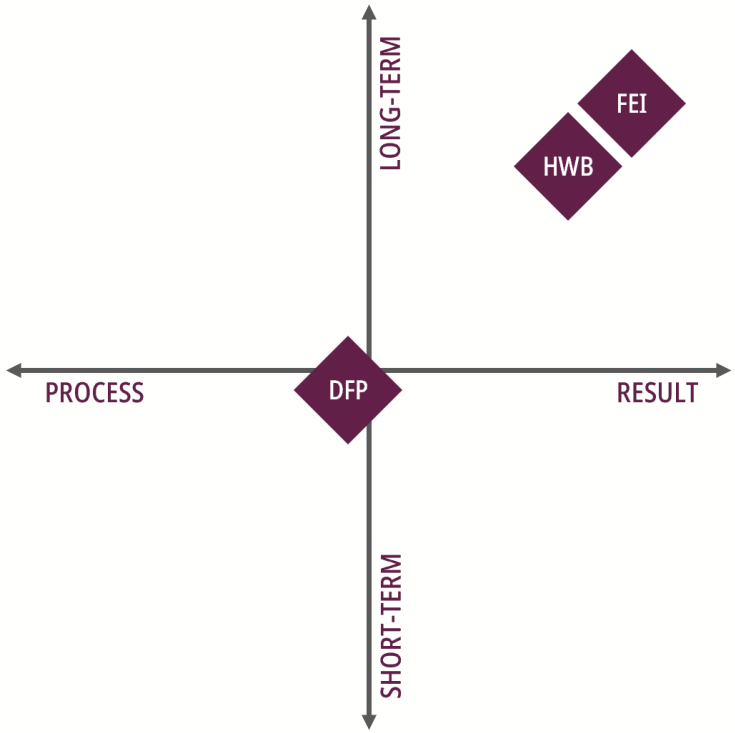
Implementation monitoring – Tracking whether management actions and interventions are proceeding as planned. Also known as *process* or *performance* monitoring.

Effectiveness monitoring – Evaluating whether a given management action was effective in meeting a stated management objective. Also known as *impact* monitoring.

Basic research – Collecting data to advance fundamental scientific understanding.

The distinctions between categories are not critically important. The key point is to note that monitoring can measure aspects across the entirety of a results chain—from more process-oriented components to more results- or impact-oriented components. For DFP MEL, we focus on both process- and results-related components (Figure 1). Monitoring of freshwater ecological integrity and human well-being primarily focuses on overall long-term *results*. Monitoring of DFP mechanism performance includes shorter-term *process*- and *results*-related components.

Figure 1. Monitoring characteristics of core DFP indicator groups



Conceptual diagram illustrating two key dimensions of monitored indicators: the type of output being measured (process vs. result) and the time lag of observed changes (short- vs. long-term). The three core DFP indicator groups are approximated along these axes (FEI: freshwater ecological integrity; HWB: human well-being; DFP: DFP mechanism performance).

MEL & audience

An essential starting point for MEL is specifying *who* needs to know *what* information by *when*. This guide specifies TNC as the primary audience for the DFP MEL priorities herein. Given all DFP projects include relevant groups/parties beyond TNC, additional planning and collaboration will be needed to consider whether these DFP priorities align to those of other entities.

Key principles of DFP MEL

Below we describe key principles that are expected to guide DFP MEL planning. While these are subjective, their essentialness is well-justified relative to the definition of DFP, the mission and values of TNC, and decades of knowledge afforded by the conservation planning sector.

1. Conservation plan as prerequisite for DFP MEL.

Effective monitoring is predicated on effective conservation planning. A conservation plan clearly identifies the impacts we expect to see, and where, when, and how these impacts are likely to occur. The most critical conservation plan elements needed for DFP MEL development include:

- Scope (spatial, temporal, social)
- Targets or objectives
- Results chain/theory change

This information directly guides the development of MEL plan components. If any of these elements are unclear, then the project team should consider whether it is possible to address such gaps. The Conservation by Design training modules or planning templates from Conservation Standards 'Lighter CS' can be useful resources for carrying out streamlined planning exercises to address such gaps.

2. Monitoring DFP relative to *freshwater ecological integrity* is central and essential.

Safeguarding the ecological integrity of freshwater ecosystems is central to every DFP project. Accordingly, monitoring for indications of freshwater ecological integrity through key ecological attributes (KEAs) is an essential part of DFP MEL (see this freshwater KEA overview document for more detail).

3. Monitoring human well-being and equity outcomes is also essential.

Just as freshwater ecological integrity is an inherent goal for DFP, so is human well-being. 'Durability' of DFP arises from addressing locally-held values—conservation that is not relevant to the people who live in project areas will not be durable. Consequently, human well-being should be monitored explicitly—including assessing equity in outcomes.

4. DFP MEL is rooted in established guidance from Conservation Standards and Conservation by Design.

As described in the introduction, this guide is not intended to replace existing guidance on conservation planning and monitoring. We consider DFP MEL well-aligned with the principles and processes described by Conservation Standards and Conservation by Design (CbD). A key area of alignment is the application of *conservation targets* and *viability assessments* as fundamental elements for DFP MEL (see Box 2).

5. DFP MEL can begin with the essential and feasible—and then build iteratively.

The key principles and core components described in this guide are intended to constitute the minimum scope of MEL for any DFP project. This suggested minimum scope should be represented within MEL plans for any DFP project. However, the specific monitoring scope for a given DFP project should reflect the priorities of relevant parties/groups and resource availability. This guide should form the basis of an MEL plan focused on the essential and feasible, and then adapted for a given project context.

Box 2. Targets, Viability & Monitoring

Conservation targets are "ecological systems/habitats and/or specific species chosen to represent and encompass the full suite of biodiversity in the scope" (from Conservation Standards). *Conservation targets* are distinct from other elements of project scope—these targets clearly communicate the specific conservation purpose of a project. Within CbD, *objectives* are analogous to targets.

We consider identification and assessment of *freshwater conservation targets* (objectives) to be an essential part of DFP MEL. TNC and others have well-elaborated processes to identify targets and assess their viability (see DFP MEL resources). The *viability assessment* approach provides several inputs that are critical for MEL development, including clear identification of (a) targets, (b) indicators, and (c) thresholds.

Viability assessment should be considered a fundamental planning step for DFP MEL. The intentional focus on holistic representation of biodiversity and supporting ecological processes is critical. For DFP, such an assessment forms the basis for monitoring changes in freshwater ecological integrity as a result of project activities.

Beyond freshwater conservation targets, we also consider the viability assessment approach a useful framing for other core indicators for DFP MEL. The Example Assessments for DFP in the Appendix illustrate application of the viability assessment approach for each of the core indicator groups for DFP MEL.

Core indicator groups for DFP MEL

We consider three core indicator groups as fundamental to DFP monitoring: (1) freshwater ecological integrity, (2) human well-being, and (3) DFP mechanism performance. The guidance below provides additional details on which attributes to consider within these groups. While all three indicator groups are crucial to DFP MEL, project teams should start with those indicators that are most essential and feasible, and aim to build toward monitoring across all three groups.

We note that this guide does not include recommendations for specific indicators. Indicators should be selected based on a variety of factors including relevance, feasibility, funding, and local context. Rather, we identify important attributes that are likely relevant to most DFP projects. Example indicators are provided for two of the three core indicator groups within the Example assessments in the Appendix.

Freshwater ecological integrity

As noted in the key principles, freshwater ecological integrity is a central part of DFP MEL. For all freshwater systems, five *key ecological attribute* (KEA) categories capture the fundamental patterns and processes that characterize freshwater ecological integrity (see Table 1).

Assess and monitor the status of all five KEA categories in order to characterize freshwater ecological integrity. KEAs are interdependent, such that the status or condition of each KEA contributes to and determines overall integrity. Even where a given project is not expected to directly affect all KEAs, all five KEA categories should be considered for potential monitoring. Given interdependencies, a change of status in one KEA category may affect one or more other KEA categories. Monitoring all KEA categories ensures assumptions of adequate status and condition remain true.

Consider all major KEAs and prioritize those directly affected by DFP activities. Results chains should be utilized to identify which specific KEAs (last column of Table 1) are expected to be significantly affected by DFP interventions. Not every KEA needs to be monitored, and other attributes may be identified beyond those listed in Table 1. KEAs that are directly/significantly affected should be priorities for monitoring resources. Less intensive monitoring can be used for indirectly affected KEAs.

Develop indicators for KEAs that are relevant, measurable, feasible, and sensitive to expected changes (actual or avoided) in ecological integrity as a result of DFP activities. There are numerous possible indicators for each KEA. The freshwater KEA viability assessment example in the appendix illustrates different indicators across KEAs. DFP managers can use the KEAs (Table 1) to ensure indicators are aligned to these attributes and therefore *relevant* to DFP freshwater conservation targets. Additional criteria of *measurability*, *feasibility*, and *sensitivity* can further guide subject matter experts in selecting appropriate indicators (see further guidance on indicator selection in Conservation Standards and Conservation by Design).

Table 1. KEAs for monitoring freshwater ecological integrity

Category	Description	Example attributes (KEAs)
Hydrologic regime	Summation of hydrologic (water cycle) characteristics for a freshwater ecosystem. Characteristics primarily relate to flow for lotic systems (rivers) and levels for lentic (lakes & wetlands).	Magnitude of events Frequency of events Duration of events Timing of events Rate of change of events
Connectivity	Degree to which freshwater habitats are structurally and functionally connected.	Longitudinal Lateral Vertical Temporal
Water quality	Physical, chemical and biological characteristics of water.	Temperature Clarity/color Chemical Biological
Habitat	The characteristics of the local environment occupied by organisms.	Structure Distribution
Biotic composition	Biological features of organisms such as genes, populations, species, and communities.	Composition Distribution Abundance

Key ecological attributes (KEA) categories for freshwater systems and their major attributes. Listed attributes are not exhaustive but can be considered broadly comprehensive of the primary ecosystem patterns and processes that would be expected to determine freshwater ecological integrity for DFP projects. See Example assessments for examples of specific indicators that could be monitored.

Human well-being

DFP projects can support HWB targets both indirectly and directly. Human well-being (HWB) targets can represent the social values supported by freshwater ecosystems—whereby supporting freshwater ecological integrity targets *indirectly* benefits HWB targets. For example, protecting instream flows and river connectivity to maintain migratory fish species could also support fishing communities dependent on these species. HWB targets can also represent social values supported *directly* through DFP investments and activities. For example, supporting improved employment conditions or household incomes through alternative livelihood efforts aligned with conservation goals.

Human well-being focal areas can be considered analogous to freshwater KEA categories. HWB is multi-faceted and CbD provides a helpful breakdown into 'focal areas' that should form the basis

of DFP planning for HWB MEL (see resources under *Human well-being*). Just as freshwater KEAs represent the integrity of freshwater ecosystems, HWB focal areas represent the 'integrity' of human communities.

By definition, all DFP projects should support one or more HWB focal areas. Which focal area(s) should be monitored will depend on the specific objectives of a given DFP project. In concert with the project's results chain, all HWB focal areas should be reviewed to determine which are expected to be materially and significantly affected. Importantly, such effects could include potential *adverse* effects.

Table 2 lists HWB focal areas and provides common attributes of each. These lists are not exhaustive and other attributes may be more relevant for a given DFP project. Additionally, for all HWB attributes considered for monitoring, the project team should consider disaggregating selected indicator(s) to account for equity considerations (see Box 3).

Table 2. Attributes for monitoring human well-being

Category (focal area)	Description	Example attributes
Living standards	The material needs of basic life including income, wealth, material goods, and necessities.	Income Housing Assets
Health	Relates to any component of people's mental or physical condition.	Nutrition Vector-borne disease Mental health
Education	Includes any transfer of knowledge, either through formal or informal means.	Training Schooling Literacy
Work & leisure	Includes employment but also characteristics related to time use, family life, and personal activities beyond work.	Employment Freedom of time choice Family life
Governance	Broadly captures components across local, national, and global scales in both formal and informal forms.	Rights Decision-making Corruption
Social cohesion	Captures social capital, community connectedness, trust, and spiritual or cultural opportunity.	Intergroup cohesion Trust Cultural opportunity
Security	Not only physical security (safety), but also other aspects of security including those critical to stable livelihoods such as economic, political, legal, and food security.	Safety Food security
Equity	Refers to the fair distribution of benefits among people. Equity is a crosscutting focal area and should be considered in reference to every other focal area.	Gender Age

Human well-being categories or focal areas and their major attributes. Listed attributes are not exhaustive and subject matter experts should be consulted to determine the most appropriate and relevant attributes for a given project.

Box 3. Equity & HWB Monitoring

Similar to TNC's VCA Common Measures guidance, equity should be considered across all relevant HWB focal areas. Key elements of VCA guidance on equity include:

- The relative importance of data disaggregation for a specific social identity will depend on context—for example, whether there are large wealth disparities and vulnerable ethnic minorities in the community—and should be informed by a program's situation analysis.
- Common social identities include gender, age, socio-economic status, religion, and race/ethnicity.
- Always disaggregate data by gender where possible and appropriate.

DFP mechanism performance

All approaches for DFP mechanisms entail complex actions and agreements which must be carefully monitored. Given this complexity—and uncertainties thereof—it is vital to monitor the status of DFP mechanism performance. While mechanism implementation does not itself indicate whether freshwater ecological integrity will be achieved, the absence of mechanism implementation precludes any such possibility.

Core functional attributes of DFP mechanism performance are generalizable across projects. The specific mechanism activities and outputs (i.e., results chain) for a given DFP project will always be context-specific. However, there are core functional attributes that would be expected across all DFP projects regardless of mechanism type. It is possible that some attributes may be out of scope for a given project—but such cases would be expected to be uncommon.

These core functional attributes build from the definitional foundation of durable freshwater protection. Table 3 presents proposed attributes to inform implementation monitoring for DFP projects. Similar to HWB focal areas, these attributes are considered conceptually analogous to freshwater KEAs. These attributes are not exhaustive but should present a good starting point for planning DFP mechanism monitoring.

Table 3. Attributes for monitoring DFP mechanism performance

Category	Description	Example attributes
Recognition	Formality and social extent of recognition of protection mechanism(s).	Recognition
Protectiveness	Enforceability, permanency, and extent of protection mechanism(s).	Enforceability Permanency Freshwater scope[1] Spatial scope[2]
Enforcement	Status and effectiveness of protection mechanism(s) enforcement.	Status Efficacy
Funding	Adequacy and long-term predictability of mechanism(s) funding.	Adequacy Sustainability
Management	Operational status of staffing and implementation.	Staffing Implementation

Core functional attributes of DFP mechanisms and their major components. See Example assessments for examples of specific indicators that could be monitored.

[1] Freshwater scope: Thematic scope of DFP mechanism relative to KEAs of freshwater ecological integrity

[2] Spatial scope: Spatial extent of protection relative to the extent freshwater ecosystem(s) of interest

DFP MEL example: Mrežnica-Tounjčica project

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In the section that follows, we illustrate the *key principles* and *core indicator groups* described previously through application to the Mrežnica-Tounjčica project. This case example is not intended to provide comprehensive guidance on the entire MEL process. Rather, it illustrates how the *key principles* and *core metrics* described in this guide can be applied in practice.

Building from the Mrežnica-Tounjčica theory of change, we focus on the connection between DFP core indicators and the project's results chain. Utilizing the *core indicator groups* framing, we focus in particular on indicators for freshwater ecological integrity and DFP mechanism performance—acknowledging that specifying indicators of human well-being is a critical gap to be addressed. In addition to indicators, we identify specific target values that define success for the Mrežnica-Tounjčica project. Defining such targets is an essential component of developing specific, measurable objectives.

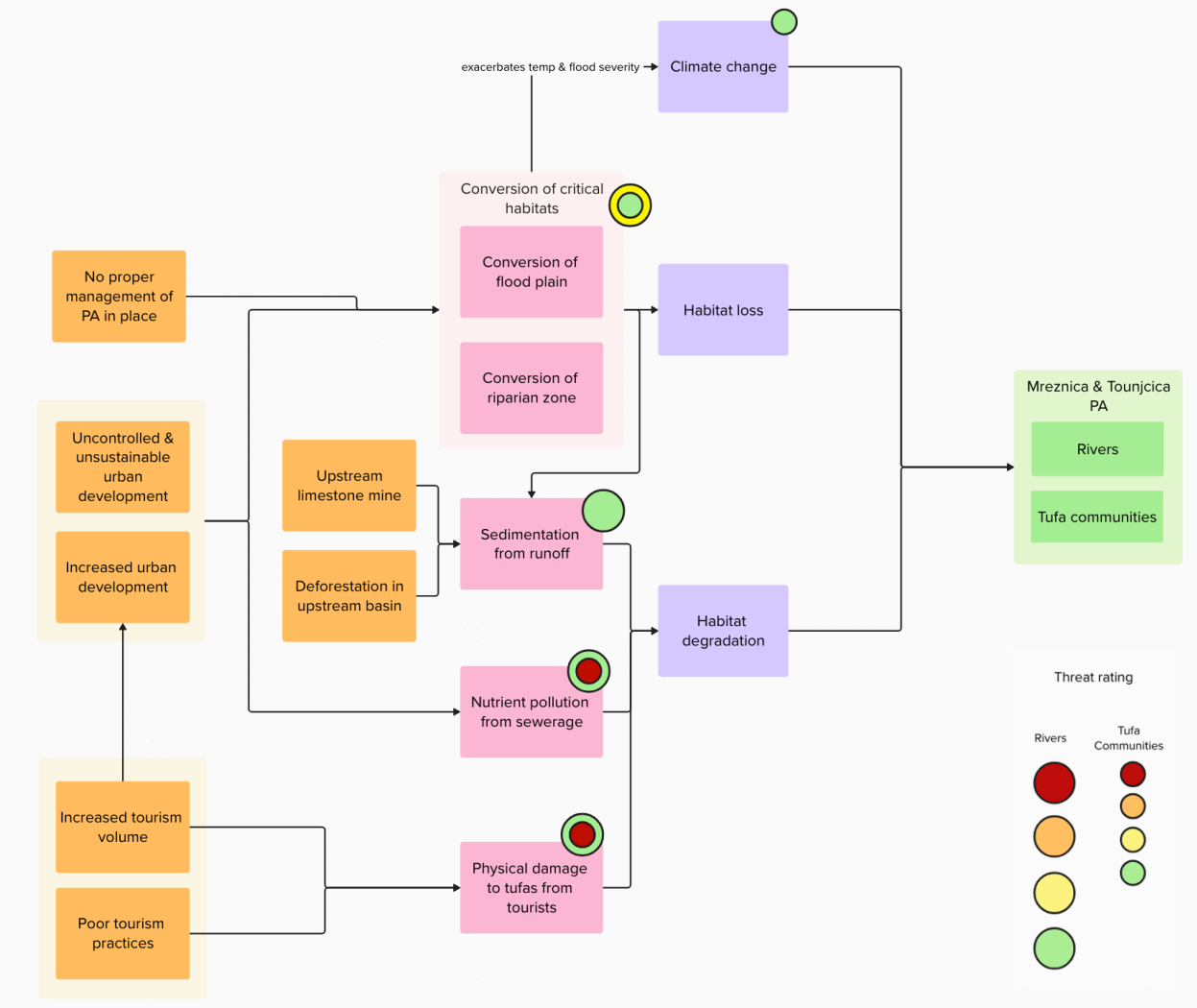
It is important note that the Mrežnica-Tounjčica project example as presented here is **strictly illustrative**—specific project details continue to be refined and will change over time. Additionally, where necessary to address gaps, we have included hypothetical information in order to present a more complete example.

Project overview

Overview

In 2024, important areas of the Mrežnica and Tounjčica Rivers were formally protected. This area was identified by TNC and local partners as one of 13 priority rivers in the Balkans region—thanks largely to its rich biodiversity and abundance of unique tufa structures. Through a situation analysis process (Figure 3), the team carefully considered the main threats to conservation targets. Identified threats included water quality contamination, conversion of critical habitat, and damage to the river's unique tufa structures as persistent threats to the PA. The team has accordingly developed its strategic plan to address these threats through the protected area management efforts and additional interventions. Given the abundance of data available from the Water Framework Directive reporting, the team is monitoring the status of all 5 KEAs, but it will primarily be focused on influencing water quality and habitat.

Figure 3. Situation analysis for Mrežnica and Tounjčica Rivers



High-level summary of situation analysis for Mrežnica and Tounjčica Rivers. Colored rectangles indicate indirect threats (orange), direct threats (pink), stress (purple), and conservation targets (green). Relative threat level ratings are indicated separately for river condition and tufa communities.

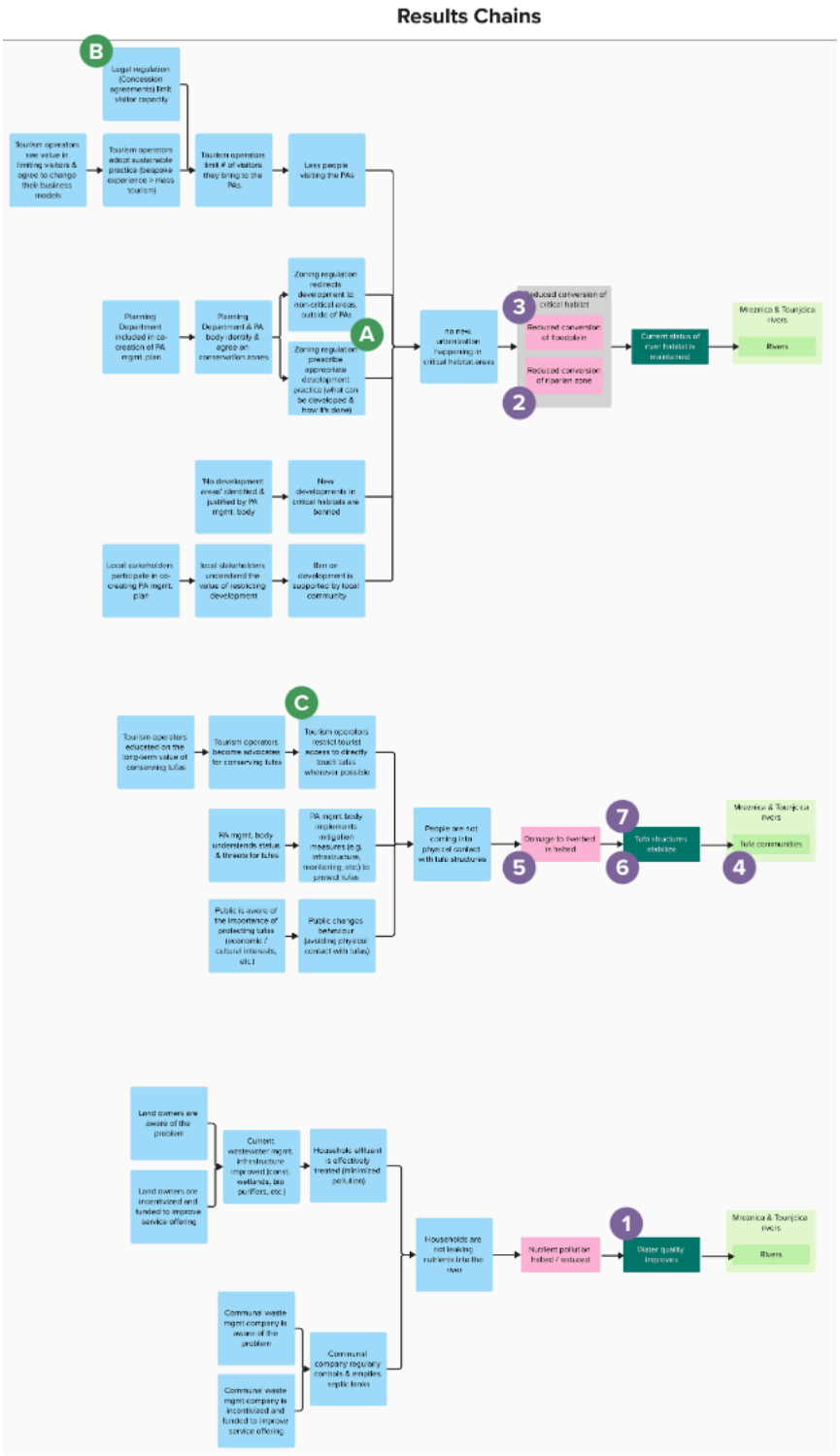
Results chain

The Mrežnica-Tounjčica project well demonstrates the importance of conservation planning as a critical input for MEL planning (see principle 1). The results chain provides a comprehensive conceptual map of how project efforts will cumulatively result in achieving project outcomes. The results chain explicitly links the implementing actions of the DFP mechanism to desired results including freshwater ecological integrity outcomes.

The figure below presents the results chain for Mrežnica-Tounjčica project. This results chain clearly and succinctly captures the activities, results, and conservation targets for the project. As indicated in the figure, durable freshwater protection (upper portion) is just one strategy for

Mrežnica-Tounjčica project. Strategies focused on tourism and wastewater management (middle and bottom portions) are also important for supporting long-term conservation targets.

Figure 4. Results chain for Mrežnica-Tounjčica project



Results chain for the Mrežnica-Tounjčica project. Numbered and lettered symbols correspond to indicators from Table 4 and Table 5, respectively. See this link for a higher resolution version of the results chain.

Indicators of freshwater ecological integrity

Overview

The Mrežnica-Tounjčica project benefits significantly from existing environmental monitoring in support of the European Water Framework Directive (WFD). The Framework requires comprehensive water monitoring for member countries, whereby the challenge becomes how to effectively utilize this large dataset (as opposed to the usual challenge faced by projects of insufficient data). Additionally, for many indicators, the WFD further defines thresholds ('very good', 'good', 'fair', and 'poor') for healthy waterways. While availability of preexisting data and targets may be unique compared to other TNC projects, the Mrežnica-Tounjčica team still must decide which data to consider relative to project goals and their theory of change.

The table below is structured according to the freshwater ecological integrity framing presented earlier in this guide.

Table 4. Indicators & targets for freshwater ecological integrity

Category	Attribute	Indicator	Target value	Explanation
Hydrologic regime	Undefined	Undefined [a]	Maintain in WFD category 'very good' within protected area	While not specifically identified as a project result, hydrologic regi maintaining tufa communities. The project team tracks this comp indicator ensure conditions remain supportive of project ecologic (i.e., surveillance monitoring).
Connectivity	Longitudinal	Undefined [a]	Maintain in WFD category 'very good'	Similar to hydrologic regime, connectivity is monitored to ensure remain supportive of project ecological outcomes.
Water quality	Chemical composition	Lowest value of panel of chemical values [a]	Maintain in WFD category 'good' in Mrežnica and reach 'good' in Tounjčica	Water quality is a critical KEA for the project—particularly nutrient As comprehensive monitoring already exists, the project team lev panel of water quality data while focusing particularly on nutrient-
Habitat	Distribution	Riparian extent	No loss compared to 2024	Freshwater habitat condition is a key conservation target. The pro determining the specific indicator and methodological approach f
		Floodplain extent	No loss compared to 2024	(see above)
		Tufa community extent	No loss compared to 2024	(see above)
	Structure	Morphological condition [a]	Maintain in WFD category 'very good'	Similar to hydrologic regime & connectivity, stream morphologica monitored to ensure conditions remain supportive of project ecol outcomes.
		Tufa structure	In development	The project team is collaborating with partners to develop metho monitoring tufa structure and composition.
	Composition	Tufa composition	In development	(see above)
Biotic composition	Abundance	Macrophyte biomass [a]	Maintain in WFD category 'good'	Macrophyte abundance increases with impaired (nutrient) water q Monitoring this attribute ensures water quality conditions do not p increased macrophytic growth.

[a] *Denotes indicators and thresholds defined for purposes of Water Framework Directive (WFD) reporting.*
[b] *Symbols for identifying corresponding results location of indicators within results chain from Figure 3.*

Discussion

In addition to illustrating the specific connections between conservation goals and indicators, Table 4 also highlights important lessons relevant across freshwater ecosystems and projects.

- **Conservation plan components are key inputs for MEL planning.** As noted in the overview, the project team has developed a number of key conservation plan elements—especially scope, targets, situation analysis, and results chain—that greatly facilitate the process of key attribute and indicator selection.
- **Attribute and indicator identification is iterative with beneficial feedback for conservation plans.** Specification of attributes and indicators is likely to evolve over time as new information is collected, new priorities are identified, etc. Even where project information is incomplete, the process of considering core indicators groups can be beneficial—for advancing MEL and for clarifying conservation plans.
- **Indicator and threshold selection requires local knowledge and expertise.** While the Mrežnica-Tounjčica project team benefits from a preponderance of data available through national Water Framework Directive reporting, significant consideration is still needed to ensure existing data are appropriately representative of corresponding KEAs. There is no easy formula or template, and local knowledge and expertise is particularly valuable.
- **Relevance and interdependence of key attributes may not be readily apparent from results chain.** Table 4 demonstrates that some KEAs may not be explicit components within a results chain but may still be important to monitor. For example, tufa structure and composition are highly dependent on hydrologic regime and connectivity. While these KEA categories may not be an explicit focus of conservation actions, their good condition is important for enabling project outcomes.

Indicators of DFP mechanism performance

Overview

In contrast to freshwater ecological integrity, indicators of DFP mechanism performance are not readily derived from existing EU or other monitoring efforts. These indicators must be selected and defined by the Mrežnica-Tounjčica project team.

Table 5. Indicators & targets for DFP mechanism performance

Category	Attribute	Indicator	Target value	Explanation
Recognition	Recognition	Public approval process for protected area designation	Passes public hearings	Public approval processes are expected to reflect broade key parties / stakeholders.
Protectiveness	Enforceability	Status of new zoning regulations for land use & development	New zoning regulations established	Land use change is primary threat to Mrežnica and Tounjč zoning regulations are a key mechanism for reducing this
		Regulations for protected area activities	Regulations established by protected area authority	Many activities will continue within the protected area an these activities support conservation and human well-bei
	Permanency	Timespan of protected area designation	Legal designation includes protection in perpetuity	The duration of legal protection is primarily codified withi process.
	Freshwater scope	Freshwater targets within legal designation	Legal designation includes specific freshwater targets	Embedding freshwater ecosystems as a specific focus as is expected to help ensure freshwater outcomes remain a protected area management.
	Spatial scope	Extent of catchment within protected area	In development	The relative extent of catchment within the protected are indication of whether efforts are sufficiently protective o and processes.
Enforcement	Status	Status of boat allocation policy	Boat allocation policy is formally adopted by protected area authority	Limiting the number of boats allowed is expected to help tufa communities.
	Efficacy	Status of ranger compliance checks	Ranger boat allocation compliance checks are ongoing	Monitoring boat policy enforcement ensures boat allocati
Funding	Adequacy	In development	In development	Funding and management indicators and targets have no
	Sustainability	In development	In development	(see above)
Management	Staffing	In development	In development	(see above)
	Expenditures	In development	In development	(see above)

[a] *Symbols for identifying corresponding location of indicators within results chain from Figure 3.*

Discussion

As Table 5 illustrates, the Mrežnica-Tounjčica project is impressively robust—project plans include many of the most important elements of DFP mechanism implementation. Consideration of DFP mechanism performance highlights other important lessons:

- **DFP mechanism performance attributes can be a helpful guide for considering project scope.** DFP implementation is multi-faceted and complex. The attributes listed in Table 3 and 5 can be helpful for MEL development as well as broader considerations of project scope and the sufficiency of conservation plans.
- **Including relevant DFP mechanism outputs within results chain can be instructive.** Several of the indicators identified in Table 5 are not clearly identified within the project results chain. It is worth considering inclusion of these outputs to ensure results chain linkages are coherent and critical assumptions can be identified.
- **Indicator identification is iterative and adaptive.** As with attributes for freshwater ecological integrity, project teams should allow for iterative development of DFP mechanism performance indicators. For the Croatia project, there remain key information gaps including funding and management. Such gaps do not prohibit MEL planning and can be addressed as more information is collected.
- **DFP mechanism performance attributes do not account for other conservation activities.** As illustrated in Figure 4, the Mrežnica-Tounjčica project includes conservation elements beyond DFP mechanisms (ex. wastewater management). While conservation targets are consistent and indicators of freshwater ecological integrity are still relevant, additional consideration is needed for monitoring implementation of actions outside the scope of the DFP MEL framework described here.

Appendix

DFP MEL resources

Topic	Resources
Durable Freshwater Protection (DFP)	• Securing our rivers, lakes, and wetlands for generations to come (TNC) • Higgins, J., Zablocki, J., Newsock, A., Krolopp, A., Tabas, P., Salama, M., 2021. Durable Freshwater Protection: A Framework for Establishing and Maintaining Long-Term Protection for Freshwater Ecosystems and the Values They Sustain. Sustainability 13, 1950.
Key ecological attributes (KEAs)	• Freshwater Ecological Integrity & Key Ecological Attributes (TNC) • Higgins, J., Zablocki, J., Newsock, A., Krolopp, A., Tabas, P., Salama, M., 2021. Durable Freshwater Protection: A Framework for Establishing and Maintaining Long-Term Protection for Freshwater Ecosystems and the Values They Sustain. Sustainability 13, 1950. • Parrish, J.D., Braun, D.P., Unnasch, R.S., 2003. Are We Conserving What We Say We Are? Measuring Ecological Integrity within Protected Areas. BioScience 53, 851–860. • Olden, J.D., Poff, N.L., 2003. Redundancy and the choice of hydrologic indices for characterizing streamflow regimes. River Research and Applications 19, 101–121. • Karr, J.R., Fausch, K.D., Angermeier, P.L., Yant, P.R., Schlosser, I.J., 1986. Assessing biological integrity in running waters. A method and its rationale. Illinois Natural History Survey, Champaign, Special Publication 5, 1–28. • Schick, A., Porembski, S., Hobson, P.R., Ibisch, P.L., 2019. Classification of key ecological attributes and stresses of biodiversity for ecosystem-based conservation assessments and management. Ecological Complexity 38, 98–111.
Human well-being	• The Nature Conservancy, 2016. APPENDIX E: Detailed Explanation of the Conservancy's Human Well-Being Focal Areas and Associated Components., in: Conservation by Design 2.0: Guidance Document. • Leisher, C., Samberg, L.H., Van Buekering, P., Sanjayan, M., 2013. Focal Areas for Measuring the Human Well-Being Impacts of a Conservation Initiative. Sustainability 5, 997–1010. • VCA MEL Guidance (TNC) • Milner-Gulland, E. J., Mcgregor, J. A., Agarwala, M., Atkinson, G., Bevan, P., Clements, T., Daw, T., Homewood, K., Kumpel, N., Lewis, J., Mourato, S., Palmer Fry, B., Redshaw, M., Rowcliffe, J. M., Suon, S., Wallace, G., Washington, H., Wilkie, D., 2014. Accounting for the Impact of Conservation on Human Well-Being. Conservation Biology 28, 1160–1166. • OECD, 2020. How's Life? 2020: Measuring Well-being. Organization for Economic Co-operation and Development, Paris. • Croft, Trevor N., Blake W. Zachary, Courtney K. Allen, et al., 2023. Guide DHS Statistics, DHS Questionnaires and Manuals. USAID.

Protection effectiveness	• Hockings, M., 2003. Systems for Assessing the Effectiveness of Management in Protected Areas. BioScience 53, 823–832. • Assessing Protected Area Management Effectiveness: A Quick Guide (TNC)
General guidance on monitoring, evaluation & learning (MEL)	• Conservation Standards • CbD MEL Module • Foundations of Success. 2019. Designing Monitoring and Evaluation Approaches under the Open Standards: How-To Guide. Foundations of Success, Bethesda, Maryland, USA.
Viability assessment	• Conservation Action Planning (CAP) Handbook (TNC) • Target Viability Worksheet (TNC)

Example attribute indicators

The tables below present attribute indicators for the core DFP metrics. These assessments are based on the *viability assessment* approach for *conservation targets*. The examples present a mix of quantitative and qualitative measures, demonstrating that DFP viability assessments can be carried out even with data or information constraints. These examples are *conceptual* and *are not* intended to be applied directly to any DFP project.

Indicators of freshwater ecological integrity

Category	**Attribute (KEA)**	**Status**			
		Poor	*Fair*	*Good*	*Very good*
Hydrologic regime	Magnitude of flow events	Annual runoff decreased by >40%	Annual runoff decreased by >20%	Annual runoff decreased by >10%	No change[1] in annual runoff
	Frequency of flow events	>10 additional low flow days	>5 additional low flow days	<5 additional low flow days	No additional low flow days
	Duration of flow events	>20% change in mean flood duration	<20% change in mean flood duration	<10% change in mean flood duration	No change in mean flood duration
	Timing of flow events	>20 day change in low flow onset date	<20 day change in low flow onset date	<10 day change in low flow onset date	No change low flow onset date
	Rate of change of flow events	>20% change in mean rise rate	<20% change in mean rise rate	<10% change in mean rise rate	No change in mean rise rate
Connectivity	Longitudinal	Impassable barriers affect >50% of river network	Impassable barriers affect >10% of river network	Impassable barriers affect <10% of river network	No impassable barriers
	Lateral	<20% of floodplain connected	<60% of floodplain connected	<90% of floodplain connected	100% of floodplain connected
	Vertical	>20% catchment impervious or compacted	>5% catchment impervious or compacted	<5% catchment impervious or compacted	<1% catchment impervious or compacted
Water quality	Temperature	Extended periods of high temperatures throughout the system	Extended periods of high temperatures in specific reaches	Very few periods of high temperatures in any reaches	No occurrences of high temperatures

[1] Relative to natural flow regime or other reference

	Clarity/color	Detrimental to all species	Detrimental to most native species	Supportive of most native species	Supportive of all native species
	Chemical	Detrimental to all species throughout the system	Detrimental to most native species	Supportive of most native species	Supportive of all native species
	Biological	Extended periods of low DO throughout the system	Extended periods of low DO in specific reaches	Very few periods of low DO in any reaches	No occurrences of low DO
Habitat	Structure	<60% of riparian vegetation extent	>60% of riparian vegetation extent	>90% of riparian vegetation extent	100% of riparian vegetation extent
	Distribution	Loss of spawning habitat throughout catchment	Loss of spawning habitat in several reaches	Some loss of spawning habitat in limited reaches	No change in spawning habitat
Biotic composition	Composition	>5 non-native fish species	<5 non-native fish species	<2 non-native fish species	No non-native fish species
	Distribution	Target species absent throughout majority of catchment	Target species absent from 1 or more tributaries	Target species absent from specific reaches	Target species found throughout catchment
	Abundance	<50% of historical population levels	>50% of historical population levels	>90% of historical population levels	Species at historical population levels

Indicators of human well-being

Category	Attribute	Status			
		Poor	*Fair*	*Good*	*Very good*
Living standards	Income	Consult with subject matter experts on household and community indicators of human well-being. See *Human well-being* section of DFP MEL Resources for additional resources.			
	Housing				
	Assets				
Health	Nutrition				
	Vector-borne disease				
	Mental health				
Education	Training				
	Schooling				
	Literacy				
Work & leisure	Employment				
	Freedom of choice regarding time				
	Family life				
Governance	Rights				
	Decision-making				
	Corruption				
Social cohesion	Intergroup cohesion				
	Trust				
	Cultural opportunity				
Security	Safety				
	Food security				
Equity	Gender				
	Age				

Indicators of DFP mechanism performance

Category	Attribute	Status			
		Poor	*Fair*	*Good*	*Very good*
Recognition	Recognition	No recognition	Recognition by only local or only non-local relevant groups	Recognition by both local and non-local key relevant groups	Recognition by all relevant groups
Protectiveness	Enforceability	No customary or formal regulation	Non-binding regulation	Mostly binding	Fully binding and enforceable
	Permanency	< 5 years	5-10 years	>10 years	>25 years
	Freshwater scope	No freshwater KEAs	1 KEA	2-4 KEAs	All KEAs
	Spatial scope	Only a few isolated reaches	Several tributaries or reaches	Majority of catchment and all important tributaries	Entire catchment
Enforcement	Status	No enforcement	Weak active enforcement	Moderate active enforcement	Strong active enforcement
	Efficacy	Many disallowed activities observed	Some disallowed activities observed	Few disallowed activities observed	No disallowed activities observed
Funding	Adequacy	<25% of needed funding	<50% of needed funding	>75% of needed funding	100% of needed funding
	Sustainability	Funding for <2 years	Funding for <5 years	Funding for 5-10 years	Funding >10 years
Management	Staffing	No staff	Limited staff	Mostly sufficient staff	Full staffing
	Implementation	<50% of budgeted expenses	50-70% of budgeted expenses	70-90% of budgeted expenses	90-100% of budgeted expenses