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Accelerating learning and impact in conservation by tailoring learning and adaptive management approaches to the stage of strategy development

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Abstract

Conservation has successes to celebrate, but it is not on track to achieve global goals for biodiversity, climate, and people. There is an urgent need to learn how to increase conservation impact by identifying more effective conservation actions and how to scale them. We provide a framework for selecting learning approaches that support adaptive management at different stages in the maturity of a strategy. We use case studies from The Nature Conservancy (TNC), a global conservation organization, to illustrate the framework. During the "emerging" stage, teams used relatively rapid evidence synthesizing and generating practices (e.g., interviews, focus groups, expert input, pilot tests) to develop ideas, check assumptions, and refine or reformulate their theory of change (TOC). During the "validating" stage, teams used impact and performance evaluations to evaluate the effectiveness of conservation actions to inform decisions to adjust their TOC, expand, or exit. We suggest that teams can use similar approaches during the "scaling" stage to evaluate scaling mechanisms and verify conservation effectiveness in new contexts. These case studies had one or more enabling conditions for learning (i.e., motivation from individuals, partners, or donors; clear learning agenda questions; special expertise or support; technical feasibility; adaptive management processes). In sum, we argue conservation could accelerate learning and impact by using more rapid learning practices early in strategy development and shifting to using more rigorous evaluation & learning as a strategy matures. Future research could help support learning during the "scaling" stage by advancing evaluation methods that are suitable to these situations.

KEYWORDS

adaptive management, evaluation, learning, strategy

1 | INTRODUCTION

The fight to save nature and halt climate change has successes to celebrate. Two-thirds of conservation actions improve or slow the decline of biodiversity according to a meta-analysis of 186 studies (including 665 trials) with suitable counterfactuals (Langhammer et al. 2024). But the broader reality is that the world is not on track to achieve goals for biodiversity (Secretariat of the Convention on Biological Diversity, 2020) and climate (Diffenbaugh & Barnes, 2023; UNFCCC, 2023), which also has significant implications for sustainable development (United Nations, 2022). Conservation impact depends on both the effectiveness of conservation actions and the ability to scale successful actions (Pienkowski et al. 2024). We posit that improving learning is an important step toward improving the effectiveness of conservation actions and scaling those actions to achieve global goals.

Adaptive management can be defined as "a structured process of learning by doing, and adapting based on what's learned" (Williams, 2011). The Conservation Standards and The Nature Conservancy's (TNC's) Conservation by Design are two long-standing adaptive management frameworks that include steps for monitoring & evaluation (M&E) (Margoluis et al., 2013). The Conservation Standards define M&E as *the periodic collection and evaluation of data relative to stated project goals* (*i.e., desired impact or state of a conservation target*) *and objectives* (*i.e., desired outcomes or state of a threat or opportunity*) (Conservation Measures Partnership, 2020). Despite the long history of these frameworks, using evidence generated through M&E, or other approaches, to learn and make adaptive management decisions is highly variable in conservation (Reddy et al., 2021). A survey of 116 nonprofits showed that 97% value learning to achieve their missions but face challenges implementing (e.g., a lack of measurable goals, insufficient incentives, uncertainty about processes, lack of capacity and resources) (Milway & Saxton, 2011). Further, mission-driven staff may perceive learning as a distraction from "real work" (Edwards, 1997), despite its potential to save resources and increase impact (Wardropper et al., 2022).

The field of conservation has a long tradition of monitoring ecological states to support adaptive land management. However, conservationists have been slower to adopt methods for measuring the impact of specific actions or mechanisms to scale those actions. In the early 2000s, a number of influential papers criticized conservation for lacking rigorous evidence and advocated for impact evaluation research (e.g., Ferraro & Pattanayak, 2006; Junker et al., 2020; Pressey et al., 2021), i.e., evaluations[1] that seek to establish a cause-and-effect relationship between an action and its impact by comparing outcomes with and without the actions (Gertler et al., 2016). This movement drew on the practice of impact evaluations in other disciplines and sectors such as public health and international development (Craigie et al., 2015; Stem et al., 2005). The US Agency for International Development and other organizations provided definitions of performance monitoring, performance evaluation, and impact evaluation that are relevant to conservation practitioners and researchers, but which are distinct from those offered by the Conservation Standards (USAID, 2020). Since that time, environmental NGOs have both commissioned and implemented impact evaluations (e.g., Hagen et al., 2024; Hamilton et al., 2011; Leisher et al., 2022; McKinnon et al., 2015; Oliveira Fiorini et al., 2020; Weigel et al., 2021). Yet, there is still a sense in this community that impact evaluations are underutilized (SCB, 2025) and there are challenges to "bridging the impact evaluation research-practice gap" (the prompt for this special issue).

Most conservation practitioners and scientists agree on the need for "rigorous evidence" (Curzon & Kontoleon, 2016); but conservation teams also need more clarity around when rigorous evidence is important versus when less rigorous evidence can be useful and what techniques can be employed. This lack of clarity is a major barrier to learning. In this paper, we aim to help accelerate learning in conservation by providing a framework for selecting learning approaches that support adaptive management at different stages in the development of a strategy. We illustrate this framework with case studies from TNC, a global conservation organization. In sum, we argue conservation could accelerate learning and impact by using more rapid learning practices early in strategy development and shifting to more rigorous evaluation and learning to evaluate conservation action effectiveness and scaling mechanisms when a strategy is more mature. We also outline future opportunities and challenges to testing this framework and to planning, learning, and adapting conservation strategies together with partners.

2 | LEARNING APPROACHES THAT SUPPORT ADAPTIVE MANAGEMENT AT DIFFERENT STAGES

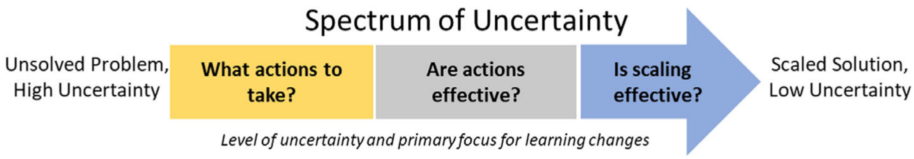
2.1 | Selecting learning approaches

Our proposed framework for selecting learning approaches that support adaptive management is based on the stage of maturity of a strategy (i.e., emerging, validating, scaling, Figure 1). According to the Conservation Standards, *a strategy is a set of one or more activities with a common focus that work together to achieve specific goals and objectives by targeting key intervention points, integrating opportunities, and limiting constraints* (Conservation Measures Partnership, 2020; Langhammer et al. 2024). Strategies can be high-level or specific, in which case conservation actions may be a suitable synonym for strategy (Conservation Measures Partnership, 2020). Note, however, this definition of strategy does not fully encompass Indigenous and community-led, community-based, or relationship-based strategies. Furthermore, we assume that the audience for our framework is primarily staff at conservation organizations and their partners.

A key assumption of our framework is that strategies at different stages of maturity have different levels and types of uncertainty (Figure 1). A team faces three main questions over time as they develop, implement, and scale a strategy: (1) How might they solve the problem (i.e., what conservation actions should they implement or what conservation actions should they seek to influence and how)?, (2) Is their strategy or are their specific actions effective?, and (3) Is their mechanism to scale the strategy or conservation actions working? Is the conservation action effective at different scales or in different contexts? As the strategy matures, their overall uncertainty should reduce as they generate evidence to answer these questions. Their focus for learning will also change as they focus on addressing the different sources of uncertainty represented by these questions.

Another key assumption is related to the enabling conditions for this framework. We assume that accountability will shift from learning to results as strategies mature and increase in confidence. Despite the increased focus on results, learning should be a focus of accountability at all stages because we argue it is important for achieving, scaling, and sustaining results. Conservation teams can have accountability to themselves and their values, managers and donors, partners, communities, or other interested parties.

In our framework, strategies are in the emerging stage if they have identified a problem to solve and have one or more ideas about how to solve it. At this stage, a team's learning questions should include questions such as: (1) What has been done before and how well did it work?, (2) How might we solve this problem and is the solution desired by key parties?, and (3) Are we capable of implementing the solution? Note—for strategies that are promoting the adoption of conservation actions (e.g., promoting cover crop adoption amongst farmers), a team may want to focus on the desirability question first before tackling questions related to feasibility and



Stage	Emerging	Validating	Scaling
Characterized By:	Unsolved problem Multiple ideas about how to solve the problem	Theory of change with clear actions and initial mechanisms for scaling	Theory of change with validated impacts from actions and clear mechanism for scaling
Learning Questions:	What has been done before? How might we solve this problem? What actions to take?	Is our strategy achieving results? Are our actions effective? How might we improve the effectiveness of our actions? How might we scale?	Is our scaling mechanism working? Are our actions effective in new contexts? How might we improve scaling and effectiveness of actions?
Learning Approaches:	Learn from previous work Explore different approaches Learn quickly	Monitoring Evaluation of conservation action effectiveness in one or more contexts Learn periodically	Monitoring Evaluation of scaling mechanism and effectiveness of actions in new contexts Learn periodically

FIGURE 1 Framework for selecting learning approaches that support adaptive management depending on the stage of the strategy (emerging, validating, scaling). The level of uncertainty should decrease as strategies mature from the emerging stage where they are addressing an unsolved problem to the scaling stage where they are delivering a solution at scale. The primary focus for learning, and hence learning questions, also changes with each stage (as indicated by the questions in the spectrum of uncertainty portion of the figure). In the scaling stage, the primary focus is on scaling mechanism effectiveness with a secondary focus on whether the conservation actions are still effective at different scales or contexts.

viability, because these might not be relevant if the conservation action is not desired (Orton, 2017).

Learning approaches during this phase could include a variety of evidence synthesis approaches (e.g., reviews of reports, knowledge products, scientific literature, evidence databases, expert input, and community input), and evidence generating approaches (e.g., interviews, focus groups, observation, experiential learning, "rapid tests" or pilot experiments). As appropriate, evidence should include Indigenous or traditional knowledge.[2] At this stage, learning approaches should be relatively rapid so that the team, together with their partners and community members as relevant, can narrow in on promising ideas without wasting too much time on unsupported ideas. However, a team may decide to invest more deeply at this stage if they are working on a long-standing problem, there is a major knowledge gap, or there is an opportunity for generating transferable knowledge via research.

Strategies are in the validating stage once they have accumulated enough evidence to formulate a clear theory of change that has moderate or well-defined uncertainties. At this stage, the team's learning questions should include questions such as: (1) Is our strategy achieving results?, (2) What conditions or design factors are moderating the effectiveness of our strategy and how might we improve our strategy?, and (3) How might we scale our strategy? Put another way, the team should be able to articulate and test the main cause-and-effect hypothesis of their strategy using reliable indicators. At the same time, a team should be starting to clarify and gather evidence for a potential scaling mechanism because the design of an effective conservation action and scaling mechanisms are highly intertwined. For example, if a team is developing ways to promote cover crops among farmers, their tests should include organizations or financing mechanisms that have the potential to scale (e.g., government agencies, university extension, agricultural businesses).

If the strategy is specific (i.e., a conservation action), defining and answering the questions during the validating stage questions may be relatively straightforward. However, if the strategy is high-level and involves multiple distinct conservation actions, we recommend focusing on the aspects of the strategy (i.e., specific conservation actions the team seeks to implement or influence) that have the most uncertainty. As appropriate, partners (including Indigenous peoples, local communities, or other groups as relevant) should co-develop the learning questions and the plan for using learnings in adaptive management. At this stage, impact evaluation approaches (e.g., randomized controlled trials/experiments, quasi-experimental analyses) that establish cause-and-effect are important if the conservation action or approach to influencing it is novel,[3] risky, or the strategy team or organization is seeking to scale the strategy (i.e., significant resources may be spent in the future and/or generalizable knowledge can be transferred to other teams). Alternatively, teams may choose to use other evaluation approaches such as performance evaluations that compare outcomes over time (e.g., baseline, midline, and endline) if there is evidence supporting the strategy in other contexts, risk is low, and resources being spent are relatively small. Regardless of the evaluation approach, ongoing monitoring of implementation (activities, outputs) and results (intermediate results, outcomes) is important at this stage to support periodic evaluation, learning, and adaptive management. However, the decision to use impact evaluations should be made prior to implementing a strategy's activities so that data can be collected over time (e.g., baseline, midline, and endline) that will allow for a comparison of outcomes with and without the strategy activities in treatment and control areas.

Strategies are in the scaling stage once they have sufficient evidence to support their theory of change (e.g., evaluations show that the conservation action(s) are effective in one or more geographies and there is some initial evidence to support the scaling mechanism). At this stage, the team's learning questions should include questions such as: (1) Is our mechanism for scaling working? What conditions or design factors are moderating the effectiveness of our scaling mechanism, and how might we improve our scaling mechanism?, (2) Is our conservation action(s) effective in new contexts? What conditions or design factors are moderating the effectiveness of our conservation actions or our approach to influencing them, and how might we improve the conservation actions in the new contexts? In this stage, the team will have new uncertainties related to their scaling mechanism and may use similar learning approaches from the validating stage (i.e., impact evaluations or performance evaluations) to validate their scaling mechanism. At the same time, the team should have lower uncertainty with respect to conservation action effectiveness, which should allow them to design more efficient monitoring and performance evaluation plans focused on a small set of reliable indicators. However, the team should also consider how scaling may affect conservation action effectiveness and the degree to which they need to continue to evaluate conservation actions under changing conditions. For example, does the effectiveness of the conservation actions depend on the scale (e.g., the number of people adopting the actions)? (see Pienkowski et al. 2024 for more examples).

2.2 | Learning and adaptive management at the validating or scaling stages

Figure 2 illustrates how learning approaches might integrate into adaptive management of a strategy at the validating or scaling stage over a four-year period. Conservation teams should periodically hold meetings to review progress, reflect on what is working well or not well, and improve implementation. A key to learning in these meetings is being able to reflect on the difference between what actually happened and what the team expected to happen. Having clear theories of change, near-term learning questions, and targets for what the team expects to achieve can help avoid hindsight bias (e.g., the tendency to believe they knew an outcome was going to happen after learning about the outcome). Conservation teams should also have annual or milestone meetings with managers where they use the results of M&E to make decisions to "pause, pivot, persevere, or expand." For example, midline evaluation may help a team decide to adjust their theory of change significantly (i.e., "pivot"). Endline evaluation should help a team verify whether the expected outcome or impact was achieved and whether scaling the strategy is warranted (i.e., "expand") or whether they should exit the work. This adaptive management approach can also be applied to strategies in the "scaling" stage. In this case, the endline evaluations might help a team decide if they can complete their work and expect the results to be sustained without further action from them.

3 | CASE STUDIES

We illustrate our proposed framework for selecting different learning approaches for different stages of strategy maturity using case studies. We provide one case study of an emerging strategy, one case study of a strategy in both the emerging and validating stages, and two case studies of strategies in the validating stage.

3.1 | Emerging

New York, USA: Climate Adaptation. TNC's New York Climate Adaptation program seeks to help communities

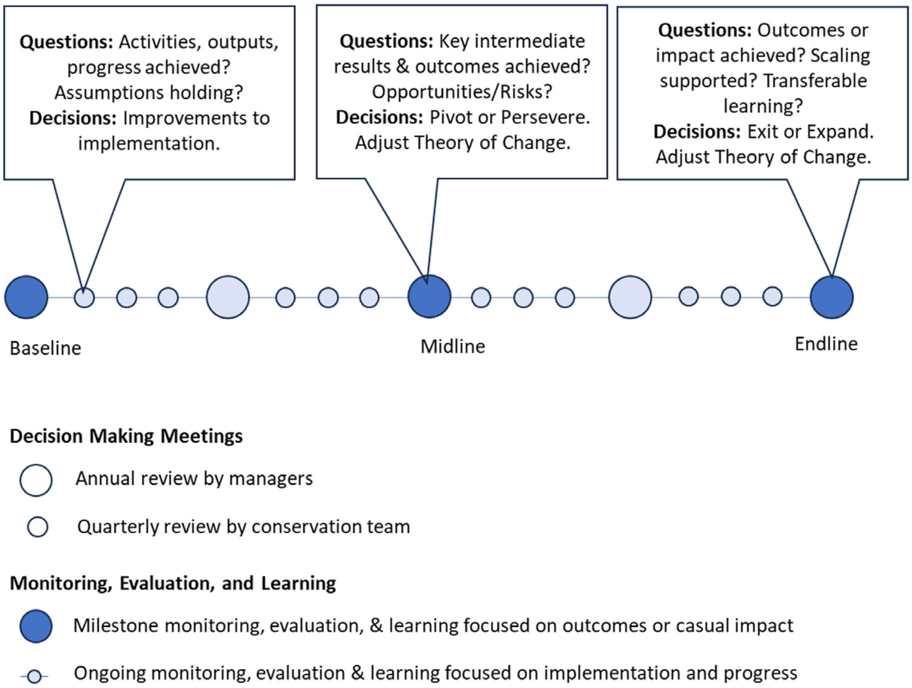


FIGURE 2 Example timeline depicting adaptive management and monitoring, evaluation and learning processes for a validating stage strategy. This timeline could also apply to a strategy in the scaling stage, with the final questions focused on further scaling or sustaining conservation.

adapt to increased flooding and coastal erosion by restoring natural buffers or protecting them from development. Early feedback from local elected officials led the team to explore working with private landholders, especially those that own residential or vacant parcels within floodplains. This strategy could be categorized as *emerging stage* since it was a new approach with a high degree of uncertainty in this particular context. The team set out first to learn from similar projects and to design rapid tests of their strategy, inspired by "agile" approaches from the technology sector. Their approach aimed to focus on the problem to be solved rather than the solution and to test their riskiest assumptions. By doing so, they were able to quickly learn critical information about the environment in which they are working and about the needs, interests, and challenges of stakeholders.

The team hypothesized that they might be able to offer incentives to landowners to avoid developing flood-prone properties. However, virtual focus groups and interviews with local landowners revealed that flooding was not salient to most landowners, and while some were interested in receiving incentives, other factors were more motivating in their decision-making, like considering future uses of their land for their children. To gain additional insights into developing incentive programs for landowners, the team conducted key informant interviews with TNC staff engaged in the Family Forest Carbon Program (FFCP), which provides incentives to private landowners for improved management of their forested lands. The FFCP informants indicated that for an incentive program to succeed, it needed substantial investment in relationship-building via in-person interactions.

Based on their learnings from the focus groups and key informant interviews, the NY Climate Adaptation Team determined that instead of standing up their own incentive program, they would pivot to testing a new hypothesis: integrating flood and erosion data and mitigation practices into existing incentive programs would more efficiently prevent new development on flood and erosion-prone lands. The team is currently working with two incentive programs to learn whether flood and erosion information is useful to outreach staff in communicating with landowners about the benefits their land provides, how this information resonates with landowners, and whether landowners are motivated to learn more about mitigation practices.

3.2 | Emerging to validating

USA Cornbelt: Agriculture. TNC's agriculture program in the US Cornbelt seeks to promote practices such as cover crops to reduce nutrient run-off in waterways and sequester carbon. As of 2015, cover crops had remained low in this region despite long-standing efforts by the government, TNC, and other organizations to work with farmers to adopt these practices. At that time, TNC implemented a process to refresh their strategy. During this process, the team observed that the majority of lands where they were seeking to promote cover crops were rented, meaning that the landowners were not the farm operators. With support from innovation funds, they decided to develop a new strategy focused on "non-operating landowners" (NOLs). Initial consultations with experts, practitioners, and the scientific literature revealed that little was known about NOLs (e.g., who they were, their role in decision making, motivations, etc.).

This new strategy fell between the *emerging* and *validating stages* on the continuum, representing a pivot to a new population for a relatively well-established strategy as well as a strategic re-think in response to slower-than-expected progress. The team was able to focus on some relatively well-defined sources of uncertainty relating to NOLs and decided to both learn more about this population and design a study testing the causal impact of different messaging on this new audience's behavior. TNC formed a collaboration with Purdue University to conduct qualitative research to understand NOLs and barriers to cover crops on rented lands (Ranjan et al., 2019). The team used the results of this research, focus groups, expert consultation, reviews of similar programs, and a behavior change framework to develop hypotheses of how they could design a program to address these barriers (Reddy et al., 2017; Wardropper et al., 2022).

A key assumption of the emerging strategy was that they could reach NOLs and provide them with support (e.g., information, technical assistance, incentives, etc.). First, the team pursued a partnership with a farmland management company that had a contact list for NOLs and was interested in expanding their support of conservation practices. However, the farmland management company and TNC team concluded that their ability to try new forms of support with a large number of NOLs would be too limited to support the development of this new strategy. The team pivoted to expand their partnership with Purdue University to include implementing a trial program for NOLs.

The team's next focus was on how to encourage NOLs to sign up for the program. They used focus groups to get feedback on draft mailers and messages and conducted a pilot experiment of messages (i.e., mailing different messages to different NOLs). For example, they changed one of the photos on the mailers because the focus group said the corn looked unhealthy and made the messenger seem untrustworthy. Lastly, when they implemented the recruitment campaign, they designed it as a randomized controlled trial so they could both enroll NOLs into the program and generate broader learnings about commonly used messages. Through this experiment, they learned that a simple "what is soil health?" did better than messages that focused on economic or economic and environmental benefits (i.e., a "win-win") (Reddy et al., 2020). Furthermore, the results suggested that commonly used economic messaging can backfire with NOLs who have not used cover crops on their land (i.e., the primary group of interest).

Continuing with the intent of the innovation funds, the main program was implemented as a randomized controlled trial (i.e., trial or experimental program). NOLs were offered information, lease templates, and financial incentives to agree with their farmer to integrate cover crops into their leases. See Figures A1 and A2 in the appendix for the strategy and project trial program design diagrams, which show how the project fits into a broader strategy and how the actions of the project team and the conservation actions they seek to influence fit into a simple theory of change (Wardropper et al., 2022). None of the treatments had a significant impact on cover crops as measured by satellite images (Weigel et al., 2021). However, a survey showed that many NOLs took first steps toward adopting cover crops (e.g., talking to their farmer, seeking information from extension) and a follow-up experiment offering $5000 had higher uptake, indicating that large financial incentives may be effective. Although the program failed to increase cover crop adoption via lease templates or financial incentives relative to information, it was a success in generating learnings faster than previous programs. Furthermore, the TNC agriculture program built on these learnings by pursuing other forms of financial incentives and the results informed the design of government and corporate programs.

3.3 | Validating stage

Northwest India: Agriculture. TNC's Promoting Regenerative and No-burn Agriculture (PRANA) project aims to reduce crop residue burning in the states of Punjab and Haryana in India. Residue burning is a significant source of greenhouse gases, black carbon, and particulate matter, which contribute to climate change as well as damage to human respiratory health and lower crop production. Punjab and Haryana—in addition to being one of the centers of the Green Revolution, where crop yields increased between 1% and 5% every year in the 20th century (Hazell, 2010)—have some of the highest rates of crop residue burning in the world (Hall et al., 2024).

With support from the Bezos Earth Fund, TNC developed the PRANA project, which aims to reduce residue burning by building awareness among farmers, developing their capacity to use no-burn crop residue management (CRM) practices, and supporting them to adopt machinery that allows them to directly seed into residue stubble. The program focused on behavior change communication for awareness building and creating a large network of field trials (>1000) to provide the evidence and demonstration of how to incorporate this machinery into farming systems. To improve access to no-burn CRM machinery, the program identified and trained a pool of machinery service providers and helped build linkages with farmers for timely availability of machinery. The project also developed a mobile app so farmers can rent or borrow machinery from a nearby owner.

This project is in the *validating stage*, as it applies a number of conservation actions that are relatively well-known in the agricultural sector with the goal that together the components of the project will combine to create wide-scale change in the system of agriculture used in Northeast India. The team focused their learning on answering questions related to the causal impact of their actions, as well as the causal pathways through which the impact is being seen.

PRANA worked with KPMG to implement baseline and midline surveys in implementation villages and villages not covered by the PRANA project. The surveys revealed that farmers are shifting toward no-burn CRM: the usage of CRM machinery increased over time, and the most cited reason to continue burning changed from unavailability of machinery to agronomic issues. An additional, critical learning from the surveys is that more farmers are cultivating short-duration rice varieties, like basmati, which can require less residue burning and capture more market revenue. Short-duration varieties take less time to mature, which increases the time window between paddy harvesting and wheat sowing, and have low straw load as compared to long duration high yielding varieties. Supporting rice variety and crop diversification, therefore, offers an important opportunity to further reduce residue burning across northwest India.

Supporting farmer transition to alternative rice varieties—and other crops—requires a new approach for the PRANA project. Rather than narrowly focusing on access to CRM machinery, there is a need to support all aspects of agronomy, markets, and policy related to crop and varietal switching. For instance, short-duration rice varieties require different irrigation patterns, which require agronomic support, but also present the opportunity to significantly reduce groundwater extraction. Changing varieties also requires connecting farmers to new markets. Long-duration varieties have a guaranteed Minimum Support Price from the government and are purchased by the government for its food procurement system. Short-duration varieties like basmati are sold on the free market and are more susceptible to price volatility and risks for farmers, even though there is a potential for a greater price.

As a result of these learnings, the team is adapting their strategy. This updated strategy will continue to provide technical support to farmers on crop residue burning, building on the successful adoption of no-burn CRM, but will also focus on attempting to identify and implement new solutions to structural barriers that maintain path dependency for the rice-wheat system.

Tanzania: Fisheries and Family Health. The Tuungane Project is an innovative collaboration between TNC and Pathfinder International aimed at improving conservation outcomes, livelihoods, and maternal and child health in western Tanzania on the shores of Lake Tanganyika. The partnership supported actions focused on increasing access to contraception and maternal and child health services alongside efforts to improve the sustainability of fishing and farming practices and conserve forests.

The Tuungane project began in 2010 and is in the *validating stage*. Its actions are relatively well-evidenced in other contexts but needed to be validated in the project area; the strategy of pursuing integrated programming needed to be tested as a whole. The team focused on measuring the causal impact of the individual actions as well as attempting to assess the degree to which they work together to further the partnership's shared goals.

To monitor the project's performance on population, health, livelihood, and environmental indicators, the Tuungane partnership commissioned three rounds of household surveys in the project area around Mahale Mountains National Park—a key location for chimpanzee and endemic fish conservation. The survey design originally included comparison areas for counterfactual estimation, but program expansion included these areas in the project activities. Nevertheless, survey data from the project area was used to conduct a performance evaluation of the project's first 10 years; the project team convened a pause, reflect, and adapt (PRA) workshop to consider the findings.

The trends in reproductive health care were largely positive, with family planning utilization, antenatal healthcare visits, and professional birth assistance all improving in the project area. Conservation results indicated some improvement in fish availability and a strong presence of conservation enforcement from local institutions, though challenges for long-term sustainability remain significant. Results for sanitation and farming livelihoods were mixed and indicated a need to review and revise these approaches to enhance their relevance and effectiveness. Following the PRA, the strategy team

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generated recommended actions to take forward the adjustments (The Nature Conservancy, 2024).

Tuungane is now revising its strategy to scale up the success in family planning, community forest protection, wetland protection, and climate change adaptation, and to expand into the terrestrial Lake Tanganyika Catchment Basin. In addition to informing the next phase of the Tuungane collaboration, these learnings have been incorporated into TNC's broader strategy for community-led freshwater conservation around Lake Tanganyika. A follow-on study is also being performed which integrates the Tuungane survey data with data from a comparison sample drawn from the Tanzania Demographic and Health Survey. Preliminary results from this study appear to confirm the hypothesis that the program had an impact on contraception use and fertility rates, as there is a significant difference between the trends in the program area and in the matched comparison areas.

4 | ENABLING CONDITIONS FOR LEARNING

The example case studies presented in this paper each had one or more enabling conditions for learning (i.e., motivation from individuals, partners, or donors; clear learning questions; special expertise or support; technical feasibility; adaptive management processes).

Motivation from individuals, partners, donors. The motivation for learning in these cases was driven by specific individuals, including managers, partners, and donors. Based on our experience, we believe that it is especially critical for managers and teams to drive learning because they have the authority to act on learnings to adapt management. For example, in Tanzania, the manager and team, including partners, specified the questions that set out the terms for the evaluation. Now, they are using the answers to those questions to turn recommendations into decisions and actions.

Learning questions. In addition to motivation for learning, we believe that having managers and teams develop clear learning questions that are based on theories of change is also an important enabling condition. Specifying learning questions can help set clear objectives for learning and facilitate accountability to learning. For example, TNC recently began requiring that teams receiving central funds must specify learning questions and report back to managers and leaders on their findings. Furthermore, our initial observations suggest that managers and teams perceive the results of evaluations as less valid when they do not specify the research question, participate in the research design, or interpret the results; this needs further investigation (see future work).

Special expertise or support. Each of these teams had special expertise or support for learning, ranging from internal staff and scientists to contractors. For example, TNC's executive leadership demonstrated its commitment to increased learning by evolving its conservation impact system that helps teams plan, measure, and adapt. This included funding programs to support strategy development, monitoring, evaluation, and learning and adaptive management, including programs specifically supporting equitable and community-based conservation approaches.[4]

Resources and technical feasibility. All learning approaches require dedication of resources. Staff time is the primary resource, which is part of why we believe teams with more fully dedicated staff (e.g., 80%–100% time on the project) are better able to focus and learn more rapidly. In addition to staff time, some forms of monitoring and evaluation require special expertise (discussed above) and data collection. Furthermore, data on some indicators are not available at the right temporal and spatial scale or cost to support evaluation, which means research and development of new data products is needed. For example, in the US Cornbelt, TNC has supported the development of satellite-derived measures of agricultural conservation practices (Weigel et al., 2021) and nitrates in the Mississippi River (Tufillaro et al., 2024).

Impact evaluations that seek to establish cause-and-effect relationships between conservation actions and impact have other considerations for technical feasibility. For example, conservation actions involving many individuals or communities are more amenable to quasi-experimental and experimental designs to estimate cause-and-effect; however, synthetic control methods and other advances are expanding technical feasibility. Furthermore, methods such as process tracing provide an alternative to traditional counterfactual approaches (e.g. Brandão et al., 2023).

Adaptive management processes. Translating learning into decisions and improved strategies requires moments for reflection and making adaptive management decisions. These can take many forms, including highly or lightly structured "pause, reflect, adapt" meetings, quarterly reviews, and annual reviews (Figure 2). While teams and technical staff can play a role in these processes, we believe it is critical that these processes are championed and led by managers and leaders who have decision-making authority. As appropriate, these processes should include partners, Indigenous and local communities, and other interested parties.

5 | SCOPE OF LEARNING

Conservation strategies are increasingly complex, which means that testable learning questions are unlikely to capture the full scope of the strategy. Furthermore, there tends to be a trade-off between the rigor of evidence and the scope of the question that can be asked. These challenges underscore the importance of having a theory of change and a learning strategy that helps the team accumulate knowledge over time in pursuit of systems change.

6 | CONCLUSIONS AND FUTURE WORK

To accelerate learning and impact in conservation, we provide a framework for selecting learning approaches that support adaptive management at different stages of strategy maturity. We illustrate the utility of this framework with case studies. Each of the case studies we describe had one or more enabling conditions for learning (i.e., motivation from individuals, partners, or donors; clear learning questions; special expertise or support; technical feasibility; adaptive management processes). A key limitation of this paper, and area for future work, is that this framework is itself an emerging idea and has yet to be validated with more rigorous evidence or illustrated with case studies of strategies in the "scaling" stage. In the near term, we plan to continue to take a more rapid approach to testing this framework at TNC by helping teams identify the stage of maturity of their strategy and use this framework to select learning approaches, including identifying when more rigorous evaluations are needed to evaluate the effectiveness of their actions and scaling mechanisms. In addition, we plan to continue to investigate how organizational initiatives to accelerate learning and impact affect conservation teams who are integrating equitable approaches in their strategies (e.g., does a focus on learning and transparency help teams build trust with communities? does a focus on accelerating impact create challenges for teams who are building relationships with communities?).

We invite the conservation science and practice community to test this framework and advance methods and studies that support greater learning in conservation. For example, future research could help support learning during the "scaling" stage by advancing evaluation methods that are suitable to these situations, recognizing that much of the field of impact evaluation research is more narrowly focused on conservation action effectiveness. This will be especially important for strategies that are primarily focused on changing policies, markets, or other institutions. Another area for future collaborative work by practitioners and researchers is to review previous evaluation research to identify actionable lessons learned, understand if these lessons have been used, and identify barriers to uptake, if they have not been used.

DATA AVAILABILITY STATEMENT

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

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ENDNOTES

[1] Evaluations are considered research if they are systematic and seek to develop generalizable knowledge, according to definitions under the US Health and Human Services Policy for Protection of Human Research Subjects (HHS, 2018).

[2] Indigenous or traditional knowledge is defined as "*a body of observations, oral and written knowledge, innovations, practices, and beliefs that promote sustainability and the responsible stewardship of cultural and natural resources through relationships between humans and their landscapes*" according to the US Guidance for Federal Departments and Agencies on Indigenous Knowledge (Daniel et al., 2022).

[3] The USAID (2020) evaluation policy required impact evaluations for innovative or untested interventions.

[4] See public resources: Conservation by Design Modules, Agility Lab, and Voices, Choices, Action Framework.

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