CHAPTER FOUR:

Science to Implementation

Science to Implementation as a Core Value & Function of the IWJV

The IWJV Science to Implementation Team supports our partners in bridging science and implementation to strengthen ecosystem restoration and management.

The Problem

The gap between science production and on-the-ground implementation is widely recognized as a persistent challenge to conservation and management communities.[1] Applied conservation science produces innovative science and cutting-edge datasets, maps, and tools to support the conservation and management of globally significant ecosystems. Adopting this ever-increasing body of science and technical information is challenging for resource managers. It often lags behind science production and sometimes does not happen at all. Too often, science production is treated as a top-down, linear process ending with peer-reviewed literature left for land managers to find.[2]

Scientists may take the additional step of conducting outreach and presentations to make managers aware of the research. Still, the burden of translating science into actionable steps has largely rested with practitioners, who may not fully understand or be able to access the information being delivered and who likely have a full list of other job priorities. This "loading dock" approach to science dissemination has proven inadequate for solving complex natural resource problems, especially because managers and practitioners face other barriers to using science beyond lack of information access.[3]

Many scientists do not have institutional incentive structures to support time-consuming co-production, which is a way of developing knowledge by engaging end users of science in the design and development of research.[4] Furthermore, the sheer volume of new science, technologies, and "decision-support" tools being developed exceeds the capacity of scientists and resource managers to engage in co-production, even when desired. Regardless of the approach taken, even the best translation of technical products does not readily lead to consumption and adoption by resource managers. Effective science communication alone does not equate to changes in behavior or practices, and there are many behavioral, cultural, and institutional barriers to adopting technical information.[5]

[1] Cook et al. 2013, Bea et al. 2019, Dubois et al. 2019
[2] Beier et al. 2017
[3] Cash et al. 2006, Walling and Vaneeckhaute 2020, Wardropper et al. 2021, Olsen et al. 2024
[4] Lemos et al. 2018, Naugle et al. 2020, Bandola-Gill et al. 2023
[5] Toomey 2023, Olsen et al. 2024

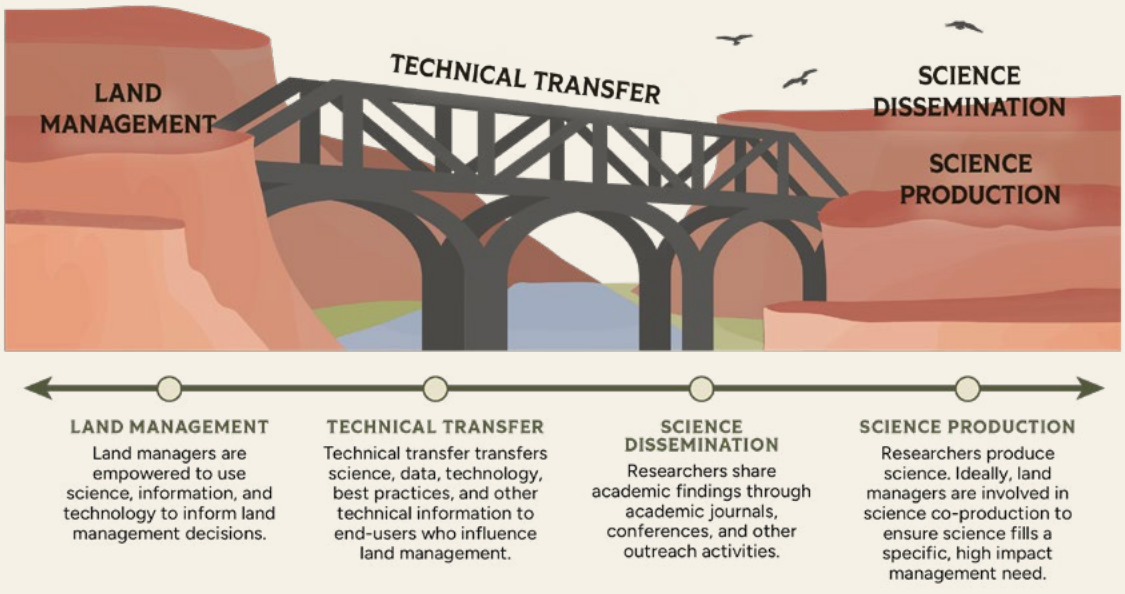
Technical Transfer as a Solution

Fortunately, there is a field of practice that overcomes these barriers. Technical transfer (i.e., science-to-implementation, cooperative extension, and science application, among other terms) is the process of transferring science, data, technology, best practices, and other technical information to end users who influence land management (Box 1)[6].When done successfully, technical transfer expands awareness and integration of this information and facilitates the adoption of best practices, strengthening on-the-ground management outcomes. Although often overlooked in traditional, top-down science delivery, technical transfer is an established concept with deep roots in American land grant universities and, in particular, agricultural extension.[7]

Boundary-spanning organizations like the IWJV legitimize technical transfer by bringing science producers, users, and facilitators together and providing capacity for their work.[8] The IWJV will serve as an organization for technical transfer by creating an environment where the convergence of perspectives and knowledge systems related to bird habitat management and conservation results in the transfer of information to land managers and other on-the-ground practitioners.

BOX 1

Bridging Science & Land Management Through Technical Transfer



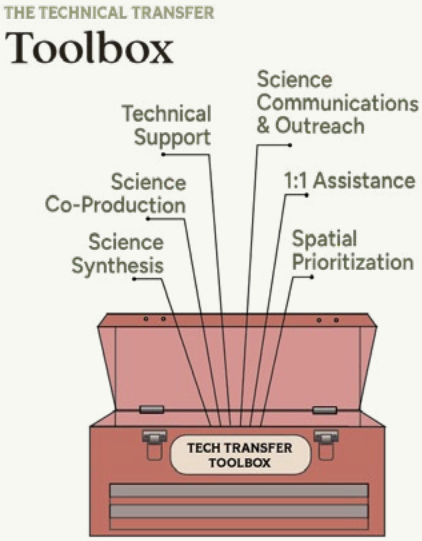
[6] Olsen et al. 2024, [7] Bahar and Griesbach 2020, [8] Kirchhoff et al. 2013, Beier et al. 2017, Olsen et al. 2024

Technical Transfer in Action

In practice, the Science to Implementation Team uses a toolbox of technical transfer tactics (Box 2). Efforts are tailored to the needs of end users, from using spatial data to prioritize management actions across the landscape to accessing the latest science to support a planning process. Examples of the IWJV's tech technical transfer work include:

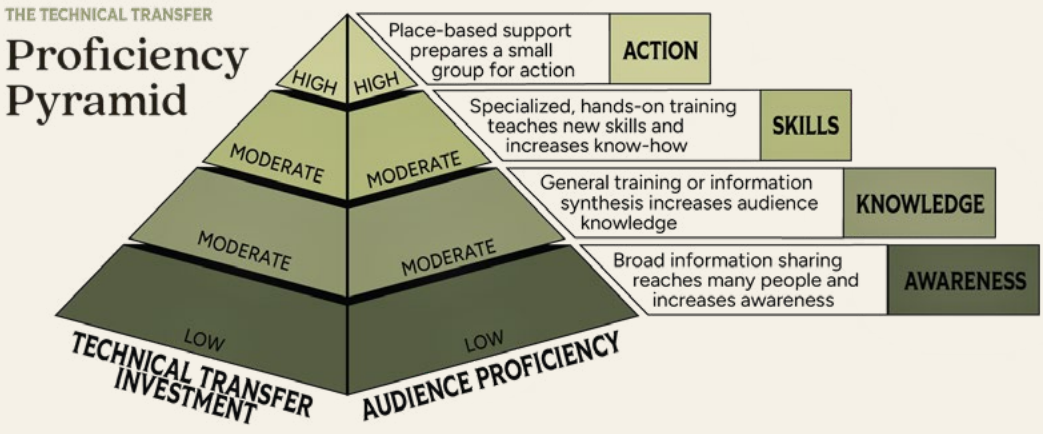
- One-on-one support, targeting conservation collaboratives in using spatial data in planning and users of the Wetland Evaluation Tool (WET).
- Reports on climate resilience in pinyon-juniper woodlands and carbon storage in rangelands.
- Virtual and in-person workshops to teach low-tech Zeedyk techniques.
- Development of spatial tools to incorporate bird values into forest management.
- A sortable, searchable list of top management-relevant resources.
- Technical support for the development of the USDA Climate Smart Agriculture and Forestry Mitigation Activities List.

The Technical Transfer Toolbox



The technical transfer toolbox describes some of the approaches used by the IWJV Science to Implementation Team.

BOX 2



The technical transfer proficiency pyramid describes the desired audience proficiency for a technical transfer effort and the corresponding effort (i.e., time, capacity, funding) needed to meet audience proficiency objectives.

Science Production

Despite the ever-increasing abundance of science related to birds and their habitats in the Intermountain West, knowledge gaps remain, hindering the efficacy of conservation and management in the habitats we work in. Our focus on science production emphasizes filling such gaps. Some examples include:

- **In wetland ecosystems**, the consequences of large-scale loss of wetland habitat due to the effects of climate change[9] on migratory waterbird space use and demography remain largely unknown.
- **In western forests**, basic information is lacking about the biology of the declining Pinyon Jay and how active management might benefit pinyon-juniper woodlands under a changing climate.
- **In sagebrush ecosystems,** knowledge is limited but growing on how simple structures made of sticks and stones, like Zeedyk practices, affect wildlife habitat.

The IWJV employs a co-production approach to science development to address these knowledge gaps and others. Co-production is an effective tool for engaging with partners and meeting their science needs. Through internal and external science production, the IWJV will remain a productive supporter of scientific advancement in the Intermountain West.

Internal Science Production

The IWJV contributes to a growing body of science used to inform conservation through in-house science production. Our primary science production niche has been understanding flyway-scale patterns in wetland habitat availability and dynamics and waterbird use of these habitats[10]. Leveraging remote sensing, cloud computing, and artificial intelligence technologies, the IWJV continues to innovate and advance our collective understanding of wetlands in the Intermountain West in ways not previously feasible. While the IWJV Science Team (the IWJV's Spatial Ecologist and Science to Implementation Team) has expertise and scientific credibility on a variety of habitats and species in the Intermountain West, we anticipate our primary internal science production focus will remain on addressing knowledge gaps related to flyway-scale perspectives of waterbirds and their habitats. Although all IWJV-led science has involved some co-production, opportunities exist to expand these efforts. For example, as the IWJV considers conservation strategies and science that support public wetland managers, increased engagement with these managers[11] will be necessary to ensure that IWJV science meets their needs and applies to their conservation and management objectives.

[9] Donnelly et al. 2020, [10] Current Science at the IWJV, [11]2025 IWJV Implementation Plan Wetland Ecosystems Chapter

Partner Science Production

In addition to in-house science production, the IWJV facilitates and supports additional science production through research partners. Given the diversity of habitats and research needs in the Intermountain West, there is a limit to how much science the IWJV can produce internally to meet these needs. As such, the IWJV has a history of "exporting" science production by supporting partners in filling key knowledge gaps through funding, technical transfer support, or communications. For example, the IWJV supported the development of several science products at the University of Montana with financial support from the BLM as part of the USDA NRCS Working Lands for Wildlife program[12]. This included the development of the Rangeland Analysis Platform[13] and the Landscape Explorer[14]. Thanks to the financial support and interest at Montana NRCS in assessing biological outcomes of their work, the IWJV facilitated the development of science and tools by Bird Conservancy of the Rockies to assess expected outcomes from forest management for western forest birds[15].

Leveraging this approach to developing science requires a network of science producers with appropriate expertise. The IWJV Science to Implementation Team and Spatial Ecologist maintain this network by participating in professional societies (e.g., Society for Range Management), tracking current research on relevant topics, and actively building partnerships with science producers.

Looking Ahead

Given accelerating ecosystem change, high investment in ecosystem conservation and restoration, and the large body of knowledge, data, and tools available, bridging science and implementation is vital to durable conservation outcomes. Technical transfer can rapidly put existing and emerging information into action.

The IWJV Science to Implementation Team is well-positioned to bridge science and implementation gaps within our partnership and advance the developing practice of technical transfer using the technical transfer toolbox (Box 2).

[12] wlfw.org
[13] rangelands.app
[14] landscapeexplorer.org
[15] A previous example of this work from Colorado