Technical Transfer Framework

An Introduction to Technical Transfer

What Is Technical Transfer?

Technical transfer is a collaborative practice that helps people integrate relevant science, data, technology, and practices into natural resource management. The goal is to *empower managers and practitioners to strengthen outcomes on the ground* through the use of science, data and technology.

Why Is Technical Transfer Needed?

Decades of research and technological advances provide opportunities to use a wealth of knowledge in natural resource decision-making. However, the adoption and use of products and practices in resource management lags behind their development. It is often difficult for resource managers to access, interpret, integrate, or apply this information to their management decisions, and the large volume of new science and technical products can quickly lead to information overload.

Who Does Technical Transfer?

People with a variety of backgrounds do technical transfer. Technical transfer can be done by dedicated technical transfer professionals, university extension or research faculty, scientists, agency resource specialists or biologists, communications specialists, and anyone else who supports others in using technical information in resource management. Many of the people engaging in technical transfer do not have any training in this subject. A main purpose of this Framework and other guidance from the Sagebrush Technical Transfer Network is to provide a resource to develop skills and strengthen outcomes of technical transfer.

Are There Other Terms For Technical Transfer?

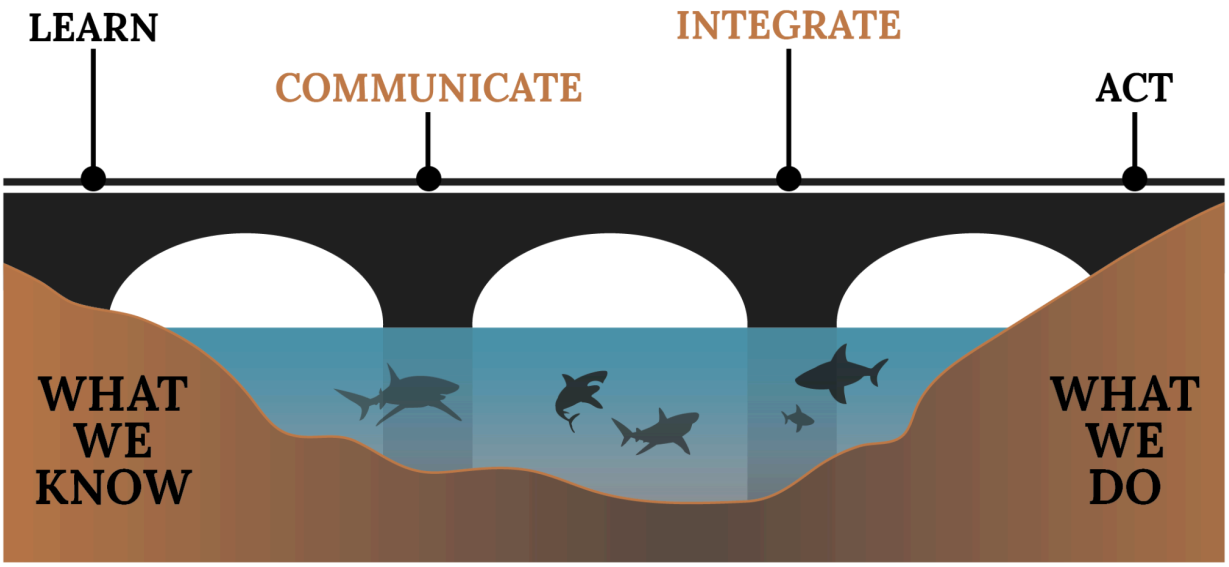
You may have heard technical transfer referred to as extension, technology transfer, science-to-implementation, science-to-practice, science integration, or other terms.

What Does Technical Transfer Look Like?

Technical transfer bridges *what we know* and *what we do* (**Figure 1**). Concerted, collaborative, bidirectional effort is needed to move technical information developed from learning and knowledge generation processes into action. Engaging managers and practitioners in shaping and co-developing science and research is essential in producing relevant and actionable knowledge. Communicating and integrating technical information—key technical transfer actions—help bridge between knowledge and practice.

The Technical Transfer Framework

The **Technical Transfer Framework** provides a flexible, 5-step guide to planning and implementing what is done *before, during,* and *after* technical transfer as a resource for people engaging in the art and science of technical transfer. This Framework was developed by the Sagebrush Technical Transfer Network, sourcing knowledge from many people with decades of experience. As you use this Framework, let the **Shared Principles** (Page 3) guide your approach. Use the five steps outlined below alongside the Planning Worksheet to set your effort up for success. Additionally, check out our Case Studies of real-world examples, and use the Reflection Worksheet to document your approaches and lessons learned.



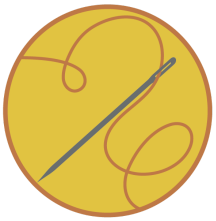
LEARN	Learning happens through the conventional scientific process and other means of generating and sharing knowledge. Scientists and others contribute to a body of knowledge, ideally involving managers and end users through co-production. Other forms of knowledge, such as place-based local expertise, Indigenous Knowledge*, and peer-to-peer learning networks, are elevated alongside Western science.
COMMUNICATE	For academic audiences, knowledge is typically shared through journal articles and scientific conferences. For broader audiences, communication **highlights** key takeaways, **visualizes** information creatively, and **paints a narrative**. However, communicating about every scientific study or product perpetuates information overload for managers and practitioners due to the volume of data, science, and tools.
INTEGRATE	The most impactful technical transfer **filters** and **distills** the most actionable information and best practices from a wide body of knowledge. This approach **integrates** important, relevant, digestible, and actionable information. For maximum impact, technical transfer is conducted in collaboration with specific audiences and applied within the context of management decisions, actions, or questions.
ACT	Resource managers are empowered to make decisions informed by relevant science, data, technology, and knowledge. Local communities, diverse values, and agency or group policies and norms also guide decisions.

** We emphasize the importance of Indigenous Knowledge and other ways of knowing as equal to that of Western Science. However, technical transfer is not an appropriate process for engaging with Indigenous Knowledge. Indigenous Knowledge requires relationships with Indigenous Peoples through a process that is participatory and inclusive, not extractive and appropriative. Mutually beneficial partnerships centered in place, respecting Tribal and Indigenous sovereignty and land rights, protecting Indigenous Knowledge and Indigenous People, and acknowledging historical context and injustice are one model for integrating Indigenous Knowledge with decision-making. This model likely differs from how practitioners engage with Western Science.*

Figure 1. Technical transfer connects what we know and what we do, addressing barriers to accessing, interpreting, applying, and integrating information into resource management.

Shared Principles of Technical Transfer

Keep in mind these four principles as you engage in technical transfer.



Tailor Your Effort To The Audience

The audience is the driver of a successful technical transfer effort. Take the time to get to know your specific audience, their management goals, and their decision space. Ask questions to understand what's important to them, their level of knowledge and skill, and the challenges they face. Let these factors guide your effort. If you can, meet the audience face-to-face in their communities or workplaces.

Focus On A Specific Management Need

Effective technical transfer focuses on a specific management need. This includes a topic of resource management importance and the needs of your audience related to a specific decision, action, or question. Your technical transfer approach should consider the organizational or institutional processes, regulations, laws, policies, etc., that influence how technical information informs their decisions or actions. Acknowledge and embrace that decisions and actions are based on many values, sources of information, and perspectives far beyond Western science.

Filter, Distill, And Integrate Relevant Information

Technical transfer efforts ideally will filter and distill from the body of technical information (science, data, technology, and tools) available to address a specific management need, integrating the most actionable and relevant information. Try to avoid overly narrow efforts that do not adequately address the needs of the audience or are exclusively focused on promoting a specific tool or product.

Prioritize Relationship-Building

Enduring technical transfer prioritizes relationships. Trust and respect often have a greater bearing on the success of a technical transfer effort than academic credentials or the impressiveness of technical products. Build and foster relationships with science producers and end-users early in the process. When necessary, leverage the relational capital of others and consider the right messenger for your audience.

Before Technical Transfer

① DEFINE YOUR AUDIENCE AND MANAGEMENT NEED

To center your effort, identify the "for who?" and the "why?"

The **audience** is a specific set of end users who are usually involved in decisions or actions related to resource management. They have a **management need:** for a topic of resource management importance, needs related to a specific management decision, action, or question. They may have a defined decision space or process for making and implementing decisions or actions. They may have specific ways in which they can or are required to incorporate technical information into management.

The technical transfer effort should help integrate relevant technical information, including science, data, technology, and practices, into the audience's decision-making process. Each effort must be tailored to the audience's social, cultural, and institutional context, decision process, and **knowledge or skill level**. A technical transfer effort may have multiple audiences, but approaches (Step 3) should be tailored to each.

Key questions for Step 1. See the **Planning Worksheet** for more detail about each.

1A. *What is the management need, and why is it important? What resource management decision, action, or question is being addressed?*

1B. *Who is your intended audience(s)? How can your audience use information to inform a decision, action, or question?*

1C. *What is your audience's background and technical skill level relative to the topic? Is there a need to establish a shared understanding of the technical issues?*

② DETERMINE IF TECHNICAL TRANSFER IS APPROPRIATE

Verify you are using the appropriate tool for your audience's needs

Technical transfer is not always the most effective or appropriate solution to a management need. Before beginning a technical transfer effort, verify that technical transfer is appropriate for your situation by considering the questions below. *You do not need to meet all of these conditions*, but if any of these "enabling conditions" are absent, you may need to consider additional approaches to strengthen your effort. Additional detail on each consideration, and suggestions for how to address gaps in each area, is included in **Table 1** of the **Technical Transfer Planning Worksheet.**

Key considerations for Step 2. See the **Planning Worksheet** for more detail about each.

- ☐ Data, science, or other information can influence the management need (i.e., it is not dictated by policy, law, regulation, etc.).
- ☐ A sufficient volume of actionable information (science, data, traditional or local knowledge, etc.) exists to inform management need.
- ☐ You have relationships, trust, and credibility with an audience that can influence decisions or actions related to the management need.
- ☐ The social and administrative conditions exist to set your effort up for success. Your audience is ready to act.
- ☐ Your team has the capacity (time and skills) to address at least some technical transfer barriers for this management need.

③ DEVELOP A TECHNICAL TRANSFER APPROACH

Tailor your approach to your audience's needs and desired outcomes

Selecting an approach for your technical transfer effort is about increasing your audience's proficiency in a focused, engaging, and participatory way. The **Proficiency Pyramid** (**Figure 2**) can be used to calibrate your effort and set expectations for your audience's desired knowledge or skill level related to their management need. Ideally, the audience is specific. However, especially on lower levels of the Proficiency Pyramid, it may be broad. Further up the pyramid you go, the more time and effort it takes for effective technical transfer and the narrower your audience.

There is no one-size-fits-all technical transfer approach. Each effort should center its audience's management need, social, cultural, and institutional context, decision process, and level of knowledge or skills. There are many potential formats for technical transfer (**Figure 3**), each with tradeoffs in time investment, specificity, and breadth of reach to your audience.

Key questions for Step 3. See the Planning Worksheet for more detail about each.

3A. *What does success look like for this effort?*

3B. *Where do you want your audience to land on the **Proficiency Pyramid** (**Figure 2**) after technical transfer?*

3C. *What are the learning outcomes or the main take-home messages for your audience? What do you want them to walk away with?*

3D. *How will you filter, distill, and integrate information from the existing body of knowledge? Can you combine forces with experts or other technical transfer efforts that focus on this management need?*

3E. *What format(s) will likely fit your management need, audience, and desired proficiency level(s) (**Figures 2 & 3**)? Can you include interactive peer-to-peer learning or other best practices?*

3F. *Who are the most effective messengers for your audience? Are there opportunities to collaborate with people who have trust and credibility with the audience and sufficient knowledge to carry out the technical transfer?*

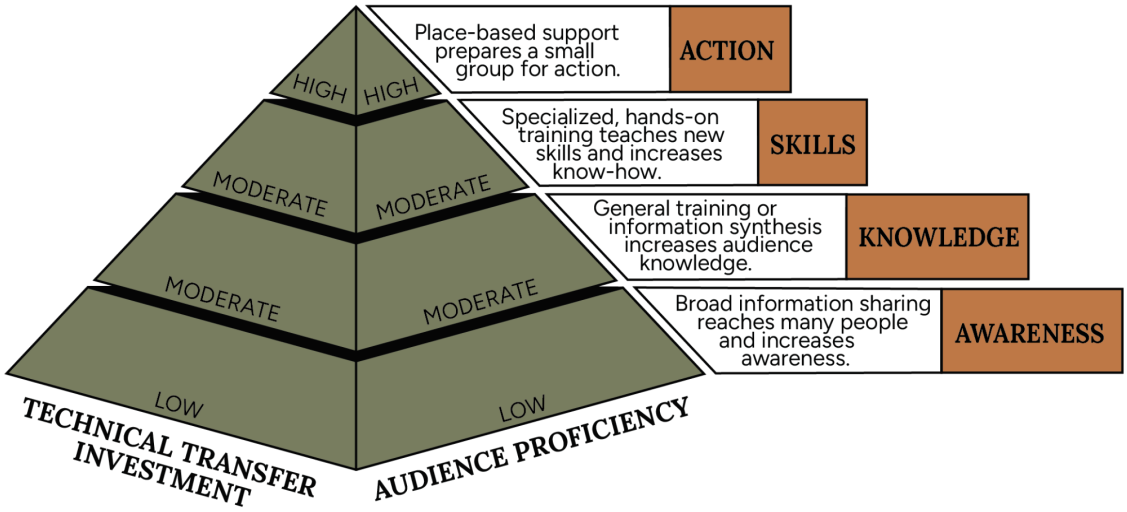


Figure 2. The **Proficiency Pyramid** is a tool to match technical transfer approaches to desired audience outcomes.

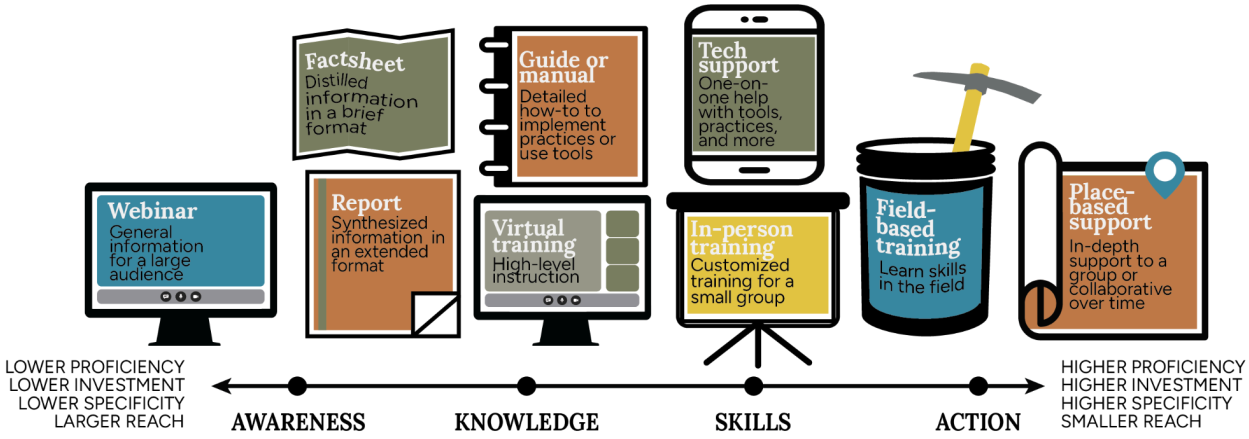


Figure 3. Consider what format(s) might help your audience reach the desired level of proficiency (see **Figure 2**).

During Technical Transfer

④ IMPLEMENT TECHNICAL TRANSFER

Follow your technical transfer approach and use best practices for a successful technical transfer effort

Best practices for implementing a technical transfer effort include:

- Keep centered on the "why?" of the management need throughout.
- Empower your audience, don't just educate. After all, "telling ain't training"! Where possible, seek opportunities to facilitate peer-to-peer learning, spark conversation among colleagues, and foster relationship-building among participants that will extend beyond the technical transfer effort. Integrate hands-on or other interactive activities as much as possible, and consider using multiple formats or approaches that address varying learning styles (**Figure 3**).
- Focus on what the audience *really* needs to know. Be aware of information overload. Understand that adults learn best when information provides a personal benefit, relates to their experience, and can be used immediately. Rely on your 3-4 main messages, and reinforce them repeatedly. Use plain language when possible and always define acronyms.
- Come prepared but be flexible. Ensure you have adequate capacity for facilitation and other needs to make the technical transfer run smoothly, especially for in-person events. Build flexibility into your approach to adapt to your audience's needs. For example, in a workshop or webinar, leave a buffer for extra time for discussion in case it is needed.

For more tips and examples see our paper Crossing the Chasm: Using Technical Transfer to Bridge Science Production and Management Action and 5 Ways to Engage with Your Technical Transfer Audience.

After Technical Transfer

⑤ REFLECT ON YOUR SUCCESS AND THE NEED FOR NEXT STEPS

Assess how you did and what's next

After a technical transfer effort or event, take a few minutes to document successes, challenges and lessons learned. For a structured set of questions you can use our Reflection Worksheet or simply consider the prompts below.

Key steps of evaluating a technical transfer effort:

- Assess how your outcomes measured up to the vision of success you set before the effort was underway. Did your audience meet your desired learning outcomes or internalize the key take-home messages? For longer-term outcomes, are concepts being carried forward into the day-to-day work of your audience? Is there an increase in technical tools or a common language being used among your audience, where applicable?
- Consider your audience's view of the effort's success and potential for building and maintaining relationships. Are there opportunities to strengthen relationships with your audience, and would they work with you again?
- Evaluate if additional steps are needed to achieve success. Have you identified new technical transfer needs through your effort? Do you have any new information relevant to your effort? Is more support needed to increase the audience's proficiency and confidence in the topic? Do you have the capacity to keep working on the topic?
- Reflect on what went well and what you would do differently next time, including formal or informal ways to evaluate your effort. Consider using our **Technical Transfer Reflection Worksheet** to debrief with your team and document your lessons learned to benefit others working on tech transfer.

Additional Resources

Please consider joining the **Sagebrush Technical Transfer Network** for training opportunities, networking, and more. Additionally, we recommend checking out the following resources:

- Crossing the Chasm: Using Technical Transfer to Bridge Science Production and Management Action
- 5 Ways to Engage with Your Technical Transfer Audience
- USGS Toolkit for Coproducing Actionable Science to Support Public Land Management
- Becoming an Actionable Scientist: Challenges, Competency, and the Development of Expertise
- Northwest Climate Adaptation Science Center: Actionable Science webpage
- A How-to Guide For Coproduction Of Actionable Science
- Actionable Knowledge For Environmental Decision Making: Broadening The Usability Of Climate Science
- Assessing Conservation Readiness: The Where, Who, and How of Strategic Conservation in the Sagebrush Biome
- Adaptive Learner-Centered Education: A Toolkit for Extension