Modernizing 4FRI Implementation: Progress After Two Years
Workshop Final Report

February 11, 2020

Prepared for

USDA Forest Service
Four Forest Restoration Initiative (4FRI) Team

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Introduction

On October 29 and 30, 2019, the Ecological Restoration Institute (ERI), in collaboration with The Nature Conservancy (TNC), and the Forest Service (FS) 4FRI Team, held a workshop in Flagstaff, Arizona to:

1) Review the status of modernization actions identified during a fall 2017 workshop and that are underway as a part of 4FRI implementation;
2) Discuss lessons learned with an emphasis on operational experiences, challenges, troubleshooting, and future application;
3) Promote learning using a field trip and discussion sessions; and
4) Explore benefits and issues of partnerships in a two-way dialogue between the Forest Service and partners.

In addition to the goals stated above, we also sought to test different approaches for sharing information and fostering learning. This additional goal was included to help inform the national Forest Products Modernization (FPM) initiative, which is focused on improving the efficiency of forest product delivery through a series of innovative changes in technology, policy, and implementation.

Budget constraints have forced many organizations, including the FS, to increase reliance on computer-based learning at the cost of peer-to-peer learning. Yet, according to the FPM team, "Wi-Fi connections are not consistently available and internet bandwidth is insufficient to meet needs at agency offices." This problem impacts employee access to web-based learning options. In addition, online learning limits hands-on mentoring and peer-to-peer interaction. We sought to assess how implementers respond to peer-to-peer learning combined with hands-on field experience using new technology. To understand how FS staff receive information and how they felt about their workshop experience, we encouraged participants to complete a workshop evaluation.

Workshop materials can be found on the Southwest Ecological Restoration Institutes' website. The web page includes:

- Workshop Materials: Workshop Agenda, Workshop Participants, and History and Action Items developed at the 2017 workshop.
- Fact Sheets: Branding and Painting, In-Woods Drying, Load Accountability, Merchantability, LiDAR, Standard and Potential Lidar Products, Script for Creating a Tile Package From an Image Service, Virtual Boundaries, and DxP and DxP+ (Designation by Prescription and Designation by Prescription using tablets(+)).
- Presentations: Branding and Painting, In-Woods Drying, Load Accountability, Merchantability, LiDAR, Virtual Boundaries, and DxP and DxP+.
- Key Note Address: "Modernization: What it Takes," by John Crockett, Deputy Director of Forest Management, USDA Forest Service, Washington, DC.

Workshop Structure

The two-day workshop was intentionally designed to meet information and education needs of multiple interest groups. Day one participants included FS staff representing implementers on the 4FRI forests to Regional and Washington Office personnel (see "Workshop Participants" on website). Key external partners representing industry, local government, congressional offices and other agencies were also invited. The day was split into two formats. The morning included plenary sessions and panel discussions designed to provide a broad look at modernization, FS decision-making, and partnership roles. A field trip in the afternoon gave participants an opportunity to explore technology tools in the field. Field trip attendees were divided into groups that rotated between three technology stations. The stations included, 1) Creating Virtual Boundaries, 2) Using Designation by Prescription (DxP) and DxP+, and 3) LiDAR and Unmanned Aerial Systems (UAS). At each station, groups of four individuals had a tablet managed by a tech savvy individual with prior experience. After listening to an overview and instructions from the station leads, groups were able to explore the technology in the field themselves.

Day two focused on the FS staff who are expected to adopt new innovative and modernization approaches. Participation was limited to FS staff to foster honest conversations about implementation experiences including mistakes, successes, and challenges. Individual topic sessions led by FS staff gave participants the opportunity to ask questions about the innovations and presenter experiences. The day two topics included, 1) DxP and DxP+, 2) Virtual Boundaries, 3) Remote Sensing, LiDAR, UAS, and 4) Merchantability Standards and Responding to Industry Requests for Change.

Workshop Results

This section analyzes key results from the workshop. Specific discussions include: 1) progress on innovation action items identified in 2017; 2) lessons learned from two years of implementation; and, 3) feedback from the workshop evaluation and how well the workshop met participant expectations and goals.

Progress on Innovation Actions Identified in 2017

In 2017, the Washington Office (WO) of the FS launched the Forest Products Modernization (FPM) initiative to improve the efficiency of FS management, the delivery of forest products, and to carry out timber sales to increase acres treated and volume produced. Also, during 2017 The Nature Conservancy (TNC), Arizona Chapter developed a Master Stewardship Agreement (MSA) with the FS with the goal of identifying, promoting, and testing innovative approaches to implementing forest restoration treatments on the 4FRI CFLRP project. On November 29 and 30, 2017, FS staff representing the 4FRI team, the 4FRI national forests, Region 3 (R3), and the WO assembled in Phoenix, Arizona, at the "Accelerating Restoration Implementation Workshop" to discuss innovative actions.

The workshop was collaboratively designed by ERI, TNC, and the FS. The Nature Conservancy MSA and the conclusions of a time and efficiency study conducted by a TNC fellow provided an

important framework for the conversation. Partners at the workshop included staff from TNC, Campbell Global, and NewLife Forest Products. The group identified 21 action items for advancing innovation and modernization with the understanding that capacity would limit testing and implementation.

A detailed description of the status of the 21 items can be found at: https://sweri.eri.nau.edu/4fri-modernization-workshop/. An annotated summary is provided in Appendix A of this report.

Progress has been made for most of the actions identified in 2017:

- Eight action items are underway in the field
    - DxP and DxP+ (DxP and DxP+ were already being used but acres using this approach have increased)
    - Branding waivers to a lower percentage of load
    - In-woods processing
    - Increased collaboration with industry
    - Increased FS learning from industry
    - Facilitation of consistent interpretation of financial instruments across the FS
    - Convening of contracts and agreements staff with field staff to identify the correct financial instrument to achieve management goals (underway at highest levels of FS)
    - Weight-scaling/load counts
- Three innovations are in the testing phase
    - Virtual Boundaries
    - Cruising timber using LiDAR
    - Testing Unmanned Aerial Systems for sale administration and monitoring
- Three are in development or authorization is being pursued
    - Raising the authorized limit for disposition of wood products by the Regional Forester
    - Barcoding to replace paper load tickets
    - Determining the appropriate definitions for products
- Two action items were authorized but are not known to be in use
    - Extended decking time
    - Streamlining sales less than $2,000
- Three received partial authorizations or a variation were approved
    - Assessing the need to cruise timber when weight-scaling is used
    - Increasing weight limits on state, county, and federal highways
    - Assessing with industry partners the pros and cons of standard rate appraisals
- Two were considered and rejected
    - Closing FS roads to increase hauling efficiency
    - Assessing the need for a new financial instrument to accomplish landscape-scale objectives

Lessons Learned from Two Years of Implementation

Day two of the workshop included in-depth sessions and discussions of the technology featured during the previous day's field trip. We gathered lessons learned and recommendations from these sessions and their associated fact sheets for this section of the report. The fact sheets and presentations from the workshop can be found at: *https://sweri.eri.nau.edu/4fri-modernization-workshop/.*

The technology and innovation areas of focus where chosen based on their relevance, progress, and ripeness for the workshop audience. They included: DxP and DxP+, Virtual Boundaries, Remote Sensing, LiDAR, and UAS, and items relevant to merchantability standards and responding to industry requests for change, which included in-woods drying and decking, load accountability using electronic load ticketing and weight scaling, log branding and painting, and merchantability. A comprehensive summary of the lessons learned can be found in Appendix B of this report. Many of the lessons are detailed and technical. Before pursuing one of the innovations, implementers should review the fact sheet and the full summary in Appendix B. Contact information for innovators is also provided. For purposes of this report, we have highlighted key lessons and recommendations and the associated business practices that helped advance learning and adoption below.

DxP and DxP+

- Basal area (BA) targets were met under both DxP and DxP+, but spatial objectives were met more closely with DxP+. Without the DxP+ guidance, the operators left excess trees.

- Regular inspection occurred during implementation so adjustments were made on the fly. DxP can be successful when applied and inspected appropriately.

- Cost savings were achieved using DxP as opposed to Individual Tree Marking (ITM); 20–40 acres in the beginning, up to 50, versus 5–10 acres with ITM. However, concern exists about whether the efficiency gained at the front end of sale preparation by technology will be at the cost of operator efficiency or downstream sale administration work.

- Issues with the technology can cause delays.

- Heads-up digitizing with remote sensing (this enables delineating units in the office) has promise for the future. Canopy height models from LiDAR could especially be helpful for this.

- Operator guidance and coordination is key.

Virtual Boundaries

- At the beginning, a "fire team" approach was used to work out all the steps in the process of virtual boundaries (i.e., assembling leads from all the discipline areas in a face-to-face meeting to move the innovation forward). This was effective and efficient.

- Collaboration and communication between the sale preparation team, sale administrator, silviculturist, and other resource specialists during the risk assessment phase was important. Input from the purchasers is also necessary for successful implementation.

- Having partners with resources in technology/planning helped support testing.

- Having a partner who can interface with the logger to help implement the technology was important.

- The interest and willingness of everybody to try something different helped.

- Be prepared for trial and error. It is a valuable and inevitable part of the learning process.

- Education for both FS staff and contractors is necessary to incorporate geo-fences into management projects.

- Determine at the beginning of the project the actual areas of risk and how much risk the FS is willing to take.

- Determine what boundaries can and cannot be moved according to the NEPA decision.

- At the beginning, identify the leader who will make final decisions.

In-Woods Drying and Extended Decking

- Site-specific reviews take time. Formal requests should be provided in advance of planned implementation to avoid delays.

- Begin collaboration early to develop a monitoring and mitigation plan.

- Establish an agreed-upon timeframe to obtain response/signature from the responsible official.

- Communicate early and often.

- Ensure that the Supplemental Project Agreements (SPAs) include in-woods drying and extended decking with specific site-based considerations.

Load Accountability Using Electronic Load Ticketing/Weight Scaling

- This is an effort between the FS and National Technology Development Program (NTDP) to develop an electronic system to track all loads. It is a work in progress.

Log Branding and Painting

- Modifications for branding/painting were made by the RO in response to industry requests. However, industry was dissatisfied and requested justification for any branding given the low value of the wood. In response, the RO requested authority from the WO to give a 100% branding waiver.

- Make proactive waiver determinations when practical.

Feedback from the Workshop Evaluation

Modernization requires effective teaching and learning, a willingness to work with partners, and a healthy approach to experimentation, risk-taking, and learning from failures, as well as successes. The "Modernizing 4FRI Implementation Workshop" combined several learning approaches, including plenary sessions/panels, a field trip with technology stations, fact sheets, and peer-to-peer learning sessions with presentations and discussion. To understand the effectiveness of the workshop design, and to determine how to continue to promote learning and

information sharing in the future, we asked participants to complete a workshop evaluation. The comprehensive evaluation results are included in Appendix C.

We summarize key findings below with the goal that the results can inform the design of future workshops. Many questions asked for narrative responses. For more detail, read the comments in Appendix C.

Forty-eight surveys, representing approximately 50% of the participants, were returned.

- Participants learned about the workshop by either receiving the original invitation (48%), a forwarded email from a colleague (23%), and a forwarded email or communication from a supervisor (21%). We asked this question because we relied on forwarded emails by supervisors or others to ensure the appropriate staff attended the workshop.
- The Forest Products Modernization (FPM) initiative is using a variety of communication tools to reach FS implementers. To understand which of their outreach tools have been most effective, we asked whether participants had taken part in outreach activities and to identify all the activities that applied to them. Discussing FPM with a colleague (67%) was the most frequent learning mechanism, followed by FPM webinars (31%), participation on an FPM team (23%), visiting the website (21%) and reading the FPM newsletter (21%). Five respondents asked, "What is FPM?"; however, this response could have been from external partners.
- We asked respondents to indicate their level of agreement on a series of statements about the workshop. Participant satisfaction was very high with respondents either "strongly agreeing" or "agreeing" that: the goals of the workshop were clear (91%), the organization was effective (90%), workshop materials had useful information (89%), quality of the plenary/panels was high (87%), quality of the field trip was high (83%), quality of the learning sessions was high (90%), stated goals were met (92%), and personal expectations were met (98%).
- With respect to what method of learning people liked most, the second day learning sessions were most preferred (44%), followed by panels and field trips (25% each). Fifteen percent of respondents liked the entire workshop. People frequently mentioned the value of the question and answer opportunities and discussions, networking, and how it was great to have representatives from the FS Washington and Regional offices.
- When asked about what needed improvement, most surveys had no comments or complimented the event. Beyond that, it was a scatter shot of comments.
- Based on the survey DxP/DxP+ (71%), virtual boundaries (71%), and LiDAR/remote sensing (73%) are modernization approaches that participants anticipate adopting. Respondents were given the opportunity to say why they wouldn't adopt modernization approaches, and their answers included lack of infrastructure, technology isn't ripe (LiDAR), poor internet service, while one respondent said they were not 100% on board.
- Attendees were asked how they anticipate using the information they learned at the workshop. They were not given specific options so individual responses were grouped by themes. Also, some responses included multiple potential uses for the information.

Therefore, responses are grouped by theme and the number of responses are indicated as opposed to by percentage. Innovate (19), not applicable or unsure (11), training staff and industry partners (7), sharing with others (5), fostering more networking (4) and advocating to leadership (3).

- Respondents were asked if they have implemented efficiencies that weren't discussed at the workshop. Thirteen different items were listed.

- Participants were asked what other modernization or implementation information they need. Responses were grouped by theme and include: more training (7), improving biomass utilization (2), more validation that efficiency has been achieved (2), and several smaller specific improvements.

- A critical piece of information for informing future learning is to understand what staff feel is the most effective way to learn about modernization and innovation. Face-to-face workshops (83%) and training (69%) were the preferred learning approaches. Next most popular are word of mouth/peer-to-peer learning (35%) followed by online courses/other online resources (21%). Webinars (6%) and online training videos (15%) were less popular.

- Responses to the question of how participants would like to see innovation and learning proceed after the workshop were grouped by themes. Fifteen respondents stated the next step should be to implement, monitor and verify efficiency. Eleven suggested workshops and trainings. Three asked for maintaining and open dialogue with leadership, while two want to make sure there are regular updates.

- Quarterly face-to-face meetings are the preferred way to stay updated on 4FRI modernization (65%), while 38% would like on-line materials and 29% would like quarterly webinars. Other suggestions included emails, phone calls, and creating a working group.

- There were 16 comments provided to the open-ended question inviting feedback, in addition to 15 responses complimenting the workshop and saying thank you.

Conclusion

Innovation is underway as a part of 4FRI implementation. Based on the results of this workshop, applying and testing innovation on 4FRI has helped to deepen staff understanding of how to implement new technology, as well as illustrated the importance of supporting business practices that include regular communication, engaging a team that wants to innovate, and identifying the key decision points and decisionmakers to accelerate change. Key elements of success include consistent communication, clear leadership intent, accountability to making progress, and a commitment to moving beyond "business as usual."

Based on the results of our workshop evaluation, participants at the "Modernizing 4FRI Implementation Workshop" liked the opportunity to assemble in a face-to-face workshop format that emphasized peer-to-peer learning, allowed plenty of opportunities for dialogue and Q&A, and encouraged networking. Participants emphasized that including leaders from the WO and RO was a benefit, as it helped bring in perspectives from other levels of the FS that may not

reach field staff. Furthermore, it allowed leadership to reinforce the importance of the work, clarify policy and interact with the people on the ground.

In the future, we recommend that the FS continue to use in-person, peer-to-peer learning formats to advance modernization whenever possible. We also recommend that support for the experimentation and healthy risk-taking necessary to advance modernization be effectively communicated at all levels of the FS in order to support innovators working to fulfill the goals of FPM.

Acknowledgements

APPENDIX A

Annotated Summary of Action Items

	Action Item	FPM	4FRI	Action	Implementation
1	Designation by Prescription (DxP) and DxP+ using tablet technology+	x	x	In use by field	Use of DxP and DxP+ has been expanding across the 4FRI.
2	Virtual Boundaries (VB)	x	x	In testing phase	VB is being tested by 4FRI for national application.
3	Assess the need to cruise timber when weight-scaling is used	x		Related action authorized	Sampling error for cruising for high value sales was increased to reduce preparation costs.
4.	Raise the limit of the RF to dispose of wood products to > 10,000 CCF per agreement. This will reduce the number of agreements that must be prepared.			Authorization being sought	RO has requested authority from WO
5.	Streamline standards for sales less than 2,000 CCF to achieve time and cost savings.			Action Authorized	New direction exists related to sales that are $2,000 in value or less (not CCF). Standard rates can be applied to sales equal to or less than $2,000 in total advertised sale and also provides direction that for all sales greater than $2,000 in total advertised value will conduct a detailed appraisal.
6.	Identify industry standard and/or digital methods for tracking and accountability.				
	a. Branding		x	In use by field	RO is requesting a policy deviation from the WO to waive branding when appropriate.
	b. Barcoding in lieu of load tickets			In development	Work is underway nationally to identify

No.	Item				
					to identify appropriate equipment
	c. Weight-scaling/load counts		x	In use by field	Permission has been given to contractors to use load counts where consistent truck-trailer configurations and weight are used.
7.	In-woods processing		x	In use by field	TNC is chipping logs in the woods. The CC Cragin project ROD permits in-woods processing.
8.	Extended decking to reduce weight of logs and to decouple harvest and hauling		x	Action authorized with caveats. Not in use	Preliminary approval was granted to TNC, however, timing precluded use.
9.	Raise road weight limits			Partial authorization in place	Industry and county government have successfully worked with the AZ Dept of Transportation to increase weight limits. FS is doing diligence on their roads.
10.	Close FS roads to allow hauling to be more efficient			Rejected	Road closures are only used for public safety. Closures to improve hauling efficiency have not been tested. Authority exists but isn't generally used due to multiple-use requirements by the FS.
11.	Increase collaboration with industry		x	In use by field	Annual industry round-table is used by the 4FRI to engage industry.
12.	FS should seek opportunities to learn from industry and expand capacity		x	In use by field	The new 4FRI RFP2 asks industry to provide substantive input to make implementation more industry efficient.
13.	Implement actions to facilitate consistent interpretation of financial instruments across the Forest Service			In use by field	RO has convened relevant staff to promote learning.

14.	Convene contracts and agreements staff with field staff to identify the correct financial instrument to achieve management goals			In use at high levels of the FS	A "Best Tool Decision Tree" has been developed to guide field decisions as well as Stewardship End Result contracting training.
15.	Assess the need for a new financial instrument to accomplish landscape-scale objectives	x		Considered and rejected	
16.	Determine appropriate definitions for products.			In development	RO is finalizing reclassification of products and merchantability.
17.	Assess with industry partners the pros and cons of standard rate appraisals.			Partial authorization.	Detailed appraisals required for all products with an advertised value greater than $2,000. Either detailed or standard appraisal can be used for sales less than $2,000.
18.	Cruise with LiDAR		x	In testing phase	Two tests underway
19.	Test UAS for sale administration and monitoring		x	In testing phase	FS does not have authority to use UAS. Partners are leading testing efforts

Acronyms:

WO-Washington Office of the Forest Service

RO- Region 3 Office of the Forest Service

RF- Regional Forester

CCF-100 cubic feet

RFP2- 4FRI Phase 2 Request for Proposal

UAS- Unmanned Aerial Systems

APPENDIX B

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Lessons Learned from the Modernizing 4FRI Implementation Workshop

DxP and DxP+

Lessons Learned:

- DxP+ can't really be compared to individual tree marking (ITM), there's a big difference in these approaches, but it does make more sense to compare to DxP.
- DxP should only be used in certain stand conditions. A good place is an even-aged, single species stand. It gets more complicated after that.
- Basal Area (BA) targets were met under both DxP and DxP+, but spatial objectives were met more closely with DxP+. Without the DxP+ guidance, the operators left excess trees.
- The operator successfully followed the polygons. The FS was happy with how closely the prescription (Rx) was reflected on the ground, particularly with spatial pattern.
- Trees infected with Dwarf Mistletoe (DMT) were reduced with DxP+, even though operators can't see the rate of DMT from the cab, and there was no ITM to identify trees that should be removed.
- The proportion of "defect" trees was not reduced, therefore the proportion of post-treatment trees increased, but addressing "defect" trees was not part of the Rx, and is not as important when the management is not timber production.
- There was a lot of inspection as the project during implementation so adjustments were made on the fly. DxP can be successful when applied and inspected appropriately.
- Implementation should smooth out polygons and set a minimum size (0.1 acres)
- It is more efficient to reduce group types – they didn't use all of them and could meet objectives with fewer group specifications.
- Account for individual trees to be left. A point feature was added for trees between groups, also used paint. Most of the time these are yellow pine, so the operator knows to leave them. The point helps account for the BA left behind.
- Cost savings were achieved using DxP as opposed to ITM. (20-40 acres in the beginning, up to 50, versus 5-10 acres with LTM)
- Issues with the technology can cause delays.

Recommendations:

- Formalize inspection process for checking DxP.
- There's a role for GIS specialists to get involved. There's a learning curve, and GIS expertise is a helpful resource.
- Consider using heads-up digitizing (HUD) with remote sensing (this enables delineating units in the office). Canopy height model from LiDAR could especially be helpful for this.
- There are special considerations, such as DMT, that can't be addressed with HUD.
- GPS accuracy is important. Cellphone GPS results in too much error.

- Updating the USFS handbook with a digital Rx guide could help push this forward, but it could also be restricting.
- Standardize data models to support automated processes. Changing the approach to tablet marking from project to project means the model must change also. This means there isn't a good way to know if you're meeting objectives in the moment.
- Operator guidance and coordination has been key.

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Virtual Boundaries

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Lessons Learned:

- At the very beginning of planning for advancing Virtual Boundaries as a new tool, it was effective to use a "fire team" approach to work out all the steps in the process (i.e. assembling leads from all the discipline areas in a face-to-face meeting to move the innovation forward).
- The use of ESRI ARC GIS Online was effective.
- Collaboration and communication between the sale preparation team, sale administrator, silviculturist, and other resource specialists during the risk assessment phase is important. Input from the purchasers is also necessary.
- Having partners with resources in technology/planning helped support testing.
- Having a partner who can interface with the logger to help implement the technology was important.
- The interest and willingness of everybody to try something different helped.
- In-cab mapping software on GPS enabled tablets mounted in operating equipment
- Discernable boundaries are already permitted under FS regulations. The technology and hardware for implementing virtual boundaries already exists and are in use.
- Although Avenza software is popular with operators it isn't robust enough for virtual boundary applications.
- Discernable boundaries must be discernable from in the cab and from the ground.
- In-cab technology is needed for the operator to view geo-fence boundaries.
- The area of risk as defined by the contract should consider the accuracy of the GPS being used.
- Be prepared for some trial and error. It is part of the learning process.

Recommendations:

- Education for both FS staff and contractors will be necessary to incorporate geo-fences into management projects.
- Forest Service policy and contract language concerning geo-fence implementation are currently under development. Consult with the Regional Office specialists when considering geo-fences for a project.
- Consider evaluating HUD to increase efficiency.
- Determine at the beginning of the project the actual areas of risk and how much risk the FS is willing to take.
- Determine what boundaries can and cannot be moved according to the NEPA decision.
- At the beginning identify the leader who will make final-decisions.
- Provide tablets to operators so their accuracy is consistent with USFS standards.

In-woods drying and extended decking

Lessons learned:

- Site–specific reviews take time. Ensure that formal requests are provided in advance of planned implementation to avoid delays.

Recommendations:

- Begin collaboration early in to develop a monitoring and mitigation plan.
- Establish an agreed-upon timeframe to obtain response/signature from the responsible official.
- Communicate early and often.
- Ensure that the Supplemental Project Agreements (SPAs) include in-woods drying and extended decking with specific site-based considerations.

Load Accountability using electronic load ticketing/weight scaling

- This is an effort between the FS and National Technology Development Program (NTDP) to develop an electronic system to track all loads. It is a work in progress.

Log Branding and Painting

Lesson Learned:

- Modifications for branding/painting were made by the RO in response to industry requests. However, industry was dissatisfied and requested justification for any branding given the low value of the wood. In response the RO has requested authority from the WO for authority to give a 100% branding waiver.
- Make proactive waiver determinations when practical.

APPENDIX C

Modernizing 4FRI Implementation Workshop Evaluation

Total number of survey respondents: 48

1. **What did you hope to gain from this workshop?**

Networking	Understanding FPM and the big picture	4FRI implementation/tech tools
8 (16%)	11 (22%)	23 (48%)

Other illustrative examples:
- Understand how modernization will impact my job. (3)
- Get on the same page as RO and WO on policies and assess their support. (2)
- Insights on how the FS changes. (1)
- Understanding of modernization context for industry. (1)
- Assess employee level of acceptance. (1)
- Don't want to be left in the dark. (1)

2. **How did you learn about the workshop? Please circle one.**

Original Invitation	Email or communication from Supervisor	Email from Colleague	Other _____
23 (48%)	10 (21%)	11 (23%)	4 (8%)

3. **Have you participated in any Forest Products Modernization (FPM) outreach activities? Please circle all that apply.**

FPM Webinars	FPM Website	FPM at a Glance Monthly Newsletter	Discussed with a Colleague	Participating in an FPM team (e.g. solution or extended team)	What's FPM?
15 (31%)	10 (21%)	10 (21%)	32 (67%)	11 (23%)	5 (10%)

4. **Please indicate your level of agreement with the following by marking the appropriate boxes below:**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The goals of the workshop were clear.	28 (58%)	16 (33%)	3 (6%)	0	0
The organization of the workshop agenda was effective.	28 (58%)	20 (42%)	0	0	0

The workshop materials provided useful information.	27 (56%)	16 (33%)	2 (4%)	0	0
The quality of the workshop plenary sessions and panels on the first day was high.	25 (52%)	17 (35%)	4 (8%)	1 (2%)	0
The quality of the field trip was high.	29 (60%)	11 (23%)	3 (6%)	0	0
The quality of the learning sessions on the second day was high.	30 (63%)	13 (27%)	4 (8%)	1 (2%)	0
The stated goals of the workshop were met.	26 (54%)	18 (38%)	2 (4%)	0	0
My expectations of the workshop were met.	29 (60%)	18 (38%)	1 (2%)	0	0
The workshop facilities were appropriate.	29 (60%)	16 (33%)	3 (6%)	1 (2%)	0
The workshop was effectively facilitated.	35 (73%)	13 (27%)	0	0	0

5. Which part of the workshop was most useful to you (e.g., plenary talks, panel sessions, field trip, day 2 learning sessions) and why?

Illustrative survey comments:

- Panel (12 or (25%))
    - I heard a lot and great feedback, good discussion, heard what people are concerned about and can provide better service- discussions are vital for learning ways to improve. (3)
    - Q&A. (2)
- Field trip (12 or (25%))
    - Seeing it on the ground. Having specialist available to discuss their experience and potential of products or methods. Discussions. (7)
    - I'm a hands-on learner. (1)
- Learning sessions (21 or (44%)
    - Amount of material presented/detail/learning what's been accomplished/most relevant to my work. (6)
    - Q &A and ability to participate. (4)
- All (7 or (15%))
    - I loved the open discussions and Q&A. (1)
- Other
    - Networking. (5)
        - Offers a chance to interact with other who know more and hold other perspectives and I can ask specific questions relevant to my work.
    - It was nice to have WO and RO leadership voicing support for these efforts and providing context. (5)
        - Great to have practitioners presenting and WO/RO there to listen and provide needed context.

6. Which part of the workshop needed the most improvement and why?

Illustrative survey comments:

- (18) surveys did not comment and (5) complimented the event
- First day panel sessions (6)
- Comments on specific presentations or their relevance (6)
- Suggested change in program sequence (4)
- Lunch amount or length (3)

- The field trip - bit chaotic or desire for more time (2)
- Facilities – seating (2)
- Present other topics such as industry perspective (1)
- More discussion (break out groups were suggested) (1)
- Facilitation- Keep Q &A relevant to panel (1)

7. **Which of the modernization items, if any, do you anticipate adopting or attempting to adopt? Please circle all that apply.**

DxP/ DxP+	Virtual Boundaries	LiDAR/ Remote Sensing/ UAS	Industry-Related Changes	None (please see Question 8)
34 (71%)	34 (71%)	35 (73%)	22 (46%)	3 (6%)

8. **If you do not anticipate adopting or attempting any of the modernization items, please explain why.**

People were directed to answer this question if they answered "none" to question #7. However, more than three people responded.

Illustrative survey comments (individual comments unless otherwise indicated):

- Modernization is not relevant to their job. (5)
- Will adopt only those components relevant to job. (2)
- Infrastructure doesn't exist to implement modernization.
  - No certified scales. (2)
  - Poor internet, WIFI and computer access.
- Technology isn't ready such as LiDAR.
- Not 100% on board. Very technical work for the outputs currently demanded. Don't believe in prepping acreage that doesn't match demand.

9. **In what other ways do you anticipate using the information you learned in this workshop?**

Survey results grouped into common themes with illustrative comments:

- To innovate. (19)
  - Using LiDAR canopy scans to aid in tablet marking productivity.
  - Changing contract type with new product rates.
  - Excited to do more data collection with LiDAR.
- Not applicable or unsure. (11)
- Sharing with others. (5)
  - There was a lot of information about changes that are occurring in forest restoration and mostly everything that was talked about can be used. Passing this information along to the crew on the changes or upcoming changes.
- Training staff and industry partners. (7)
  - Better sense of how the field can use LiDAR for designing training, products, and making the case to leadership.

- o Able to hear where people are comfortable and not and can follow up accordingly. Got good information on the kind of communication and leadership employees need. I'll be able to track better with employees on technical aspects of material.
- Foster more networking. (4)
  - o I plan to network others who have at least tried some of the methods discussed.
  - o Using the contacts I made to discuss future projects, new ideas and challenges.
- Advocating to leadership. (3)
  - o Working to get more LiDAR in R3 and work with new partners that I met at this event.

10. Have you implemented any other innovations or efficiencies that were not discussed in this workshop? If yes, please explain.

Illustrative survey comments (individual comments):

- Designating group selection cuts.
- We are using acre-collector to collect walk-through data for silvicultural Rx.
- Starting to work with TNC to consider modernizing/digitizing the timber sale prep/admin/monitoring process.
- The Kaibab is working with TNC on an economic and operational feasibility tool that was not yet ripe for presentation.
- Using tablets/collector for silvicultural walk-throughs.
- Fuelwood- other restoration with partners, youth, and tribes.
- Using tablets for sale administration. Tracking landings/skid trails etc.
- Using tablets and ArcGIS online for prescription development and layout of sale administration.
- Deck sales.
- Estimating timber volume defect. Conversion from CCF to BDFt has so much fudge it negates our defect deductions. Use a standard 8% reduction.
- Cut stem data collection during operations.
- Burn first, then cut. Cut and hand pile and burn piles for non-commercial sites.
- We were already doing DxP, including scoping with specialists, to help build to field approval guide to use with the markers (demo marks for DxP) and with the loggers.

11. What other modernization or implementation information needs do you have?

Illustrative survey comments (individual comments unless otherwise indicated):

- More training
  - o LiDAR. How are other units and regions using it? How can it be used for timber/fire? (3) We need a cruise design training that implements all the items in modernization.
  - o How will training be managed for rural districts?
  - o Need better delivery platforms.
  - o Remote sensing and how can it be or is being used to evaluate treatment effectiveness. What measures are being used to assess canopy openness, a likely sticking point for stakeholders/environmental groups.
- Improving designation and handling biomass and non-saw wood. Would like to see on-site conversion of slash and small trees into chips or biomass materials.
- Need to understand if we are really gaining efficiency and if we are transferring risk and to whom.

- o Will have to see how the DxP sales are cut.
- Improving the log accountability. Electronic systems.
- How can drones be used for difficult locations like steep slopes?
- Electronic bid package submission/sharing.
- Timber Information Management – TIM.
- How involved can we be with the developers of used systems and applications i.e. can we get improvement from ArcCollector according to our specific needs?
- More information/ideas on how sale administration can adapt to these new efficiencies so they can be efficient/modernizing as well.
  - o Need to increase the pace and scale of completing sales. Timber volume sold means nothing if the sales are never cut.

12. What is the most effective way for you to learn about modernization and innovations? Please circle no more than three.

Webinars	Online training videos	Online courses/ other online resources	Face-to-face workshops	Face-to-face training	Written material	Word of mouth/ peer-to-peer
6 (6%)	7 (15%)	11 (23%)	40 (83%)	33 (69%)	11 (23%)	17 (35%)

Other: In-woods applications and learning by doing.

13. How would you like to see innovation and learning proceed after this workshop?

Survey results grouped into common themes with illustrative comments:

- Implement, monitor and verify efficiency. (15)
  - o Keep going-trying new things and monitoring their costs and benefits. Zoom out in the monitoring process i.e. how does tablet marking affect sales administration? Are we saving on one end and incurring more cost on the other?
  - o Set up experiment – set bench mark standards and do work with and without innovation and compare results.
  - o Better reporting/summarizing results, expansion/pilots beyond westside 4FRI, operationalize these approaches that are more research-based/driven.
- Workshops and trainings. (11)
  - o More hands-on training. We plan to have a representative from a nearby forest show us how they implement tablet marking, uses, troubleshooting.
  - o More of the same! Annual check-in to allow employees to share learning and network.
  - o Plan on one new tool every-other month within driving distance, to learn, discuss, and brown bag lunch.
- No response. (9)
- Leadership commitment and open dialogue. (3)
  - o District and forest staff and line officers need to drive the change on their district/forests.

- I would like for upper management to consider new ideas from districts differently depending on risk/importance.
- Provide updates (2)
  - We need to do updates to show we are making progress or the learning needs to be institutionalized.
  - Communicate what works and what doesn't.

14. How would you like to stay updated on 4FRI modernization efforts?

Quarterly Webinars	Quarterly Face-to-Face Meetings	Online Materials	Other _____
14 (29%)	31 (65%)	18 (38%)	Peer to Peer (4) (8%) Email (3) (6%) Phone calls (1) (2%) Form working groups (1) (2%)

15. Please provide any additional feedback or comments.

Illustrative survey comments (individual comments unless otherwise indicated):

- Good, great, or well-done workshop, thank you. (15)
- Great news on changes in appraising. Wow. No more "no bids" I hope.
- It is very essential and a great thing that the minimum rates decreased especially in the PIPO. However, if there is only one main company (4FRI), and only a few small companies it does not matter how fast we put up sales, they will either go to 4FRI (who has 15+ sales and just sitting), go no bid, etc. We need more competition if we want to succeed and have vigorous forests for the future generations, the likelihood of that happening seems to be bleak. I am NOT trying to sound negative just worried about the feasibility of our own success. But I am here to ensure our forests can be around for future generations, a commendable way to spend one's life and will continue to do my best.
- Hearing ideas and networking with folks really helps smaller programs stay relevant. In addition, thank you for not charging a fee to attend.
- I would have liked breakout sessions like the field trip to have a conversation with the specialist involved.
- Hope to have a follow-up early summer 2020.
- Consider sending out a request for feedback in a month and see how folks think or feel after some time has passed.
- The workshop was well planned and carried out. For the most part, we had the right mix of people in the room at various level of the organization. It would have been nice to have more people show up from the A-S and the Tonto NFs. We might need to have a special session to involve these folks more. I'm sure they are doing wonderful things too.
- Discussions highlighted how FPM efforts may impact other resources. Perhaps that could be summarized and shared out.
- I really liked that the location was off forest. Helped me focus and "get away from email"
- Employees absolutely benefited. Very professional, well organized and well facilitated with plenty of time for networking.

- Enjoyed the feedbacks on all new and updated forest restoration efforts.
- Development of electronic bid processes & email expanded use of direct award for contracts – increased information criteria when determining market research, competition, true bidders.
- So happy to be able to attend at least one day. As a seasonal employee (timber marker) events like these are great learning opportunities to see how my job relates to the bigger picture. Also, as a young and newer forest service employee adopting these techniques can be easier for me since I have less time using the older methods. Change is harder to adopt when folks are more set in their ways and less willing to experience change.
- Will like to see the fire program involved and topics presented. More upper level silviculture representation, innovations and support. Bring in other "ologists" (biologists, archeologists) to help communicate. Don't limit the amount of people to the workshop.
- Good to have regional folks and industry alike.