2018 Annual Report

to the USDA Forest Service under Sponsor Award

#17-DG-11031600-047 for 2017 (NAU Projects 1003334-1003338)

#18-DG-11031600-057 for 2018 (NAU Projects 1003729-1003734)

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Summary

This report presents an integrated and coordinated series of actions for $2.54 million awarded to the ERI in Fiscal Years 2017 ($1.2 million) and 2018 ($1.3 million) under CFDA 10.694, Southwest Forest Health and Wildfire Prevention.

The information provided herein reflects our annual progress as of July 1, 2018 and comprises the final report for 2017 deliverables under 17-DG-11031600-047 (NAU Projects 1003334-1003338). It also includes a progress report for deliverables received under 18-DG-11031600-057 (NAU Projects 1003729-1003734).

All of the activities (deliverables) summarized in this report respond to land manager and stakeholder requests and needs. The deliverables are informed by best available science and scientific evidence which is translated into the language and product appropriate for the target audience. The ERI actively delivers information using a variety of approaches that includes individual and group presentations and discussions, to printed and electronically accessible fact sheets, short technical reports, longer white papers and management reports, and peer reviewed archival literature.

The Ecological Restoration Institute at Northern Arizona University is grateful for the funding that the United States Forest Service has provided for these efforts.

USFS FY17 Plan of Work - #17-DG-11031600-047

Annual Report to the **USDA Forest Service**

for 2017 and 2018

USFS FY17 Plan of Work - #17-DG-11031600-047

FY17 Deliverables (Final) - #17-DG-11031600-047

Project 1: Science Delivery and Support for Collaborative Restoration and Conservation from the Local to Landscape Scale	
Deliverable	**Status**
1.1) Provide West-wide science delivery and collaborative support for collaborative landscape restoration projects.	
a) Deliverable: Report on support to West-wide collaborative efforts via national and regional planning and learning efforts. i. Webinar series b) Deliverables: Sponsor, support, and participate in a national CFLRP social science lessons-learned and policy review writing workshop. i. Sponsor workshop ii. 1–2 book chapters iii. Fact Sheet for audience	a) Report on support: • Waltz, A.E.M., Ongoing. Provides leadership, coordination, and support to the Washington Office CFLRP wildfire risk national indicator committee. • Waltz, A.E.M., Ongoing. Provides leadership, coordination, and support to the Washington Office CFLRP ecological indicator 10-year report committee. i. Webinar series. • Esch, B.E. July 24, 2018. "Partners and Data Providers in Landscape-scale Monitoring Peer Learning Session." Webinar conducted in partnership with the National Forest Foundation. 80 participants. b) Report on sponsorship, support, and participation in a national CFLRP social science lessons-learned and policy review writing workshop: i. Sponsored the Collaborative Forest Restoration Symposium in Tallahassee, FL. ii. Book chapters completed: 1. Colavito, M.M. 2018. "Use of Scientific Information to Inform Decision Making in the CFLRP." In *Collaborative Forest Restoration: Challenges and Opportunities of Landscape-Scale Forest Management*, eds. W. Butler and C. Schultz. 2. Butler, W., and B.E. Esch. 2018. "Collaborative Forest Landscape Restoration in Action: An Overview of the 23 CFLRP Cases." In *Collaborative Forest Restoration: Challenges and Opportunities of Landscape-Scale Forest Management*, eds. W. Butler and C. Schultz. 3. Cheng, A., G. Aplet, and A.E.M. Waltz. 2018. "Translating Collaborative Adaptive Management Principles into Practice for Forest Landscape Restoration." In *Collaborative Forest Restoration: Challenges and Opportunities of Landscape-Scale Forest Management*, eds. W. Butler and C. Schultz. iii. Fact Sheet: In lieu of a fact sheet for the above project and additional chapter was completed (1–2 were promised, 3 were completed).
1.2) Science delivery and support for the Four Forest Restoration Initiative (4FRI), a Collaborative Forest Landscape Restoration Act project.	
a) Deliverable: Report on science delivery to 4FRI Stakeholder Group and Forest Service ID Team.	a) Report on science delivery: • Waltz, A.E.M., and C. Stotts. Ongoing. Provides leadership, coordination, and support to TNC tablet technology. *Technical assistance*

b) Deliverable: Report on leadership activities. c) Deliverable: Report on IT support for the 4FRI website and BASECAMP (an online collaborative workspace) and administrative support including minutes and agendas.	• Waltz, A.E.M. September 27, 2017. Delivered Alan Ager optimization results and process to Tessa Nicolet, Mary Lata, and Shaula Hedwall. Captured data layers from Tessa Nicolet for Alan Ager's all lands project. Provided support to All-Lands and 4FRI at the request of Tessa Nicolet, R3 Fire Ecologist. *Technical assistance* • Esch, B.E. October 6, 2017. "4FRI Monitoring." Presentation for USFS Washington and Regional Office staff during 4FRI Field Review. 30 participants. *Presentation* • Waltz, A.E.M. October 6, 2017. "Treatment optimization of the 4FRI 1st EIS." Presentation for USFS Washington and Regional Office staff during 4FRI Tour. 60 participants. *Presentation* • Esch, B.E. December 1, 2017. Assisted with the 4FRI photo-point project design and pretreatment implementation. *Technical assistance* • Waltz, A.E.M., A. Ager, K. Vogler, and M. Nigrelli. April 25, 2018. "4FRI Treatment Optimization: Ecological and Economic Tradeoffs." National Cohesive Fire Management Workshop. Reno, NV. 50 participants. *Presentation* b) Report on leadership activities: i. Stakeholder Group: • Vosick, D. Ongoing. Monthly participation and leadership assistance to support the Stakeholder Group and Steering Committee. *Meeting organization and facilitation* • Vosick, D. Stakeholder Group Co-Chair from August 2017 through January 2018. *Meeting organization and facilitation* ii. Working Groups: • Esch, B.E. Ongoing. Provides leadership, coordination and support to 4FRI Multi-Party Monitoring Board (MPMB). *Meeting organization and facilitation* • Waltz, A.E.M. Ongoing. Monthly participation and science support for the 4FRI Planning Working Group (PWG). *Technical assistance* • Dubay, T. Ongoing. Monthly participation and support for the 4FRI Communication Working Group (CWG). *Technical assistance* • Colavito, M.M. June 2017. Assisted the Forest Service with the 4FRI Strategic Plan Meeting by helping develop the agenda and conducting facilitation at the meeting. 30 participants. *Meeting organization and facilitation* • Colavito, M.M. June–November 2017. Provided assistance to the 4FRI ID Team and helped write the 4FRI Strategic Plan. The final plan was approved on November 15, 2017. *Technical assistance* • Colavito, M.M. October 2017. Provided an overview of the upcoming ERI workshops on USFS implementation efficiencies to participants from the 4FRI ID Team, 4FRI Stakeholder Group, and USFS Washington and Regional Office staff during the 4FRI Field Review. 30 participants. *Field trip* c) Report on IT and administrative report: i. IT Support: • Norton, H. Year-round updating and maintenance of the 4FRI website. ii. Administrative Support: • Jourden, A. Ongoing. Monthly agenda preparation, minutes, site scheduling, and management for Stakeholder Group general meetings.

	• Jourden, A. Ongoing. Management of BASECAMP, an internal online communication tool. • Esch, B.E. Ongoing. Monthly. Agenda preparation, minutes, and meeting coordination for steering committee calls.

Project 2: Evaluation and Synthesis of Best Available Scientific Information (BASI) for Landscape Restoration West-Wide

Deliverable	Status
2.1) Evidence-based review of the literature.	
a) Deliverable: Synthesis of Best Available Science. b) Deliverable: Presentation at professional conference or to stakeholder group or practitioners.	a) Manuscript: Huffman, D.W., J.D. Springer, J.E. Crouse, and J.P. Roccaforte. Effectiveness of resource objective wildfires for restoring frequent-fire forests in the western US: A status of knowledge review. b) Presentation: Huffman, D.W., J.D. Springer, J.E. Crouse, and J.P. Roccaforte. September 12, 2018. "Restoring western forests using natural fire ignitions: A status of knowledge review." 2018 Annual Conference of the Society of Ecological Restoration – Southwest Chapter. Flagstaff, AZ. 125 participants.

Project 3: Monitoring, Evaluation, and Adaptive Management of Landscape Restoration in Western Fire-Adapted Forests and Woodlands

Deliverable	Status
3.1) Continue development of long-term study in a mixed-conifer forest on the Mogollon Rim Ranger District of the Coconino National Forest (build from FY15).	
a) Deliverable: Report on progress with the Coconino National Forest to complete marking, administer timber sale, and develop slash treatment options.	a) Report on progress: • Waltz, A.E.M., and C. Stotts. Ongoing. Provides leadership, coordination and support to the Mogollon LEARN project. A detailed progress report is attached. **LINK TO REPORT**
3.2) Initiate reference conditions study in transitional ponderosa pine forests, Prescott and/or Tonto national forests.	
a) Deliverable: Progress report that includes: consultations with national forests, study plan development, collection on preliminary data, processing existing samples, and data analysis. b) Deliverable: Presentation for USFS leadership and staff, collaborative stakeholder groups, and/or professional conference.	a) Report on progress: i. Initiated study – Complete ii. Collected preliminary data – Complete iii. Processed and analyzed samples – Complete b) Presentations: • Floyd, M.L., D.W. Huffman, D.P. Hanna, and E. Harrison. 2017. "Historical fire regimes and shrub persistence in ponderosa pine forest of the Mogollon Highlands, Arizona." 14th Biennial Conference of Science and Management on the Colorado Plateau and Southwest Region. Flagstaff, AZ. 150 participants. *Presentation* • Huffman, D.W., D. Hanna, and J.D. Springer. February 22, 2018. "Actionable Science for Transitional Ponderosa Pine Forests in the

	Southwest." Presentation for Prescott and Tonto national forests. Phoenix, AZ. 30 participants. *Presentation*
3.3) Re-measurement (11-yr) of pinyon-juniper fuels reduction study (LEARN), Tusayan Ranger District, Kaibab National Forest.	
a) Deliverable: Manuscript prepared for publication. b) Deliverable: Presentation for USFS leadership and staff, collaborative stakeholder groups, and/or professional conference.	a) Huffman, D.W., M.T. Stoddard, J.D. Springer, J.E. Crouse, A.J. Sánchez Meador, and S. Nepal. 2018. Stand-level dynamics of pinyon-juniper woodlands following hazardous fuels reduction treatments in Arizona. Manuscript for publication completed. (ERI # 274) b) Huffman, D.W., M.T. Stoddard, J.E. Crouse, and J.D. Springer. 2018. "Stand-level dynamics of pinyon-juniper woodlands following hazardous fuels reduction treatments in Arizona." Fire Continuum Conference. Missoula, MT. 40 participants. *Presentation*

Project 4: Understanding and Solving the Economic, Social, and Political Issues and Opportunities of Ecological Restoration.	
Deliverable	**Status**
4.1) Advance economically practical solutions for biomass harvest, removal, and processing.	
a) Deliverable: Report on actions that advance economically practical and efficient solutions for biomass removal and processing.	a) Report on actions: • Covington, W.W., and D. Vosick. June 6, 2017. Provided information to potential wood utilization investors at the commercial site at Camp Navajo at the request of LTC Ray Garcia, commander with the Arizona National Guard. • Vosick, D. April 20, 2018. Provided information via email to David Shiels and Eero Mikkola with the Natural Resources Institute of Finland. They are interested in providing technical support to advance biomass utilization in northern Arizona. • Vosick, D. April 20, 2018. Answered questions about biomass opportunities in northern Arizona during a conference call with David Shiels and Eero Mikkola.
4.2) Facilitate workshop to identify changes in the Forest Service Handbook and Manual that will improve the efficiency of sale preparation.	
a) Deliverable: Organize a workshop and prepare a compilation of recommendations for Forest Service consideration.	a) Deliverables: • Vosick, D., and M.M. Colavito. Ongoing. Provide assistance to 4FRI ID Team and The Nature Conservancy to plan workshop on implementation efficiencies within the Forest Service. • Vosick, D., and M.M. Colavito. November 29–30, 2017. Accelerating Restoration Implementation Workshop. Phoenix, AZ. 37 participants. https://cdm17192.contentdm.oclc.org/digital/collection/p17192coll1/id/927/rec/1 (ERI # 284) • Ecological Restoration Institute. 2018. Accelerating Restoration Implementation Workshop. ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 2 p. https://cdm17192.contentdm.oclc.org/digital/collection/p17192coll1/id/926/rec/2 (ERI # 273)

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Project 5: Science Delivery and Outreach to National, Western, and Southwestern Audiences: Federal, State, Tribal, and Private Forestry	
Deliverable	**Status**
5.1) Provide support to federal land managers for restoration treatment planning and implementation.	
a) Deliverables: Report on actions to deliver science. i. A combination of ten (10) total services based on previous and anticipated demand that may include: workshops, technical assistance, field trips, and presentations. ii. Present two (2) webinars in partnership with the Southwest Fire Science Consortium and/or National Forest Foundation to present emerging science to land managers and practitioners. iii. Rapid Assessment (RAP) support for restoration projects at the forest level. 1. Project-level BASI synthesis to localize peer-reviewed literature. 2. Project-level demonstration area.	a) Report on actions: i. Report on services: • Stotts, C. Ongoing. Provides leadership, coordination and support to the Camp Navajo mixed-conifer demo. *Technical assistance* • Waltz, A.E.M. May 17, 2018. "Wallow 2016 Data Update and Preliminary Results." Apache-Sitgreaves Forest Leadership Team Meeting. Flagstaff, AZ. 15 participants. *Presentation* • Waltz, A.E.M. June 6, 2017. "Fire Restoration and Smoke." Smoke Open House for the Coconino National Forest — Red Rock District. Sedona, AZ. 15 participants. *Presentation* • Springer, J.D. July 28, 2017. Provided information on plant germination to Mary Lata, USFS Fire Ecologist. *Information request* • Springer, J.D. August 22, 2017. Complete a data request on Mt. Trumbull herb response for Lee Hughes, former BLM AZ Strip employee. *Technical assistance* • Springer, J.D. September 8, 2017. Provided plant identification assistance to Julie Crawford from the USFWS, on behalf of Jim Crawford from the Rocky Mountain Research Station (RMRS). *Technical assistance* • Waltz, A.E.M., D. Vosick, and W.W. Covington. October 31, 2017. "Broader-Scale Monitoring Strategy." Presentation for T. Randall-Parker and Prescott National Forest staff. Flagstaff, AZ. 4 participants. *Presentation* • Waltz, A.E.M., and T. Cheng. November 18, 2017. Coordinated Society of American Foresters (SAF) Session: Innovative Silivicultural to meet Collaborative Desired Conditions. SAF Annual Convention. 45 participants. *Technical assistance* • Esch, B.E., and A.E.M. Waltz. December, 2017–May, 2018. Provided coordination, data collection, and report writing support for the Prescott National Forest Monitoring Plan Evaluation and Biennial Report Review. *Technical assistance* **LINK TO REPORT** • Springer, J.D. February 7, 2018. Provided information on the differences between thinning and burning shrubs to Mary Lata, USFS Fire Ecologist. *Information request* • Springer, J.D. February 9, 2018. Provided information on rare plant modeling to Deb Crisp from the USFS 4FRI ID Team. *Information request* • Waltz, A.E.M. February 22, 2018. Transitional Pine Workshop for staff members with the Tonto and Prescott national forests. Phoenix, AZ. 35 participants. *Workshop* • Springer, J.D. January 22, 2018. Provided information on the revegetation of *Penstemon clutei* to Glenn Rink and Rob Masarati from USGS. *Information request*

	• Springer, J.D. March 20, 2018. Provided information on plant diversity and rare mammal species to USFWS staff member, David Smith. *Information request* • Springer, J.D. April 2, 2018. Provided technical assistance on seeding in Arizona with barley to Ken Stella with NPS, Denver. *Technical assistance* • Springer, J.D. April 4, 2018. Provided information on invasive species located in the White Mountains to USFWS staff member, David Smith. *Information request* • Dubay, T. April 5, 2018. Provided key literature on climate change and restoration to Jacki Banks, PAO for the Kaibab NF. *Information request* • Waltz, A.E.M. April 20-21, 2018. Mixed Conifer Restoration and Resiliency Demo for the SAF Southwest chapter. Safford, AZ. 40 participants. *Presentation/Field trip* • Vosick, D. May 13, 2018. Provided information on fire regimes to Derek Padilla, District Ranger on the San Juan National Forest. *Information request* ii. Services completed in partnership with the Southwest Fire Science Consortium and/or National Forest Foundation. • Esch, B.E. July 24, 2018. "Partners and Data Providers in Landscape-scale Monitoring Peer Learning Session." Webinar conducted in partnership with the National Forest Foundation. 80 participants • Lynch, M., and A. Evans. 2018. 2017 Wildfire Season: An Overview, Southwestern U.S. Special Report. Ecological Restoration Institute and Southwest Fire Science Consortium, Northern Arizona University. 20 p.https://cdm17192.contentdm.oclc.org/digital/collection/p17192coll1/id/916/rec/1 (ERI # 265) iii. Rapid Assessment (RAP) support: 1. Stotts, C., M. Stoddard, and D. Hanna. 2018. Brookbank Meadow Rapid Assessment: Structural and compositional reference conditions in a dry mixed-conifer forest. Technical Report. Ecological Restoration Institute, Northern Arizona University. https://cdm17192.contentdm.oclc.org/digital/collection/p17192coll1/id/936/rec/1 (ERI # 276) 2. Stotts, C., and A.E.M. Waltz. 2018. Provided technical assistance, including data collection, prescription development, tree marking, and public interpretation sign.
5.2) Assist with forest planning and implementation by recommending best available science and program support.	
Science and timing of support are variable for each national forest based on its individual planning schedule. a) Deliverable: Report on actions to support forest plan revisions on the Region 3 forests undergoing plan revision.	a) Report on actions: • Waltz, A.E.M. November 21, 2017. Participated in strategy development at the Tonto National Forest technical partnership workshop. 50 participants/partners. *Technical assistance* • Esch, B.E. May 9, 2018. "R2/R3 BSMS Pilot Final Report." Regional Inventory and Monitoring Coordinators National Meeting. Fort Collins, CO. 45 participants. *Presentation*

i. Facilitate across-forest learning by participating on R3 planning class; produce summary "shared lessons" for R3 distribution	
5.3) Provide website science delivery support for ERI, SWERI, the Arizona Prescribed Fire Council (AZPFC), and 4FRI (see Project 1 for 4FRI web support).	
a) Deliverable: Redesign ERI website and website maintenance for AZPFC, SWERI and 4FRI. b) Deliverable: Report on technical support for ERI, SWERI, 4FRI, and AZPCF websites.	a) Report on redesign of ERI website and website maintenance for AZPFC, SWERI and 4FRI: • The ERI website design continues to develop; we changed the operation of it to the NAU ITS web team. While multiple pages are complete, the research and science delivery pages are still in progress. • We continue to provide maintenance, design support, and security services for the SWERI, 4FRI, and AZPFC websites. b) Report on technical support: • Reports on technical support for the ERI, SWERI, and 4FRI websites are included in this report. **LINK TO REPORT**
5.4) Edit and deliver biophysical and social-political-economic information for affected entities.	
a) Deliverables: Editorial support for a total of three (3) white papers and/or working papers. ii. Working or white paper for elected officials describing the steps required to conduct a prescribed burn. iii. Working paper describing the role of mistletoe and mistletoe management in ecological restoration. iv. Working paper on smoke and smoke management in cooperation with the Southwest Fire Science Consortium. b) Deliverable: Eight (8) fact sheets that translate and summarize scientific papers and journal articles.	a) Deliverables in progress: i. Greco, B. 2018. Planning for and Implementing Prescribed Fire in Fire-Dependent Forests. ERI White Paper—Issues in Forest Restoration. Ecological Restoration Institute, Northern Arizona University. 11 p. https://cdm17192.contentdm.oclc.org/digital/collection/p17192coll1/id/917/rec/1 (ERI # 270) ii. Wasserman, T.N., and A.E.M. Waltz. 2018. Restoration as a Mechanism to Manage Southwestern Dwarf Mistletoe in Ponderosa Pine Forests. ERI Working Paper No. 39. Ecological Restoration Institute, Northern Arizona University. 11 p. https://cdm17192.contentdm.oclc.org/digital/collection/p17192coll1/id/923/rec/1 (ERI # 281) iii. Stotts, C., and P. Lahm. 2018. Resources for Predicting and Mitigating Smoke Impacts of Wildland Fires. ERI Working Paper No. 40. Ecological Restoration Institute, Northern Arizona University. 11p. https://cdm17192.contentdm.oclc.org/digital/collection/p17192coll1/id/928/rec/2 (ERI # 285) b) Eight (8) Fact Sheets: 1. Rodman, K.C. 2018. Reference Conditions are Influenced by the Physical Template and Vary by Forest Type. ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 2 p. https://cdm17192.contentdm.oclc.org/digital/collection/p17192coll1/id/890/rec/4 (ERI # 255) 2. Huffman, D.W. 2018. Restoration Benefits of Re-Entry with Resource Objective Wildfire on a Ponderosa Pine Landscape in Northern Arizona. ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 2 p. https://cdm17192.contentdm.oclc.org/digital/collection/p17192coll1/id/910/rec/1 (ERI # 256)

	3. Owen, S.M. 2017. Spatial Patterns of Ponderosa Pine Regeneration in High-Severity Burn Patches. ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 2 p. https://cdm17192.contentdm.oclc.org/digital/collection/p17192coll1/id/898/rec/2 (ERI # 254) 4. Esch, B.E. 2018. Using Best Available Science: Determining Best and Available. ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 2 p. https://cdm17192.contentdm.oclc.org/digital/collection/p17192coll1/id/924/rec/1 (ERI # 282) 5. Stotts, C., and P. Lahm. 2018. Resources for Predicting and Mitigating Smoke Impacts of Wildland Fires. ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 2 p. https://cdm17192.contentdm.oclc.org/digital/collection/p17192coll1/id/929/rec/10 (ERI # 286) 6. Wasserman, T.N., and A.E.M. Waltz. 2018. Using Restoration to Manage Southwestern Dwarf Mistletoe in Ponderosa Pine Forests. ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 2 p. https://cdm17192.contentdm.oclc.org/digital/collection/p17192coll1/id/925/rec/1 (ERI # 283) 7. Laughlin, D.C. 2018. Using Trait-Based Ecology to Restore Resilient Ecosystems. ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 2 p. https://cdm17192.contentdm.oclc.org/digital/collection/p17192coll1/id/912/rec/1 (ERI # 271) 8. Ecological Restoration Institute. 2018. Planning for and Implementing Prescribed Fire in Fire-Dependent Forests. ERI Fact Sheet. Ecological Restoration Institute, Northern Arizona University. 2 p. https://cdm17192.contentdm.oclc.org/digital/collection/p17192coll1/id/920/rec/2 (ERI # 269)
5.5) Initiate and facilitate knowledge services and science support for non-federal entities through field trips, filling information requests, and presentations for affected entities. These numbers may vary based on demand.	
a) Deliverable: Report on actions to educate and support affected entities. Provide a minimum of ten (10) activities that may include field trips, presentations, and information requests.	a) Report on actions: • Waltz, A.E.M., and C. Stotts. Ongoing. Provides leadership, coordination and support to the transitional pine research on the Tonto and Prescott national forests. • Esch, B.E. Ongoing. Provides leadership, coordination, and support to the Greater Flagstaff Forest Partnership (GFFP). • Stotts, C. Ongoing. Coordinates with GFFP for educational materials for the Ft. Tuthill forest/fire ecology kiosk. *Technical assistance* • Dubay, T. June 15, 2017. Assisted Mark Brehl with AZ State Forestry by providing public-friendly papers/fact sheets and web links on general restoration treatments to include on the Ft. Tuthill Thinning Project webpage and in the project FAQs. *Information request* • Dubay, T. June 20, 2017. Provided Andi Thode with ERI publications on fire, like D.W. Huffman's managed fire paper, for a public talk she was giving at the Museum of Northern Arizona on fire in northern Arizona. *Information request*

	• Stotts, C. June 28, 2017. Provided ERI publications and discussed evidence-based restoration prescriptions with members of the Ashland Forest Resiliency Stewardship Project. *Information request* • Dubay, T. July 10, 2017. Provided information on ERI accomplishments and partnerships as well as editing assistance to the NAU President's office for an opinion piece to run in the Quad City Paper and Flagstaff Business Network. *Information request* • Dubay, T. July 13, 2017. News reporter Emery Cowan with the AZ Daily Sun requested an interview for an article on the costs versus the benefits of a fire like the Boundary Fire; D. Vosick responded to request. *Media request* • Dubay, T. July 13, 2017. News reporter Trudy Balcom with the White Mountain Independent and Payson Roundup requested an interview on how livestock grazing altered forest conditions. She also requested the 1975 paper by W.P. Clary, "Range management and its ecological basis in the Ponderosa pine type of Arizona." The paper was provided and AJ Sanchez Meador gave the interview. *Information request* • Springer, J.D. July 26, 2017. Provided plant identification assistance to Ted Martinez from the NAU Honors College, on behalf of the City of Flagstaff. *Technical assistance* • Dubay, T. July 27, 2017. A member of the general public sought information on protecting old growth trees from fire. An ERI working paper on protecting old growth trees from prescribed fire was provided. *Information request* • Vosick, D. July 27, 2017. Provided information to Rose Houck, writer assembling an article on the FWPP for CityScape. *Information request* • Vosick, D., and M. Waddell. August 10, 2017. Request from Randy Fuller on the Apache-Sitgreaves NF for two older reports concerning land management on the A-S. Search included Cline and ERI Library and all other collections. *Information request* • Vosick, D. August 16, 2017. Interview with Kelly Lacroix, USFS Presidential Fellow, regarding the lessons learned from the Flagstaff Watershed Protection Project. The information will inform a series of case studies designed for Forest Service leaders that describe innovative approaches to watershed protection. *Interview* • Dubay, T. August 16, 2017. Provided information about the Director of Forest Operations and Biomass position to news reporter Emery Cowan with the Daily Sun. *Information request* • Dubay, T. August 17, 2017. Lee Ann Beery with AZ State Forestry requested 100 copies of the Restoration for Homeowners guide. Forty guides went to the Flagstaff Ranch Firewise Community group. *Information request* • Springer, J.D. August 21, 2017. Provided information on bark beetles to Denise Roggio from the Yarnell Fire District. *Information request* • Dubay, T. August 21, 2017. Matt Millar with the Flagstaff Fire Department requested historical sequence photos, pre and post settlement. He was provided with photos from Ft. Valley Experimental Forest, Gus Pearson NA, and Hart Prairie. *Information request* • Springer, J.D. August 28, 2017. Provided plant identification assistance to Mark Daniels from Envirosystems. *Technical assistance*

	• Vosick, D. September 11, 2017. Presented on a field trip for the Bicentennial Colorado Plateau Conference. Observatory Mesa. 11 participants. *Field Trip* • Waltz, A.E.M. September 12, 2017. Tabled at the Colorado Plateau Biennial Conference that ERI sponsored. Flagstaff, AZ. 300 participants. *Information request* • Vosick, D. September 22, 2017. Interviewed with Kelly Jaramillo for a project designed to refine leadership skills of emerging leaders in the Forest Service. Interview focused on collaboration. Links to 4FRI White Papers were provided. *Information request* • Stotts, C. October 10, 2017. "Ft. Tuthill Demonstration." Presentation to the Coconino Board of Supervisors on behalf of the Arizona Department of Forestry and Fire Management (AZ DFFM). Flagstaff, AZ. 12 participants. *Presentation* • Vosick, D. October 18, 2017. "If the Trees Don't Pay for Restoration what will?" Restoring the West Conference (invited speaker). Logan, Utah. 120 participants. *Presentation* • Vosick, D. October 20, 2017. Pascal Berlioux requested information regarding the full cost accounting of wildfire. Citations sent. *Information request* • Vosick, D., and T. Dubay. October 24, 2017. Provided information to the Payson Roundup (Michele Nelson) for an article on fire. *Information request* • Dubay, T. October 26, 2017. Sent information on Julie Mueller's grant to measure economic value of forest ecosystems to Nancy Harrison, a producer with NAZ TV. Nancy requested info for a forestry-related story idea. *Information request* • Stotts, C., and T.N. Wasserman. October 27, 2017. Greater Flagstaff Forest Partnership (GFFP) tour of the Fort Tuthill treatment and demo area for GFFP and Coconino County board members. 30 participants. *Field trip* • Vosick, D. November 2, 2017. Request from Paul Smith of APS for information about watershed responses to thinning. He is preparing information on the feasibility of biomass energy production for the Arizona Corporation Commission. *Information request* • Vosick, D. November 15, 2017. Presented before the USFS Regional Leadership Team on ways to improve USFS Environmental Analysis and Decision Making. Albuquerque, NM. 100 participants. *Presentation* • Vosick, D., and M.M. Colavito. December 18, 2017. Congresswoman McSally's office requested information about wildfire risk in Arizona and Congressional District 2. Information from AZ WRAP was provided with a summary. *Information request* • Dubay, T. December 29, 2017. Emery Cowan, a reporter for the Daily Sun, requested a source for a story she was writing on the impact to ponderosa pines from a dry winter. Potential sources were provided. *Information request* • Dubay, T. January 3, 2018. Emery Cowan requested an interview with Dr. Han-Sup Han about biomass emissions. *Media request* • Vosick, D., and M.M. Colavito. January 9, 2018. Jennifer Zimmerman from the community of Summerhaven, AZ, requested information

	about collaboration and 4FRI. Sources about collaboration and contacts in Summerhaven were provided. *Information request* • Vosick, D. January 14, 2018. Provided information to Brian Schaulk of Holistic Engineering and Land Management on whether or not biochar has been considered for biomass use in 4FRI. *Information request* • Springer, J.D. January 26, 2018. Provided information on rare and endangered species to Pima County resident, Martha. *Information request* • Vosick, D., A.E.M. Waltz, and M.M. Colavito. January 26, 2018. Provided information to Ryan Hunt on the number of acres vulnerable to catastrophic fire in the US. *Information Request* • Crouse, J. February 9, 2018. Created a map to be used in a manuscript for NAU School of Forestry Professor, Carol Chambers. *Technical assistance* • Colavito, M.M. February 26, 2018. Provided peer-reviewed articles about the role of science in 4FRI to Connie Woodhouse, a professor with the School of Geography and Development at the University of Arizona, for a seminar. *Information request* • Dubay, T. March 1, 2018. Provided 100 copies of the Restoration for Homeowners guide to Jerolyn Byrne with Flagstaff Fire. *Information Request* • Stotts, C. March 15, 2018. "Rapid Assessment: Brookbank Meadow Findings." Presentation and technical transfer of results to leadership of the Flagstaff Watershed Protection Project (FWPP). Flagstaff, AZ. City of Flagstaff staff. *Technical assistance* • Dubay, T. April 2, 2018. Provided ERI working papers to Barb Satink-Wolfson with SW Fire Science Coordination for a trip to Washington, DC. *Information request* • Dubay, T. April 2, 2018. Coordinated and provided information on a series of articles and source contacts to Joshua Bowling, a reporter with the AZ Republic, and photographer Mark Henle. *Media request* • Dubay, T. April 17, 2018. Provided 100 copies of the Restoration for Homeowners Guide to Mark Brehl with the Arizona Department of Fire and Forest Management. *Information request* • Colavito, M.M., and T. Dubay. April 27, 2018. Provided copies of the 4FRI brochure to Anne Mottek with Mottek Consulting for the WUI Summit. *Information request* • Vosick, D. April 30, 2018. Explained to Wade Ward from APS the concept of Merriam's Life Zones. This question was generated after a presentation by Ward at the 4FRI meeting. *Information request* • Dubay, T. May 1, 2018. Coordination an interview with Dr. Covington for Brandon Loomis with the Arizona Republic. May 1, 2018. *Media request* • Dubay, T. May 2, 2018. Provided 600 copies of the 4FRI brochure to the Flagstaff Convention and Visitors Bureau. *Information request* • Dubay, T. May 2, 2018. Provided 100 copies of the Restoration for Homeowners guide to Jerolyn Byrne with Flagstaff Fire. *Information request*

	• Vosick, D., and A.E.M. Waltz. May 3, 2018. Coordinated a field trip to Gus Pearson for the Federal Timber Purchasers Council. 60 participants. *Field trip* • Vosick, D. May 8, 2018. Presentation for the Portland State Executive Seminar Series on the Citizen's Role in the "Yes on 405" campaign to pass the Flagstaff Watershed Protection Project bond. Flagstaff, AZ. 40 participants. *Presentation* • Stotts, C. May 9, 2018. "Rapid Assessment: Reference conditions in dry-mixed conifer." Presentation for the Portland State Executive Seminar Series. Flagstaff, AZ. 40 participants. *Presentation* • Dubay, T. May 15, 2018. Provided photos to Anne Mottek with GFFP for use in a newspaper insert about smoke and fire. *Information request* • Dubay, T. May 16, 2018. Provided a study by Combrink and Rousse, "The Economic Impact of Post Fire Flooding: Bill Williams Mountain," to Joshua Bowling with the AZ Republic. *Information request* • Waltz, A.E.M. May 17, 2017. Moderator. Fire and Water Film Screening and Panel Discussion. Hosted by GFFP, NFF, and SWFSC at Museum of Northern Arizona. 80 attendees. *Presentation* • Waltz, A.E.M. May 20, 2018. Provided information on mistletoe, including Conklin and Merriweather 2010 publication, to Joe Trudeau with the Center for Biological Diversity. *Information request* • Dubay, T. May 22, 2018. Provided information to Michael McNamara with SRP on gaining access to Gus Pearson Natural Area for a photo shoot for SRP's Trees for Change program. *Information request* • Waltz, A.E.M. May 23–25, 2018. Treasure Park site visit for Rapid Assessment photo points retake and attendance at leadership meeting requested by Craig Wilcox at Coronado National Forest. *Technical assistance* • Dubay, T. June 12, 2018. Provided a link to the White Mountain Stewardship 10-year assessment by Sarah Hurteau to Sue Sitko with TNC for TNC's DC office. *Information request* • Springer, J.D. June 16, 2018. "Firewise landscaping." Coconino County Master Gardener Association Plant Sale and Garden Festival. Flagstaff, AZ. 12 participants. *Presentation* • Dubay, T. June 19, 2018. Provided the electronic version of the 4FRI brochure to Cynthia Nemeth-Briehn, Coconino County Parks & Rec Director, for a kiosk at a new disc golf course. *Information request* • Dubay, T. June 19, 2018. Provided information to Tayler Brown with Cronkite News on research regarding post-fire recovery. *Media request* • Vosick, D. June 21, 2018. "The ERA of Mega-Fire." Science on Tap panel discussion about a multi-media presentation hosted by Paul Hessburg. Flagstaff, AZ. 70 people. *Presentation* • Vosick, D. July 7, 2018. Provided information on the economic efficacy of forest restoration and hazardous fuels reduction treatments to Jay Smith, Coconino County Restoration Coordinator. *Information request*
5.6) Educate the general public through media.	

a) Deliverable: Two (2) newspaper articles to educate the general public about the need for forest restoration to restore frequent-fire forests.	i. Hook, J. July 27, 2017. "Expert: Climate change, giant wildfires pose great risk to Arizona's forests." Fox 10 News Phoenix. http://www.fox10phoenix.com/news/arizona-news/expert-climate-change-giant-wildfires-pose-great-risk-to-arizonas-forests ii. Aleshire, P. September 27, 2017. Study: West faces frightening "wildfire deficit." *Payson Roundup*. https://www.paysonroundup.com/news/forest_management_wildfires/study-west-faces-frightening-wildfire-deficit/article_95652625-6aa8-54a3-9b76-200ec822c1f5.html

Project 6: Duty 5 under the ACT. Provide annual progress reports	
Deliverable	**Status**
a) Complete annual progress report on June 30, 2018.	*Complete*

USFS FY18 Plan of Work - #18-DG-11031600-057

FY18 Deliverables (In Progress) - #18-DG-11031600-057

Project 1: Science Delivery and Support for Collaborative Restoration and Conservation from the Local to Landscape Scale	
Deliverable	**Status**
1.1) Science delivery, leadership, and administrative support for the Four Forest Restoration Initiative (4FRI), a Collaborative Forest Landscape Restoration Act project.	
a) Deliverable: Report on leadership activities (stakeholder group and working groups). b) The ERI will work with 4FRI Multi-Party Monitoring Board (MPMB) and Monitoring Coordinator, with R3 FVS to analyze pre-treatment data. In addition, the ERI will analyze data management challenges and create recommendations that are designed to facilitate adaptive management. Deliverables: i. Monitoring report that includes an analysis of pre- and post-vegetation data. ii. Presentation of monitoring results to the 4FRI Stakeholder Group and Forest Service 4FRI team. iii. Data management report discussing the process steps required to incorporate MPMB collected data and the external analysis back into the federal database. iv. Presentation of findings to Region 3, Washington Office Inventory, Monitoring and Assessment	All deliverables are in progress.

Program at the Washington Office. c) Report on IT support for the 4FRI website and BASECAMP (an online collaborative work space) and administrative support, including minutes and agendas.	
1.2) Analysis of 23 CFLR pilots to assess the monitoring questions, metrics and the database management used to measure biophysical restoration success.	
a) Deliverable: White paper and seminar.	All deliverables are in progress.

Project 2: Evaluation and Synthesis of Best Available Scientific Information (BASI) for Landscape Restoration West-Wide	
Deliverable	**Status**
2.1) Evidence-based review of the literature on tree regeneration dynamics in frequent-fire forests and implications for restoration.	
a) Deliverable: Synthesis of Best Available Science. b) Deliverable: Presentation at professional conference and to stakeholder group or practitioners.	All deliverables are in progress.

Project 3: Monitoring, Evaluation, and Adaptive Management of Landscape Restoration in Western Fire-Adapted Forests and Woodlands	
Deliverable	**Status**
3.1) Continue long-term studies in southwestern mixed-conifer and ponderosa pine forests (LEARN)	
a) Deliverable: Report on progress toward treatment implementation of a mixed conifer restoration project in the Mogollon Rim Ranger District of the Coconino National Forest (build from FY 2015). b) Remeasurement (10-year) of mixed conifer project on San Juan National Forest, Colorado; collaboration with Dr. Julie Korb at Fort Lewis College.	All deliverables are in progress.

Deliverables: i. Manuscript for publication. ii. Presentation to stakeholder group, agency staff, or professional conference. c) Deliverable: Report on progress toward collection of pre-burn data at ponderosa pine project sites on Ft. Valley Experimental Forest (15-20 years) and preparation for subsequent response measurements.	
3.2) Continue collaborative studies with the Prescott and Tonto national forests on historical conditions and restoration prescriptions for transitional ponderosa pine forests.	
a) Deliverable: Manuscript for publication. b) Deliverable: Presentation for stakeholder group, agency staff, or professional conference.	All deliverables are in progress.
3.3) Support development of software platform for fusing remote sensing data (e.g., LiDAR point cloud segmentation of individual trees and imagery-derived species information) and forest inventories to assist managers in forest landscape assessments.	
a) Deliverable: Fact Sheet: Overview of LiDAR-derived products commonly used in forest ecosystem assessments. b) Deliverable: Needs Assessment Report and set of half-day focus group workshops (2-3) targeting resource managers and interdisciplinary specialists to identify standardized data products needed to facilitate analyses, assessment of landscape condition, and treatment potential and implementation.	All deliverables are in progress.
3.4) Collaborate with the Arizona National guard to develop a mixed-conifer restoration demonstration site at Camp Navajo.	
c) Deliverable: Progress report.	All deliverables are in progress.

Project 4: Understanding and Solving the Economic, Social, and Political Issues and Opportunities of Ecological Restoration.	
Deliverable	**Status**
4.1) Support implementation of recommendations developed at the November 2017 "Accelerating Implementation" workshop.	
a) Deliverable: Report on the progress made on action items from the November 2017 workshop with an emphasis of co-defining with the Forest Service the methods and opportunities to collect lessons learned and share them with other regions and units of the Forest Service. b) Deliverable: Workshop designed in cooperation with relevant units of the Forest Service. Follow-up webinars quarterly to track progress.	All deliverables are in progress.
4.2) Provide constructive feedback on proposed actions informed by 4FRI Innovations implementation experience, consultation with outside partners and Forest Service staff on the following topics: Appraisals, Contracts, Accountability, Sale Layout, and Training.	
a) Deliverable: A short, written summary of lessons learned and observations as a result of participation in this effort. Although the Forest Service did not require this deliverable, the ERI is committed to documenting and sharing lessons learned that may benefit future strategic planning efforts. b) Deliverable: Distribution of the summary to appropriate Forest Service leadership and staff.	All deliverables are in progress.

Project 5: Improving Forest Operations and Biomass Utilization	
Deliverable	**Status**
5.1) Evaluate current log and biomass transportation practices, including weight scaling and selection of trucks.	
a) Deliverable: Technical report summarizing the effect of using weight scales and optimal truck selection on transportation efficiency. b) Deliverable: Presentations to disseminate the study results at professional conferences.	All deliverables are in progress.
5.2) Develop an implementation plan for a research and demonstration project designed to test mobile processing systems operated at or near the forest.	
a) Deliverable: Report on the economics and operations logistics of mobile processing systems that run at or near the forest. b) Deliverable: Report on how a mobile processing system can be set up logistically and operated.	All deliverables are in progress.
5.3) Develop a forest products business cluster plan consisting of various wood processing and utilization facilities in northern Arizona.	
a) Deliverable: Technical report explaining how manufacturing facilities within a forest products business cluster support each other and key factors determining the successful location of a business cluster.	All deliverables are in progress.

Project 6: Science Delivery and Outreach to National, Western, and Southwestern Audiences: Federal, State, Tribal, and Private Forestry	
Deliverable	**Status**
6.3) Provide support to federal land managers for restoration treatment planning and implementation.	
a) Deliverable: Redesigned 4FRI website and website maintenance for	All deliverables are in progress.

AZPFC, SWERI, and 4FRI. b) Deliverable: Report on technical support for ERI, AZPFC, and SWERI websites.	
Deliverable	**Status**
6.4) Edit and deliver biophysical and social-political-economic information for affected entities.	
a) Deliverable: Editorial support for a total of three (3) white papers and/or working papers. i. White Paper that compiles the biophysical desired conditions, monitoring protocols, monitoring governance and metrics of success at achieving desired conditions of the 23 CFLR pilots (Project 1.2). ii. Working Paper that details restoration prescriptions based on recommendations from the best available science. iii. Working Paper on historical forest structural characteristics and natural range of variation across the southern Colorado Plateau.	All deliverables are in progress.
Deliverable	**Status**
6.5) Initiate and facilitate knowledge services and science support for non-federal entities through field trips, filling information requests, and presentations for affected entities.	
a) Deliverable: Report on actions to educate and support affected entities. Provide a	All deliverables are in progress.

minimum of ten (10) activities that may include field trips, presentations, and information requests.	

Project 7: Duty 5 under the ACT. Provide annual progress reports	
Deliverable	**Status**
b) Complete annual progress report on June 30, 2019.	All deliverables are in progress.

FY17 Project 3.1) Continue development of long-term study in a mixed-conifer forest on the Mogollon Rim
Ranger District of the Coconino National Forest (build from FY 2015).
a) Deliverable: Report on progress with Coconino National Forest to complete marking, and administer timber sale, and develop slash treatment options.

7/12/2018

Implementation of treatment marking

Ecological Restoration Institute (ERI) and Mogollon Rim Ranger District (MRD) staff met in mid-May with tree-marking contactors to train for evidence-based prescription marking. ERI delivered a presentation, discussing the project background along with the evidence-based prescription process. After the presentation, ERI staff led a field-training session, walking through the decision making process and answering questions for implementing the evidence-based treatment prescription. After this training-day, MRD staff trained the contract crew to implement the Mexican Spotted Owl (MSO) Recovery prescription. By the middle of June, the contract crew had implemented all of the tree-marking for the Mog LEARN project. ERI staff conducted a follow-up visit to confirm that the tree-marking process was implemented correctly, and determined that some adjustments needed to be made to accurately determine presettlement status of smaller diameter stumps. During the timber cruising process, the District Forester helped to spot-check and correct as needed.

Timber sale administration

MRD staff decided to include the units into the nearby General Springs timber sale unit that is part of the larger CC Cragin project. With inclusion into a larger cutting unit, this will likely increase the chance that Mog LEARN units will receive a bid for harvesting, rather than being offered as a 'stand-alone' unit. With the tree-marking and cruise work complete, MRD staff will start writing the contract soon. Pending the finalization of the CC Cragin EA, as well as the finalization of Section 18 of the Biological Assessment for the Mog LEARN units, MRD staff hope to offer the General Spings sale (including Mog LEARN units) up for bid by September 30, 2018. The Section 18 is expected to be complete in late July.

Operational considerations

In Mid-March, ERI staff met with MRD forestry, silvicultural, and fire staff to discuss operational considerations. Regarding slash treatments, all present expressed flexibility regarding different slash treatment options, though ERI recommended that it would be desirable to avoid placing log decks and slash piles in plot locations if possible. ERI expressed flexibility regarding different operational strategies for harvesting implementation, confirming that it was acceptable for skid trails to go through plots.

NORTHERN ARIZONA UNIVERSITY
Ecological Restoration Institute

Monitoring Report

Prescott National Forest Monitoring Project Report

July 16, 2018

Prepared for:
USDA Forest Service
Prescott National Forest

***Prepared by*:**
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This research was funded by a grant from the USDA Forest Service.

Introduction

This project was conducted by the Ecological Restoration Institute (ERI) in order to gather information on monitoring to inform the Prescott National Forest (PNF) biennial monitoring report (as required by the 2012 US Forest Service Planning Rule), as well as to identify how PNF monitoring can be best used to inform decision-making and management planning.

The ERI and PNF worked together to identify the following project objectives:

1. Build an understanding of current state of PNF monitoring across resource areas to inform biennial reporting.
2. Develop understanding of PNF monitoring needs to support management decisions and adaptive management.
3. Identify opportunities for monitoring efficiencies.

Monitoring is one of three critical components of the 2012 US Forest Service Planning Rule framework. The monitoring section of the rule calls for monitoring at the unit (i.e., national forest) level and also at a broader scale. All monitoring is meant to "enable the responsible official to determine if a change in plan components or other plan content that guide management of resources on the plan area may be needed" (77 FR 21161).

The Prescott National Forest Plan states that "monitoring is the part of the adaptive management strategy used to determine the degree to which on-the-ground management is maintaining or making progress toward desired conditions. The monitoring plan includes questions and performance measures designed to inform implementation and evaluate effectiveness." The following strategy is included in the monitoring plan.

> *A strategy for plan monitoring and evaluation has been designed to answer these three basic questions:*
>
> 1. *Did we do what we said we were going to do? The answers to this question should tell us how well the direction in the plan is being implemented. Collected information is compared to objectives, standards, guidelines, and management area direction.*
> 2. *Did it work how we said it would? The answers to this question should tell us whether the application of standards and guidelines is achieving objectives, and whether objectives are achieving or moving toward desired conditions.*
> 3. *Is our understanding and science correct? The answers to this question should tell us whether the assumptions and predicted effects used to formulate the desired conditions and objectives are valid.*

Based on PNF staff insight, the ERI-developed recommendations include formalizing the adaptive management process, providing opportunities for learning about the monitoring program, for training, and for technical information transfer.

Methods

We worked with PNF staff to identify key interviewees to capture diverse perspectives on the forest monitoring program across resource areas. In April 2018, the ERI conducted seventeen interviews with PNF staff, including line officers and resource leads. Interviews were informal and unstructured, but generally captured the following questions:

- What's your current experience with monitoring?
- Have you used/how are you using the monitoring plan?
- What kind of data/information is most useful for assessing progress toward desired conditions?
- What kind of data/information is used in decision-making?
    - What do *resource staff* use? What does *leadership* use?
- What kind of data/information is used in communication?
    - What is currently used for communication?
    - What should be used in communication?
    - Differences between audiences: stakeholders/public, region, Washington Office (WO)?
- What kinds of data do you wish you had either to support management decisions or communication efforts? (What are the current information gaps?)
    - Why isn't this data currently available to you?
    - What capacity/support is needed to fill information gaps?
- (*Resource staff*) What monitoring data is currently collected for your resource area?
    - How is that data stored? Analyzed? Used?
    - Is data collected or used in coordination with other resources areas?
        - How so? Or why not?
- Do you work with partner organizations on monitoring?
    - What kinds of data do partners provide?

Interview content was captured through notes during and after the interview. This information was then distilled into major themes, and is summarized in the results below.

Results

Current State of PNF Monitoring

Current PNF plan monitoring is informal, observational, and accomplishment focused. Forest staff feel that the current level of monitoring is the bare minimum and doesn't allow for an understanding of the "big picture" of current conditions, treatment effectiveness, or trends over time. Many interviewees describe effectiveness monitoring that is informal and based on informal observation or "gut feeling." For example, project planning or implementation may be based off of a resource specialist's informal observations on similar projects completed in the past, which may or may not be documented.

Interviewees who were more familiar with the forest monitoring plan thought it to be appropriate overall, and an improvement on the previous monitoring plan. Some staff identify specific gaps, such as the lack of soil-specific questions and gaps in the range monitoring plan. Some staff have general concerns about the forest monitoring plan and the upcoming biennial report. For example, the wildlife specific questions in the monitoring plan related to fish, reptiles, amphibians, breeding birds, bats, cannot be appropriately answered with the current level of monitoring and data available. Similarly, some staff state that the habitat trends monitoring for Threatened and Endangered (T&E) and sensitive species are not being completed, there are no standardized habitat protocols to address these monitoring needs, and staff lack the expertise to complete this type of monitoring and assessment. Some staff feel that some plan monitoring questions and biennial report questions are unspecific, and that the qualitative information is not helpful in objectively tracking progress toward desired conditions. For example, staff mention the difficulty in quantifying how a resource has "improved" if there is no quantitative data available on that resource.

Regular data entry and reporting processes can be unclear as well. Staff identify unclear questions and inconsistency across reporting requirements as complicating factors in monitoring and data entry. For example, one question asked in treatment reporting is "is this a first, interim, maintenance, or final treatment?" This question does not provide context or evaluation of the relationship of the treatment to the desired condition.

Corporate database systems are used by staff for project planning across resource areas. Some staff state that information from corporate database systems is applied homogenously across the forest. For example, data on fire return intervals or potential natural vegetation type (PNVT) is applied to the entire forest, regardless of local ecological differences or issues of special interest or risk — such as areas closed for nest birds, access to mining claims, or grazing allotments.

The following monitoring efforts were mentioned by as staff as currently underway:

- Stream temperature monitoring. Currently twelve streams have temp gauges and more are to be installed.
- Wildlife monitoring. Bird counts are being done, but there are gaps and database entry is spotty. Wildlife monitoring is focused on T&E species, staff report there is no capacity for anything additional.
- Recreation project monitoring. In addition to tracking projects implemented, the recreation staff take feedback from the public, employees, and campground hosts into account, and consider this an approach to monitoring.
- Range monitoring. There is active range monitoring, but capacity is such that only a fraction of what is needed is being completed. There is some monitoring with the Arizona Cooperative Rangeland Monitoring Program (University of Arizona).

This list is not comprehensive.

Monitoring Needs

Most PNF staff desire additional monitoring data for understanding the outcome of management actions over time and in relation to desired conditions. Some staff are concerned that the lack of well-documented quantitative monitoring data leaves the forest exposed to litigation, especially when reporting on management outcomes, range condition, and wildlife issues. Most staff would like more monitoring data to help drive decision-making and prioritization, recognizing that a number of other factors also drive decision-making, such as national, regional, and forest plan objectives, local needs and desires, and community protection, among others. Some staff recognize that more information on ecological condition may or may not influence decision-making. One staff member in particular points out that more monitoring information may influence NEPA and prioritization. For example, data on treatment effectiveness would help inform what kind of treatments are put in, but given all the things that drive decision-making, monitoring data may not be very influential even if it was available.

Most staff feel that monitoring is not prioritized, which results in it being treated as a collateral duty. Many also attribute the lack of monitoring to staffing issues, not lack of interest or desire. However, some staff also describe a lack of technical expertise as an issue in establishing standardized monitoring protocols, collecting data, and analyzing data. There is a feeling among staff that if monitoring is going to be a priority, it needs to be made clear by leadership.

Many staff do not believe there is sufficient data for understanding if treatments are having the desired impact, and if analysis areas are within the effects analysis post-treatment. Staff report that there is no pre or post-treatment monitoring for quantitative evaluation of project impacts or outcomes for vegetation management or prescribed fire implemented for hazardous fuel and restoration objectives. A few staff mention the challenge of keeping up with monitoring of conditions on grazing allotments, and this is an area where staff are concerned about litigation. There is also a concern among staff and leadership that the monitoring for T&E and sensitive plant and wildlife species is inadequate for assessing trends, and the legally required monitoring is not even being completed.

Staff identified specific monitoring needs as:

- Developing baseline data and better understanding the ecoregion.
- Developing long-term data. Inconsistency in record keeping means that staff cannot look back over time to see what was done to compare to current conditions.
- Vegetation and fuels
    - Understanding how management actions in the WUI impact fuel loading.
    - Understanding relationship between management actions and response of understory (specifically chaparral) — pre and post-treatment data.
    - Understanding how management actions influence forest structure (age classes) and progress toward uneven-aged forest structure.
- Aquatics
    - Stream habitat inventory and assessments.

- Range
    - Long-term trends.
    - Impacts of grazing on fire, wildlife, watershed.
    - Understanding treatment effects in grass/juniper system.

Data Storage, Access, and Management

Corporate data systems are the primary tool used for USFS data management and are key for Forest Service monitoring. Interviewees report that the databases are not kept up to date; specific examples given were aquatics, wildlife, and rare plants. A few staff believe that much of the vegetation data used now is from 2009–2010. Several staff mention that there is a tradeoff between spending time on database entry and reporting or other necessary duties, with database entry commonly deprioritized. Many staff said the corporate databases are cumbersome, and find them to be "complicated, confusing, and redundant" systems. Some resource areas have redundant data stored across systems and these systems do not crosswalk or share information between each other. Many staff see the difficulty of entering in data as a deterrent to putting it in the system and getting useful data out of the corporate databases as difficult. Some staff feel that spatial data on shared servers is more useful than the corporate databases.

Some staff also mentioned that sometimes the data or information within databases is not available in the right format at the right times. For instance, if the information on deferred maintenance is not saved as a report at the time it is created there is no way to find it again. Another example of database challenges is signage, which is tracked and reported across three programs. Additionally, the total number of signs on the forest is unknown, so knowing a percentage of added or improved signs is impossible.

Specific issues mentioned included:

- Watershed related reporting is especially cumbersome with numerous databases to capture similar data.
- FACTs is not up to date.
- INFRA database is not up to date, is not used properly, and is not useful for looking at previous years' data.

Capacity

Staff attribute the lack of quantitative monitoring to lack of resources, expertise, and time. There is an impression among some PNF staff that there was more monitoring ten or more years ago, due to there being more staff and a larger budget at that time. One staff member thought that the decline of monitoring on the forest could be partially attributed to the elimination of a monitoring line item in the budget from the Regional Office (RO), which was eliminated for simpler budgeting, not with the intent to eliminate the monitoring program. A few staff expressed that with major planning documents now done, the next major phase of work will be implementation, and which may free up more capacity to address monitoring.

Some staff pointed out that the lack of capacity for monitoring is related directly to the forest structure and staffing. There is currently no monitoring coordinator, and there has been an overall decline in resource staff over time, with many empty positions staying unfilled. Over time the forest has become more horizontally structured with more mid-level positions (GS 11/12) and fewer lower-level positions (GS 5/7). This has resulted in fewer staff available for work like data collection. Some staff feel that most staff time is spent on program management, and little is spent on data collection and management. Many staff feel that there has been inadequate training on monitoring protocols, and some staff mentioned that, in addition to monitoring, more overall science support is need. One staff member noted that there is a large body of science available, but staff members do not have the time to access or assess it.

Internal Communication

Coordination and communication among staff and from resource staff to line officers is mostly informal. PNF line officers largely rely on resource staff to make assessments and provide direction related to their recourses in decision-making.

Most staff feel that the timber and fire programs are the ones driving planning. Some staff mention that engagement of other programs and specialists in those planning processes is inconsistent. Some staff feel that integration across west and east sides of the forest is also inconsistent, and is particularly challenging compared to other forests because all staff are forest-wide, and not east or west-dedicated. Most staff mentioned that forest organization is complicated and contributes to communication issues. For example, some program managers do not supervise the program staff.

Most staff feel there are issues in understanding existing datasets and communication about how data is being used. For example, fire and fuels decisions are based on fire regime condition class (FRCC), but there is little understanding on how FRCC was determined, or data on how management is changing FRCC. Turnover also impacts the monitoring program. Many staff mention not having information available to them from their predecessors, and in at least one case data was lost, and then found, that was key to program area.

Partnerships

Staff see a clear role for partners in monitoring. There is currently some monitoring and volunteer work provided by partners, mostly local volunteer groups made up of students and citizens. Some staff thought that partners may be able to provide more capacity and expertise in monitoring moving forward. There was some push-back on the use of volunteer groups — some staff feel that volunteers cannot be relied upon. Staff relationships with other forests are very inconsistent; forest planners talk some, but otherwise there is little coordination. Some staff members see monitoring as an opportunity to provide additional monitoring information to partners like the Bureau of Land Management, other forests, and state agencies, but most staff do not think the public wants more detailed or quantitative data.

Staff mentioned current relationships with:

- AZ Department of Environmental Quality (AZ DEQ) on water quality (e.g., no focal species for aquatics, but water quality and macroinvertebrate data will still be acquired from AZ DEQ).
- Rocky Mountain Research Station has data on the upper Verde River, and staff report this relationship is being revived.
- AZ Game and Fish Department both receives data from and shares data with the PNF. AZGFD provides funding, analysis of data (e.g., pronghorn), and consults on projects related to wildlife habitat.
- V Works. This partnership is focused on Verde River invasive species removal.
- Prescott College provides student volunteers and data collection restoration applications class.
- The University of Arizona, Arizona Cooperative Rangeland Monitoring Program.

Recommendations from PNF staff

Interviewees had a number of insights and recommendations on approaches to strengthening the existing monitoring program and adding additional components to fill gaps. These suggestions are in the bulleted list below.

- More partner engagement. Staff saw the potential for expanded programs in partner data collection, sharing data sets and analysis, and knowledge coproduction.
    - This may be specifically helpful for areas that are research-poor, such as wildlife or highly local species responses.
    - Data collection events, like bio blitzes, with partner groups.
- Realize efficiencies across resource areas. Staff saw opportunities to collect data that would answer key monitoring questions across resource areas. Many resource areas have similar and inter-related vegetation dependent questions that would be ideal for this approach. One suggestion was that a single staff member with ecology/statistics background could be dedicated to monitoring, with a seasonal team for data collection on vegetation, could make a significant difference in filling knowledge gaps.
- Use of tools and technology. Most staff saw potential for increased use of and added capacity for remote sensing tools, which may be the easiest way to assess forest condition.
- Most staff mentioned the role for a monitoring coordinator, including:
    - Coordinating monitoring programs and reporting.
    - Overseeing the monitoring plan, identifying monitoring needs, overseeing data collection.
    - Providing statistical and scientific expertise.
    - Coordinating monitoring across multiple forests. It was noted by some staff that there are similar vegetation types and monitoring questions across northern Arizona

forests, which presents an opportunity to coordinate monitoring across administrative units.

    - Some staff desired specific definition of the roles, responsibilities, and needs if the monitoring coordinator position is not filled.

- Some staff thought that further prioritization and strategy for addressing the monitoring plan would be helpful. For example, if monitoring is going to be more of a focus, what are the highest priorities? Where are the best efficiencies?
- Some staff expressed the desire for a more detailed adaptive management process to be developed, as well as accountability for implementing the process.
- Most staff thought that leadership from the RO or WO, and funding, would be necessary for a successful monitoring program.
- Staff expressed a desire to better understand and or develop the intent and goals of monitoring.

Recommendations

Address staff knowledge gaps.

The results suggest most staff desire more monitoring data and analysis to inform their work, and specifically more data on treatment effectiveness to inform future project implementation. That said, few staff were well-versed in the current monitoring plan, the on-going monitoring being implemented, or the adaptive management process. Several staff report having only a cursory familiarity with the forest plan.

Some staff are also unclear on the usefulness of monitoring, the way monitoring can influence the Forest Plan under the 2012 Planning Rule, and the mechanisms for adaptive management. The planning cycle and any monitoring being done are separate and do not currently feed into one another. If the planning process has an adaptive management component built in, staff are not aware of it.

Some additional confusion may be a result of the transition to comply with the 2012 Planning Rule. The crosswalk of the Forest Plan monitoring chapter to the monitoring transition is confusing, and requires referencing several different portions of the forest plan. Given the inconsistency of staff knowledge of the monitoring plan, what data is available, or what monitoring has been done in the past, it may be appropriate to provide opportunities for learning about monitoring among staff. Investing staff time to streamline the monitoring transition crosswalk may create a more efficient guidance document, while also increasing staff familiarity with the monitoring plan. Opportunities to learn more about the monitoring plan, the adaptive management process, and the intent behind these processes may also increase staff buy-in for monitoring.

Formalize adaptive management.

While staff saw gaps in the PNF monitoring program and the need for added capacity, many were adamant that adaptive management is being done on the forest, just through more informal means. Formalization of the adaptive management process could be started by documenting even informal

observations that can inform project planning. Modernization is underway at the WO level, which will hopefully address some of the problems staff experience with the corporate database systems. Until new systems are available, and regardless of what changes are made, staff should be encouraged to prioritize database entry and documentation of even informal observations that can influence decision-making.

Encourage training and use of available resources.

Some of the corporate tools available to staff are not utilized, and more training in corporate data management systems may provide more opportunities for use of existing data. No staff mention engaging with Forest Service regional level staff, who could potentially provide support in broad-scale data collection (e.g., remote sensing products), data analysis, and scientific expertise. In addition to regional staff, other Forest Service resources are available for data collection, analysis, and science expertise, such as Geospatial Technology and Applications Center (GTAC), and the Forest Inventory and Analysis program (FIA) can provide analyst expertise.

Integration through annual monitoring workshops.

Annual monitoring workshops provide an opportunity for learning across program areas, and for coordination of technical information transfer with experts and technical partners. These workshops would provide the venue for further integrating planning and resource specialists as monitoring information is translated into adaptive management actions. Dedicating time for communication and coordination is necessary for an effective monitoring and adaptive management program.

References

(77 FR 21161) April 9, 2012. National Forest System Land Management Planning.

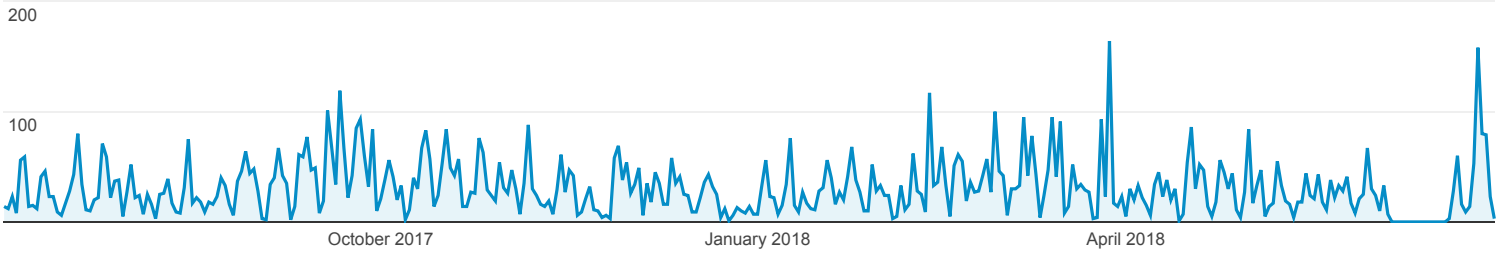
Overview

All Users
100.00% Pageviews

Jul 1, 2017 - Jun 30, 2018

Overview

Pageviews



Pageviews	Unique Pageviews	Avg. Time on Page	Bounce Rate	% Exit
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2.	/index.html	864	7.56%
3.	/documents.html	774	6.77%
4.	/stakeholders.html	729	6.37%
5.	/maps.html	725	6.34%
6.	/description.html	722	6.31%
7.	/background.html	670	5.86%
8.	/meetings.html	458	4.00%
9.	/press.html	442	3.86%
10.	/workinggroups.html	420	3.67%

Overview

All Users
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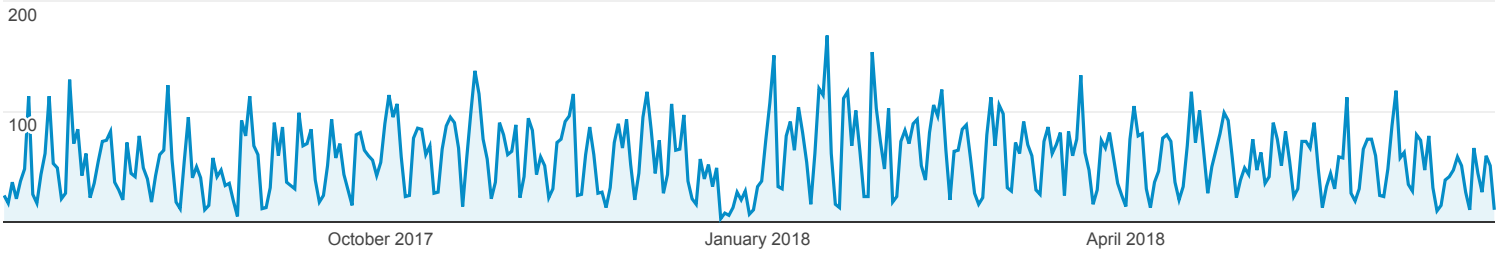
Overview

Pageviews



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3.	/eri/resources/for-policymakers/effects-of-thinning/	1,106	5.24%
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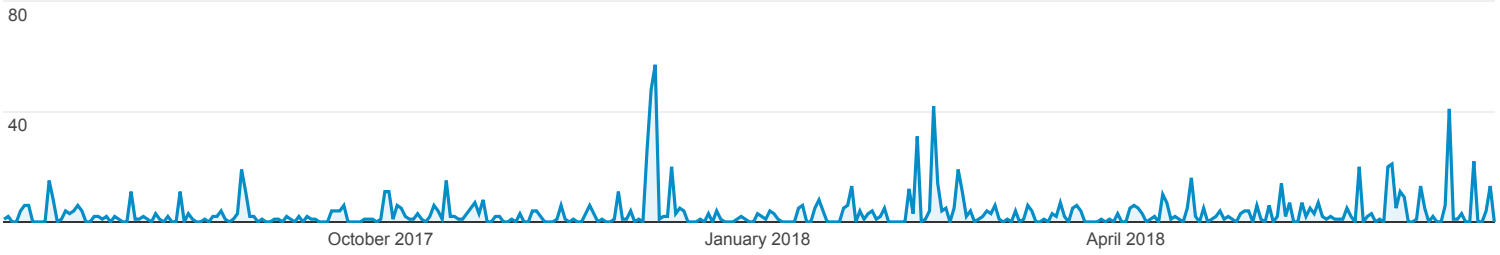

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4.	/Accelerated_Restoration_Implementation_WS.html	102	8.36%
5.	/dfc_wksp.html	83	6.80%
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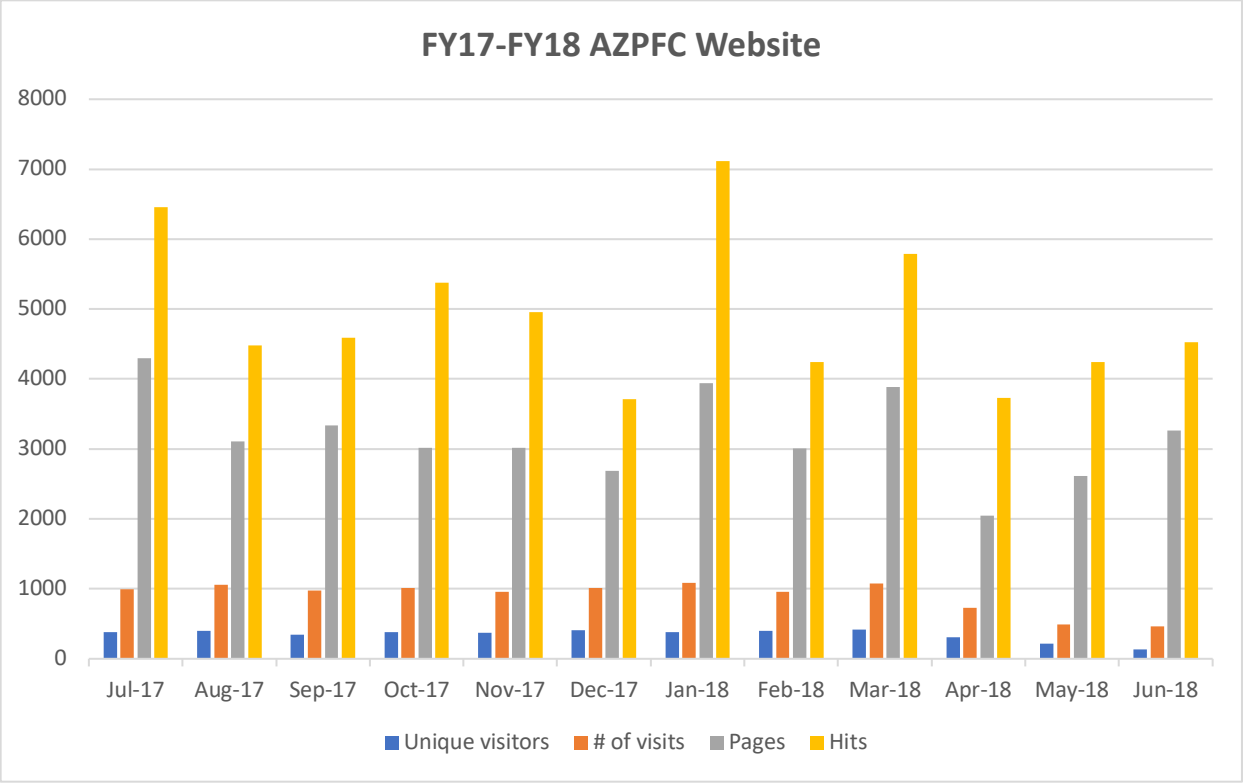
7.	/reviews.html	54	4.43%
8.	/contactus.html	42	3.44%
9.	/legislation.html	37	3.03%
10.	/aboutus.html	24	1.97%

ARIZONA PRESCRIBED FIRE COUNCIL

AZPFC.ORG FY-17/18 Website Stats

Month	Unique visitors	# of visits	Pages	Hits
Jul-17	382	996	4,298	6,457
Aug-17	398	1,056	3,112	4,481
Sep-17	343	980	3,333	4,591
Oct-17	380	1,009	3,017	5,379
Nov-17	375	961	3,020	4,957
Dec-17	410	1,017	2,688	3,708
Jan-18	381	1,084	3,938	7,111
Feb-18	402	960	3,006	4,246
Mar-18	419	1,078	3,890	5,787
Apr-18	310	728	2,049	3,729
May-18	220	489	2,612	4,242
Jun-18	131	466	3,260	4,528
Total	**4,151**	**10,824**	**38,223**	**59,216**



Pages-URL (Top 10)

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/event/wui-summits-in-az-nm/	451	156	158
/feed/	322	212	233
/about/	302	46	48
/event/azpfc-recurring-conference-call-for-memberspartners-2/	259	85	88
/news/	239	19	17
/events-calendar/	220	3	10
/lessons-learned/	220	7	20