

Forest Health to Spur Watershed Protection

Final Report



Prepared for:
Colorado Healthy Rivers Fund Grants
Attn: Chris Sturm

December 2018

Dolores Watershed Resilient Forest Collaborative/Wildfire Adapted Partnership

Fiscal agent: San Juan Mountains Association

Grant Amount: \$15,000

Prepared by: Rebecca Samulski, Danny Margoles, and Ashley Downing



Table of Contents

Introduction.....	3
Background.....	3
Methods.....	6
Task 1 – Watershed Health Workshops.....	6
Task 2 – Community Outreach.....	7
Task 3 – Forest Health Site Visits	7
Task 4 – Forest Resilience Treatments.....	8
Task 5 – Monitoring	8
Results.....	9
Task 1 – Watershed Health Workshops.....	9
Task 2 – Community Outreach.....	9
Task 3 – Forest Health Site Visits	10
Task 4 – Forest Resilience Treatments.....	10
Task 5 – Monitoring	10
Conclusions and Discussion	10
Task 1 – Watershed Health Workshops.....	10
Task 2 – Community Outreach.....	11
Task 3 – Forest Health Site Visits	11
Task 4 – Forest Resilience Treatments.....	12
Task 5 – Monitoring	12
Actual Expense Budget.....	13
Appendix.....	14
References	19

Introduction

The Dolores Watershed Resilient Forest (DWRF) Collaborative is now in its fourth year, participants discuss and identify projects that will lead to a more resilient upper Dolores watershed. While the first couple of years were focused on bringing partners together around shared goals and evaluating risk, 2018 has been a year of broadcasting opportunities to public stakeholders. This water plan implementation project was focused on creating connections between partners and with local forested landowners in the upper Dolores watershed to promote private land forest health projects that benefit the watershed. Private lands were identified as having the most value at risk in 2017's wildfire and post-fire flooding risk assessments. The Dolores Watershed Resilient Forest Collaborative identified the need to provide education and connection to local resources as a key strategy to accomplish forest health and wildfire risk reduction projects in the watershed. This outreach includes workshops, targeted events, direct outreach, and site visits with forested landowners. The collaborative also desired to track effectiveness of treatments spurred by outreach, and so established a contract with Mountain Studies Institute to develop a monitoring plan and establish plots on private, state, and federal lands in the upper Dolores watershed.

The DWRF Collaborative is an ad hoc group currently under the fiscal sponsorship of Wildfire Adapted Partnership for group coordination. Wildfire Adapted Partnership was previously doing business as FireWise of Southwest Colorado under the fiscal agency of San Juan Mountains Association, but they were received their own 501 (c) 3 nonprofit tax-exempt status as Wildfire Adapted Partnership in July 2018. Other DWRF participants spent additional funds and obtain grants for on-the-ground projects. The Dolores Water Conservancy District pursued and was awarded a WaterSMART planning grant from the Bureau of Reclamation to support DWRF Collaborative strategic planning in 2019 and 2020.

Background

The upper Dolores watershed covers 1,284 square miles, from Lizard Head Pass in the western San Juan National Forest down to McPhee Reservoir near the Town of Dolores (Figure 1). The diverse ecosystems within the watershed include alpine tundra, spruce-fir forests, mixed conifer and aspen forests, ponderosa pine forests, pinyon-juniper ecosystems, as well as scrub and sage-dominated systems. On the southwestern edge of the focus area, the 350,000 AF McPhee Reservoir captures, stores, and filters high-quality water that communities within and outside of the watershed rely on for drinking, agriculture, and recreation. Communities within the geographic area include the Town of Dolores, Town of Rico, Dunton Resorts, and Groundhog VISTA subdivision, totaling 1,600 private parcels with 3,800 structures. The significant geographic area that includes US Forest Service, Bureau of Land Management, and state land bordering private parcels makes collaborative approaches to forest health a priority.

The DWRF Collaborative leveraged results of two assessments in order to prioritize wildfire protection outreach within the watershed. The first was a Highly Valued Resources and Assets Fire Risk Assessment (HVRA; Figure 2) and the second was an Automated Geospatial Watershed Assessment (AGWA), which

Figure 1. Map of Dolores Watershed Resilient Forest Collaborative focus area. Included are major communities within and outside of DWRF boundaries.

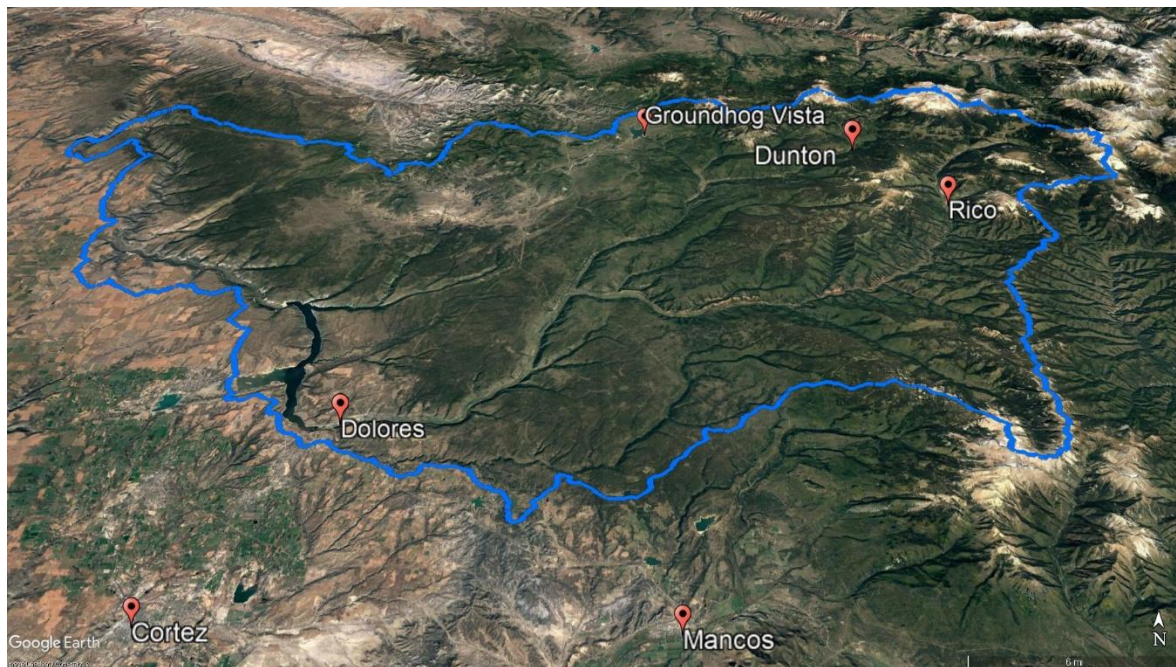
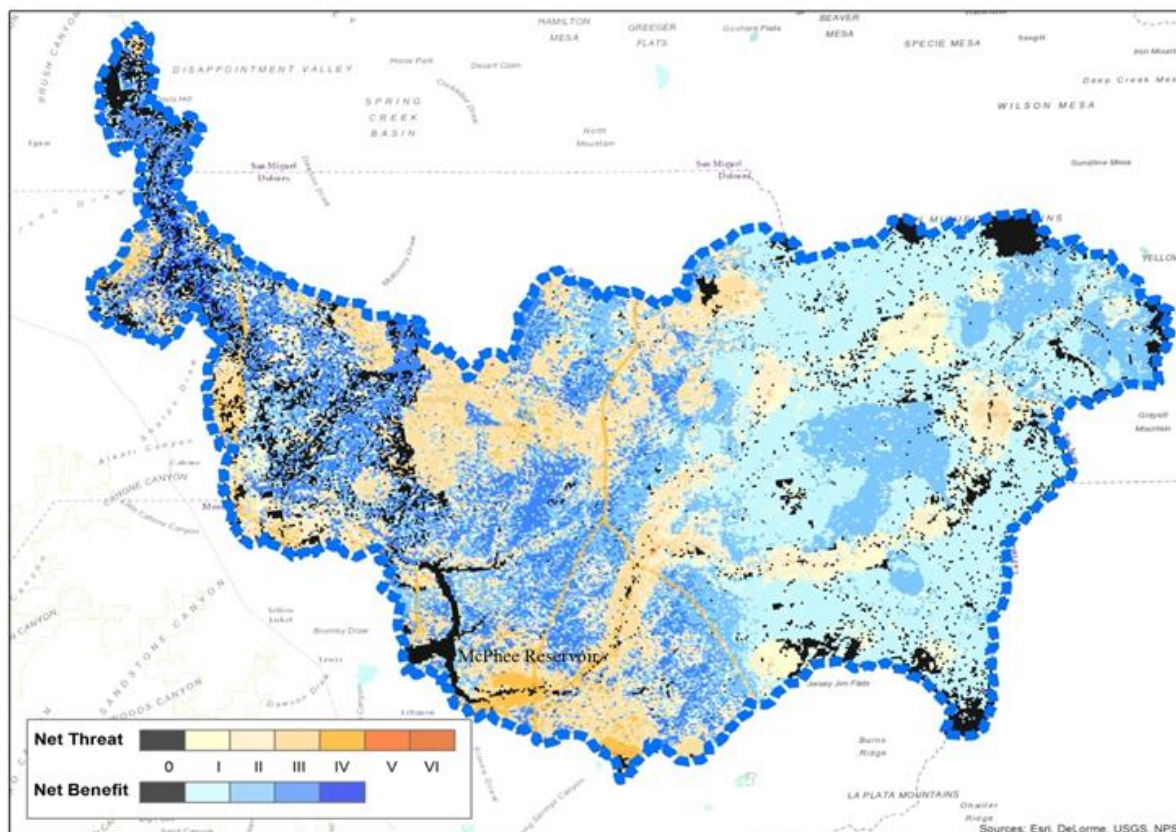


Figure 2. Highly Valued Resources and Assets Wildfire Risk Assessment results. Higher risk resources (warmer colors) tend to surround reservoirs and private lands.



models post-fire runoff and sediment. These assessments were both completed in 2017 and include values and locations for all water distribution infrastructure within the upper Dolores River Basin. There is also a weighted value included in the modeling for higher elevation snowpack areas critical to water flows. In 2018, additional GIS information was gathered to inform and prioritize watershed strategy recommendations, such as [projected impacts of climate change on the forests of the Dolores Watershed](#), [roundheaded pine beetle surveys](#), and [trout strongholds](#). These mapping resources were available to share with fire managers and Burn Area Emergency Response teams during the Burro and Plateau fires in the watershed this summer.

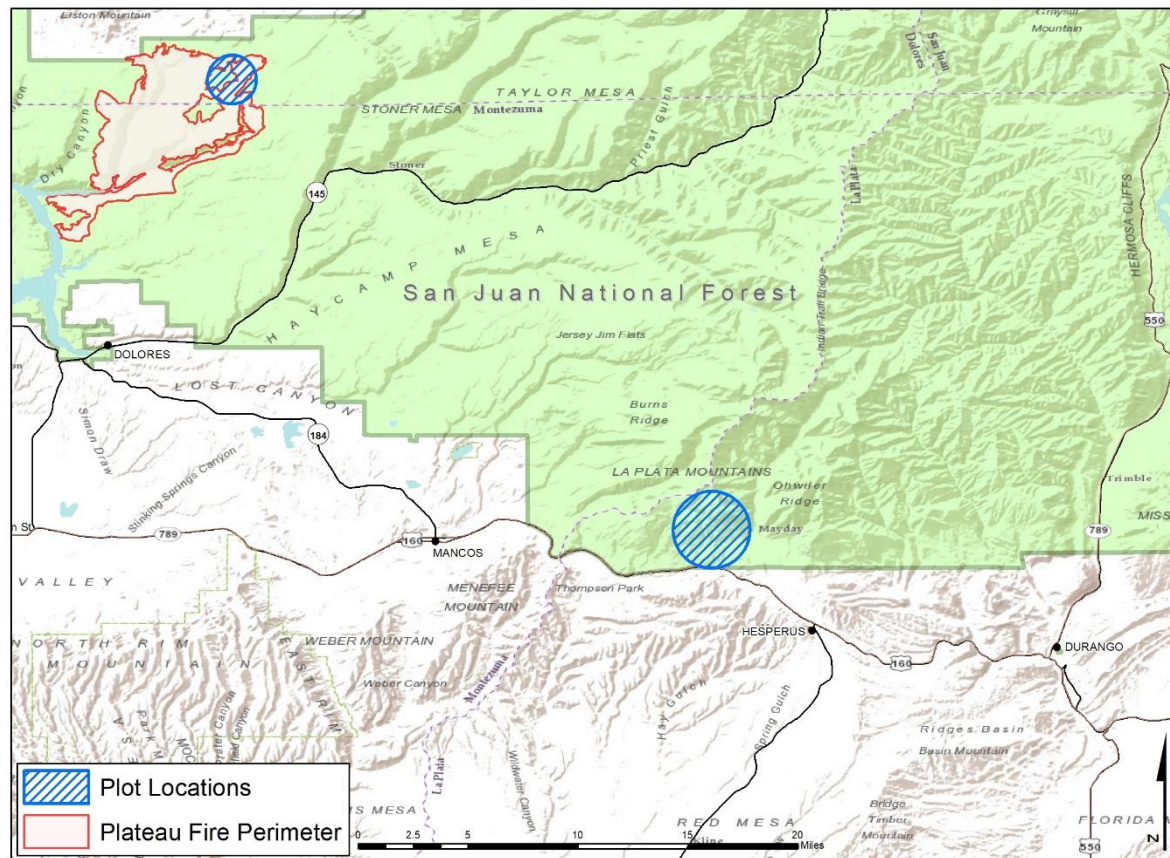
The wealth of well-grounded modeling provided participants helpful background to consider and communicate with a broad range of stakeholders, including private forest owners, but additional consideration was needed to determine how best to reach these landowners. Most decisions on the types of workshops and outreach to pursue came from the collective wisdom of collaborative group participants. The DWRF Coordinator attended an Asset Based Community Development workshop which the New Mexico Fire Adapted Communities Network hosted in Santa Fe, providing an additional framework and peer assistance for watershed outreach. Other opportunities that supported outreach and education were also developed or taken advantage of in compliment to the support of this Colorado Watershed Restoration Program grant. DWRF launched a website, developed informative one-page posters, and completed a 2017 annual report and an illustrated infographic map of the watershed in 2018. All of these resources provided valuable materials for landowner outreach. DWRF forestry participants hosted a high school forestry intern in partnership with Conservation Legacy and 90% matching funds provided by a Great Outdoors Colorado (GOCO) Inspire grant to the Montezuma Inspire Coalition. The intern was a valuable asset for additional outreach to landowners, both during the internship and as a local resident youth who now shares her knowledge in the community. Local fires in the watershed as well as smoke in the air from nearby fires last summer also raised interest in forest health, providing many opportunities for Wildfire Adapted Partnership staff to respond to landowner requests and present to community groups.

To identify and monitor the influences beetles and wildfire have had on the forest health within the watershed, the DWARF Collaborative entered into an agreement with Mountain Studies Institute (MSI) to engage and support multifaceted monitoring and mapping efforts (see Appendix for copy of agreement). These include: forest health monitoring developing monitoring guidelines; supporting and guide landscape level prioritization; and supporting the development of GIS products from DWRF's prior high value risk assessment (HVRA). These objectives are supported via this grant - Forest Health to Spur Watershed Protection - and the San Juan National Forest Cohesive Strategy Project, Participation Agreement 16-PA-11021300-039 between the San Juan National Forest and MSI. The objectives were split into categories by funding source: monitoring and monitoring guideline development under the CWCB grant; and mapping, HVRA, and prioritization support under the Cohesive Strategy funding.

To date, MSI has made steps to establish basic monitoring protocols, locations, and an initial round of monitoring related the beetle infestation and the impacts of the 2018 Plateau Fire near Dolores, Colorado. MSI had the opportunity to support an effort by the San Juan National Forest, the Rocky

Mountain Research Station, and the Colorado State Forest to document changes in insect conditions on the Dolores Ranger District in areas that were affected by the Plateau Fire. In recent years, there has been continued infestation and expansion of roundheaded pine beetle, *Dendroctonus adjunctus*, in the ponderosa pine stands north and west of Dolores, Colorado. The objective of the monitoring supported by MSI was to determine the expansion of new mortality by bark beetles within and around the Plateau Fire perimeter. The “on-the-ground” monitoring was intended to supplement insect overflights conducted by the Colorado State Forest and establish plots/transects for long-term monitoring (Figure 3).

Figure 3. MSI beetle monitoring plot locations.



Methods

Task 1 - Watershed Health Workshops

The Dolores Watershed Resilient Forest Collaborative coordinator hosted two daylong and one half-day beetle workshops at Nature Center at Butler Corner. Participants in the beetle workshops largely attended with the goal of building personal, local, and institutional capacity for beetle identification. Local bark beetle species have subtle differences in size, shape, and galleries, and include the mountain pine beetle, western pine beetle, and roundheaded pine beetle. While their physical characteristics can seem similar, the species can have varying effects on tree mortality and ecosystem dynamics. Helping

agency professionals identify affected trees as well as the beetle species present allows for more targeted management objectives and outcomes.

The US Forest Service Entomologist from the Gunnison Field Office and the Colorado State Forest Service (CSFS) Entomologist co-presented two of the workshops on April 17 and 18, 2018. These workshops focused on beetle identification and management options.

In conjunction with the "Oktober ForEST in Dolores" event, the third beetle workshop was co-presented by a Colorado State University Extension agent and the CSFS Entomologist. The topic of this workshop was assessing forest health in relationship to local bark beetles. Other presentations during the Oktober ForEST event included the home ignition zone, managing water for the future, noxious weed management, a tour of the Plateau Fire burn footprint (which came to the edge of McPhee Reservoir), and a public introduction to the DWRF Collaborative.

CWCB funds were used to coordinate and implement the workshops in April and during OktoberFoREST.

Task 2 – Community Outreach

The DWRF Collaborative coordinator attended and presented forest health information and resources at four communities in the Upper Dolores Watershed in order to communicate wildfire risk mitigation opportunities and recruit Neighborhood Ambassadors for Wildfire Adapted Partnership:

- June 11 – Dolores – presentation to the Town Board and 20 residents
- July 2 – Rico – presentation at community picnic
- July 7 – Groundhog Vista – presentation at Property Owner's Association meeting
- July 14 – Dunton Resort and River Camp – wildfire risk assessments in cooperation with Wildfire Adapted Partnership, DWRF forestry intern, and the West Fork Fire Chief.
- August 12 – Dolores – rapid risk assessments for wildfire risk

Rapid risk assessments in Dolores involve systematically identifying wildfire risk for every home and business. These assessments use a streamlined variety of measures that include, among others, defensible space, fuel loads, roof type, and building materials to develop a risk rating. These ratings are then communicated to property owners and businesses along with the opportunity to get resources to mitigate hazards.

During aerial insect surveys in 2016, beetle disturbance was identified on privately held forested land. After acquiring ownership information relating to this beetle disturbance, the DWRF coordinator reached out to the landowners with affected forests through mailings. Information in the mailings included management options for beetle-affected trees.

CWCB funds were used to coordinate and implement outreach activities and rapid risk assessments.

Task 3 – Forest Health Site Visits

Site visits are one of the most effective way to motivate landowners and direct them to appropriate

resources to take action. Wildfire Adapted Partnership completed hour long site visits on private parcels within the watershed, resulting in scopes of work with identified forest health issues developed for each property owner. Some of the site visits were specific to watershed health and at large forest health concerns, while others directly addressed protecting homes and infrastructure from wildfire through creating defensible space.

Wildfire Adapted Partnership was aware of available cost share programs and was capable of designing appropriate forest treatments for wildfire risk reduction, water infiltration and erosion mitigation, and improved ecosystem vigor. The scopes of work included recommendations to reduce short-term risks of insect and disease attack, such as not limbing live branches during active beetle cycles and rapid processing of actively infested trees.

Funding for site visits came from Wildfire Adapted Partnership and was match for the CWCB funds.

Task 4 – Forest Resilience Treatments

Wildfire Adapted Partnership designed and supervised forest health treatments (both forest health and defensible-space) on private lands to reduce wildfire size, intensity, and post-fire impacts to water quality. Additionally, some projects directly addressed forest health by thinning larger areas, and beetle activity was used as an indication of forest health and a motivator for private landowners. Through site visits (Task 3), Wildfire Adapted Partnership created a scope of work for each individual project and then the scope of work was carried out by a mitigation contractor. For landowners to be eligible for a 50 percent cost share reimbursement, all projects had to be completed within 90 days of a signed award letter and a final inspection of the property was completed. The inspection guaranteed that the full scope of work was completed by the contractor.

Funding for forest resilience treatments came from Wildfire Adapted Partnership (50 percent reimbursement) and private landowners. Both were match for the CWCB funds.

Task 5 - Monitoring

The objective of the monitoring supported by MSI was to determine the expansion of new mortality, by the roundheaded or other beetles, within and around the Plateau Fire perimeter. The “on-the-ground” monitoring was intended to supplement insect overflights conducted by CSFS and establish plots/transects for long-term monitoring.

To fulfill the goals of long-term monitoring, MSI installed a subset of plots as a priority for follow up monitoring, in 2019, and the establishment of long-term, citizen science led, monitoring locations. The initial design established by the San Juan National Forest and Rocky Mountain Research Station consisted of two 1/10 acre, fixed radius, plots separated by a half mile long transect. Within the plots, all trees greater than 4.9in dbh were measured for diameter at breast height and distance from plot center. Each tree was then assessed for beetle infestation: green; green with pitch tubes; new fader or red needles with pitch tubes; or no needles with recent pitch tubes. To facilitate long-term monitoring, and

to match MSI's existing forest health citizen science efforts, trees were tagged in the 12 sub-set plots and reference photos were taken in the cardinal directions from plot center. The 12 sub-set plots were marked with metal spikes to aid in location on return visits. Along the half mile transects between each plot, all beetle affected trees within a one chain (66') belt were counted for the same categories as with in the fixed radius plots.

Due to the timing and season of this monitoring effort several measurements were not completed: total height; crown base height; photo load of fuels, 1hr, 10hr, 100hr; groundcover percentage; canopy cover; and line-intercept transects for understory composition. The follow up plan for the 12 sub-set plots will be to revisit in the summer of 2019 to complete the tree and understory mensuration, i.e. complete baseline monitoring. Then return with citizen science groups in the fall of 2019 to document insect and disease changes using the same categories as in 2018. MSI and DWRF will work with the local middle and high schools to develop several field/monitoring trips. The intent is to match these school led efforts with similar monitoring initiated on the Columbine and Pagosa Ranger Districts. Aside from the educational opportunities and value provided to the San Juan National Forest, these plots can serve as established locations to expand monitoring efforts to a research level. Currently, the connection between precipitation and forest condition is a question central to the DWRF collaborative.

CWCB funds were used for MSI to create and carry out this monitoring plan. (Executed agreement with MSI is found in Appendix.)

Results

Task 1 – Watershed Health Workshops

The workshop on April 17th focused on increasing and showcasing local capacity for beetle management (see Figure 5 in the appendix). Twenty-two individuals participated in this workshop, including local residents, mitigation contractors, FireWise of Southwest Colorado (now Wildfire Adapted Partnership) and representatives from the Bureau of Land Management, Bureau of Indian Affairs, Natural Resources Conservation Service, regional Soil Conservation Districts, Colorado State Forest Service, and a Colorado State University Extension agent. On April 18th, the five-hour workshop informed an additional 19 residents and professionals. Seven participants attended the morning workshop coordinated with the "Oktober ForEST in Dolores" event.

Task 2 – Community Outreach

Dolores: Communicated resources to residents and outlined risk assessment plan for every structure within the town. Risk assessments were completed during August and December 2018.

Rico: Shared information and resources at community picnic (see Figure 4 in the appendix) and conducted one property site visit on the edge of the town that is adjacent to US Forest Service land. Recommendations were given to the property owner about measures to reduce wildfire risk.

Groundhog Vista: Attended annual Property Owner's Association meeting and connected with approximately 45 of the 80 total lot owners in the subdivision. The DWRF coordinator gave a

presentation on wildfire preparedness and shared information about locally available resources. Many property owners took informational material and one cabin owner signed up to become a Wildfire Adapted Partnership Neighborhood Ambassador. That individual will now spearhead efforts in the neighborhood to further enhance wildfire preparations for the subdivision.

Dunton Resort and River Camp: Along with Wildfire Adapted Partnership staff, a DWRF forestry intern, and the West Fork Fire Chief, the DWRF coordinator conducted site risk assessments for more than 50 structures with the head of grounds and maintenance at the resort. Sitting in a narrow valley with many side canyons, the group identified a significant number of post-fire hazards. As a result of the risk assessment, the resort has conducted additional vegetation removal, planned for additional hardscape improvements (including hardening a very large propane tank that sits concealed within the mouth of a large draw), and additional emergency planning.

Task 3 – Forest Health Site Visits

From March through October 2018, Wildfire Adapted Partnership completed approximately 25 site visits in the priority landscape and an additional 30 site visits in neighboring watersheds. Of these site visits 14 forest resilience treatments were initiated and completed during 2018 (please see Task 4 below), by implementing scopes of work created during these site visits.

In addition to Wildfire Adapted Partnership's site visits and cost share program, they also worked with NRCS on outreach to homeowners for a Targeted Environmental Quality Incentives Program (EQIP) NRCS initiated in the area. Many additional homeowners will benefit from this program to complete projects in the priority landscape. NRCS and Wildfire Adapted Partnership had outreach to an additional 15-20 homeowners through the EQIP Program.

Task 4 – Forest Resilience Treatments

During the summer and early fall of 2018, Wildfire Adapted Partnership completed 14 forest resilience treatments through its cost share program on private property. These projects were a combination of defensible space and forest health projects. A total of 45 acres were treated and \$41,000 spent on these treatments. \$20,500 came from private landowners and an additional \$20,500 from Wildfire Adapted Partnership, through its cost share reimbursement program, came from the Bureau of Land Management's Resilient Landscapes funding.

Task 5 - Monitoring

MSI identified and installed twelve plots throughout the Plateau Fire footprint in coordination with the San Juan National Forest and Rocky Mountain Research Station. Forest demographics and beetle-caused mortality rates are still under analysis. Monitoring of these twelve plots is ongoing and will continue into 2019.

Conclusions and Discussion

Task 1 – Watershed Health Workshops

One way to measure success of the beetle workshops is whether on-the-ground management efforts resulted from the educational events. As a result of the first two workshops, beetle-affected trees were actively removed from a minimum of three private properties throughout the season. The CSU Extension agent that attended the April beetle workshops was later able to lead the Oktober ForEST workshop.

Awareness of the beetle outbreaks in the Upper Dolores River Watershed was certainly enhanced through these workshops. The roundheaded pine beetle outbreak is of keen interest to agency professionals and private landowners and they expressed gratitude for the opportunities to learn practical identification skills as well as troubleshoot management options. The outbreak does not appear to be slowing and, as a result, follow-up educational workshops and educational events seem very appropriate. These events would reach additional agency personnel and residents and could communicate new findings about beetle disturbance pattern outcomes.

Task 2 – Community Outreach

The first objective for this project is to educate residents and stakeholders about the connections between forest health and watershed function. These outreach activities effectively communicated wildfire preparedness with individuals and spurred local action to reduce risks. Rapid risk assessments, which began in August and are being finished in December, directly communicate priorities for wildfire hazard reduction to landowners and businesses.

The success of community outreach around forest health and reducing wildfire hazards can be measured by local buy-in and on-the-ground treatment. The recruitment of a Wildfire Adapted Partnership Neighborhood Ambassador at Groundhog Vista is important to maintain energy toward wildfire risk reduction. That individual will now be able to spearhead efforts within the community in cooperation with Wildfire Adapted Partnership. More generally, increased knowledge that resources exist to assist landowners with wildfire risk reduction will help those individuals, as well as communities and public lands as a whole.

Task 3 – Forest Health Site Visits

One of the biggest difficulties Wildfire Adapted Partnership experienced when completing forest health site visits is the sheer number of those interested. Due to drought conditions and wildfire threat, requests for site visits doubled from 2017. Wildfire Adapted Partnership was able to complete approximately 50 site visits (25 in the priority landscape), but there were additional individuals who were put on a wait list for next year.

Capacity was the main issue with completing the site assessments. To ensure that a complete scope of work is delivered to each landowner the average time of the visit is 1 hour, and there is additional travel time to and from each location. If the landowner decides to move on to a cost share project, then on average that will take an additional 4 hours of staff time.

Although site visits can be time consuming and require a great deal of capacity, they are still the best mechanism for reaching private landowners and motivating them to take action. It is also the best opportunity to give them the necessary education and incentives to complete forest resilience treatments. Therefore, the site visits objective was very successful and allowed us to reach approximately 50 private landowners.

Task 4 – Forest Resilience Treatments

Extreme drought conditions and active fires in the area lead to difficult conditions for completing additional forest resilience treatments. Due to the drought, there were active fire bans and this meant that some equipment could not be used as it posed a risk of ignition. Additionally, with the threat of beetles some treatments were pushed to later in the year to ensure work was not completed during active beetle cycles. Even with these delays, Wildfire Adapted Partnership was able to complete 14 projects for a total of 45 acres treated, so the objective was still met.

Wildfire Adapted still has funding available through the BLM and Colorado State Forest Service to complete additional treatments in the landscape through 2020, and NRCS has EQIP funding to complete larger forest health projects. Therefore, additional acres will be treated in this area over the next two years that will continue to reduce wildfire size, intensity and post-fire impacts to water quality in the Southwest Basin.

Task 5 - Monitoring

Joint beetle and postfire monitoring efforts are ongoing. Twelve plots were established by MSI and initial forest measurements were taken. Due to time constraints and the timing of plot establishment (November), a number of forest measurements could not be established, as mentioned in the methods section: total height; crown base height; photo load of fuels, 1hr, 10hr, 100hr; groundcover percentage; canopy cover; and line-intercept transects for understory composition.

These data will provide important information to the USFS, CSFS, NRCS, and private landowners. Roundheaded pine beetle populations have experienced exponential growth in the southwest corner of Colorado since 2011 (see the presentation linked in the background section by CSFS Entomologist D. West). This is occurring on federal, state, local, and private land. This research with MSI will help monitor beetle patterns and identify linkages between wildfire and beetle populations - two disturbances anticipated to be highly influenced by increasing temperatures and aridity (see Williams et al., 2010).

MSI has continued grant funding to support this research with DWRP through grant the San Juan National Forest Cohesive Strategy Project, Participation Agreement 16-PA-11021300-039 between the San Juan National Forest and MSI for this research

Actual Expense Budget

PROJECT BUDGET AND TIMELINE							
Task	Description	Target Start	Target Completion	CWCB Funds	Other Funds (Cash)	Other Funds (In Kind)	Total
1	Forest Health Field Workshops	4/16/2018	7/31/2018	\$4,200.00		CSFS, USFS, NRCS Foresters design and teach, 32 hrs at \$50/hr planning rate = \$1,600	\$5,800.00
2	Community Presentations	4/2/2018	9/30/2018	\$1,800.00		Wildfire Adapted Coordinator time \$400	\$2,200.00
3	Site Visits	3/19/2018	10/31/2018	-	\$3,200.00		\$3,200.00
4	Forest Resilience Treatments	4/2/2018	10/31/2018	-	\$20,500 BLM and \$20,500 owner match = \$41,000	Landowner Volunteer Labor	\$41,000.00
5	Monitoring	5/1/2018	11/15/2018	\$7,500.00		MSI \$6,500	\$14,000.00
	Fiscal and Administrative - 10%			\$1,500.00			\$1,500.00
				\$15,000.00	\$44,200	\$8,500.00	\$67,700.00

Appendix

Figure 4. Outreach event at Rico town picnic.



Figure 5. Beetle workshop and participants in April, 2018.



Figure 6. Member of DWRF collaborative with Smokey the Bear at Oktober ForEST.



Figure 7. DWRF collaborative stakeholders introduce themselves and explain why they are part of the collaborative at the Oktober ForEST t event.



Figure 8. Firefighting demonstration at Oktober ForEST.



Figure 9. Lone Pine Vegetation Management Project Tour



Figure 10. Site visit with Conservation District Partners at Hackley Place



**Project Partner Agreement Between
Wildfire Adapted Partnership (Wildfire Adapted) and Mountain Studies Institute (MSI)**

The purpose of this agreement is to support the Dolores Watershed Resilient Forest Collaborative (DWRf) with mapping and monitoring capabilities provided by MSI and to outline funding commitments by MSI and Wildfire Adapted for this work.

Wildfire Adapted Partnership (WAP), (formerly FireWise of Southwest Colorado) has received a Colorado Water Conservation Board Restoration grant for DWRf including funding to establish strategic monitoring for the Upper Dolores watershed. MSI and Wildfire Adapted have both received funding through the San Juan National Forest to:

- Support collaborative watershed analysis and assessments
- Evaluate completed work and assess effectiveness of current partnerships

Wildfire Adapted may be billed by MSI for \$7,500 by submitting monthly invoices to Wildfire Adapted Partnership, 701 Camino Del Rio, Suite 306, Durango, CO 81301.

MSI will work toward the following tasks:

Mapping

- Mapping support for watershed wildfire protection plan
 - Establish base layers for DWRf planning team and work with team to turn additional layers on and off for planning work
 - Break out watershed into management units for planning purposes
- Setup ArcOnline project map for DWRf partners
- Data management and integration of monitoring information into interactive map
- Training for other DWRf/Wildfire Adapted staff on ArcOnline data upload and maintenance

Monitoring

- Develop forestry project monitoring plan for DWRf projects in collaboration with DWRf
- Advise on long-term monitoring placement of points/transects; methods
- Develop forest monitoring protocols: baseline; forest condition (BA, stand density, canopy, tree health); soil moisture; invasive weeds; grazing conditions; understory/ladder fuel; fuels, regeneration
- Conduct initial monitoring for CAFA

Time Period

This mapping and monitoring work shall be initiated by October 15, 2018. Modifications may be added to this agreement by signature of both parties.

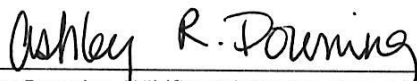
This agreement is to provide a match to an MSI agreement with the San Juan National Forest Service for assisting DWRf with mapping (\$6500, MSI funds) and to carry out monitoring in support of WAP outreach activities through CWCBC funds (\$7,500, WAP funds). MSI will work to complete as much of the scope as is possible with the total of the combined funds.

Future work as funding allows

- Initiate literature review on hydrologic changes from forest treatment including a wide range of forest treatment types, fire (wild and RX), and the forest types present in the Dolores watershed including any available research on Spruce-fir, mixed conifer, ponderosa pine, and pinyon-juniper ecosystems.
- Develop water quantity and flow monitoring plan and protocol leveraging the literature review to determine what new questions about forest hydrology the collaborative wants to inform or monitor for.

This Agreement is read, understood, and agreed upon this 1st day of October, 2018 by

Marcie Demmy Bidwell, MSI


Ashley Downing, Wildfire Adapted Partnership

References

Williams, A. P., Allen, C. D., Millar, C. I., Swetnam, T. W., Michaelsen, J., Still, C. J., & Leavitt, S. W. (2010). Forest responses to increasing aridity and warmth in the southwestern United States. *Proceedings of the National Academy of Sciences*, 107(50), 21289-21294.