WESTERN BARK BEETLE MITIGATION
FY 2011 ACCOMPLISHMENT REPORT

December, 2011

U.S. Forest Service

EXECUTIVE SUMMARY

The US Forest Service is aggressively implementing projects to mitigate the effects of the bark beetle in Regions 1-6 under the 2011 Western Bark Beetle Strategy (WBBS). The strategy is being achieved through three well-defined goals: human safety, forest recovery, and long-term forest resiliency. This report presents bark beetle mitigation accomplishments during FY 2011.

During the fiscal year, the US Forest Service made significant progress in implementing the strategy. Mitigation efforts resulted in a total of 303,929 treated unified acres across the three goals, of which 174,522 acres were core accomplishments. The majority of the accomplishments (78%) achieved the resiliency goal. In addition, 978 miles of roads and 1,072 miles of trails had hazard trees removed to improve human safety. All the activities resulted in 303.3 million board feet of timber sold and 153,801 green tons of biomass produced. A total of 22 research tools were developed, and these are expected to increase the effectiveness of forest management practices towards bark beetle mitigation.

The Forest Service spent $105.8 million supporting safety, recovery and resiliency activities in FY 2011. The agency is committed to maintain the same level of funding in FY 2012 (assuming FY 2012 and FY 2011 appropriations are equal), demonstrating its commitment to respond to the beetle epidemic.

CONTENTS

BACKGROUND

The unprecedented bark beetle epidemic across six states of the interior west is growing at an estimated 600,000 ac a year with the potential to affect the majority of our western pine, fir and spruce forests, posing serious environmental impacts. In addition, it is estimated that 100,000 beetle-killed trees are currently falling daily, posing a serious health and safety threat to forest visitors, residents and employees.

On July 11, 2011, the Forest Service released the Western Bark Beetle Strategy (WBBS), which identified how the Forest Service is responding to and will respond to the western bark beetle epidemic. The strategy covers a five-year period: FY 2011 to FY 2016. The strategy is being achieved through well-defined goals, objectives, and action items, to address each of the three prongs of the bark beetle problem: human safety, forest recovery, and long-term forest resiliency across Regions 1 - 6.

The annual report is intended to be a brief synopsis of the western bark beetle mitigation accomplishments for FY 2011.

ACCOMPLISHMENTS

The top priority goal of the Forest Service in responding to the western bark beetle epidemic is to ensure that people and community infrastructure are protected from the hazards of falling bark beetle-killed trees and elevated wildfire potential (*Safety Goal*). Work performed included the removal of standing hazardous trees as well as dead and down trees near roads, along trails, and in campgrounds that supported the most user traffic. After the priority of safety, forested areas with severe mortality were reforested (*Recovery Goal*) with the appropriate species. The overall goal was to regenerate healthy forest ecosystems in beetle-killed areas. Some of this recovery work occurred in areas that were treated for safety issues. Other recovery work occurred in areas that did not have public safety concerns, but still needed attention to restore ecosystem functioning condition. Forests were thinned to reduce the number of trees per acre in order to create more diverse stand structures as well as minimize future extensive epidemic bark beetle attack (*Resilience Goal*). Generally, thinning reduces the relative competition for moisture, nutrients, and sunlight between trees, enabling trees to withstand stress causing situations, such as bark beetle attack.

Acres treated

In this report accomplishments are reported as unified, core, integrated, partnership, and unspecified. Unified accomplishments are a combination of core, integrated, partnership, and unspecified accomplishments. Core accomplishments are achieved through direct expenditure of Forest Service funds that are associated with the same resource as the specific budget line item (BLI). Integrated accomplishments are those

that were achieved using funds from a BLI that is not associated with the resource program tied to that particular accomplishment measure. Partnership accomplishments are achieved through partnership funds or reimbursable agreements, volunteer agreements, or in-kind contributions. When the system of record does not have a BLI or valid BLI, these accomplishments are known as unspecified accomplishments.

Table 1. FY 2011 unified accomplishments (acres)

Goal	Performance measure	Region					
		1	2	3	4	5	6
Safety	FP-FUELS-ALL (Acres of hazardous fuels treated)	1,700	7,104	0	1,346	0	3,135
	TMBR-SALES-TRT-AC (Acres of forestlands treated using timber sales)	1,089	2,011	0	437	0	0
Recovery	FOR-VEG-EST-IMP (Acres of vegetation established& improved)	7,733	2,973	0	7,849	149	1,803
	FP-FUELS-ALL (Acres of hazardous fuels treated)	7,900	1,501	0	1,388	0	327
	INVPLT-NXWD-FED-AC (Acres treated for noxious weeds and invasive plants)	13,235	4,653	0	124	0	0
	TMBR-SALES-TRT-AC (Acres of forestlands treated using timber sales)	267	0	0	243	0	0
Resilience	FOR-VEG-EST-IMP (Acres of vegetation established& improved)	9,496	6,609	4,325	15,982	16,050	15,716
	FP-FUELS-ALL (Acres of hazardous fuels treated)	25,140	11,814	2,829	25,949	30,128	26,143
	SP-NATIVE-FED-AC (Acres treated for native pests)	11,760	12,461	1,876	7,275	2,089	2,666
	TMBR-SALES-TRT-AC (Acres of forestlands treated using timber sales)	2,025	15	1,155	2,723	699	2,037

Table 1 shows the unified accomplishments. A total of 16,822 acres were treated to improve human safety (safety goal), 50,145 acres were reforested (recovery goal), and 236,962 acres were thinned to improve resilience (resiliency goal). The total number of unified accomplishments across all goals was 303,929 acres. This number exceeds the actual treated acres on the ground because one activity can satisfy multiple objectives, and multiple activities can occur on the same acre. However, unified accomplishments are important because they enable field staff to take credit for all the work they do as well as acknowledge and value accomplishments from integrated and partnership work.

Treated acres for safety were the least, while those for resiliency were the greatest. In the strategy the safety goal was planned to have the most acres. The reason the safety goal achieved the least treated acres could be that most of the fuels activities were considered for resiliency purposes, and not necessarily safety purposes when the treatment was not in WUI.

The majority of the unified accomplishments (48.2%) were through fuels treatments, followed by those for forest vegetation establishment and improvement (29.2%), and the least were for timber sales activities (4.2%) (Figure 1).

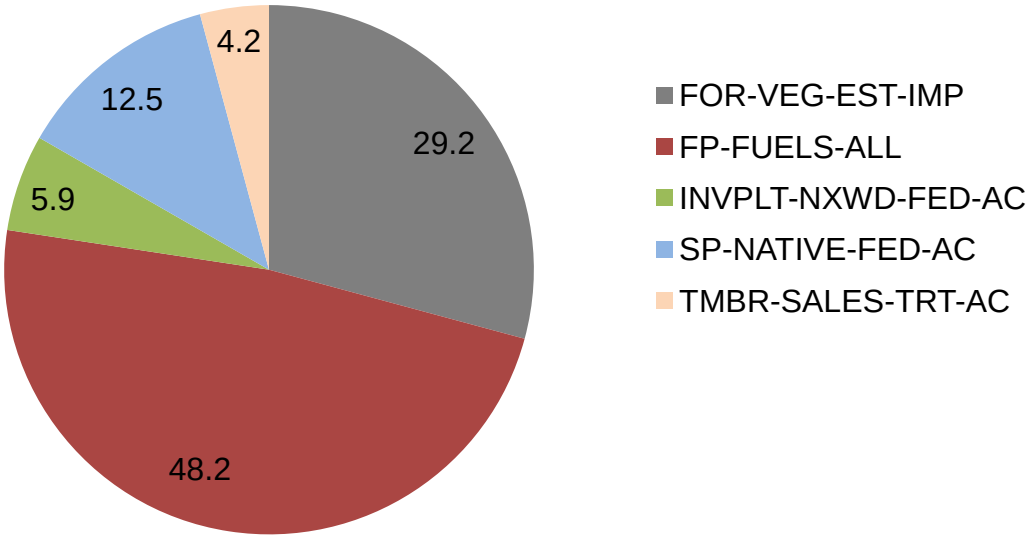

Figure 1. Unified accomplishments by performance measure.

Detailed core, integrated, partnership and unspecified accomplishments are given in Table 2. Of the total unified accomplishments, 57.4% were core, 28% were integrated, 1.3% were partnership and 13.3% were unspecified (Figure 2).

Table 2. FY 2011 Core, integrated, partnership, and unspecified accomplishments (Acres)

Goal	Performance measure	Accomplishment	Acres
Safety	FP-FUELS-ALL	Core	6,384
		Integrated	5,558
		Partnership	177
		Unspecified	1,166
	TMBR-SALES-TRT-AC	Core	119
		Integrated	2,387
		Partnership	0
		Unspecified	1,031
Recovery	FOR-VEG-EST-IMP	Core	19,920
		Integrated	17
		Partnership	570
		Unspecified	0
	FP-FUELS-ALL	Core	1,392
		Integrated	8,034
		Partnership	225
		Unspecified	1,465
	INVPLT-NXWD-FED-AC	Core	12,185
		Integrated	4,069
		Partnership	1,756
		Unspecified	0
	TMBR-SALES-TRT-AC	Core	0
		Integrated	230
		Partnership	0
		Unspecified	280
Resiliency	FOR-VEG-EST-IMP	Core	36,058
		Integrated	24,265
		Partnership	80
		Unspecified	7,775
	FP-FUELS-ALL	Core	59,254
		Integrated	39,261
		Partnership	1,099
		Unspecified	22,390
	SP-NATIVE-FED-AC	Core	38,127
		Integrated	0
		Partnership	0
		Unspecified	0
	TMBR-SALES-TRT-AC	Core	1,083
		Integrated	1,157
		Partnership	0
		Unspecified	6,414

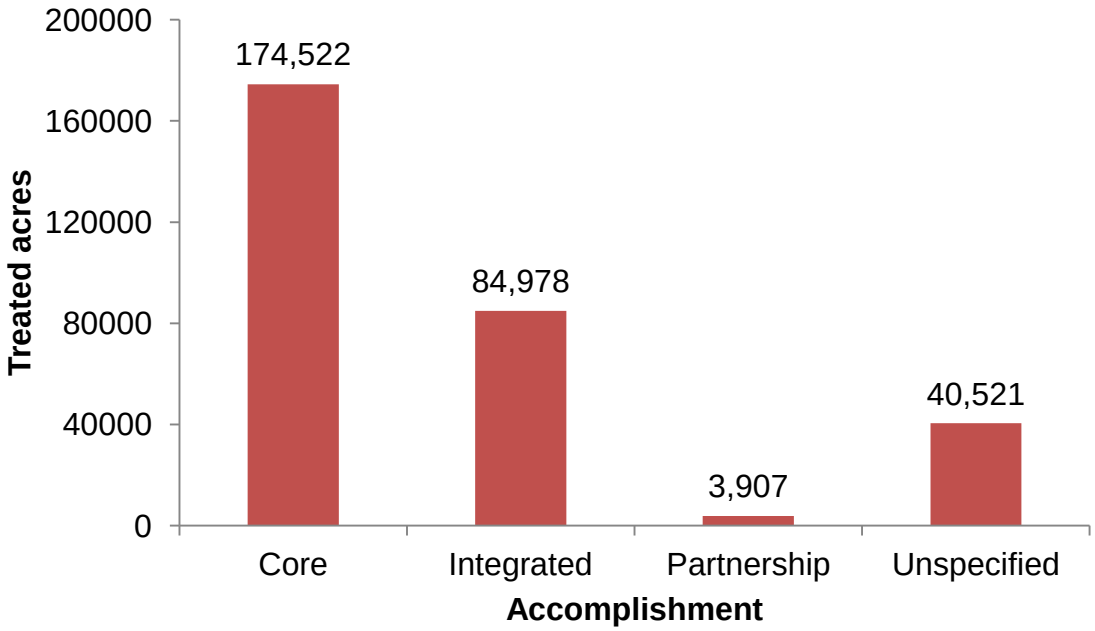

Figure 2. Core, integrated, partnership and unspecified accomplishments.

Core accomplishments varied by performance measure. All the native pests accomplishments (SP-NATIVE-FED-AC) were core, while only 9.5% of the timber sales treated acres (TMBR-SALES-TRT-AC) core accomplishments. The largest proportion of partnership funds (9.6%) were used to treat acres for noxious weeds and invasive plants.

Timber volume sold

During the report period, a total of 303.3 million board feet (575,681 CCF) of timber were sold across all goals (Table 3). The majority (72.1%) of the timber sold was in areas treated for resiliency. Areas treated for safety comprised 17.6% of the timber sold, while those treated for recovery comprised 10.3%.

Table 3. Timber volume sold (CCF)

Region	Safety	Recovery	Resilience	Total
1	35,090	5,633	73,025	113,748
2	8,885	39,567	30,401	78,853
3	0	0	0	0
4	31,153	14,276	49,286	94,715
5	6,001	0	118,955	124,956
6	19,972	0	143,437	163,409
Total	101,101	59,476	415,104	575,681

Bio-energy production

During the report period, a total of 153,801 green tons of biomass were produced across all goals (Table 4). As expected, the majority (79.7%) of the bio-energy came from areas treated for resiliency. Areas treated for safety comprised 18.8% of the bio-energy produced, while those treated for recovery produced only 1.5%.

Table 4. Bio-energy production (green tons)

Region	Safety	Recovery	Resilience	Total
1	9,683	903	10,686	21,272
2	0	0	0	0
3	0	0	0	0
4	2,077	1,353	15,750	19,180
5	8,102	0	96,182	104,284
6	9,065	0	0	9,065
Total	28,927	2,256	122,618	153,801

Road and trail maintenance

During the report period, a total of 978 miles of roads had hazard trees removed to improve safety (Table 5). Most of these activities took place in regions 1 and 2. A total of 1,072 miles of trails had hazard trees removed to improve safety. Regions 2 and 4 were the only regions to remove hazardous trees from trails. Because region 2 has the highest recreation use, it is not surprising that the region had the greatest accomplishment in road and trail maintenance (57.2%).

Table 5. Miles of roads and trails maintained

Measure	Region	Safety	Recovery	Resilience	Total
Road maintenance (Miles)	1	292	0	0	292
	2	686	0	0	686
	3	0	0	0	0
	4	3	0	0	3
	5	0	0	0	0
	6	0	0	0	0
Trail maintenance (Miles)	1	0	0	0	0
	2	666	4	0	670
	3	0	0	0	0
	4	406	199	109	714
	5	0	0	0	0
	6	0	0	0	0

Research Tools Developed and Applied to Management

Research and Development made good progress toward developing new tools that will be used to improve the efficiency and effectiveness of management in bark beetle infested western forests. The research made contributions in the following areas:

1) Enhanced the understanding of the mechanisms by which thinning and other disturbance agents influence tree physiology and thus susceptibility to successful colonization by bark beetles.
2) Increased the understanding of the interaction of bark beetles, fire and climate change.
3) Modeled above ground tree carbon stocks and fluxes following a bark beetle outbreak.
4) Increased understanding of the bark beetle population dynamics.
5) Developed communication plans to explain the purpose of and the need for bark beetle management.

The list of publications produced during FY 2011 is provided below.

Publications

Bentz, B.J., J. Régnière, C.J. Fettig, E.M. Hansen, J.L. Hayes, J.A. Hicke, R.G. Kelsey, J. Lundquist, J.F. Negrón, and S.J. Seybold. 2010. Climate change and bark beetles of the western United States and Canada: Direct and indirect effects. Bioscience 60: 602−613.

Burnside, R.E., Holsten, E.H., Fettig, C.J., Kruse, J.J., Schultz, M.E., Hayes, C.J., Graves, A.D., and Seybold, S.J. 2011. The northern spruce engraver. USDA Forest Service, Forest Insect & Disease Leaflet No. 180, July 2011, 12 pp. (Peer reviewed).

Fettig, C.J. 2010. Bark beetles and fire. In: Proceedings of the 2010 Society of American Foresters National Convention, Forests & People: A Watershed Event. Albuquerque, NM. (ePublished).

Fettig, C.J., and S.R. McKelvey. 2010. Bark beetle responses to stand structure and prescribed fire at Blacks Mountain Experimental Forest, California, USA: 5-year data. Fire Ecology 6: 26−42.

Fettig, C.J., C.J. Hayes, and S.R. McKelvey. 2011. The effectiveness of thinning for preventing bark beetle infestations in western North America. In: Proceedings of the 61st Western Forest Insect Work Conference, Flagstaff, AZ, April 5-8, 2010, p. 64.

Fettig, C.J., C.J. Hayes, and S.R. McKelvey. 2011. Bark beetle responses to fuels reduction and forest restoration treatments two and four years after the application of prescribed fire in a mixed-conifer forest. In: Proceedings of the 61st Western Forest Insect Work Conference, Flagstaff, AZ, April 5-8, 2010, p. 73.

Fettig, C.J., S.R. McKelvey, D.L. Cluck, S.L. Smith, and W.J. Otrosina. 2010. Effects of prescribed fire and season of burn on direct and indirect levels of tree mortality in ponderosa and Jeffrey pine forests in California, USA. Forest Ecology and Management 260: 207−218.

Fettig, C.J., C.J. Hayes, K.J. Jones, S.R. McKelvey, S.L. Mori, and S.L. Smith. 2011. Thinning Jeffrey pine stands to reduce susceptibility to bark beetle infestations in California, U.S.A. Agricultural and Forest Entomology, in press. (Refereed) DOI: 10.1111/j.1461-9563.2011.00543.x

Flint, M.L., Graves, A.D., and Seybold, S.J. 2010. Thousand cankers disease of walnuts spreads in California. CAPCA Advisor Magazine, June 2010, 8(3): 36-39.

Griffin, Jacob M.; Turner, Monica G.; Simard, Martin 2011. Nitrogen cycling following mountain pine beetle disturbance in lodgepole pine forests of greater Yellowstone. Forest Ecology and Management. 261: 1077-1089.

Graves, A.D., Coleman, T.W., Flint, M.L., and Seybold, S.J. 2009. Walnut twig beetle and thousand cankers disease: Field identification guide, UC-IPM Website Publication, 2 pp., Nov. 21, 2009, http://www.ipm.ucdavis.edu/PDF/MISC/thousand_cankers_field_guide.pdf

Hishinuma, S., Coleman, T. W., Flint, M. L., and Seybold, S. J. 2011. Goldspotted oak borer: Field identification guide, University of California Agriculture and Natural Resources, Statewide Integrated Pest Management Program, 6 pp., January 13, 2011, http://www.ipm.ucdavis.edu/PDF/MISC/GSOB_field-identification-guide.pdf

Hofstetter, R.W., C. Hayes, J. McMillin, C.J. Fettig, and M.P. Ayres. 2010. Relating bark beetle trap catch with beetle populations within trees and across stands. In: J.A. Parrotta and M.A.Carr (eds.), Forests for the Future: Sustaining Society and the Environment XXIII IUFRO World Congress, August 23-28 2010, Seoul, Republic of Korea. The International Forestry Review 12: 367−368.

Jacobi, W.J., A. Crump, and J.E. Lundquist. 2011. Dissemination of forest health research information in the Rocky Mountains. Journal of Forestry 109(1): 43-49.

Owen, D.R., Smith, S.L., and Seybold, S.J. 2010. The red turpentine beetle. USDA Forest Service, Forest Insect & Disease Leaflet No. 58, June 2010, 9 pp.

Patton-Mallory, M.; Barbour, J. 2011. Harvesting Energy- Western States' Response to Landscapes Impacted by Bark Beetle. Forest Service Internal Report. 2011.

Pfeifer, Eric M.; Hicke, Jeffrey A.; Meddens, Arjan J.H. 2011. Observations and modeling of above ground tree carbon stocks and fluxes following a bark beetle outbreak in the western United States. Global Change Biology. 17: 339-350.

Progar, R.A., N. Sturdevant, and M.J. Rinella. 2011. Trapping Douglas-fir beetle (Dendroctonus pseudotsugae) with pheromone baited multiple-funnel traps does not reduce Douglas-fir, (*Pseudotsuga menziesii*) mortality. Pan-Pacific Entomologist.86: 111-118.

Seybold, S. J., Dallara, P. L., Nelson, L. J., Graves, A. D., Hishinuma, S. M., and Gries, R. 2011. Methods of monitoring and controlling the walnut twig beetle, *Pityophthorus juglandis*. Provisional Patent filed with the U.S. Patent and Trademark Office, U.S. Dept. of Commerce, July 15, 2011, 22 pp.

Seybold, S.J., Paine, T.D., and Dreistadt, S. H. 2008. Bark beetles: Integrated pest management for home gardeners and landscape professionals. University of California Statewide Integrated Pest Management Program, Agriculture and Natural Resources Pest Notes, Publication 7421, Oakland, California, November 2008, 7 pp.

Seybold, S.J., Haugen, D., O'Brien, J., and Graves, A.D. 2010. Thousand cankers disease. USDA Forest Service, Northeastern Area State and Private Forestry Pest Alert, NA-PR-02-10, May, 2010, reprinted Aug. 2010, 2 pp.
http://na.fs.fed.us/pubs/palerts/cankers_disease/thousand_cankers_disease_low_res.pdf

Seybold, S. J. 2011. Invasive Woodboring Beetles. Western Pest Diagnostic Network Newsletter, June, 2011, Volume 4, Number 2, 1 pp.,
https://www.wpdn.org/common/newsletters/wpdn/WPDN%20Newsletter%202010-02.pdf.

Communication plans and other technology transfer

Rocky Mountain Research Station (RMRS) developed a Communication Plan for the response to the bark beetle epidemic in Colorado and Wyoming.

RMRS developed an Incident Management Organization Bark Beetle Communication Plan specific to the "Theatre of Operations".

RMRS developed a technology transfer product, "Where Wood Works".

RMRS implemented the "Hazard Tree Accident Crisis Communication Plan". Bright yellow and black posters were developed to warn people that falling trees are a hazard.

Northern Region (NR) developed 14 Communication Plans as well as posted hazard tree informational signs, posters and fliers in all developed recreation sites.

NR completed and updated vegetation management plans for developed recreation sites.

Pacific Southwest (PSW) developed six field identification guides, Pest Alerts, and Forest Insect and Disease Leaflets for the walnut twig beetle, the red turpentine beetle, and the goldspotted oak borer.

PSW developed a baited trap for the walnut twig beetle, to provide early detection of thousand cankers disease in the U.S.

FUNDING

There is not a dedicated budget line item exclusively for bark beetle management however the agency committed to providing a stable level of funding from existing budget line items to support safety, recovery and resiliency activities. In FY 2011, the Forest Service provided $99.1 million for bark beetle mitigation activities of which $2.4 million was dedicated to developing research tools. Expenditure and budget levels were close for all regions, except region 4 which overspent by $5.6 million (Table 6).

Table 6. FY 2011 Investment Levels ($ million)

Region	Budget	Expenditure	Difference (Expenditure-Budget)
1	23.10	24.66	1.56
2	32.20	31.97	-0.23
3	2.70	2.50	-0.20
4	9.00	14.60	5.60
5	18.10	18.10	0
6	11.60	11.60	0
Research	2.40	2.40	0
Total	99.10	105.83	6.73

CONCLUSION

Despite funding challenges, the FY 2011 accomplishments were excellent. While success for the safety goal is usually realized in the short-term, success for recovery and resilience goals is usually long-term. The benefit of the removal of hazardous trees to address safety is realized immediately. However, the poor survival of regeneration under unfavorable weather conditions, extreme competition and heavy browsing underscores the need for long-term monitoring of recovery efforts. The Forest Service is committed to continuing to monitor the effects of management activities in creating healthy, resilient ecosystems over the long-term.

A number of science tools were developed during the report period. These tools are expected to increase the effectiveness of forest management practices towards bark beetle mitigation.

Future collaborations and partnerships will facilitate the long-term bark beetle mitigation across all ownerships.