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Forest Service

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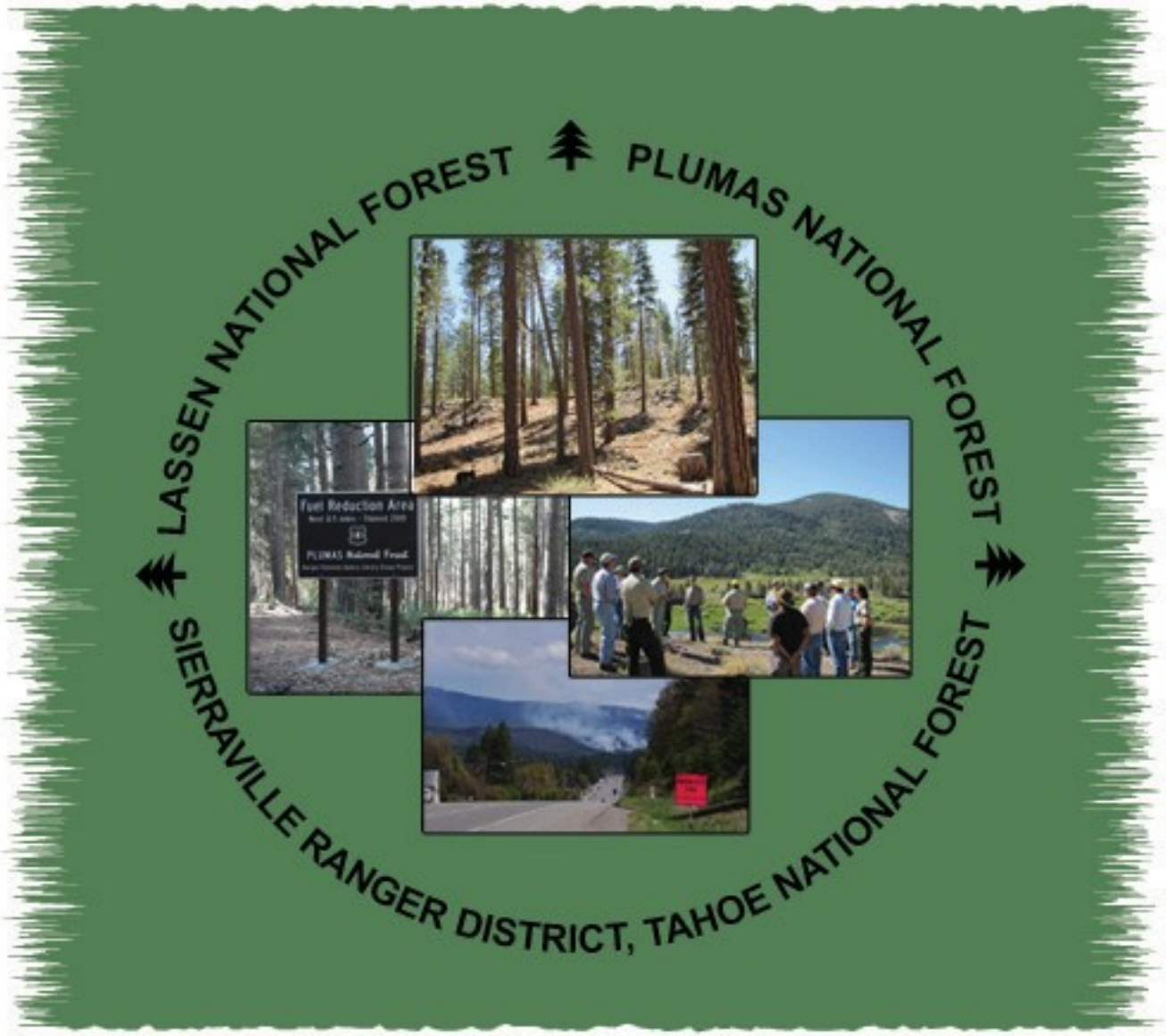
# Status Report to Congress Fiscal Year 2011

## Herger-Feinstein Quincy Library Group Forest Recovery Act Pilot Project



# Report Preparation and Contact Information

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This report will be made available online following finalization.
Printed copies or CDs of the document will be available upon request by contacting the team.

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## Cover Photos

*Clockwise from Top Center: 1) Lyons Defensible Fuel Profile Zone, Eagle Lake Ranger District, Lassen National Forest; 2) Perazzo Meadow Restoration, Sierraville Ranger District, Tahoe National Forest; 3) Prescribed fire viewed from Quincy, Plumas National Forest; 4) Slapjack Defensible Fuel Profile Zone, Feather River Ranger District, Plumas National Forest.*

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# INTRODUCTION AND BACKGROUND

The Fiscal Year (FY) 2011 Herger-Feinstein Quincy Library Group (HFQLG) Forest Recovery Act Pilot Project Status Report to Congress is the twelfth annual status report on the pilot project. This report is a summary of the information required by the HFQLG Forest Recovery Act (HFQLG Act). For more detailed information, the FY 2011 HFQLG Monitoring Reports will be available at www.fs.fed.us/r5/hfqlg. Printed copies of all documents are also available upon request.

Over the course of the pilot project, implementation has been affected by appeals and litigation. Since 2005, decisions and injunctions have been in effect off and on from the Federal District Court and Ninth Circuit Court of Appeals. In September 2011, a court order dissolved an injunction on a long-delayed HFQLG project. Though court decisions in the last 2 years have generally been favorable to HFQLG projects, appeals, litigation and expanded project planning/analysis in response to the potential for appeals/litigation can still cause delays or restrictions in implementation. These issues may result in reduced acreage accomplishments.

As with the rest of the nation, the market for timber products in California is depressed. In current market conditions, HFQLG timber sales planned in previous years might have to be modified to increase their economic viability, or might have to be implemented through stewardship or service contracts. Both of these options increase project cost and reduce the level of accomplishment possible with a given level of funds.

As required by the HFQLG Act, the Forest Service monitors socioeconomic and environmental effects of the pilot project. Discussion of these effects makes up much of this report. Among other things, monitoring and analysis of wildland fires has indicated that Defensible Fuel Profile Zones (DFPZs) are effective in reducing size and intensity of fires, tree mortality, and fire suppression costs.

Monitoring efforts also continue to provide effective feedback to inform planning and implementation of current and future projects. Over the course of the pilot project, various mitigation measures have been applied to management techniques in response to issues identified through monitoring, such as soil compaction and smoke from prescribed burning. Various components of the monitoring program were modified in FY 2009, in response to recommendations from the independent scientific review panel required by the HFQLG Act.

## Background

Congress enacted the HFQLG Forest Recovery Act and established the pilot project in October 1998. The pilot project has been extended twice and is now scheduled to conclude in September 2012.

*Tim Holabird, aide to Congressman Tom McClintock, reviews proposed Defensible Fuel Profile Zone (DFPZ) on Almanor Ranger District. Large marked tree will be retained in proposed thinning to restore stand health.*

The pilot project area covers approximately 1.53 million acres in the Lassen and Plumas National Forests and the Sierraville Ranger District of the Tahoe National Forest. It is designed to implement and demonstrate the effectiveness of fuels and vegetation

management activities to meet ecologic, economic, and fuel reduction objectives. These activities include:

- A system of DFPZs, which are coridors, ¼ to ½ mile wide, where the forest is thinned to provide shaded fuel breaks.
- Group selection (GS) timber harvesting, which creates forest openings of ½ to 2 acres where trees less than a certain diameter (30 inches under the 2004 Sierra Nevada Forest Plan Amendment) are removed.
- Individual tree selection (ITS), also known as area thinning.
- Riparian management and restoration.

*HFQLG monitoring coordinator explains map of Eagle Lake Ranger District DFPZ network.*

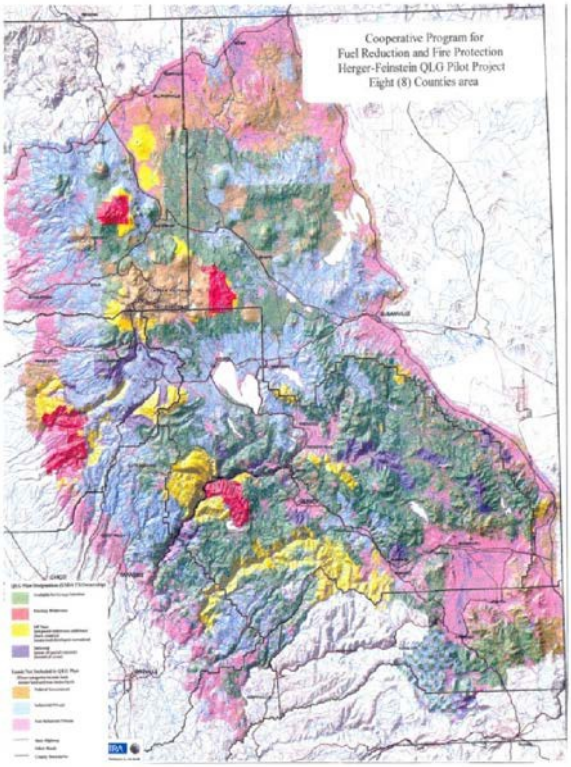
The Quincy Library Group Community Stability Proposal, the basis for the HFQLG Act, identifies a desired condition of an all-aged, multi-storied, fire-resilient forest that will provide a continuous supply of forest products and promote community stability. The record of decision and final environmental impact statement for the pilot project were released in August 1999.

Implementation has been subject to a variety of challenges, including restrictions from previous land and resource management documents. The Sierra Nevada Forest Plan Amendment (also known as the Sierra Nevada Framework) Record of Decision, signed in January 2004, provides for full implementation of the Act, but has been affected by litigation as discussed above.

## Collaboration Across National Forest Boundaries

Interspersed with and adjoining the eight-county HFQLG Pilot Project area are 1.3 million acres of private timberland. Since the start of the pilot project and the National Fire Plan, private timberland owners have developed and maintained strategic hazardous fuel reduction and fire protection projects (shaded fuel breaks) on their properties.

These projects tie into and support the DFPZ network of the HFQLG Pilot Project, and fire protection projects of Fire Safe Councils, in the eight counties. Combined with the HFQLG DFPZs, these projects establish a strategic network to resist wildfires across the public and private lands within the pilot project area.




*Private property (industrial timberlands in blue; non-industrial lands in pink) is interspersed with National Forest lands (shown in green, yellow, purple, and red) in the eight county HFQLG Pilot Project area.*

# FUNDING

Funding and expenditures for the HFQLG Pilot Project over the 13 years since inception are summarized in Table 1 below.

**Table 1. Allocation and Expenditures, 1999 through 2011 (millions)**

| Fiscal Year | Available Funding | Indirect Cost | Funding to Projects | Total Expenditures | Unobligated Balance | Not Returned to Project |
|---|---|---|---|---|---|---|
| 1999 | 8.0 | 0.0 | 2.0 | 2.0 | 6.0 | 0.0 |
| 2000 | 12.2 | 0.8 | 6.4 | 7.2 | 5.0 | 5.0 |
| 2001 | 31.2 | 3.1 | 25.2 | 28.2 | 3.0 | 3.0 |
| 2002 | 26.2 | 3.1 | 18.4 | 21.5 | 4.7 | 1.3 |
| 2003 | 29.6 | 3.1 | 20.0 | 23.1 | 6.5 | 1.9 |
| 2004 | 30.8 | 3.1 | 27.0 | 30.1 | 0.7 | 0.7 |
| 2005 | 31.0 | 3.1 | 26.1 | 29.2 | 1.8 | 1.8 |
| 2006 | 26.2 | 3.4 | 22.4 | 25.8 | 0.4 | 0.4 |
| 2007 | 26.2 | 3.1 | 22.7 | 25.9 | 0.3 | 0.3 |
| 2008 | 25.3 | 2.6 | 21.6 | 24.2 | 1.1 | 0.9 |
| 2009 | 26.2 | 2.9 | 22.9 | 25.8 | 0.3 | 0.3 |
| 2010 | 26.2 | 3.1 | 23.0 | 26.2 | 0.0 | 0.0 |
| 2011 | 25.6 | 3.1 | 21.0 | 24.1 | 1.5 | TBD |
| **Total** | **324.7** | **34.5** | **258.7** | **293.3** | **31.3** | **15.6** |

Note: Numbers have been rounded.

FY 2011 project expenditures include:

- Administering and monitoring projects from prior years.
- Implementing projects from prior-year planning.
- Planning and implementing FY 2011 projects and planning projects for FY 2012 and beyond.
- Responding to appeals and litigation, in some cases including paying legal fees.

Three primary fund codes are used to track project expenditures:

- Wildland Fire Hazardous Fuels (WFHF). Fuels reduction project (including DFPZ) planning, preparation, implementation, monitoring and administration.
- National Forest Timber Management (NFTM). Timber sale planning, preparation and administration.
- National Forest Vegetation and Watershed (NFVW). Forest health improvement, watershed and riparian restoration project planning, preparation, and implementation.

*Shaded fuel break constructed and maintained on adjoining private industrial timberlands along Highway 32 in Tehama County.*

**Table 2. FY 2011 Pilot Project Expenditures (millions)**

| | WFHF | NFTM | NFVW | Total |
|---|---|---|---|---|
| Lassen | 4.307 | 1.536 | 2.216 | **8.059** |
| Plumas[1] | 6.480 | 4.447 | 0.290 | **11.217** |
| Tahoe | 1.579 | 0.000 | 0.177 | **1.756** |
| Total | 12.366 | 5.983 | 2.683 | **21.032** |
| 12% Indirect Cost | | | | **3.076** |
| Unobligated Balance | | | | **1.530** |
| **Totals FY 2011 Budget** | | | | **25.638** |

[1]Plumas funds include HFQLG implementation team and monitoring program

Indirect costs are expenses for general administration support, office space, rental agreements, communications and other expenses, which are not to exceed 12 percent of the annual HFQLG budget.

*The 1931 photo on left is typical of historic conditions found within the Herger-Feinstein Quincy Library Group pilot project area. Photo on right of the same forest shows the current dense conditions that often prevail before any treatment.*

# REVENUE AND RESOURCE ACCOMPLISHMENTS

To help monitor the effects of the pilot project and the level of accomplishment, the HFQLG Act requires a report of revenue, expenditures, and timber management activities between 1992 and 1997 for the National Forests in the pilot project area. This information provides a valuable perspective on the activities and accomplishments of the pilot project, as well as an opportunity to compare historic and current figures.

Volume of sawlogs and biomass is measured in hundred cubic feet (CCF). One load of either a standard log truck or a standard chip truck contains approximately 10 CCF.

*Feller-buncher thins the forest to create DFPZ, Mt. Hough Ranger District.*

Appeals and litigation, including adjustments to project plans and National Environmental Policy Act (NEPA) documents due to court decisions, have affected revenue and accomplishments. Several projects continue to be tied up in litigation initiated in previous years. Market conditions also affect sawlog and biomass revenue and demand.

In addition to tracking accomplishment through sawlog and biomass volume, the pilot project monitors the number of acres receiving fuels reduction treatments.

The focus of timber management on the National Forests in the pilot project area changed with passage of the HFQLG Act. Instead of traditional elements like regeneration, site preparation, and timber stand improvement, the pilot project reports on different treatments, including the following:

- Defensible Fuel Profile Zone (DFPZ) construction
- Group Selection (GS)
- Individual Tree Selection (ITS)

**Table 3. Historic Revenue, Expenditures and Timber Activity for the HFQLG Pilot Project Area**

| FY | Revenue (millions) | Expenditure (millions) | Regen-eration (Acres) | Site Prep (Acres) | Timber Stand Improve-ment (Acres) | Sawlog Vol. Offered (CCF) | Sawlog Vol. Sold & Awarded (CCF) | Total Area Harvested (Acres) |
|---|---|---|---|---|---|---|---|---|
| 1992 | $67.187 | $25.856 | 8,634 | 6,176 | 10,045 | 426,000 | 329,400 | 55,689 |
| 1993 | $34.408 | $18.194 | 7,853 | 5,264 | 10,600 | 424,000 | 535,200 | 70,885 |
| 1994 | $44.501 | $17.376 | 8,206 | 4,667 | 8,740 | 375,000 | 332,600 | 57,922 |
| 1995 | $52.873 | $22.596 | 7,531 | 2,363 | 13,866 | 555,200 | 316,400 | 47,317 |
| 1996 | $24.590 | $20.490 | 9,063 | 3,321 | 15,062 | 374,200 | 242,600 | 38,917 |
| 1997 | $24.465 | $22.207 | 15,591 | 3,321 | 22,646 | 383,000 | 353,400 | 32,223 |

**Table 4. Revenue, Expenditures and Timber Management for HFQLG Pilot Project**

| Fiscal Year | Revenue (millions) | Expenditures (millions) | Number of Projects | Sawlog Vol. Offered/Sold (CCF) | Biomass Vol. Offered/Sold (CCF) | Sawlog & Biomass Vol. Removed (CCF) |
|---|---|---|---|---|---|---|
| 1999 | 0.000 | 1.943 | 1 | 4,785 | 4,278 | 0 |
| 2000 | 0.020 | 7.182 | 10 | 44,422 | 64,517 | 5,754 |
| 2001 | 0.140 | 28.267 | 34 | 88,802 | 143,117 | 33,151 |
| 2002 | 0.989 | 21.557 | 33 | 37,168 | 31,354 | 99,163 |
| 2003 | 0.960 | 23.100 | 28 | 41,418 | 44,402 | 61,810 |
| 2004 | 1.958 | 30.100 | 55 | 171,692 | 198,204 | 61,792 |
| 2005 | 2.914 | 29.200 | 37 | 112,270 | 129,814 | 222,770 |
| 2006 | 4.613 | 25.800 | 23 | 14,625 | 25,132 | 191,875 |
| 2007 | 2.048 | 25.866 | 33 | 57,904 | 68,818 | 82,368 |
| 2008 | 0.885 | 24.200 | 34 | 28,143 | 30,850 | 58,993 |
| 2009 | 2.610 | 25.827 | 35 | 92,299 | 63,901 | 49,282 |
| 2010 | 5.002 | 26.197 | 57 | 110,579 | 49,439 | 66,720 |
| 2011 | 1.696 | 24.108 | 37 | 52,103 | 53,600 | 112,440 |
| **Total** | **23.835** | **293.347** | **417** | **856,210** | **907,426** | **1,046,118** |
| **Average 2001 to Present** | **2.165** | **25.838** | **36.9** | **73,364** | **76,239** | **94,579** |

Riparian restoration is also an important part of the HFQLG Pilot Project. This includes meadow restoration and enhancement, stream channel improvement, road relocation, road closure, slope stabilization, and aspen enhancement. In FY 2011, there were nine projects restoring 226 acres. Approximately 6 miles of road and two road crossings were eliminated, while three road crossings were restored.

Prescribed fire is a valuable tool for thinning underbrush to restore a fire-resilient forest, and may be used to create, enhance, or maintain DFPZs. Various follow-up treatments, including mastication, piling, chipping and/or burning of brush or slash, are also used to reduce forest fuels hazards.

HFQLG acres accomplished each year are shown in Table 5. From FY 1999 through FY 2006, sawlog and biomass projects were reported as accomplished once they were offered for sale. During this period, there were a few projects that were offered and reported as accomplished, but then subsequently appealed or litigated so that sale and on-the-ground implementation were suspended. In FY 2007, reporting methods changed, and since then, projects are not recorded as accomplished until they are actually sold. Beginning in FY 2009, some of these previously advertised projects began to move forward again. In FY 2009, one project was redesigned in a way that avoided further appeal or litigation, resulting in one timber sale being reoffered and sold that year and several others scheduled for subsequent years. In FY 2010, court rulings were issued on long-running litigation that allowed several other previously enjoined projects, or portions of projects, to proceed. Several previously advertised timber sales were reoffered and sold in FY 2010 and FY 2011. Acreage for the projects reoffered and sold in FY 2009 through FY 2011 is shown in Table 6, and is not included in Table 5.

*Group selection treatment on Mt. Hough Ranger District, designed to restore black oak and second age class of ponderosa pine.*

**Table 5. Acres Accomplished per Fiscal Year**

| Fiscal Year | DFPZ (Mechanical) | DFPZ (Fire) | GS | ITS | Riparian Restoration | Total |
|---|---|---|---|---|---|---|
| 1999 | 640 | 0 | 0 | 172 | 0 | **812** |
| 2000 | 7,215 | 0 | 200 | 772 | 81 | **8,268** |
| 2001 | 37,158 | 4,039 | 1,836 | 528 | 945 | **44,506** |
| 2002 | 14,982 | 1,669 | 1,258 | 395 | 838 | **19,142** |
| 2003 | 17,369 | 7,073 | 0 | 44 | 537 | **25,023** |
| 2004 | 31,023 | 5,612 | 1,191 | 28 | 603 | **38,457** |
| 2005 | 17,592 | 3,481 | 1,145 | 2,196 | 836 | **25,250** |
| 2006 | 5,299 | 3,204 | 6 | 0 | 159 | **8,668** |
| 2007 | 10,920 | 3,507 | 405 | 1,235 | 306 | **16,373** |
| 2008 | 4,944 | 5,193 | 0 | 739 | 375 | **11,251** |
| 2009 | 8,487 | 1,724 | 284 | 2,022 | 680 | **13,197** |
| 2010 | 9,057[1] | 4,694 | 236 | 718 | 4,741[1] | **19,446[1]** |
| 2011 | 6,643 | 1,841 | 328 | 2,514 | 226 | **11,552** |
| **Total** | **171,329** | **42,037** | **6,889** | **11,363** | **10,327** | **243,945** |

[1]Includes projects funded through the American Recovery and Reinvestment Act

**Table 6. Acres Shown as Accomplished in Previous HFQLG Annual Reports that were Reoffered and Sold**

| Fiscal Year | DFPZ (Mechanical) | DFPZ (Fire) | GS | ITS | Riparian Restoration | Total |
|---|---|---|---|---|---|---|
| 2009 | 751 | | 136 | 286 | | **1,173** |
| 2010 | 2,235 | | 709 | 702 | | **3,289** |
| 2011 | 488 | | | | | **488** |

Table 7 shows the actual numbers of acres treated on the ground each year. Most projects, though reported as accomplished, have contracts that extend for several years, so that actual on-the-ground work may not be completed until one or more years after the accomplishment was reported. In addition, in some locations, an initial treatment, such as a mechanical thin, may be followed up in subsequent years by another treatment in the same location, such as a prescribed burn, in order to optimize or maintain desired vegetation conditions. Consequently, the number of acres treated on the ground each year through the activities of harvest, prescribed fire, etc. is not the same as the acres reported as accomplished annually in Table 5. Table 7 includes acreage of both initial treatments and follow-up treatments. In FY 2011, 9,353 acres of follow-up treatments were completed, including 5,117 acres of mechanical treatments and 4,236 acres of DFPZ/burn treatments.

*Prescribed fire to complete Defensible Fuel Profile Zone construction, Hat Creek Ranger District.*

**Table 7. Acres Treated On the Ground per Fiscal Year**

| Fiscal Year | DFPZ (Mechanical) | DFPZ (Fire) | GS | ITS | Total Acres Treated[1] |
|---|---|---|---|---|---|
| 1999 | 0 | 0 | 0 | 0 | **0** |
| 2000 | 366 | 0 | 0 | 64 | **430** |
| 2001 | 5,109 | 1,453 | 17 | 256 | **6,835** |
| 2002 | 18,235 | 3,725 | 486 | 785 | **23,231** |
| 2003 | 4,244 | 9,816 | 498 | 762 | **15,320** |
| 2004 | 12,211 | 7,015 | 47 | 682 | **19,955** |
| 2005 | 14,722 | 7,325 | 1,379 | 0 | **23,426** |
| 2006 | 23,336 | 6,611 | 275 | 0 | **30,222** |
| 2007 | 10,160 | 2,653 | 978 | 0 | **13,791** |
| 2008 | 12,260 | 7,380 | 356 | 10 | **20,006** |
| 2009 | 6,204 | 10,309 | 38 | 97 | **16,648** |
| 2010 | 9,229 | 9,737 | 55 | 63 | **19,084** |
| 2011 | 7,493 | 7,019 | 323 | 688 | **15,523** |
| **Total** | **123,569** | **73,043** | **4,452** | **3,407** | **204,471** |

[1]does not include riparian restoration

*Before and after photos of riparian restoration treatment on Beckwourth Ranger District. Treatment laid back steep banks and planted willow cuttings to prevent erosion through Cow Creek meadow system.*

# FY 2012 PROGRAM OF WORK

The FY 2012 enacted budget is estimated to be $26.2 million. The following activities are planned in FY 2012:

- Number of Projects: 52
- Sawlog Volume (CCF): 194,160
- Biomass Volume (CCF): 93,158
- DFPZ Acres: 16,934
- GS Acres: 1,228
- ITS Acres: 5,348
- Riparian Restoration Acres: 953
- Total Planned Acres: 24,463

Activities planned for FY 2012 include the following:

- Administering current contracts
- Implementation of vegetation projects planned in previous years
- Implementation of riparian management projects
- Environmental analysis for proposed projects
- Out-year data collection and planning
- Implementation of Healthy Forest Restoration Act projects

*Local business owner Nathan Bamford explains value-added timber products. Madrone and tanoak firewood were sold to Los Angeles area distributor for sale in grocery stores.*

# SOCIOECONOMIC MONITORING

The HFQLG Act requires the Forest Service to provide annual status reports to Congress that describe the "economic benefits to local communities achieved by the implementation of the pilot project." This report tracks socioeconomic changes since implementation of the pilot project in 1999 using the most recent available data. In some cases, data for 2011 are not yet available. The following communities and their surrounding areas are monitored:

- Bieber. Population (2010): 727
- Burney. Population (2010): 4,581
- Susanville. Population (2010): 19,718 (not including incarcerated persons)
- Westwood. Population (2010): 1,647
- Chester. Population (2010): 2,267
- Greenville. Population (2010): 1,346
- Quincy. Population (2010): 2,297
- Portola. Population (2010): 3,378
- Loyalton. Population (2010): 1,628

The following highlights key study conclusions. Detailed methodology and analysis narratives for each indicator are available in the FY 2011 HFQLG Socio-economic Monitoring Report.

## Pilot Project Area Employment

**Total Payroll Jobs Impacts:** Analysis of the most recent U.S. Census data shows that from the pilot project's initiation in 1999 through 2009, the estimated number of total private sector payroll jobs decreased nearly 16 percent. From 2008 to 2009, the estimated number of total private sector payroll jobs in the pilot project area decreased by 12.2 percent. These significant losses are consistent with the recession. According to the U.S. Bureau of Labor Statistics, the unemployment rate for the State of California in 2009 was 11.3 percent. Census data for 2010 will be released in 2012. Employment data released over the next 2 years will continue to reflect the impact of the recession and for- est products industry closures, including the 2009 to 2010 temporary closure of the Sierra Pacific small-log sawmill operation in Quincy and the 2010 closure of the Sierra Pacific cogeneration plant in Loyalton.

**Forest Products Industry Job Impacts:** The pilot project has not offset the downturn in forest products industry employment within the project area. (Editor's note: the pilot project has not been implemented at the pace and scale originally envisioned, due to appeals/litigation, market conditions, and various other issues.) Sawmills, the area's largest employers, have continued to shut down (Bieber and Loyalton in 2001, Susanville in 2004, and Quincy (small log mill in 2009), and small businesses have had to search for work in other areas or close. Table 8 shows that from 2008 to 2009 the estimated total number of forest products industry jobs decreased by 22.5 percent in the pilot project area. Since implementation of the pilot project in 1999, forest product industry jobs have decreased by nearly 60 percent. (Note that the sharp decrease in the Greenville area between 2005 and 2006 is the result of a 2005 Census data reporting anomaly. Data for 2006 is more consistent with the historical trend.)

**Tourism Industry Job Impacts:** The number of tourism industry jobs has grown throughout the project area since implementation of the project. The number of tourism jobs had grown consistently year-to-year until the onset of the recession (Table 9). The pilot project area experienced a 12.8 percent contraction in tourism-related jobs from 2008 to 2009. Closures of food service and accommodation establishments occurred in all project area communities.

Overall, job growth in the tourism sector consistently outpaced the growth in the forest products industry sector throughout the pilot project area. Prior to 1999, the ratio of jobs between the two sectors was approximately one-to-one. This means for each job in the forest products sector there was one job in the tourism sector. In 2001, the balance began to tip toward the tourism sector. Despite the decline in the estimated number of tourism jobs from 2008 to 2009, there were still at least 2.5 tourism sector jobs for every one job in the forest products sector. This indicates a significant diversification in the local economy since the implementation of the pilot project.

Although tourism job growth is a positive sign, it should be noted that these jobs are often seasonal, and the wages are lower than those in the forest products industry. According to the 2009 Occupational Employment and Wage Estimates published by the U.S. Bureau of Labor Statistics, the average annual wage for workers in the forest products industry is approximately $35,360. This is higher than the $21,970 average annual wage for tourism industry workers.

**Nonemployer Establishments:** Nonemployers are typically small family-owned and owner-operator businesses. Nonemployer forest products and non-forest products industries suffered losses immediately after the pilot project's implementation in 1999. However, U.S. Census data summarized in Table 10 shows that the number of all nonemployers and nonemployers in the forest products industry began to rebound after 2001. The total number of nonemployer establishments decreased approximately 5 percent, and the number of nonemployers in the forest products industry fell 8 percent between 2008 and 2009. Despite the recent contraction between 2008 and 2009, the number of non-employer establishments has generally surpassed pre-project implementation levels.

## HFQLG Timber Sales and Service Contract Activity

**Saw Logs and Biomass Sold:** Appeals, litigation, and the resulting expanded NEPA analysis have hampered HFQLG timber sale activity. In FY 2008, approximately 90 percent of all timber sales or service contracts across the pilot project area were delayed due to Sierra Nevada Framework litigation.

**Table 8. Total Forest Products Industry Jobs (Estimated)**

| Community | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | Change '08 to '09 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bieber | 251 | 158 | 158 | 45 | 34 | 33 | 56 | 34 | 36 | 34 | 31 | -8.8% |
| Burney | 376 | 360 | 361 | 300 | 266 | 342 | 317 | 344 | 344 | 365 | 287 | -21.4% |
| Susanville | 269 | 260 | 245 | 240 | 257 | 193 | 205 | 31 | 34 | 20 | 22 | 10% |
| Westwood | 26 | 24 | 27 | 31 | 49 | 44 | 28 | 13 | 12 | 16 | 11 | -31.3% |
| Chester | 185 | 166 | 169 | 43 | 146 | 152 | 150 | 143 | 152 | 143 | 140 | -2.1% |
| Greenville | 46 | 48 | 19 | 6 | 16 | 6 | 85 | 24 | 41 | 58 | 19 | -67.2% |
| Quincy | 373 | 329 | 347 | 324 | 296 | 332 | 321 | 329 | 323 | 236 | 166 | -29.7% |
| Portola | 20 | 40 | 54 | 7 | 16 | 43 | 39 | 23 | 10 | 16 | 10 | -37.5% |
| Loyalton | 195 | 216 | 105 | 42 | 41 | 42 | 27 | 35 | 18 | 16 | 15 | -6.3% |
| **Total Pilot Project Area** | **1,741** | **1,601** | **1,485** | **1,038** | **1,121** | **1,187** | **1,228** | **976** | **970** | **904** | **701** | **-22.5%** |

Source: Estimates developed from U.S. Census data

**Table 9. Tourism Industry Jobs (Estimated)**

| Community | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | Change '08 to '09 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bieber | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0% |
| Burney | 241 | 241 | 264 | 208 | 263 | 314 | 298 | 287 | 300 | 288 | 214 | -25.7% |
| Susanville | 579 | 627 | 526 | 680 | 818 | 811 | 752 | 908 | 888 | 774 | 736 | -4.9% |
| Westwood | 213 | 194 | 207 | 217 | 211 | 251 | 186 | 187 | 164 | 151 | 126 | -16.6% |
| Chester | 135 | 147 | 142 | 127 | 102 | 109 | 95 | 111 | 141 | 136 | 80 | -41.2% |
| Greenville | 45 | 38 | 59 | 40 | 35 | 38 | 45 | 31 | 25 | 38 | 32 | -15.8% |
| Quincy | 276 | 224 | 261 | 268 | 281 | 265 | 313 | 328 | 299 | 262 | 245 | -6.5% |
| Portola | 133 | 154 | 157 | 161 | 306 | 297 | 396 | 347 | 338 | 304 | 276 | -9.2% |
| Loyalton | 35 | 26 | 16 | 32 | 36 | 36 | 28 | 33 | 36 | 45 | 34 | -24.4% |
| **Pilot Project Area Total** | **1,659** | **1,653** | **1,634** | **1,733** | **2,052** | **2,121** | **2,113** | **2,232** | **2,191** | **1,998** | **1,743** | **-12.8%** |

The volume of sawlogs sold rebounded in FY 2009 and 2010, where it hit a peak of 110,579 cubic hundred feet (CCF). However, as shown in Table 11, the volume of sawlogs sold fell over 50 percent from FY 2010 to FY 2011. This decrease is attributed to an increase in the number of "no bid" sales. For example, in FY 2010 there was one no bid sale, while in FY 2011 there were six no bid sales. According to feedback provided to the Forest Service from industry representatives, lower interest in sales was generally due to expected costs to purchasers for harvest operations versus expected revenue from available timber volume, which is affected by timber market prices.

The volume of biomass sold improved from 49,439 to 53,600 CCF (8 percent) from FY 2010 to FY 2011. This demonstrates some improvement over recent declines stemming from recession-related decreases in demand. According to the U.S. Energy Information Administration (EIA), electricity markets were affected by economic and environmental developments. In 2009, electricity generation in the U.S. was down 4.1 percent, reaching its lowest level since 2003. This decrease in power demand nationwide reflected a 2.6 percent decline in economic activity (GDP)[1].

**Timber and Biomass Removal:** The volume of sawlogs removed between FY 2010 and FY 2011 increased 77 percent, while the volume of biomass removed increased 58 percent. The total volumes of sawlogs and biomass removed in FY 2011 HFQLG projects were 64,160 CCF and 48,280 CCF respectively. The increase in volume removed may be due in part to buyers needing to complete harvest projects to meet sales contract deadlines.

**Service Contracts:** One of the goals of the pilot project is to sustain the local economy and support community stability by placing an emphasis on awarding contracts to local bidders. The Forest Service defines "local" as those firms in the pilot project area and the remainder of the Sierra Cascade Province (defined as northeast California, east of Interstate 5 and north of Interstate 80). As shown in Table 12, the percent share of total contract dollars awarded to local companies in FY 2011 was approximately 73 percent. Overall (FY 2000 through FY 2011), over 65 percent of contract dollars has been awarded to local contractors. This data indicates the majority of HFQLG contract dollars are captured by local businesses.

**Survey of HFQLG Contractors:** Staff conducted a survey targeted at businesses awarded contracts under the pilot project in FY 2011. The objective of this survey is to quantify the program's direct impact on employment and identify local forest products industry economic outlook perspectives. Out of approximately 30 local forest product contractors contacted, nine agreed to respond to the survey, a 30-percent response rate. In total, the survey identified 414 full-time, 21 part-time, and 243 seasonal workers employed by these contractors in FY 2011.

A majority of contractors reported that they would remain at the same level of operation in FY 2012. Two contractors indicated the need for downsizing. Overall, the business outlook for FY 2012 seems stagnant, which may be attributable to the slow recovery from the most recent recession. In addition to employment data, contractors were asked to provide an estimate of how much of their business is linked to the pilot project. Responses showed a range from less than 1 percent to 90 percent. The average was approximately 38 percent.

*Small diameter material being chipped for biomass electrical cogeneration facility in Oroville.*

[1] "Electric Power Annual - Electric Power Industry 2009: Year in Review," U.S. Energy Information Administration, November 23, 2010. http://www.eia.doe.gov/cneaf/electricity/epa/epa_sum.html

**Table 10. Nonemployer Firms in the Pilot Project Area**

| | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| All Nonemployers | 2,810 | 2,823 | 2,924 | 3,134 | 3,304 | 3,370 | 3,438 | 3,397 | 3,581 | 3,388 | 3,214 |
| Forest Products Industry | 305 | 290 | 290 | 331 | 353 | 353 | 340 | 329 | 339 | 333 | 308 |

Source: U.S. Census Nonemployer Statistics 1997 through 2009

**Table 11. HFQLG Timber Sale Activity per Fiscal Year – Volume and Value by Type**

| Item | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | Change FY '10 to'11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Volume of Sawlogs Sold (CCF)[2] | 39,938 | 4,495 | 30,521 | 87,983 | 75,005 | 57,904 | 27,718 | 92,299 | 110,579 | 52,103 | -53% |
| Volume of Biomass Sold (CCF) | 31,993 | 11,198 | 47,902 | 83,359 | 77,758 | 68,818 | 31,777 | 63,901 | 49,439 | 53,600 | 8% |
| Value of Sawlogs Removed ($) | $619,057 | $664,594 | $744,918 | $1,740,091 | $3,657,627 | $1,770,445 | $401,487 | $248,188 | $465,463 | $1,101,848 | 137% |
| Value of Biomass Removed ($) | $352,522 | $275,690 | $532,744 | $1,174,285 | $955,394 | $277,936 | $114,633 | $90,031 | $112,630 | $261,491 | 132% |
| Volume of Sawlogs Removed (CCF) | 35,288 | 32,811 | 31,769 | 67,310 | 107,230 | 53,603 | 31,608 | 21,666 | 36,156 | 64,160 | 77% |
| Volume of Biomass Removed (CCF) | 57,592 | 26,801 | 30,023 | 155,460 | 84,645 | 28,932 | 35,930 | 27,616 | 30,564 | 48,280 | 58% |

Source: USDA Forest Service Timber Sales Activity Reports

**Table 12. Service Contracts, Amount Awarded by Location of Awardees (millions of dollars, rounded) per Fiscal Year**

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | Total FY '00 to '11 | FY '11 | Share FY '00 to '11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pilot Project Area | $0.29 | $2.68 | $1.46 | $3.88 | $1.50 | $1.79 | $0.68 | $0.22 | $0.51 | $0.76 | $1.38 | $0.29 | $15.44 | 16.4% | 25.3% |
| Remainder of Sierra Cascade Province | $0.29 | $7.00 | $3.68 | $1.20 | $4.33 | $2.27 | $1.12 | $0.68 | $1.80 | $ .65 | $0.39 | $1.00 | $24.41 | 56.4% | 40.0% |
| Other/Non-local | $0.47 | $4.58 | $1.99 | $3.80 | $3.52 | $2.04 | $1.33 | $0.95 | $0.27 | $1.04 | $0.71 | $0.48 | $21.18 | 27.1% | 34.7% |
| **TOTAL** | **$1.05** | **$14.26** | **$7.12** | **$8.88** | **$9.36** | **$6.11** | **$3.13** | **$1.85** | **$2.59** | **$2.45** | **2.48** | **$1.77** | **$61.05** | **100%** | **100%** |

Source: USDA Forest Service, HFQLG FY 2000 through FY 2011 Contractor Lists

*Before and after photos of Individual Tree Selection (ITS) used to restore aspen, Eagle Lake Ranger District. Prior to conifer removal left; following conifer removal right.*

## Biomass Electricity Generation

Recent data published by the California Energy Commission (CEC) shows that electricity generated from biomass decreased by 1.4 percent for the pilot project area from FY 2010 to FY 2011. Five out of seven pilot project area communities showed a decrease in electricity generation, and the generation for the Bieber area was zero in both FY 2010 and FY 2011. Notably, however, electricity generation in Quincy increased by 69.3 percent in FY 2011, after a significant drop in the previous fiscal year.

Electricity generation in Quincy had declined between FY 2008 and FY 2010 due to the closure of a key feedstock provider for the plant in early 2009 and the resulting cessation of operations at a Sierra Pacific Industries plant in May 2009. Another Sierra Pacific facility biomass power plant in Loyalton also suspended operations in 2010. However, when the firm partially reopened its Quincy operation in May 2010, electricity generation in that community increased close to 70 percent from FY 2010 to 2011.

*Multiproduct timber sale landing on Feather River Ranger District with skidder, chipper, delimber, and log loader all in operation simultaneously. Sawlogs were taken to lumber mill in Lincoln, firewood to a distributor in Oroville, and biomass chips to an electrical cogeneration facility in Oroville.*

## Local Business Environment

**Jobs in Locally Owned Businesses:** Locally owned businesses help keep dollars circulating within the community since business owners are residents, and residents tend to spend locally. Examining the mix of business ownership and shares of employment between locally and non-locally owned businesses provides a good indicator of the economic health of the pilot project area communities. From 1998 to 2010, the percentage of workers employed by locally owned businesses in the manufacturing sector increased in all communities within the pilot project area except Susanville. This shift in jobs in the manufacturing sector to locally owned businesses indicates growth in the local economy since wages in the manufacturing industry are higher than the retail and services industries. In contrast, over the same period, the retail and services sectors in most pilot project area communities exhibit a decrease in the percentage of workers employed by locally owned businesses.

**Establishments by Age:** Business age statistics illustrate two points. First, increasing numbers of new businesses indicate a growing economy with positive activity in business investment. Second, for an economically isolated region such as the pilot project area, decreasing numbers of established businesses can signify a loss of local support for existing businesses or increased competition from new businesses.

Data collected from Dun and Bradstreet (D&B) data for 1998 through 2010 indicates significant growth in the number of businesses in the 0 to 5 and 6 to 15 years old age brackets in the pilot project area. However, recent changes in D&B's data collection methodology have artificially inflated these figures. In 2008, corresponding growth did not occur in the over 15 year old age bracket. Data from 2010 also fluctuate significantly from the historical pattern. This data anomaly limits the study team's ability to determine a trend until D&B completes its database revision initiative. Therefore, a trend analysis will be available after several years of more consistent data are collected through this monitoring effort.

**Lodging Revenue:** Lodging revenue is a measure of the degree to which tourism is increasing or decreas-

ing in a region. Adjusted for inflation, lodging revenue has been relatively stable in most pilot project area communities. In FY 2010 through 2011, five out of nine areas showed a decrease in lodging revenue. Total lodging revenue for the pilot project area declined from $21.19 million to $20.70 million (2.32 percent) from FY 2009/2010 to FY 2010/2011. Susanville has the largest lodging revenues over the years (approximately $6.2 million per year), followed by Portola (approximately $5.9 million per year). Bieber and Greenville have the smallest lodging revenues. Bieber's lodging revenue is approximately $0.1 million per year and Greenville's lodging revenue is approximately $0.3 million per year.

**Retail Business Activity:** Taxable transactions are an indicator of personal and business consumption in a given jurisdiction. The most recent data published by the California Board of Equalization shows that from 2008 to 2009, taxable sales transactions in the pilot project area declined significantly. All pilot project communities, except the city of Susanville, experienced larger taxable sales declines than that of California as a whole. From 2008 to 2009, taxable sales at the state level decreased by 17.5 percent. In the project area, percentage declines ranged from 13.3 percent (Susanville) to 32.2 percent (Loyalton).

## Social Health: Family Poverty and Population Age Structure

This study measures social health using statistics published by the California Department of Education on school participation in free and reduced lunch programs. As shown in Table 13, region-wide free and reduced lunch program participation has increased from 34.80 percent to 45.21 percent since the beginning of the pilot project, and reached its greatest point at 47.45 percent in the 2009/2010 school year. Compared to earlier years, region-wide program participation has increased at a greater rate since the 2007/2008 school year, increasing from 39.50 percent to 45.21 percent over 4 years. The greater growth rate of region-wide program participation reflects the significant impact of the recent recession on family poverty in the pilot project area.

Youth education is measured in this study using high school dropout rates. Research shows little statistical connection between implementation of the pilot project and youth education. There is also no single reason why students drop out of high school. High school dropout rates have remained relatively stable across all nine communities since the pilot project began in late 1999. High school enrollment in these communities is small, ranging from 100 to 1,200 students, so the addition or loss of one student significantly affects the dropout rate.

*Downtown Greenville.*

**Table 13. Percentage of Enrolled Students in Free & Reduced Lunch by School Year**

| Community | 1998/ 1999 | 1999/ 2000 | 2000/ 2001 | 2001/ 2002 | 2002/ 2003 | 2003/ 2004 | 2004/ 2005 | 2005/ 2006 | 2006/ 2007 | 2007/ 2008 | 2008/ 2009 | 2009/ 2010 | 2010/ 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bieber | 54.50 | 57.60 | 50.50 | 54.60 | 50.20 | 60.80 | 50.20 | 47.40 | 56.70 | 54.40 | 55.90 | 62.23 | 82.23 |
| Burney | 41.20 | 41.10 | 41.40 | 40.90 | 55.70 | 46.20 | 45.30 | 45.10 | 44.30 | 54.00 | 53.60 | 46.92 | 49.32 |
| Susanville | 30.60 | 27.50 | 29.10 | 29.70 | 29.90 | 31.90 | 36.60 | 34.90 | 34.80 | 33.90 | 35.10 | 39.60 | 50.32 |
| Westwood | 48..40 | 50.10 | 49.40 | 47.80 | 18.10 | 34.30 | 43.10 | 44.50 | 35.10 | 40.40 | 36.60 | 40.86 | 39.78 |
| Chester | 34.8 | 29.90 | 31.60 | 32.40 | 38.00 | 32.80 | 33.20 | 34.50 | 40.20 | 38.40 | 39.40 | 34.76 | 38.86 |
| Greenville | 53.00 | 49.70 | 53.40 | 45.70 | 40.20 | 39.30 | 40.10 | 46.40 | 55.50 | 48.90 | 47.90 | 51.57 | 48.10 |
| Quincy | 29.60 | 33.30 | 31.80 | 30.90 | 32.40 | 32.80 | 36.10 | 32.60 | 35.70 | 37.10 | 38.70 | 31.42 | 32.53 |
| Portola | 30.40 | 35.90 | 36.90 | 35.10 | 35.90 | 33.60 | 34.50 | 40.90 | 41.80 | 40.30 | 42.20 | 43.61 | 42.02 |
| Loyalton | 22.60 | 29.10 | 27.00 | NA | 37.40 | 32.30 | 35.40 | 37.40 | 32.70 | 33.20 | 40.00 | 52.25 | 50.59 |
| **Total Pilot Project Area** | **34.80** | **34.40** | **34.80** | **34.80** | **33.40** | **35.60** | **38.60** | **38.60** | **38.50** | **39.50** | **43.30** | **47.45** | **45.21** |

Source: California Department of Education

*Before and after photos in DFPZ with aspen restoration prescription, Eagle Lake Ranger District. Prior to conifer removal left, following conifer removal right.*

# ENVIRONMENTAL MONITORING AND EFFECTS

A key part of the HFQLG Pilot Project is monitoring of the effects of the variety of treatments being implemented. The monitoring effort tracks adverse and beneficial impacts to the range of ecosystems in the pilot project area and recommends mitigation actions. The following are the monitoring results for FY11.

## Old Forest Habitat

The HFQLG Pilot Project Record of Decision requires that suitable habitat for old forest-dependent and aquatic/riparian-dependent species not be reduced by more than 10 percent of levels originally measured in 1999 within three specific old forest vegetation types, totaling 204,770 acres across the pilot project area. A cumulative total of reductions in habitat are tracked to monitor loss of old forest habitat. To date, 4,518 acres (2.2 percent) have, or will have, a reduction based on projects with a signed record of decision. For comparison, wildfire through 2010 reduced an additional 25,953 acres (12.7 percent). There were no reductions across the pilot project area from either HFQLG projects or wildfire in 2011.

## Forest Structure

Data on trees, understory vegetation, and fuels have been collected in permanent plots across the pilot project area both before and after treatment. In 2011, work focused on developing more in-depth and comprehensive analysis of pre- and post-treatment forest conditions, as measured in the permanent plots, to address several of the HFQLG monitoring report questions. Preliminary analyses have been completed and are being adapted for publication in a research paper on the effects of fuels reduction and group selection in Sierra mixed-conifer forest. Completion and submittal of the research paper is scheduled for 2012.

### Post-Treatment Changes in Stand Basal Area and Quadratic Mean Diameter

Basal area and quadratic mean diameter are measures used when determining forest stand density and describing habitat characteristics. These measures indicate conditions such as the level of competition for growing space and the developmental stage of a forest. Basal area is the cross sectional area (in square feet) of a tree stem measured 4.5 feet from the ground. Quadratic mean diameter can be considered the diameter of the average-sized tree, but is derived from a slightly more complex formula than an arithmetic mean.

Treatments under the HFQLG Act are designed to meet multiple objectives, including removing excessive live fuels (trees less than 30-inch diameter), promoting stand health, and maintaining or developing desirable habitat such as early seral foraging habitat or late seral habitat. In meeting these objectives, basal area per acre was reduced, and quadratic mean diameter increased across the treatment units. Table 14 displays the average change in basal area and quadratic mean diameter in treatment stands grouped by ecological zone.

Treatments led to significant decreases in basal area in trees less than 24 inches in diameter. Overall, treatments averaged a 27-percent reduction of total basal area. There was no significant change in basal area of trees 24 inches in diameter and larger, including the subgroup of trees 30 inches in diameter and larger.

Large trees (30 inch diameter or greater) are an important element of late seral habitat. Large trees on average accounted for 7 percent of total basal area prior to treatments. These values are probably low compared to historical conditions. Monitoring indicates that treatments successfully maintained large trees overall. Reducing basal area by removing small trees frees up site resources for remaining trees and helps promote the development, health, and survival of large trees. In addition, silvicultural and fuels treatments remove undesirable live and dead fuels, thereby increasing stand resiliency in the event of wildfire.

**Table 14. Basal Area and Quadratic Mean Diameter (Trees ≥ 5 Inches Diameter) Pre- and Post-Treatment (1 Year) By Ecological Zone; Plumas, Lassen and Tahoe (Sierraville Ranger District) National Forests**

| Zone | Basal Area | | Quadratic Mean Diameter | |
|---|---|---|---|---|
| | Pre | Post | Pre | Post |
| | $ft^2$/acre | | inches | |
| East side | 135 (53) | 91 (34)*** | 11.9 (2.0) | 14.9 (2.9) *** |
| Transition | 253 (107) | 142 (49)*** | 12.7 (3.8) | 17.7 (5.8) *** |
| West side | 177 (67) | 132 (57)*** | 13.3 (2.7) | 16.6 (4.3) *** |
| All | 159 (68) | 111 (51)*** | 12.5 (2.5) | 15.7 (3.4)*** |

* $p < 0.05$, ** $p < 0.01$, ***$p < 0.001$; significance values for pre vs. post comparison

## Post-Treatment Changes in Understory Vegetation

Monitoring focused on early seral forage because of its importance to wildlife species dependent on this type of vegetation. While many forest understory plant species are consumed in some way, there are non-palatable, less-preferred or noxious species in the study area as well. Analyses were only done on palatable species. Table 15 displays the average change in understory vegetative cover by life form grouped by ecological zone.

Treatments increased forage for early seral species, but the pattern of increase depended on ecological zone and/or plant life form. Treatments more than doubled forbs in eastside units. Grasses increased by more than 50 percent in both east side and west side units after treatment. There was a slight decrease in shrub cover in west side units after treatment.

Shrub cover commonly decreases after mechanical or fire treatment. Monitoring data showed a decrease in shrubs after treatment in west side stands but not in east side stands. Investigators tested to see if the change in understory vegetation cover was related to decreased overstory cover after treatment. A direct correlation was not apparent in units one year after treatment; further testing for this relationship will be conducted using 5-year post-treatment surveys from 2012.

**Table 15. Percent Cover of Forbs, Grasses and Sedges and Shrubs (Mean with Standard Deviation) Before and After Treatment According to Ecological Zone (East versus West Side) in Plumas, Lassen and Tahoe (Sierraville Ranger District) National Forests**

| Zone | Forb | | Grasses and Sedges | | Shrub | |
|---|---|---|---|---|---|---|
| | Pre | Post | Pre | Post | Pre | Post |
| | percent cover | | | | | |
| East side | 1.8 (2.3) | 4.3 (4.1)* | 4.4 (6.5) | 7.0 (6.6)** | 12.5 (8.9) | 12.2 (10.1) |
| Transition | 0 | 0.4 (0.6) | 1.0 (2.2) | 1.2 (2.7) | 7.9 (16.1) | 7.9 (11.0) |
| West side | 3.3 (7.0) | 3.9 (5.5) | 3.2 (7.1) | 5.9 (6.9)* | 18.7 (15.8) | 16.1 (13.0)* |
| All | 2.4 (4.9) | 3.9 (4.7)* | 3.8 (6.6) | 6.3 (6.7)*** | 14.9 (13.0) | 13.7 (11.6) |

* $p < 0.05$, ** $p < 0.01$, ***$p < 0.001$; significance values for pre vs. post comparison

## Best Management Practices

Best management practices (BMPs) are measures used with forest management activities to protect water quality and soils. The Forest Service uses BMPs associated with stream course protection, skid trails, landings, road drainage, stream crossings, prescribed fire, and road decommissioning.

Best management practices were monitored using the Pacific Southwest Region protocols. This approach requires activity sites to have undergone at least one winter prior to evaluation. Therefore, all sites monitored were implemented in 2010 or earlier. The protocol involves a two-step process. The first step, implementation, determines whether measures to reduce risk to water quality were considered during project planning, design, and layout, and if prescribed measures were implemented on the ground. The second step, practice effectiveness, involves field review of indicators of processes that affect water quality. These focus primarily on erosion and include criteria such as rilling, sediment deposition, and sediment transport. Results from both implementation and effectiveness are summarized to yield a result of "implemented or not implemented" and "effective or not effective."

This year's monitoring results reflect the continued success of a team effort on the part of sale administrators, engineers, soils scientists, and hydrologists to meet or surpass the goal of 100 percent BMP implementation and 90 percent BMP effectiveness. Through the BMP monitoring program, we have identified problem areas and focused on improving results in those areas in order to protect and preserve the water resources on our National Forests. Out of 71 evaluations conducted in 2011, all 71 BMPs were fully implemented, and only three were not effective. For the three ineffective sites, only one site showed evidence of sediment delivery to a stream. The average effectiveness of 97 percent indicates that diligent implementation and monitoring of BMPs is an effective method for preserving water quality. The prescription, application, and monitoring of these practices should be continued across the pilot project area.

*Skid trail with logging debris crushed into surface to prevent erosion, Hat Creek Ranger District*

The target goal is to achieve 90 percent or better in effectiveness and 100 percent in implementation (Figure 1). The target was met for effectiveness and met for implementation. Areas where improvement in effectiveness can be realized are focused on road drainage and crossings. General recommendations are listed below:

- Build upon 2011 success for BMPs associated with stream courses, skid trails, landings, road decommissioning, and prescribed fire.
- Continue to designate Stream Management Zones (SMZs) for prescribed fire and all timber sale activities.
- Maintain proper drainage on all roads, which includes the maintenance of culverts and removal of problematic roadside ditches.
- Remove temporary roads from timber sales when the unit is closed.
- Stabilize erodible (unstable) areas, where roads are located.
- Identify unstable areas and drainage problems associated with roads during the NEPA process.
- Increase watershed funding allocation to implement road improvements identified in NEPA documents that are not economically feasible to include in the timber sale.

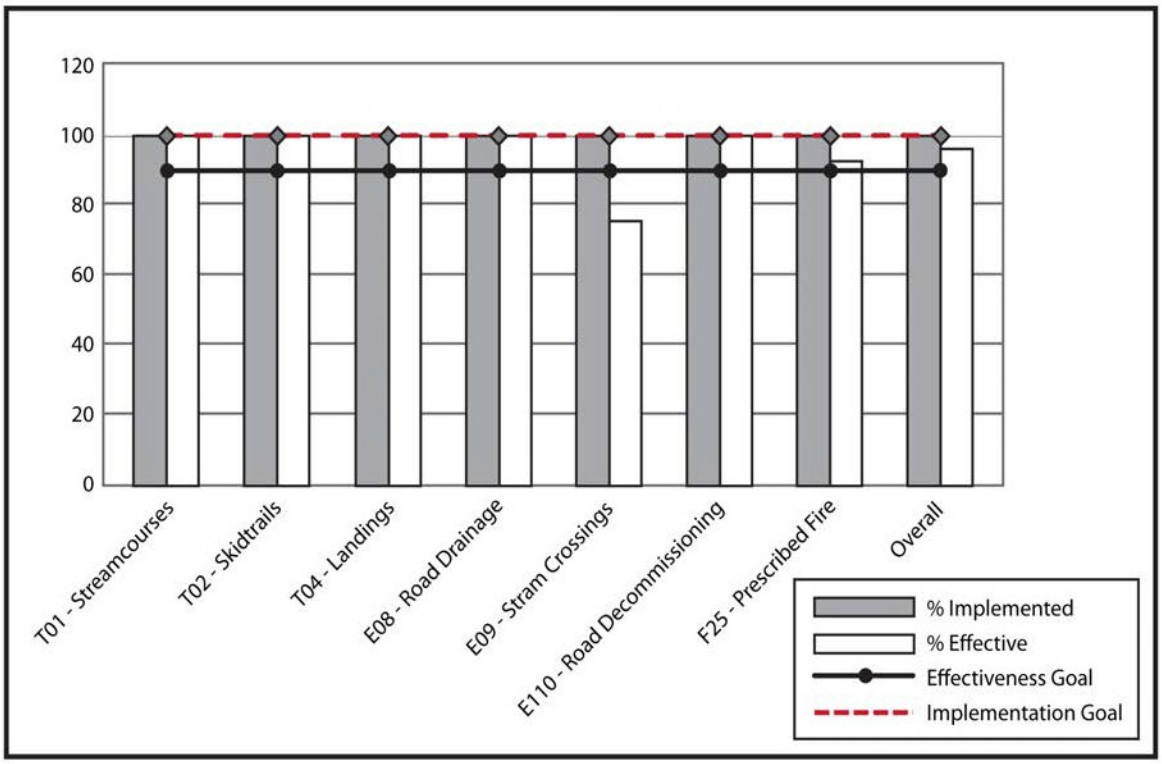



**Figure 1. Summary Results of 2011 BMP Implementation and Effectiveness, by Activity Type**

## Soils

The soil monitoring program examines the effects of HFQLG activities on four forest plan soil standards: soil compaction, soil displacement, soil cover and retention of large down woody material. Pre-activity soil monitoring began in 2001, and follow-up post-activity monitoring began in 2004. A total of 124 units with pre- and post-activity data have been sampled through the 2011 season. For this year's analysis, 2011 soil monitoring data (14 units on the Lassen and 3 units on the Plumas) were appended to the cumulative data set from previous years. The sample size in the data set is mixed: pre-activity sampling and post-activity sampling prior to 2008 generally have 60 sample points for thinning units and 21 sample points for group selection units; all units sampled post-activity since 2008 (73 of the 124) have 200 sample points.

Overall status and trend of units indicate generalized results as follows:

1. Approximately 88 to 92 percent of activity units are meeting soil quality standards for soil displacement and cover retention, both pre- and post-activity.
2. Sixty-one percent of activity units are meeting soil quality standards for compaction; compaction levels were similar pre-activity, representing persistent legacy impacts from pre-HFQLG activities.
3. Forty-three percent of activity units are meeting soil quality standards for large wood retention; HFQLG activities are affecting this parameter in a considerable number of units, particularly group selection units.

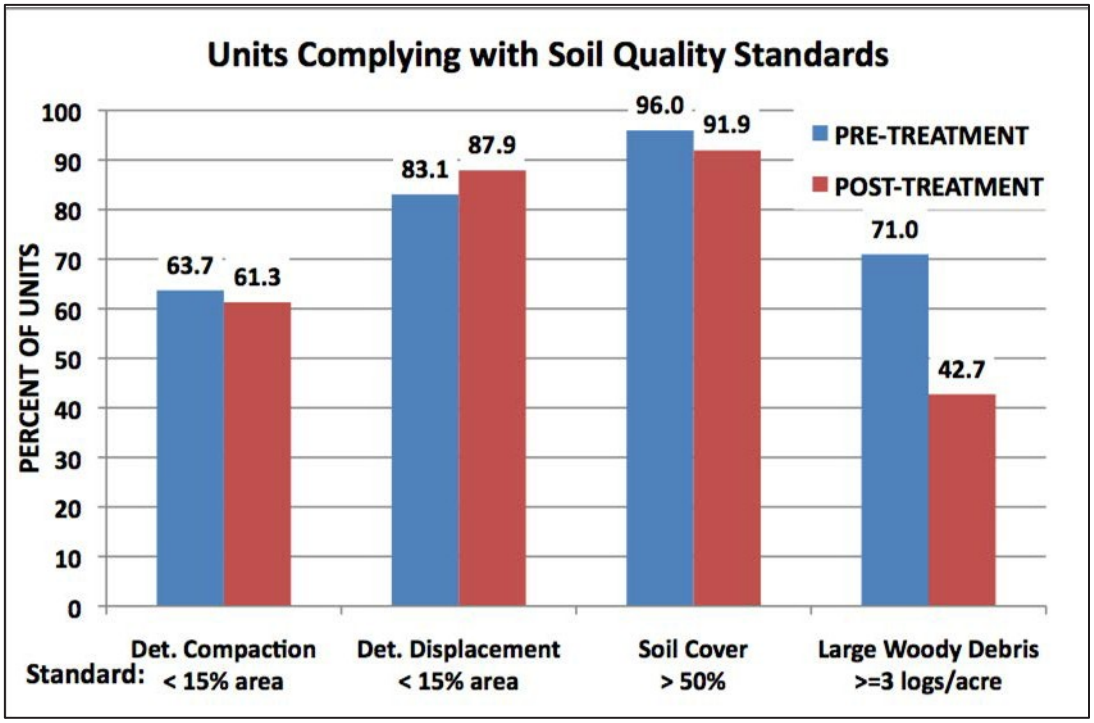



**Figure 2. Percentages of Units Meeting Various Soil Quality Conditions, Pre- and Post-Activity**

## Soil Compaction

Soil compaction is loss of soil porosity due to the physical force of heavy equipment traffic. Forest plan soil quality standards define compaction as "detrimental" when more than 10 percent of the total porosity is lost (*severity* of compaction), and further, this detrimental condition cannot occupy more than 15 percent of an activity area post-activity (*extent* of compaction). Small amounts of detrimental compaction commonly occur and are not usually of concern unless exceeding 15 percent of the area.

The cumulative review of thinning and group selection units indicates that HFQLG activities have incrementally added to the detrimental compaction on the landscape. Heavy equipment would be expected to increase the overall level of compaction on the landscape, but management practices are instituted to limit the amount of negative impacts. Before HFQLG project implementation, approximately 64 percent of the units met the soil compaction standard; this decreased to 61 percent of the units meeting the standard after implementation (Figure 2). This data indicates that the majority of the units not meeting the standard are due to historic (pre-HFQLG) impacts on the landscape. Soils monitoring continues to indicate that harvest operations can slightly increase compaction on treated areas, varying with site and treatment characteristics.

Compaction levels in many units were modified by subsoiling practices (tilling or otherwise breaking up the soil), used to reduce/repair areas of compaction in a given unit. Compaction was still found to exceed standards in 46 percent of thinning units and 36 percent of group selection units that were subsoiled. Subsoiling is generally focused on the worst areas in a unit (landings and primary skid trails). Unit-level raw data suggests that few sample points (which are elected randomly) encounter subsoiled skid trails within subsoiled units, so effects of mitigation are not effectively expressed in unit averages, even if onsite results are effective where applied.

While 39 percent of units are exceeding compaction standards, 36 percent of them exceeded the standard prior to HFQLG activity impacts (Figure 2). Overall *change* in compaction levels is not large. Thirteen of the 124 units (7 thinning units, 6 group selection units, 10 percent) changed from meeting the standard pre-activity to exceeding it post-activity, which is the most pertinent result of current activities.

## Soil Displacement

Forest plan soil quality standards and guidelines for displacement do not have a minimum quantified area considered significant, but minimizing soil displacement is an explicit management objective. According to the HFQLG monitoring protocol, soil displacement is considered "detrimental" when either 2 inches or half the total thickness (whichever is less) of the humus-enriched topsoil (A horizon) is removed from an area of 1 square meter or larger. Overall, units average 7 percent detrimental displacement, with 88 percent of units having less than 15 percent. The thinning units average 5 percent displacement, with three units (4 percent) exceeding 15 percent. Group selection units average 8 percent displacement, with 10 units (23 percent) exceeding 15 percent and two of these exceed- ing 25 percent. Detrimental displacement exceeded 15 percent in one of the five 'thin + group' units (18 percent area), and one of the two mastication units (35 percent area). Displacement averages overall were quite similar pre-activity. Amount of *change* averages
1 percent difference from pre- to post-treatment across units, but individual unit results varied greatly.

*Soil moisture probes installation in HFQLG Pilot Project area.*

## Soil Ground Cover

Forest plan soil quality standards generally require 50 percent effective soil cover to prevent soil erosion. Overall, this standard is met in 96 percent of units pre-activity and 92 percent of units post-activity (Figure 2). Effective cover can be duff and litter, large wood, vegetation, or rock, all of which help protect otherwise bare soil from eroding. Average soil cover was quite similar between silvicultural methods pre-activity, with 74 to 77 percent duff cover and 10 to 17 percent bare. Differences between silvicultural methods are apparent post-activity. Thinning units average 90 percent effective soil cover pre-activity and 83 percent post-activity. Only one unit had less than 50 percent cover post-activity. Group selection units averaged 83 percent cover pre-activity and 66 percent post-activity; nine of the 44 units (20 percent) ended with less than 50 percent cover. Duff, which is an important cover component in preventing erosion, is most reduced in group selection units. Mastication and 'thin + group selection' units all exceeded 75 percent cover post- activity.

## Large Woody Material

Large woody debris is described as downed large logs in decay classes 1 through 5, with "large" meaning at least 10 feet long and 20 inches in diameter. Forest plan soil quality standards generally require three or more such logs per acre to be left on site post-treatment. Overall, units average 3.3 logs per acre, but only 43 percent of units actually meet the standard post-activity; 71 percent of the units met the standard pre-activity, and 19 percent had no down wood at all pre-activity. From pre- to post-activity, both the average logs per acre and the number of units complying with the standard are decreasing, particularly for group selection units, as reported previously.

Thinning units as a group meet the standard with 4.3 logs per acre post-activity. More specifically, 43 units (59 percent) have at least three logs per acre, 24 units (33 percent) have one to two logs per acre, and six units (8 percent) have no large wood. Three of the 'thin + group selection' units met the standard post-treatment; the other two each had 2.6 logs per acre. One of the two mastication units did not meet the standard, both pre- and post-activity.

Aggregated group selection units do not meet the standard, averaging 1.4 logs per acre post-activity. Only six units (14 percent) have at least three logs per acre, 14 units (32 percent) have one to two logs per acre, and 24 units (55 percent) have no large wood. However, 39 percent of the group selection units had no large wood prior to treatment.

Individual unit results are highly variable, particularly pre-activity but also post-activity. Some units had no wood, and some had copious amounts of large wood, as much as 35 to 45 logs per acre pre-activity and 15 to 20 logs per acre post-activity. Both of these conditions affect overall means substantially, and reporting the median rather than mean may be more appropriate for this metric in the future.

### Conclusions

For three of the four soil quality metrics, pre-treatment (pre-HFQLG) values for units are quite similar to post-treatment values. Compaction was incrementally increased in a number of units, but only 13 units that met standards pre-activity are exceeding them post-activity. Soil displacement and soil cover retention standards are met in 88 to 92 percent of units, and are rarely problematic. Large woody debris retention continues to be somewhat problematic, particularly for group selection units; standards were met in only 14 percent of group selection units and 59 percent of thinning units. HFQLG Forests are working to continue to improve compliance with soil standards.

## Botany

Botanical resources are monitored to determine (a) if recommended mitigations and treatments are implemented as planned and (b) the response of threatened, endangered, and Forest Service sensitive (TES) plants and noxious weeds to HFQLG management actions. The intent of this monitoring effort is to highlight processes and actions that are successful, identify factors that need improvement, and provide Forest Service personnel and members of the public with information that will help guide adaptive management of botanical resources in the future.

### Sensitive Plant Protection

Of the 25 TES control areas monitored in 2011, 23 sites (or 92 percent) were protected as planned during HFQLG treatment implementation. Two sites were not protected during project implementation. Although protection measures were identified in the decision memo for the project, control areas were never explicitly designated for these two sites. Consequently, occurrences were not identified on the contract map and flagged on the ground and were subsequently not avoided by project activities.

The minimum level of protection required to be considered successful is 90 percent of control areas protected as planned; therefore, even though 100 percent compliance is considered optimal, this objective was met in 2011. Achievement of the optimum protection level will require continual improvements in communication between botanists and project implementation staff to ensure effective field identification, understanding, and avoidance of control areas.

### Sensitive Plant Response to Management Activities

Over the past 7 years, botanists and ecologists from the Lassen, Plumas, and Tahoe National Forests have collected and analyzed data aimed at investigating the response of rare plants to prescribed fire, fuel reduction, and timber harvest activities implemented under the HFQLG Pilot Project. Species-specific results from the 2011 monitoring season are summarized below.

**Webber's milkvetch (*Astragalus webberi*):** Hand thinning and prescribed fire treatments significantly increased the number of small Webber's milkvetch (*Astragalus webberi*) plants. Treatments that exposed bare ground, primarily through the construction of hand lines, were most effective at increasing density, while treatments that reduced overstory canopy were most effective at enhancing growth. Prescribed fire treatments without ground disturbance did not significantly increase seed germination. Like many other legume species, Webber's milkvetch may require damage or removal of the hard outer seed coats to stimulate germination.

Future management for Webber's milkvetch should focus on protecting established individuals while applying landscape level treatments that (a) expose bare ground to stimulate germination and (b) increase the amount of light that reaches the understory to promote growth of existing plants. Future reintroduction efforts should mechanically

scarify the seeds (i.e. rub them between two layers of sandpaper) prior to planting in order to increase germination.

**Layne's ragwort (*Packera layneae*):**

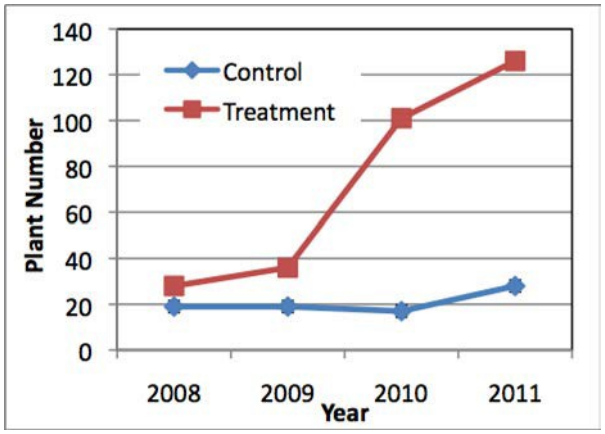



**Figure 3. A Significant Increase in Webber's Milkvetch Density in the Treatment Unit; No Change in the Control**

There were no significant changes in the density, size, or reproductive potential of Layne's ragwort after prescribed burning, which suggests that this treatment had a neutral effect. However, a significant increase in the number of flowering plants observed in the unburned area did not occur within the burned area. This suggests that there may have been some negative effects of the prescribed burn on Layne's ragwort such that it could not benefit from environmental conditions that promoted flowering. Plant density was positively associated with bare ground and negatively associated with canopy closure. This result suggests that a prescribed burn, which can reduce surface fuels and overstory canopy closure, may benefit this species by creating optimal habitat conditions.

Although effectiveness monitoring for this species is not complete, a few general recommendations can be made to improve habitat restoration efforts for Layne's ragwort using prescribed fire. First, successful prescribed burning treatments should have sufficient intensity to create the kind of environmental conditions preferred by Layne's ragwort, including (a) reduced surface fuels and exposed bare ground and (b) reduced overstory canopy closure, which might also be achieved through thinning treatments. Second, control areas should be considered to protect existing

*Layne's ragwort on the Plumas National Forest.*

Layne's ragwort individuals from the direct effects of burning.

**Closed-lip penstemon (*Penstemon personatus*):** The percent cover of closed-lip penstemon (*Penstemon personatus*) following hand-thinning, mechanical thinning, and group selection treatments, as well as controls, was analyzed over time. There were significant declines in the percent cover of closed-lip penstemon within the control plots. In contrast, there was no significant change in percent cover of closed-lip penstemon within any of the treatment units over time. These findings suggest that closed-lip penstemon benefits from thinning activities.

## TES Monitoring Lessons Learned

In addition to increasing our understanding of species-specific responses to management, a number of more general lessons have emerged from the HFQLG botany monitoring effort. First, the response of individual plant species is often linked to the intensity of the treatment and the species' ecology. Many of the species monitored naturally inhabit open sites and have evolved with fire, which could explain why moderate to low intensity fire and timber harvest treatments had negligible (and in some cases beneficial) effects. In contrast, the response to high-intensity fire or group selection harvest was variable, causing significant declines in two disturbance-intolerant species and having no effect on those species that appear to thrive in disturbed sites. Second, measuring environmental variables (such as canopy cover, fuel loads, duff depth, etc.) is important when trying to

explain a plant's response to specific treatments. Third, monitoring should occur over a long enough period to capture any initial population declines, potential recovery to pre-treatment numbers, and natural variability.

## Noxious Weeds

The objective of noxious weed monitoring is to determine if project-related activities and associated weed control and prevention measures are successful at limiting new introductions and containing or controlling existing infestations. Twenty-nine sites with associated mitigation or control measures were evaluated in 2011. All of the infestations were either treated and/or avoided during management activities and had documented equipment cleaning during project implementation.

To assess the effects of HFQLG treatments on noxious weeds, 111 treated forest stands were monitored with pre- and post-treatment plots (15 plots per stand). At the end of the 2011 monitoring season, 26 stands (or 24 percent) had invasive weed populations present 1 to 5 years after treatment. Prior to treatment, only one stand had an invasive species recorded within the plots. These weed species, which include cheat grass, Klamath weed and bull thistle, appear to increase in cover once established. Eleven infestations of noxious weeds were also assessed to evaluate the success of weed treatment measures. The species monitored included yellow starthistle (*Centaurea solstitialis*), Scotch broom (*Cytisus scoparius*), Klamath weed (*Hypericum perforatum*), perennial pepperweed (*Lepidium latifolium*), and medusahead (*Taeniatherum caput-medusae*).

Overall, repeated weed treatments have generally been successful in eradicating small populations of noxious weeds. Of those monitored in 2011, 70 percent were eradicated, and 20 percent were well contained. The only infestation that increased in response to treatments was one Scotch broom occurrence. This site was treated in 2007 with a small tractor, and the resulting increase in occurrence represents the flush of seedlings that followed the soil disturbance associated with mechanical removal.

Aggressive action prior to and through project implementation has generally been successful in eradicating small populations of noxious weeds, as well as preventing new occurrences. However, less success has been realized in larger populations or for species that are more difficult to eradicate. Additional efforts are needed to develop feasible methods of control for highly invasive species such as medusahead, Dalmatian toadflax, musk thistle, and yellow starthistle.

*Medusahead monitoring transect within a mastication treatment.*

# Wildland Fire and Fuels

## Longevity of Fuel Treatment Effects on Fuel Loads and Vegetation

In an effort to assess the longevity of post-treatment stand conditions, researchers sampled shaded fuel breaks in the pilot project region that had been established over a 15-year period. They compared stand characteristics including fuel loads, understory vegetation and overstory metrics in the years following treatment to those of untreated stands. Effects of treatment on overstory characteristics appear to be long-lived. The oldest treatment sites (8 to 15 years post-treatment) were still significantly different from untreated sites

with respect to tree density, basal area, canopy cover and canopy fuel load. Other stand characteristics, particularly timelag fuel loads, seedling density, and shrub cover, exhibited substantial variability that led to a lack of significant difference between treatments of varying age and between treated and untreated sites. Future analyses will model potential fire behavior to explore fuel treatment longevity from a fire hazard perspective.

*Prescribed fire, Beckwourth Ranger District, to reduce surface and ladder fuels.*

## Variability in Surface Fuel Loads Following Various Fuel Reduction Treatments

Pacific Southwest Research Station scientists developed a study to both characterize variability in post-treatment surface fuel loads for multiple treatment types and determine optimal levels of sampling to capture the variability in a given treatment type. Four different HFQLG treatment types were sampled from the Meadow Valley project on the Plumas National Forest: mastication, commercial thinning combined with biomass harvesting, hand-thinning followed by pile burning, and prescribed burning (Table 16). Untreated areas adjacent to sampled treated areas were also sampled as controls for comparison.

Summary fuel load calculations are shown in Table 17. Preliminary analysis indicates that fuel loads varied considerably across all treatment types with a majority of the fuel loads being in the duff and litter classes. Duff, litter, and fine woody fuel loads were highest in commercially thinned stands and control areas, while coarse woody fuel loads were highest in hand-thinned stands. Control areas had the highest total load (33.4 tons per acre), while masticated stands had the lowest (9.2 tons per acre). Prescription burned stands had the lowest litter and fine woody fuel loads.

Future work will analyze the relationship between tree density and fuel loads, the variability in fuel loads among treatment types, and the question of how many fuel transects would be needed to adequately sample fuel loads in a given area.

## Air Quality and Smoke

The Forest Service monitors the effects of HFQLG prescribed burns related to air quality and smoke. Approximately 7,019 acres of prescribed burning were implemented across the pilot project area in FY 2011 with no reported violations of smoke management plans or air quality standards and no official complaints (Table 18). The absence of violations or complaints in the past 5 years can be explained by implementation of an adaptive management strategy outlined in the 2006 report to Congress. Extensive coordination and communication of prescribed burn activities between ranger districts, air districts, and the public was initiated to address the large increase in smoke issues culminating in 2005. This included public contact, which consisted of phone calls, press releases, door-to-door visits, and public information booths set up near burn project sites to directly answer questions and address concerns from the public. This strategy has been shown to be very effective in addressing smoke management issues in the pilot project area.

**Table 16. Summary of Sampling by Treatment Type and Average Forest Stand Structure for Sampled Stands within the Meadow Valley Area**

| Treatment Type | Number of stands | Number of 50m transects | Total stand area sampled (ac.) | Basal area ($ft^2$/ac) | Canopy cover (%) |
|---|---|---|---|---|---|
| Prescription burned | 10 | 41 | 247 | 149 | 47 |
| Commercial thinned & biomass harvested | 9 | 25 | 225 | 188 | 58 |
| Hand-thinned & pile/burned | 8 | 17 | 408 | 151 | 40 |
| Masticated | 5 | 17 | 216 | 82 | 27 |
| Control (untreated) | 7 | 20 | - | 336 | 77 |

**Table 17. Average Fuel Loads by Treatment Type**

| Treatment Type | Fuel loads (tons/ac) | | | | |
|---|---|---|---|---|---|
| | Duff | Litter | Fine woody (1-100 hr) | Coarse woody (1000 hr) | Total |
| Prescription burned | 1.66 | 4.94 | 1.36 | 3.48 | 11.45 |
| Commercial thinned & biomass harvested | 7.96 | 9.79 | 3.52 | 3.61 | 24.89 |
| Hand-thinned & pile/burned | 3.86 | 7.73 | 1.36 | 11.69 | 24.64 |
| Masticated | 0.13 | 5.71 | 1.70 | 1.68 | 9.22 |
| Control (untreated) | 8.46 | 13.99 | 3.66 | 7.32 | 33.43 |

**Table 18. Numbers of Smoke Management and Air Quality Violations and Complaints Related To HFQLG Related Burning Activities**

| Year | Forest Reporting | Acres Burned[1] | # Violations of Smoke Mgmt Plans (Question 9) | # Violations of Air Quality Standards (Question 26) | Number of Complaints (Question 27) |
|---|---|---|---|---|---|
| 2001 | All HFQLG | 1,453 | 0 | 0 | 2 |
| 2002 | Plumas | 5,045 | 2 | 0 | 3 |
| 2003 | Plumas | 4,280 | 0 | 0 | 0 |
| 2004 | All HFQLG | 10,778 | 0 | 0 | 0 |
| 2005 | All HFQLG | 14,310 | 1 | 2 | 16 |
| 2006 | All HFQLG | 5,863 | 0 | 2 | 7 |
| 2007 | All HFQLG | 9,792 | 0 | 0 | 0 |
| 2008 | All HFQLG | 7,553 | 0 | 0 | 0 |
| 2009 | All HFQLG | 10,309 | 0 | 0 | 0 |
| 2010 | All HFQLG | 9,307 | 0 | 0 | 0 |

[1]Some acres are follow-up treatments to thinning treatments to achieve desired conditions. When burn acres are follow-up treatments, they are not double counted on the "Acres Accomplished" table previously shown in the HFQLG Status Report to Congress.

# American Marten

The American marten (*Martes americana*) is currently designated as a sensitive species by the Forest Service Pacific Southwest Region and is of concern due to historic trapping, loss of habitat, and subsequent declines in both population and distribution (USDA FS 2004). The monitoring objective for this forest carnivore is to document any changes in the amount and distribution of suitable marten habitat. Several other monitoring and habitat modeling projects have been initiated to meet this objective.

## Understanding Seasonal Variation in Detection of Marten

Field research was conducted to understand the effects of season of detection on the development of a habitat model for the American marten on the Lassen National Forest (NF) (Zielinski et al. 2011). Monitoring the effects of land management practices requires a habitat model, and resulting map, that is an unbiased representation of important habitat areas. However, previous research on the Lassen NF revealed differences in the locations where martens are detected in summer *and* winter versus primarily in winter, leading to marked differences in the habitat maps that are developed from these location data. The age and sex ratio structure and residential status of martens differs by season, which may explain some of the seasonality difference, especially if locations where detections occur primarily in the winter include animals that are predominately young and dispersing. Habitat models developed using the "winter only" locations may not represent the most important habitat of breeding age female animals.

Twelve individual martens were radio-marked, and fates were monitored at Swain Mountain and Humboldt Peak, areas where previous surveys have detected them primarily in the winter. The purpose was to test the hypothesis that areas where martens are detected primarily in winter include locations without year-round occupancy and that detections in these locations occur only in the winter because young, dispersing animals spend a short period of time assessing the general habitat quality, and, finding it lacking, either move on, die, or persist for unknown periods of time, but do not breed. These animals are much less likely to contribute to population persistence, thus, the habitat choices they make during their movements may be unrepresentative of the resident breeding segment of the population.

*American marten using large diameter snag, Almanor Ranger District*

Ten of the 12 animals studied were male, and 50 percent of individuals that could be aged were 1 year old or less. The sample included only one breeding-age female. Monthly survival rates declined most during the period from July to September. There was no evidence, from either telemetry or seasonal camera surveys, for pronounced changes in the size of the area used by individual martens in winter versus summer. Camera surveys verified the same phenomenon reported in previous surveys that occupancy rates, adjusted for detectability, were significantly higher in winter than in summer. As of July 2011, 14 to 18 months after original capture date, only three of the 12 animals were alive in the original study grid (all were male), and two others were alive off the study grid. Collectively, these characteristics are indicative of relatively poor habitats, where breeding is rare, leading to the conclusion that they are likely "sink" habitats, where death and in-migration rates exceed birth and out-migration rates. The hypothesis was supported by the data on age and sex structure and mortality. Habitat identified on the basis of surveys conducted during the summer is the most likely to identify areas that are important to the marten population.

## Marten Movement Ecology

Oregon State Ph.D. student Katie Moriarty is conducting a field study titled *Habitat use and movement behavior of American martens (Martes americana) in response to forest management practices on the Lassen National Forest*. This cooperative research project has begun evaluating movement patterns of adult martens within and between forest patch types that vary in structural diversity. The intent is to gain new insights on the effects of habitat fragmentation and potential barriers to marten movement on managed forest landscapes.

Objectives of the study are to (1) evaluate the effectiveness of existing habitat models that predict marten occurrence, (2) quantify the type, size, and configuration of openings in managed forests through which martens are willing to move, (3) determine thresholds of "openness" that act as barriers to marten movement, and (4) evaluate the importance of specific micro-site features and potential interspecific interactions that may influence marten movement.

The study is using a variety of observational and experimental methods, including standard (VHF) radio telemetry, satellite (GPS) telemetry, and non-invasive techniques such as snow tracking and track plates. GPS collars used in the study are the smallest made for mammals. This is the first study project to use the collars to track marten, and it will provide new information on marten movement and behavior. Researchers are also using food-titration experiments, which quantify potential predation risk and energetic costs in order to assess marten willingness to travel into contrasting habitat patch types. Through this research, improved prescriptions for management are anticipated with respect to size of habitat gaps, presence of large wood material, and undergrowth vegetation structure. Forest managers will have a better understanding regarding which types of habitat patches are conducive to marten movement.

Fieldwork will conclude in May 2012. The project has successfully captured 46 individual martens on 98 occasions since fall 2009. Of these, 23 were adults and instrumented with a VHF radio collar. Home range and rest site information has been captured on these individuals. Twelve martens have died from either predation (n=9), vehicular strikes (n=1), or undetermined causes (n=2). Necropsies and forensic examination will be performed by veterinary staff at the University of California, Davis, as funding allows. When fieldwork and data analysis are complete, researchers will be able to quantify marten home range size, marten activity patterns, GPS precision, and marten rest site use within the project area, and relate these topics to vegetation composition and previous management. A full report will be available by 2014.

# Songbirds

Point Reyes Bird Observatory Conservation Science (founded as the Point Reyes Bird Observatory) has been conducting songbird monitoring in the Northern Sierra since 1997. In 2011, monitoring in the HFQLG area consisted of continued monitoring of avian use of post-fire habitat, and bird response to fuels treatments, aspen enhancement, and meadow restoration.

*A MacGillivray's warbler forages for food in the dense understory vegetation of a regenerating aspen stand following the Storrie Fire. Understory aspen regeneration is a positive predictor of avian species richness in aspen habitat.*

Post-fire monitoring continued to document use of burns by cavity nesting birds and provided new insight into the effects of fire severity on the avian community. Monitoring found 180 cavity nests of 11

species in 2010 in the following wildfire areas: 35 in Cub, 111 in Moonlight and 34 in Storrie. Abundance was compared for 30 species that breed in the study area, representing a range of habitat types and conditions, between the three fire areas and green forest study sites in the Plumas-Lassen Administrative Study area. Ten species were significantly more abundant in fire areas, and 11 were significantly more abundant in green forest. Avian community metrics of diversity and abundance were significantly higher in green forest in 2010 than any of the three fire areas, while the Storrie fire had the highest indices of the three fires. (The Storrie fire burned in 2000, the Moonlight fire in 2007 and the Cub fire in 2008). All of these metrics were significantly lower on private lands than in the adjoining Forest Service lands. Burn severity was a significant predictor of species richness and total bird abundance in the Moonlight fire, and the effect was curvilinear with highest values at moderate burn index values. In the Storrie fire, species richness and total bird abundance increased linearly with fire severity, though the effect was not significant (Figure 4).

Analysis of bird response to commercially thinned DFPZs in the HFQLG area showed little effect of treatment on species richness in the first 5 years following treatment (Figure 5). Overall, the magnitude of individual species responses to treatment was small.

*Western tanager – a species associated with open forest conditions (like that pictured above right) and a species that responded positively to mechanical DFPZ treatments in the Plumas-Lassen Study area.*

*A mixed conifer forest stand mechanically thinned with variable retention of overstory trees, to invigorate shade- intolerant tree and understory plant assemblages.*

Two of five species associated with conifer tree habitat showed decreases following treatment, one of four shrub-associated species showed an increase, and four of five associated with edges and more open conifer habitat showed increases.

Results from monitoring bird response to aspen restoration continue to show treated stands support greater total abundance of birds and focal species such as mountain bluebird, chipping sparrow, and red-breasted sapsucker (Figure 6). Before and after comparisons of two aspen restoration projects and adjacent reference sites suggest a positive effect of treatment in the short term.

Meadow monitoring results show some northern Sierra meadows still support diverse and abundant bird populations, including several species of conservation concern, while a number of others are in need of restoration to improve meadow bird habitat. Comparisons of restored and unrestored sites in the Red Clover watershed show restoration actions (undertaken by the Feather River Coordinated Resource Management group in cooperation with the Forest Service) are supporting greater abundance and diversity of meadow focal species than unrestored sites (Figure 7). Across the study area, sites with the lowest indices all had a lack of deciduous riparian shrubs and trees, and most had a lack of herbaceous vegetation with incised stream channels now isolated from their floodplains.

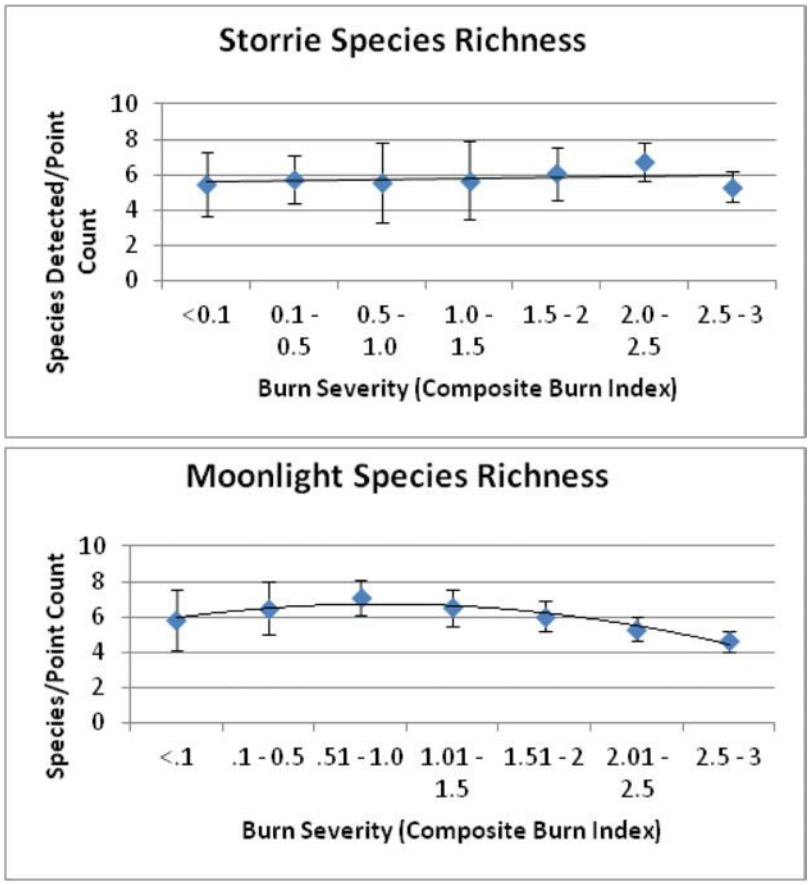



**Figure 4. Effect of Burn Severity (Composite Burn Index) on Avian Species Richness at Two Fires in 2009 and 2010 with Best-Fit Line (Based on Likelihood Ratio Test) and 95 percent Confidence Intervals** (Patterns of fire severity, pre-fire habitat conditions, and time since fire may influence the effect fire severity has on the avian community.)

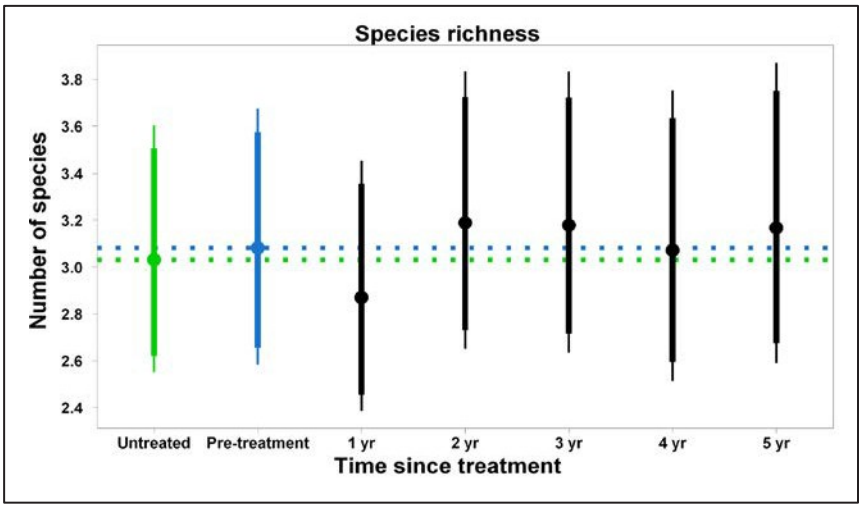



**Figure 5. Per Point Avian Species Richness at Mechanical (Commercial) Defensible Fuel Profile Zones Before (Blue) and First Five Years After Treatment (Black) and Untreated Reference Sites (Green)** (Dots = Mean, Bars = 90 percent and Whiskers = 95 percent confidence intervals. Dotted green and blue lines are the mean of pre-treatment and controls superimposed across the graph to facilitate visualization.)

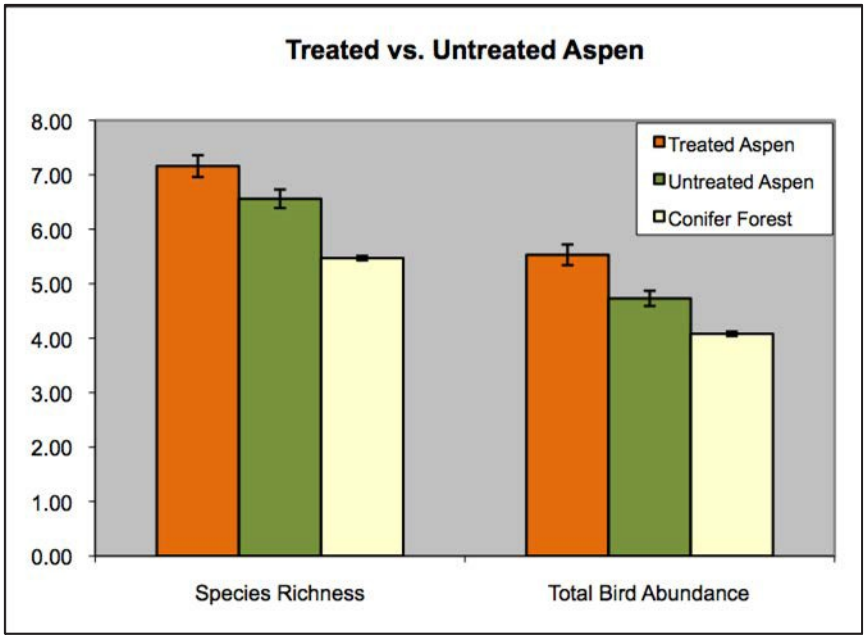



**Figure 6. Mean per Point Species Richness and Total Bird Abundance at Treated and Untreated Aspen Sites on the Eagle Lake Ranger District from 2006 to 2010 Compared to Coniferous Forest in the Plumas-Lassen Study Area from 2003 to 2006 with Standard Errors**

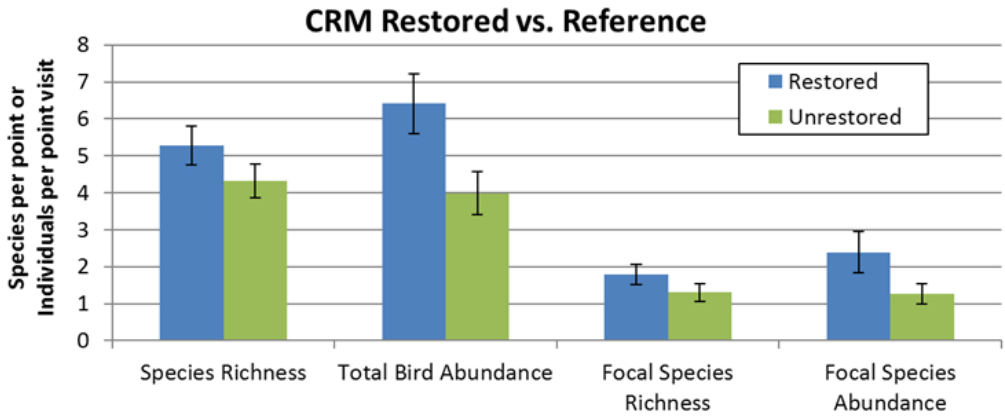



**Figure 7. Per Point Species Richness, Total Bird Abundance, Meadow Focal Species Richness, and Meadow Focal Species Abundance at Feather River CRM Restored and Un-Restored Point Count Stations in Red Clover, Last Chance, and Long Valley Watersheds in 2010, with 95 percent Confidence Intervals**

# California Spotted Owl

Knowledge regarding the effects of fuels and vegetation management on California spotted owls (CSOs) and their habitat is a primary information need in addressing conservation and management objectives in Sierra Nevada forests. Specific research objectives of the CSO study are identified and described in the Plumas-Lassen Administrative Study (PLAS) Plan.

Current information on the distribution and density of CSOs across the HFQLG study area is required to provide the data necessary to build predictive habitat models and provide baseline population information against which to assess post-treatment changes in CSO populations and habitat. Continued monitoring in the Lassen long-term Demographic Study Area is critical for estimating long-term CSO population trends and status. The focus in 2011 was to conduct landscape inventories of CSO distribution and abundance and to continue banding to provide demographic data and baseline information. Efforts were made to monitor the pair and reproductive status of each owl, and to capture, uniquely color mark, and collect blood samples from each individual owl. Capture and color marking are necessary to estimate survival and population trend, and to assess exposure to West Nile virus. All barred and hybrid barred-spotted ("sparred") owls encountered in the study area were also recorded, and data was synthesized for all existing barred owl records for the northern Sierra Nevada.

Of note, the 2011 work continued the fourth year of case studies within the PLAS to assess the distribution and abundance of CSOs across a landscape that had been fully treated under the HFQLG program (Meadow Valley project area). Researchers also completed initial surveys in portions of the Storrie Fire landscape, which had experienced high severity wildfire. This work complements surveys completed in 2008 through 2010 across landscapes that have experienced high severity wildfire (Moonlight-Antelope Complex Fire Area) and low to moderate severity wildfire (Cub-Onion Complex Fire). Thus, the study is positioned to monitor CSO response across the gradient of landscape conditions that are at the core of the CSO-wildfire-forest management monitoring questions (untreated, treated with fuels treatments, high severity wildfire, and moderate-low severity wildfire landscapes).

*California spotted owl.*

## CSO Numbers, Reproductive Success, Density and Population Trends

A total of 68 territorial CSO sites were documented in 2011 across the study area. This total consisted of 48 confirmed pairs, two unconfirmed pairs, and 18 territorial single CSOs. Only one pair successfully reproduced in 2011 (2.0 percent of confirmed/unconfirmed pairs). A total of two fledged young were documented in 2011 (2.00 young per successful nest). Across the 8 years of the study, CSO reproduction has varied annually in percentages of CSO pairs that successfully reproduced, and to lesser degrees in the number of young fledged per successful nest. Approximately 50 percent of CSO pairs successfully reproduced in 2004, 2007, 2009, and 2010, while only 14 to 18 percent were successful in 2005, 2006, and 2008 (Table 19). Annual CSO reproduction is known to vary with both spring weather and variation in prey numbers. In 2011, CSOs experienced a nearly complete reproductive failure likely associated with heavy winter and spring snowfall, and high snowpack and precipitation that occurred into June.

The crude density of CSOs was estimated based on the numbers of territorial owls detected across nine survey areas during 2011 surveys. The estimated crude density across the overall study area in 2011 was 0.058 territorial owls per square kilometer. Overall study area crude densities are not directly comparable across years because different total areas were surveyed in each year. However, crude density estimates within individual survey areas on the Plumas NF indicate similar densities and numbers of territorial sites (pair sites plus territorial single sites) between 2004 and 2010. Numbers appear to have declined somewhat on the Lassen NF survey areas between 2005 and 2008, and then increased slightly in 2009 and 2010. Crude density was lower across the study area in 2011 as a result of a lower number of owl sites in some individual study areas and because of the large number of territorial single sites associated with the overall poor reproductive year.

**Table 19. California Spotted Owl Reproduction on the Plumas and Lassen National Forests 2004 to 2011**

| Year | Percent of confirmed/ unconfirmed pairs with successful nests | Young fledged per successful nest |
|---|---|---|
| 2004 | 49.4 | 1.68 |
| 2005 | 17.7 | 1.47 |
| 2006 | 13.8 | 1.50 |
| 2007 | 55.4 | 1.81 |
| 2008 | 16.4 | 1.70 |
| 2009 | 47.6 | 1.57 |
| 2010 | 49.9 | 1.74 |
| 2011 | 2.0 | 2.00 |

## Lassen Demographic Study Results

Dedicated monitoring of owls on the Lassen Demographic Study continues to provide critically valuable demographic and population trend information for determining the status of owls. Analyses of the demographic data through 2011 continue to suggest that the owl population on the Lassen study area has declined over the 20-year study period, similar to the results through 2005 reported in Blakesley et al. (2010). The estimated mean population growth (where a stable population = 1.0) for the Lassen Demographic Study between 1990 and 2011 was 0.986 (standard error = 0.010), with 95 percent confidence limits ranging from 0.967 to 1.006. The slight increase in the mean population growth rate compared to 2010 resulted from an increased number of owls in the study area during 2010. The decrease in owls documented in 2011 will not factor into the estimate of mean population growth rate until after the 2012 field season because the current statistical models do not provide a reliable estimate of population growth rate for the most recent year of the study. Thus, we would expect the mean population growth rate to decrease when the 2011 estimate is factored in following the 2012 field season. In general, slight increases or decreases in overall mean population growth rate from year to year are expected based on survey results from the previous field season data. Estimates of realized population change, based on the time series of population growth estimates generated from modeling efforts, suggest that there have been declines in the number of territory-holding owls within the study area. These results warrant close continued monitoring of the status of owls within the study area, along with continued management focus on providing high-quality owl habitat during the planning and implementation of HFQLG treatments. Similar long-term demographic data is lacking for the Plumas NF portion of the study area. Estimates of population growth rate will become available as the study is now reaching the duration point at which it becomes possible to provide meaningful estimates. Baseline information on owl distribution and abundance suggests that numbers of territorial owls and sites have been similar year to year across 2004 through 2010, with a decline in the number of territorial sites in 2011.

## Vegetation Sampling – Nest Plots

Vegetation plot sampling was conducted at approximately 100 CSO territories from 2005 through 2010. Approximately 230 Forest Inventory and Assessment (FIA) vegetation plots have been measured for development of CSO habitat models that can be used as adaptive management planning tools. Habitat models are currently being evaluated that can be used to assess projected changes in CSO nesting and foraging habitat suitability under varying fuels and vegetation treatment scenarios.

## Banding, Blood Sampling, West Nile Virus Monitoring

Nineteen CSOs were captured and banded in 2011. Blood samples were collected from four individual CSOs in 2011. Samples from 2009 through 2011 have not been tested yet. None of the 141 individual samples tested at the University of California, Davis, for West Nile Virus antibodies tested positive from 2004 to 2008.

*Underburn completed in spotted owl habitat, retaining key habitat features for spotted owls and simultaneously protecting both the spotted owl habitat and adjacent homes from future wildfire threat, Plumas National Forest.*

## Barred and Sparred (Spotted-Barred Hybrid) Distributional Records

Barred owls have been linked to the continuing decline of the northern spotted owl and are considered a primary threat. They are likely to present a similar threat to the California spotted owl. Recent invaders to the region, barred owls, were first reported in 1989. Seven barred owls and three sparred owls were detected during 2011 surveys within the study area. The synthesis and update of barred-sparred owl records through 2011, based on Forest Service and California Department of Fish and Game databases, indicates that there are a minimum of 60 individual site records across the Sierra Nevada within the range of the California spotted owl. This includes 24 records that have been documented within the HFQLG intensively surveyed study area and 47 records across the broader HFQLG Project Area. The pattern of records suggests that barred-sparred owls have been increasing in the northern Sierra Nevada between 1989 and 2011. This issue warrants continued monitoring and management attention.

## Meadow Valley Project Area, Moonlight-Antelope Fire Area, and Cub-Onion Fire Area Case Studies

The Meadow Valley project area is the first area within the PLAS where full implementation of HFQLG treatments has occurred. Annual monitoring of CSOs between 2003 and 2010 suggested that CSO numbers were fairly stable across the survey period with the number of pairs ranging between six and nine across years. Seven to nine territorial CSO sites were documented each year between 2003 and 2007, whereas six territorial sites were located in each of the first 2 years (2008 and 2009) following full implementation of the treatments across the project area landscape. In 2010, seven territorial sites were documented in the project area landscape. However, four territorial sites were documented in 2011. Initial post-treatment results through 2010 suggested that CSOs were able to persist in the immediate post-treatment landscape, although movements of individual sites were documented in areas that had experienced treatments, as well as in areas that had not experienced treatments, across the overall Meadow Valley project area. Radio-telemetry work completed in 2010 indicated that CSOs avoid using recently treated DFPZ treatments. The decrease in number of CSO sites documented in 2011 may be associated with treatment effects in the Meadow Valley Project Area resulting from full treatment implementation.

Alternatively, high winter snowfall may have affected CSO numbers in the Meadow Valley Project Area. However, while high snowfall was associated with near reproductive failure across the entire PLS study area, the largest decrease in number of CSO sites was documented in the Meadow Valley Project Area. Information on the specific vegetation conditions pre- and post-treatment across the study area, along with consideration of potential weather interactions, is needed to evaluate the association between CSO occupancy and the effects of treatments to reach informed conclusions on treatment effects. Such vegetation data

are being developed for the PLAS and will be available to researchers in 2012 to document these relationships. Collectively, results are documenting the acute responses of CSOs to treatments at landscape, home range, and within home range scales. Detailed information on the post-treatment vegetation responses is needed to more fully explore the effects of treatments on CSOs within the Meadow Valley Project Area and across the broader PLAS. Continued monitoring of the Meadow Valley Project Area would be required to assess if the decrease in CSO sites observed in 2011 persists over time. Further monitoring of additional treated landscapes is needed to provide replicate case studies to determine if similar results are broadly documented in other situations.

The Moonlight-Antelope fire area landscape encompasses approximately 88,000 acres that burned in 2007. These high-severity fires resulted in significant change to the vegetation, with the landscape experiencing about 60-percent high severity fire and 25-percent moderate severity fire. Suitable CSO habitat decreased from 70.1 percent of the pre-fire landscape to 5.8 percent in the post-fire landscape. Twenty-three CSO Protected Activity Centers (PACs, 300-acre management areas) were located in the pre-fire landscape, but it is unknown what proportion of these PACs was actually occupied by CSOs in 2007. In 2008, surveyors documented a single pair of territorial CSOs within the 88,000 acres, plus ten detections of single, apparently non-territorial, male CSOs spread out across the area. In 2009, surveyors detected the same single pair of territorial CSOs and no other CSOs. These results indicate that these high-severity fires have negative effects on CSOs' distribution, abundance, and habitat.

The Cub-Onion Fire landscape encompassed approximately 21,000 acres that burned in 2008. These were largely low- to moderate-intensity fires, with the landscape experiencing about 10 percent high severity, 20 percent moderate-severity, and 70 percent low-severity fire. In the initial year of CSO surveys, 2009, researchers detected six territorial pairs, one unconfirmed territorial pair, and two territorial single CSOs within the fire perimeter area. In 2010, researchers attempted to repeat the complete landscape survey coverage of the Cub-Onion Fire area. However, access to the entire landscape area was precluded by law enforcement personnel due to safety concerns for field crews because of extensive marijuana growing operations protected by armed guards. Due to this limitation, researchers instead conducted focused surveys within approximately 1 to 2 miles surrounding each site occupied by CSOs in 2009. Although surveyors may have missed new sites colonized in 2010 outside focused survey areas, these efforts provided evidence to determine if the 2009 sites were still occupied in 2010. In 2010, surveys documented two confirmed territorial pairs and one unconfirmed territorial pair of CSOs within the fire perimeter, and two confirmed territorial pairs and one unconfirmed territorial pair within the 1-mile buffer. These results suggest that CSOs are able to persist within landscapes that experience predominantly low to moderate severity wildfire. To fully assess the response of CSOs and their habitat to wildfire, researchers are developing and analyzing information on the succession of post-fire vegetation conditions.

## Amphibians

Monitoring was conducted to determine potential effects on amphibians within habitats that may be affected by projects implemented under the pilot project. New methodology to establish baseline data developed in 2009 was continued in 2011 in four areas: Independence Creek (Tahoe NF), South Fork Rock Creek (Plumas NF), Lone Rock Creek (Plumas NF) and Boulder Creek (Plumas NF). Visual encounter surveys were conducted at all sites and all adult mountain yellow-legged frogs (MYLF), a candidate for listing under the federal Endangered Species Act, were tagged. Where sufficient numbers of frogs were present, population abundances of adult MYLF were estimated using mark-recapture analyses. Final analysis of monitoring efforts will be completed in 2012 and reported out in the next monitoring report.

Survey results showed that Independence Creek had the most MYLF for a third year in a row, and that adult population estimates for 2011 were similar to adult population estimates made in the prior 2 years. Independence Creek had a relatively large number of adults, including mark-recapture population estimates of 35.8 males (standard error = 6.3) and 32.7 females (standard error = 5.9). The 2011 MYLF numbers at Lone Rock and South Fork Rock Creeks were low,

similar to the prior 2 years; an estimated 6.3 (standard error = 1.8) adult females and no males were found at Lone Rock Creek, and an estimated 2.1 (standard error = 0.41) females and no males were found at South Fork Rock Creek. In the vicinity of South Fork Rock Creek, two additional adult MYLF were found in a tributary where the species has been found in the past. One adult MYLF was found on Boulder Creek in 2011, compared with two adults found in 2010. Evidence of reproduction (tadpoles) was found at three of the sites, Independence Creek, Boulder Creek, and Lone Rock Creek. Other amphibian and reptile species found in the surveyed areas included Pacific chorus frogs, western toad, long-toed salamander, three species of garter snakes, and rubber boa.

*Mountain yellow-legged frogs (Rana muscosa) on the Plumas National Forest.*

Survey sites were affected by the following activities and events. Lone Rock Creek was affected by the Moonlight Fire and subsequent timber salvage harvest. South Fork Rock Creek was affected by the Meadow Valley project, completed in 2008, which included DFPZs, group selection and individual tree selection. No pre-treatment data was collected at South Fork Rock Creek because the Meadow Valley project was completed prior to the initiation of amphibian surveys. Treatments affecting Boulder Creek, Potosi Creek, and Independence Creek have not been completed to date. Analysis of the effects of treatments will be completed in 2012.

## Watershed Condition

The effects of HFQLG project activities on indicators of watershed condition are evaluated using data compiled by hydrologists during project-level NEPA analyses. For each indicator of watershed condition (Table 20), data from individual project-level watershed analyses are used to compare the analyzed pre-project condition with the predicted post-project condition.

Published research consistently recognizes that roads are one of the primary anthropogenic sources of water quality impacts in forested watersheds. To reduce this impact, road obliteration activities are often implemented with the objective of reducing fine sediment delivery to streams. Within the HFQLG project area, road obliteration activities accounted for a predicted 3.6 percent decrease in road density, a 4.6 percent decrease in near-stream road density, and a 1.6 percent decrease in stream crossings (Table 20). The larger reduction in near-stream roads highlights the fact that road obliteration efforts planned under HFQLG projects have targeted roads in stream management zones (SMZs) and riparian habitat conservation areas (RHCAs) because roads in these areas typically have the greatest impacts to stream condition and water quality.

Past results from another facet of the HFQLG monitoring plan, namely stream condition inventory (SCI) monitoring, suggest that elimination of road-associated sediment sources can decrease the delivery of fine sediment to local streams. For example, pre- and post-project monitoring in the Panther Creek reach on the Lassen NF found a statistically significant decrease in the mean percentage of pool tail fines (one SCI measure used to assess potential delivery of fine sediment) after removal of a culvert, stream stabilization and road obliteration.

Equivalent roaded acre (ERA) is a measure used to quantify the amount of disturbance associated with different management activities and is derived by comparing the effect of a specific activity to that of a forest road. For example, one acre of tractor thinning may count as 0.2 ERA, while 1 acre of forest road prism typically counts as 0.8 to 1.0 ERA. Of the 1.5

million acres analyzed, the predicted post-project ERA is 24 percent higher than the analyzed pre-project condition. The total change in near-stream ERA is smaller (5.9 percent increase), demonstrating that HFQLG activities have been less prevalent in near-stream areas. The threshold of concern (TOC) is another measure that can serve as a yellow flag to indicate an increased risk of detrimental watershed effects. The median post-project ERA percentage for the subwatersheds analyzed is 6.5 percent, which is well below project-level TOCs.

Fine sediment delivery to streams is typically the primary threat to water quality associated with timber projects. Modest increases in land disturbance due to HFQLG project activities as modeled by ERA analyses do not necessarily imply that stream health and watershed condition would be degraded by sediment delivery from the project area. Results from SCI monitoring and BMP monitoring indicate that despite modeled increases in ERAs for project watersheds, project BMPs and protective streamside management zones effectively prevent delivery of project-generated sediment.

Between 2008 and 2011, the SCI protocol was applied to 17 streams downstream of HFQLG vegetation treatments where pre-project data had been measured. Analysis generally indicated that pre- and post-project sediment estimates were not significantly different, indicating that HFQLG vegetation treatment activities did not result in increased sediment delivery. One notable exception occurred in 2011 when fine sediment at the tail end of pools on Louse Creek indicated a statistically significant increase from the pre-project condition.

BMP effectiveness monitoring also demonstrates that increases in modeled ERA values do not necessarily imply degradation of stream or watershed condition due to sediment delivery. For HFQLG vegetation management projects, BMP effectiveness evaluations are conducted to assess practices associated with stream course protection, skid trails, landings, and prescribed burns. These evaluations focus on whether or not project-generated sediment is delivered to streams or whether channel banks are disturbed. Of the 909 evaluations conducted to date, 864 were rated as effective, resulting in a 95-percent BMP effectiveness rating.

In contrast, monitoring has detected some examples of increased sediment delivery in watersheds with drastic increases in ERA. In 2007, the Moonlight Fire burned over 46,000 acres of Forest Service land with roughly 75 percent of that area at moderate or high soil burn severity. The wildfire resulted in an increase in ERA to 13.3 percent of the total watershed area, compared to the pre-fire condition of 1.3 percent. This ninefold increase far exceeds the average increase in ERA caused by HFQLG timber projects quoted above. The post-fire ERA also exceeds the threshold of concern of 13 percent. A comparison of SCI monitoring results in Moonlight Creek for 2005 and 2008 demonstrated a large and statistically significant ($p<0.000001$) increase in pool tail fines, from 4.2 to 15.7 percent. Subsequent SCI monitoring in 2011 indicated that the fraction of pool tail fines was recovering to pre-project levels, which is expected as the burned ground heals and re-vegetates.

*Stream inventoried on Almanor Ranger District.*

**Table 20. Summary of Watershed Condition Monitoring Results (2011)**

| Watershed Condition Indicator | Total acreage of sub-watersheds reporting | Unit of Measure | Pre-Project Condition | Post-Project Condition | Percent Change |
|---|---|---|---|---|---|
| Road Density | 915,000 acres | miles per square mile | 3.31 | 3.19 | - 3.6 |
| Near-Stream Road Density | 474,000 acres | miles per square mile | 3.91 | 3.73 | - 4.6 |
| Equivalent Roaded Acres (ERA) | 1,525,000 acres | equivalent roaded acres | 77,700 (5.1% of basin area) | 96,600 (6.3% of basin area) | + 24 |
| Near-Stream ERA | 289,000 acres | equivalent roaded acres | 2,700 | 2,860 | + 5.9 |
| Number of Road / Stream Crossings | 674,000 acres | number | 4,603 | 4,529 | - 1.6 |

## Stream Condition Inventory

Stream condition inventory (SCI) tracks the trend of selected stream channel attributes in a series of streams before and after implementation of HFQLG project activities. Nineteen streams were monitored during 2011. Monitored streams included pre-project, post-project, reference, and post-fire reaches.

Monitoring crews used the Region Five Stream Condition Inventory protocol (Frazier et al. 2005). The protocol includes parameters important in classifying and assessing condition of channel morphology, fish habitat, and water quality. Because a reduction in shade and increase in stream sediment are the primary concerns associated with HFQLG projects for aquatic systems, data evaluation focused on a measure of stream shading and three measures of channel sediment (percent pool tail fines, percent of particles less than 2 mm and residual pool depth). Treatments located within streamside areas would be expected to reduce the amount of shade in the short term, while increased erosion and sediment delivery from projects would be expected to increase both pool tail fines and the percentage of particles less than 2mm. Increased sediment delivery might also increase deposition of sediment in pools, thereby reducing residual pool depth. All three changes are considered detrimental to fish habitat.

To provide a gauge for natural variation in the attributes measured, surveys are conducted annually of streams from watersheds with relatively low levels of watershed and streamside disturbance. In 2011, eight reference reaches were surveyed. The most notable variations this year were in Cottonwood, Rock, and Sagehen Creeks. Cottonwood Creek exhibited a significant decline in percent pool tail fines between 2010 and 2011, while Rock and Sagehen Creeks showed significant declines in stream channel shade. Percent pool tail fines values have varied widely over the course of five years of data collection on Cottonwood Creek, and this is likely attributable to Cottonwood Creek's being a low-gradient, response-type system. Response-type streams typically exhibit high variability in pool tail fines values between years. Significant shade declines observed on Rock and Sagehen Creeks are likely the result of strong storms blowing down shade-providing conifers during the winter of 2010/2011. This theory is supported by the relatively large increases in large woody debris observed within these streams between 2010 and 2011.

The 2011 monitoring effort includes nine comparisons of stream condition as assessed by the SCI protocols either before or after implementation of HFQLG activities, or following wildfires within the HFQLG planning area. Pre-project data was collected from 2005 to 2010. Data analysis focused on attributes that would reflect sediment input resulting from project activities, and on stream channel shade. Key findings for these reaches follow.

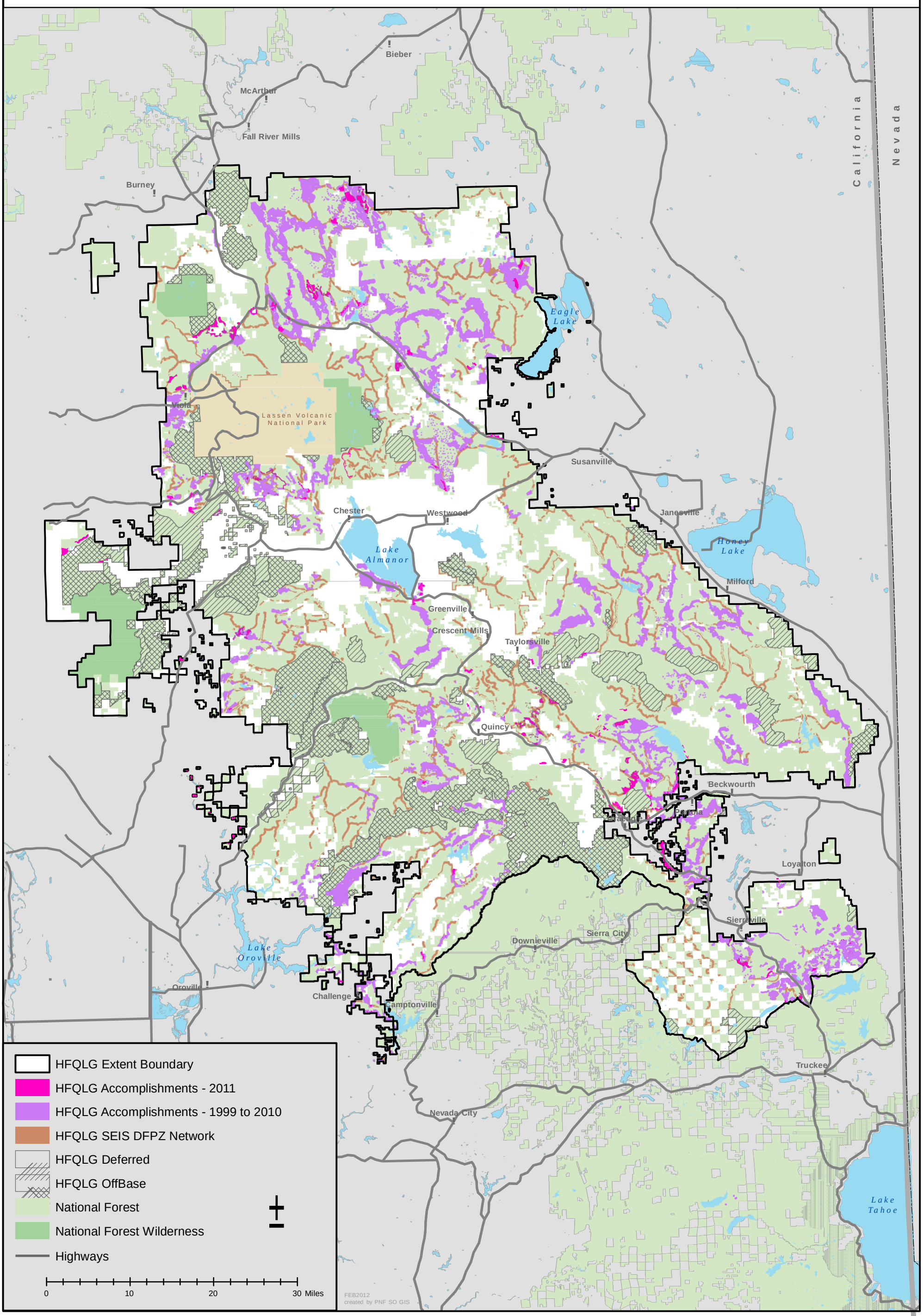
*Cow Creek restoration project had a stream condition inventory before and after project implementation, Beckwourth Ranger District.*

Survey efforts conducted on Louse Creek (Lassen NF) showed a statistically significant increase in pool tail fines following project activities, from approximately 2 percent to 6 percent. Despite this increase in fines being statistically significant, a value of 6 percent remains well below the general threshold of 15 percent pool tail fines described in the Sierra Nevada Forest Plan Amendment's Riparian Management Objectives (SNFPA RMOs) (USDA 2001). It is unlikely that this increase in pool tail fines will adversely impact aquatic fauna in Louse Creek.

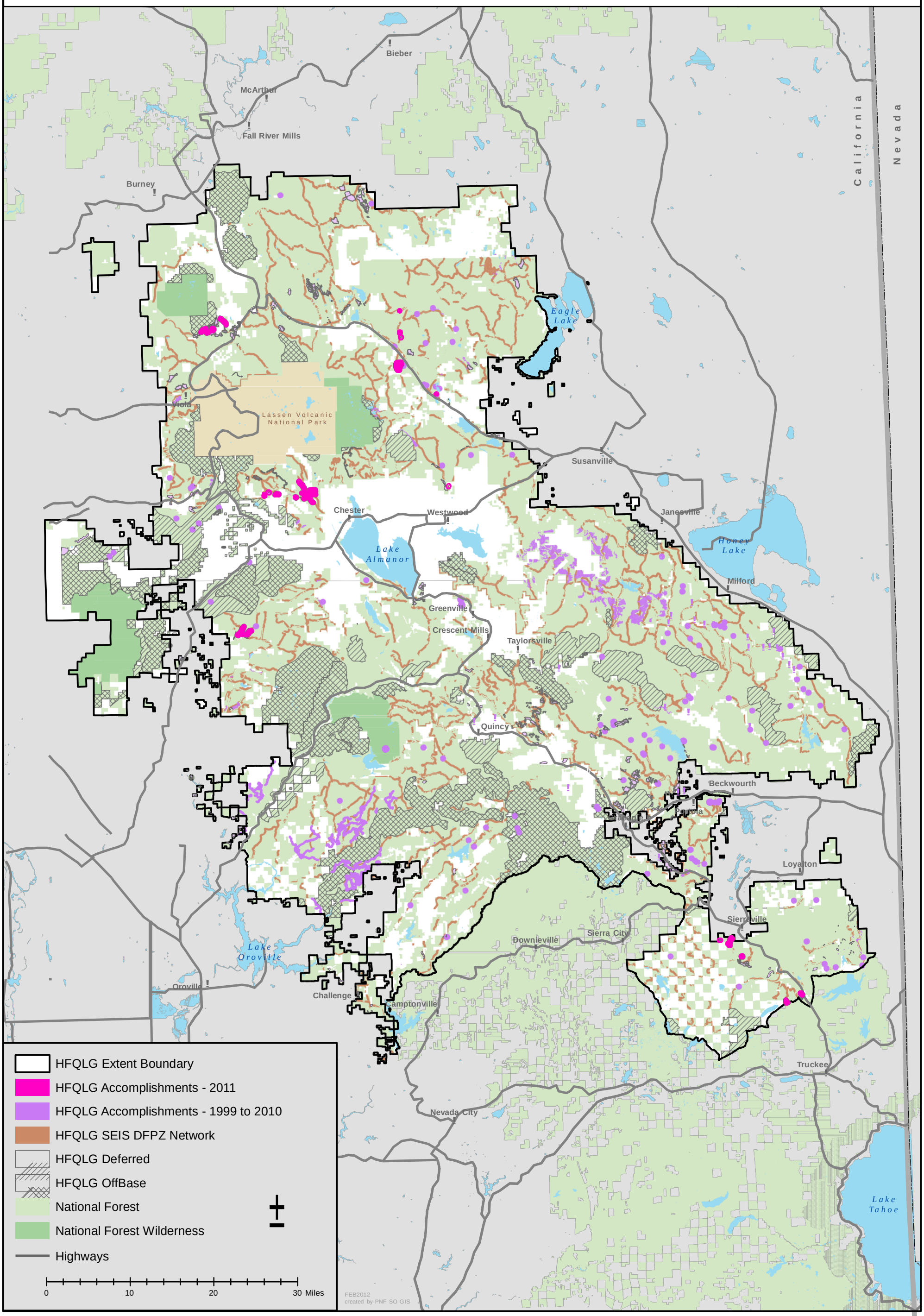
Post-project monitoring within Dark Canyon (Tahoe NF) showed a statistically significant decrease in residual pool depths following project implementation. Residual pool depths decreased by an average of 19 centimeters. The 44-percent decrease in residual pool depths observed within the Dark Canyon monitoring reach may be a cause for concern. However, it would be expected that a decrease in residual pool depths would be accompanied by an increase in percent pool tail fines, and pool tail fines measurements showed no significant change between pre- and post-project surveys. Pre-project data on Dark Canyon was collected in 2006. Analysis of reference streams surveyed over a similar period of time (4 to 6 years between surveys), including reaches within the same National Forest as Dark Canyon (Tahoe), showed that some reference streams exhibited similar changes in residual pool depths. Since no other attributes measured showed a negative change between pre- and post-project surveys, it is unclear whether the decline in residual pool depths in Dark Canyon was the result of project activities upstream, natural variation, or a combination of the two.

Post-fire monitoring efforts on Moonlight and Cub Creeks indicated significant decreases in stream shade for both creeks compared to pre-fire conditions, which were 78 and 97 percent shade, respectively. The Moonlight Creek watershed experienced high-severity burning in 2007. Stream channel shade for 2011 remained significantly reduced from pre-fire conditions; however, channel shade has significantly increased between 2010 and 2011. This increase in channel shade between years is attributable to a resurgence of riparian vegetation along the stream corridor, particularly willows. The decrease in stream shade between 2008 and 2009 post-fire surveys is likely the result of falling dead timber between the survey dates. This theory is supported by the fact that large woody debris counts have dramatically increased between 2008 and 2010. The monitoring reach on Cub Creek was exposed to wildfire, but did not burn as severely as upland areas in the watershed. Stream channel shade measurements taken in 2011 within the Cub Creek monitoring reach remain slightly lower than pre-fire shade measurements (96.5 percent shade pre-fire versus 91.7 percent in 2011). No significant change in shade measurements was observed between 2010 and 2011 within the Cub Creek monitoring reach, indicating that streamside vegetation has yet to return to pre-fire conditions of 2007. Future monitoring efforts will be required to assess streamside vegetation recovery on Moonlight and Cub creeks.

# Herger - Feinstein Quincy Library Group
# FY99 Through FY11 Vegetation Management Accomplishments



# Herger - Feinstein Quincy Library Group
# FY99 Through FY11 Riparian Restoration Accomplishments



Plumas & Lassen National Forests

Sierraville Ranger District, Tahoe National Forest

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