

New Mexico Forest Inventory and Analysis: American Recovery and Reinvestment Project Field Report 2010-2012

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Abstract

For a 3-year period, from 2010-2012, the New Mexico Forestry Division utilized contractors to collect Forest Inventory and Analysis (FIA) data in New Mexico. Funded through the American Recovery and Reinvestment Act, the State partnered with the Interior West FIA Program. Together, both agencies collected data on approximately 6,450 plots. This effort represents the largest statewide inventory of forest and woodlands to date for New Mexico. The data collection schedule deviated from standard FIA protocols of collecting annual panels of data each year; in contrast, this project collected data on an accelerated, compressed schedule that rapidly produced a current and comprehensive forest inventory dataset. Data analysis is published elsewhere and the focus of this report is to document the process of the data collection.

Keywords: forest inventory and analysis (FIA), field procedures, partnership, American Recovery and Reinvestment Act (ARRA), New Mexico

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Introduction

In the spring of 2009 the State of New Mexico, EMNRD- Forestry Division applied to the Southwest Region of the U.S. Department of Agriculture Forest Service (Forest Service) for a grant under the American Recovery and Reinvestment Act of 2009 (ARRA) to collect Forest Inventory & Analysis (FIA) data. The original request was for \$12 million based on estimates provided by Forest Service staff working on FIA. In October 2009, \$4 million dollars was granted to the State to do a portion of the collection.

This report documents processes, decisions, people, and actions that were involved in this project. The primary audiences for this report are those utilizing this data, undertaking a similar project, and/or interested in the finer details of this project. This report is organized into three sections: Background, Implementation, and Discussion. The *Background Section* describes the FIA program, the status of New Mexico data at the start of this project, and the ARRA grant. The *Implementation Section* discusses contracts and contractors including participating Tribes, training and quality control for data collection, landowner permission and denied access, and plot assignments and data collection. The *Discussion Section* includes an explanation of projects that were considered but not implemented, describes the involvement of the New Mexico FIA users group, documents the functioning partnership that developed between State Forestry and the Forest Service FIA program, outlines the future needs for FIA data in New Mexico, and explores the potential impacts of newly collected FIA data for the State.

This report does not address analysis of the data. The Forest Service Interior West FIA Analysis team has developed a State report (Goeking and others 2014) that provides general analysis of the data. The data is also available on the internet through the Forest Service's FIA website.

Background

Forest Inventory and Analysis Program and Data

The FIA program's mission is to conduct and continuously update a comprehensive inventory and analysis of the present and prospective conditions of renewable resources of the forests of the United States. The inventory consists of a grid of permanent sample locations known as plots. Theoretically, each plot in the Interior West region is visited every 10 years. Not only is the current information from the plot

valuable, but the change in conditions since it was last visited provides important trend information. Prior to 2000 data was collected as a series of periodic inventories. Crews would cycle through each State spending a few years collecting data upon which a report was written for that State. When the data collection was completed for a state, the crews moved on to the next state, returning on an approximate 10-year interval. In the year 2000, the national FIA sample design was adapted to involve an annual collection, such that data was collected each year in each State. In the West, each state's set of plots were divided into 10 annual panels. One tenth of the plots were to be visited each year. After 10 years, the process would start over again, with field crews visiting the first set of plots in the eleventh year. This staggering of data collection allows for landscape scale events such as insect outbreaks and mega-wildfires to be recorded in the years when the impact is greatest.

The plots are located on all jurisdictions including Federal, Tribal, State, local governments, and private land. Landowners or managers are contacted to gain access to the plots. Landowners have the right to deny access. Landowner privacy is an important part of the program, and information about landowners is not available to the public. Tribal data is also given special protection. Access to information that would allow someone to determine that plots occur on specific Tribal lands requires approval of the Tribe and Bureau of Indian Affairs representatives.

Although the program was initially developed to estimate marketable timber volumes, over the years the data collected and data uses have expanded to include measures of plant diversity; fuels and potential fire hazards; condition of wildlife habitats; mortality and risks associated with fire, insects, or disease; biomass and carbon storage; forest health; and other general characteristics of forest ecosystems. The program does not document or look for endangered species.

Data collection is a complex process that requires a natural resources education. The field procedures manual that outlines how to collect the data is over 400 pages in length and requires a professional background to interpret. Generally, a two-person crew can collect all the necessary data required for a plot in 1 day, though some plots may take longer.

History of FIA Data Collection in New Mexico

The Federal government has been collecting forest inventory data nationally since 1930. However, periodic inventory data collected in New Mexico in the 1950s and 1960s followed different protocols (Choate 1966). Those inventories used aerial photographs to summarize large areas of forest land and timber volume. Plot data either was not collected or was not retained from those inventories, so they are generally

not comparable to FIA data collected today (personal communication with Sara Goeking, February 2013). However, there are three datasets that were collected prior to this ARRA project. Two periodic inventories were conducted in New Mexico in the late 1980s and the late 1990s. Additional plots were established in the early 1990s on the Gila National Forest.

The oldest FIA data currently available for analysis was collected in New Mexico between 1985 and 1987. Due to budget constraints approximately 1,100 forest plots were sampled. Most of these plots were sampled using a protocol that called for a single fixed radius plot. The Gila National Forest intensified this sample in 1993 and 1994 by collecting data on more than 400 forest plots (O'Brien 2003). The protocol at that time used sub-plots with a variable radius methodology. Another periodic inventory occurred in 1996 through 2000. However, due to reduced budgets, many of the plots from the 1987 inventory were not revisited, but instead the growth was calculated for these plots for the 2000 State report. The methodology in the 1999 sample included 4 sub-plots with fixed radius similar to the layout used currently. Data was gathered on just over 800¹ forest plots between 1996 and 1998, which was combined with earlier periodic data to summarize New Mexico's forest resource in a second State report (O'Brien 2003).

As part of the 1999 inventory, FIA continued to collect data on nearly 340 additional forest plots in New Mexico until 2000, the same year that the national FIA program switched to annual data collection. The decision was made to defer collecting annual data in New Mexico, apparently because the State had a recent data set. However, each year, due to budget constraints, the decision to collect data in New Mexico continued to be deferred.

Since the earliest panel for New Mexico is designated as the 2005 panel, it is clear the Federal program had intentions of gathering New Mexico data; yet this was not happening. Meanwhile, a significant outbreak of piñon bark beetles in the State between 2002 and 2004 was going unrecorded, as well as the impact of major forest fires such as Cerro Grande (2000) and the Ponil Complex (2002). State officials were becoming increasingly alarmed at the lack of action in collecting forest inventory data in the State.

¹ O'Brien reports 819 plots measured prior to publication of the 2000 report; however, not all of these plots are utilized in the current database based on updated definitions.

On February 15, 2007 Governor Bill Richardson sent a letter to U.S. Forest Service Chief Abigail Kimball urging full funding for FIA data collection in New Mexico. The letter cited the need for a Statewide Assessment identified in the State's Forest and Watershed Health Plan and explained that current FIA data would be necessary for this assessment.

Forest Service FIA crews started collecting data from the 2008 annual panel in 2008, and continued on the same panel in 2009; they collected data on 453 forest plots during this time period. The majority of the plots visited during this time were on Federal land. The crews worked in the State on a temporary basis at the beginning and ending of field seasons in other States.

NM – FIA ARRA Grant

In 2009, the State Forester met with the director of the Rocky Mountain Research Station, the director of the Interior West FIA program, the Southwest Regional Forester, and representatives from the New Mexico congressional delegation to discuss the lack of current and comprehensive FIA data for New Mexico. At the time, grant proposals for hazardous fuels projects were being solicited from the Forestry Division through the U.S. Forest Service for the newly established American Recovery and Reinvestment Act (ARRA) program. The professionals from the congressional delegation offices urged the State to also submit a proposal for collecting the lacking FIA data utilizing the ARRA program funding.

FIA data collection was identified as the State of New Mexico's Forestry Division's highest priority for ARRA funding. The project would have a favorable ratio of funds spent on worker income versus equipment expenses, and the data would directly benefit economic development within the State on many levels. The project would also build capacity within the State to continue data collection and avoid future data gaps. Despite the ranking and the logical argument, the project was not funded in the first round of allocations, but did get approved by October of 2009.

The State has managed the program in cooperation with the U.S. Forest Service's Interior West FIA program under a memorandum of understanding (Appendix A). Utilizing ARRA funding, the State contracted the data collection to private contractors and local Tribes. With regular FIA program funds, Forest Service inspectors collected additional data in the State and insured the data collected by contractors met national program standards.

Information has been gathered on all jurisdictions; coordination includes working with the New Mexico State Forestry, New Mexico State Land Office, the Southwest Region and the Rocky Mountain Research Station of the Forest Service, the Bureau of Land Management New Mexico State Office, various Department of Defense facilities, National Parks and Monuments, many city and county governments, dozens of Native Tribes, and thousands of private landowners.

Implementation

Contracts and Contractor Selection

Contractors were selected following New Mexico State law, procedures and policies. There were two solicitations, one in the spring of 2010 and one in the spring of 2011. A Request for Proposals (RFP) for professional services (due to the depth of professional knowledge required to complete inventory plots) was posted on the Division's website. Additional outreach included developing a list of 26 potential contractors from agencies that had previous FIA contracts. A special outreach effort was made to forestry contractors in New Mexico and to Tribes with natural resource management programs. Prior to advertising the RFP, the project was presented to the New Mexico Abilities, a state-affiliated non-profit agency, who advised the State that they had no potential qualified providers.

Six proposals were submitted in 2010 and three contractors were selected: Chestnut Ridge Forestry, South Wind Conservation Inc., and SWCA Environmental Consultants. Contract amounts could not exceed \$1 million dollars and assignments were made between the three companies based on capacity. For the RFP posted in the spring of 2011, six bids were received and three contractors selected: Chestnut Ridge Forestry, South Wind Conservation Inc., and SBH Contracting. Assignments were again made based on capacity.

One lesson learned with these contracts was that each contract designated specific plots to be completed by that contractor; therefore, changing plot assignments due to access or other issues required a contract amendment. Each of these contracts was amended three times, which is the maximum number of allowable amendments. Therefore in 2011 for the next round of contracts, the new personal service agreements did not include plot assignments; instead, plots were assigned by work orders. There were between 6 and 16 work orders on each of these contracts adjusting plot assignments. The other major difference between the 2010 contracts and the 2011 contracts was to raise the

Quality Control standard from 85% to 90% to conform with FIA's national data collection protocols.

Plots were grouped into various categories for bidding. All plots were Phase 2 (P2) plots but were divided into P2 regular or P2 marginal categories based on the status of the plot as undeniable forest land or possible forest land. Any plot that meets the FIA definition of "forest land" requires further field measurements, while any plot that does not meet that definition is recorded as non-forest and does not have additional data collected. A visit type value from the FIA field database (MIDAS) was used to determine the classification. P2 regular plots had a visit value of 1 (forest) or 2 (woodland) that had been determined in the office during plot preparation. P2 marginal plots had visit values of 3-5, which indicated that office staff was uncertain the plot met conditions to require a field sample, but did require a field visit to make that determination. Federal crews commonly refer to P2 marginal plots as "checker" plots. Table 1 lists the successful bid prices for the 2010 contracts and table 2 lists the successful bid prices for the 2011 contracts.

Table 1—2010 Successful bid prices for contracts (All prices are per plot).

Offerers	Project manager	Project size	Price range - regular	Price range - marginal
SWCA	Coleman Burnett	Bernalillo, Navajo Nation, Rio Grande Pueblos, Western Pueblos	\$1526.53 - \$1593.42	\$854.86 - \$879.90
Chestnut Ridge Forestry	Joel Fyock	All	\$1048 - \$1325	\$840 - \$890
Southwind Wind Conservation, Inc.	J. Ike Wennihan	All but RG Pueblos; Western Pueblos; and Mescalero	\$791.12	\$631.43

Table 2—2011 Successful bid prices for contracts (All prices are per plot).

Offerers	Project manager	Project size	Price range - regular	Price range - marginal
Chestnut Ridge Forestry	Joel Fyock	All	\$888 - \$928	\$725 - \$765
Southwind Wind Conservation, Inc.	J. Ike Wennihan	All but Cimarron District	\$1175 - \$1200	\$900-\$925
SBH Contracting	Stuart Hall	Capitan, Chama, Cimarron Districts	\$1,100	\$850

Tribal Participation

Although no Tribes bid on the statewide contract, Tribes were provided the opportunity to collect the data on their own Tribal lands, as allowed by the State-Tribal Collaboration Act. Initially four Tribes opted to participate: Navajo Nation, Mescalero Apache, Pueblo of Santa Clara, and Ramah Navajo. Work plans were developed under existing Joint Powers Agreements for Navajo Nation, Mescalero Apache, and the Pueblo of Santa Clara. We were not able to develop an agreement with Ramah Navajo due to unresolved issues of contract legality. In the fall of 2011 the Pueblo of Taos offered to participate. There were multiple delays with their agreement; it was not approved by the State until late summer in 2012, which conflicted with the Tribe's hunting program so they had to decline the agreement.

Tribes did not bid on the project and were offered a flat fee of \$1200 per plot (no distinction between P2 regular and marginal plots was made). Table 3 list the number of plots for which each Tribe collected data on their reservation.

Table 3—Number of plots contracted to tribes.

Tribe	Plots
Navajo Nation	186
Mescalero Apache Tribe	41
Pueblo of Santa Clara	6

Training and Quality Control

High quality data is essential to the effectiveness of the FIA database. Over the years, the Forest Service has developed a complex Quality Assurance/Quality Control (QA/QC) process. Rather than re-invent the wheel, the State adopted and adapted the existing QA/QC program. This section discusses contract requirements, training, inspections, blind check plots, and problem resolutions. Throughout our QA/QC process, we had an excellent collaboration between Federal Forest Service staff, State Forestry staff, and contractors. One of the key contributing factors to this success was frequent communication.

Contract Requirements—Our intention in the contract was to have identical standards for Quality Assurance/Quality Control as required by the Forest Service crews. Unfortunately, due to miscommunication, our contracts in 2010 listed the passing score for a quality control inspection as 85%. After the contracts were issued, we learned that the FS crews were required to earn a score of 90% to pass. Fortunately,

we had very few passing scores under 90%, and in most cases this was due to a missed tree or another mistake that was easily corrected for that plot. The 2010 contracts with the 85% minimum included the first contracts for South Wind Conservation, Inc.; Chestnut Ridge Forestry; the contract for SWCA Environmental Consultants; and the work plans for Mescalero Apache, Navajo Nation, and the Pueblo of Santa Clara. The 2011 contracts for Chestnut Ridge Forestry, South Wind Conservation, and SBH Contracting required a score of 90% to pass the quality control inspection.

A sample copy of the 2011 contract is provided in Appendix B. The Scope of Work required contractors to adhere to the Interior West Forest Inventory & Analysis P2 Field Procedures, commonly referred to as the field manual. The 2010 contract referenced Version 4.0 of this manual for the 2010 and 2011 field seasons. Version 4.0 refers to both the field manual and the MIDAS software program used to collect data on digital data recorders. An amendment to the 2011 contracts and the continuing Tribal work plans referenced Version 5.0 for the 2012 field season². The Scope of Work also required the contractors to gain legal access to each plot. Although contractors were not paid for plots where access was denied, they were required to document the denial before receiving new plot assignments. The language regarding inspections is located under the Compensation heading.

Training—The primary goal of the ARRA FIA project was to collect quality data that would meet or exceed the quality of data collected by Federal crews. Therefore, an FIA training workshop was held in Silver City from June 17 to June 24, 2010, to train the crew leaders who were working for each of the contractors and Tribal programs. Students included 46 contracted staff and eight staff from State Forestry (Appendix C). Approximately nine Federal FIA staff provided the training on data collection methods and the use of portable data recorders using MIDAS software (Appendix D). Several specialty instructors provided sessions for identifying insects, diseases and habitat types. Following this training session, contractors were responsible for additional training for the staff and any new hires. Several contractors spent additional days with crew leaders working together on the same plots until they felt they had developed thorough competence to work alone or in pairs. Most training of new hires after this initial training course occurred in a

² While the USFS crews started using the Version 5.0 manual in other States for the 2011 Field Season, the plan in New Mexico was to complete the ARRA project by December 2011 so the decision was made not to switch protocols for 2011. Once the decision was made to extend contracts to 2012, it was imperative to switch the data collection to the Version 5.0 manual for the 2012 field season.

one-on-one environment. In 2011 a single individual successfully bid and received a contract. He spent several days with Federal crew leaders to come up to speed on specific FIA inventory requirements.

Additional 2-day trainings were sponsored by the State in February and April of 2012 to review the changes from the Version 4.0 to Version 5.0 of MIDAS and the field manual. These workshops were held at the Sevilleta Long Term Ecological Research station near La Joya, New Mexico. Contractors also attained access to the national MIDAS database; in 2012 crew leaders, rather than inspectors, were responsible for loading data and photos for each plot.

Equipment—Contractors were required by the contract to provide all of the field gear necessary for installing and measuring plots. However, the Forest Service chose to provide some of the supplies to ensure consistency throughout the survey: RP and witness tree tags, steel and aluminum nails, sample envelopes for leaf samples, and micro-climate sensors. In addition, the State provided heavy gauge wire for use as plot center stakes. A list of recommended field equipment is included in Appendix E.

Contractors were required to provide a data recorder for each crew leader. The type of data recorder was limited because it had to have the capability to run the MIDAS software. Many cheaper data recorders are available that work fine for continuous forest inventory and other inventories; however, the devices that handle the MIDAS software are more expensive. This cost was anticipated upfront and emphasized with potential bidders. The U.S. Forest Service crews use the Juniper Allegra, and those contractors who purchased this device were able to get more specific assistance in trouble shooting software problems.

The other device that required a higher level of accuracy was the GPS unit. National FIA protocols require that GPS units are capable of averaging to provide more accurate location information.

Quality Control Inspections—Inspections were handled by seasoned, well-qualified Forest Service FIA crew leaders who worked for the Interior West FIA Program. The majority of the inspections were done by three individuals: Jim Dexter, Dave Herwig, and John Capuano; however, there were times when other Forest Service personnel helped out, particularly at the end of each field season. The State developed a plot packet handling protocol (Appendix F) and provided procedures for bundling packets into sets and submitting them for inspection.

The inspectors followed standard protocols that provided for scoring a sample that represented 10% of each set of plots. Generally, there were 10 plots turned in for each set, and an inspector would select one plot

to visit. Based on contract language, the minimum passing score varied between 85% and 90%. However, only a few of the passing scores were below 90%, and most scores were above 95%.

Contract crew leaders were in direct communication with the inspectors to arrange drop off points for the sets. Crew leaders would print out the reports generated by the MIDAS software and leave them in each packet. At the same time, crew leaders or contractors were required to send an email to the ARRA project manager, the ARRA grants manager, and the Forest Service FIA supervisor for New Mexico and Arizona to initiate tracking the set through the inspection and payment process. However, this step was often missed, and the State did not learn of the sets until they received an inspection report from the Inspectors.

For the most part, this process worked with one major exception. At the end of 2011 and in early 2012, the usual inspectors were not available; however, the crew leaders with the Navajo Forestry program were finishing up their assignments. The personnel assigned to inspect the plots during this time period did not provide inspection reports to the State and it took over a year to determine which plots had or had not been completed. In addition, the use of varied personnel on this project was frustrating for the crew leaders because of the variation in expectations among the various inspectors.

Blind Check Plots—Another aspect of the QA/QC program is to have field crews revisit plots that another crew has completed. The second crew does not have access to the original crew's data, so these are referred to as blind check plots. Analysts use the data to identify the reliability of the values collected, or quality assessment. The programmatic goal is to collect this data on 3% of the plots. In 2010, blind check plots were only assigned within each contractor group, so although the blind plot check was done by a different crew leader, they both worked for the same company. In 2011 and 2012 there were some cross-company assignments. A total of 134 blind plots were completed by contractors, which represented 3.4% of the total number of plots inventoried in the contract program.

The selection of blind plots included some bias, because selected plots were generally on public lands where access would not be a major issue. Also, plots that were identified in the first visit as non-forest land were generally not selected as blind plots. Because blind plot assignments were being made before the first visit, this was achieved by only selecting plots that had a visit value of 1 (forest) or 2 (woodlands). When an access problem arose due to weather, terrain, or access permission the plot was removed from the contractor list and a different blind plot was assigned.

Ideally, the programmatic goal is to have blind plots visited within a month of the original assignment. Since blind plots were assigned with regular plots and there were no contract specifications on when these plots were completed, there were some blind plots that were inventoried the field season after the original data collection. Any assigned blind plots that had catastrophic disturbance (wildfire) was removed and replaced if the fire occurred after the first visit but before the second visit.

Landowner Permission and Denied Access

One of the most critical coordination tasks for the field collection of FIA data is acquiring permission and access to the plots. Not only is this important for private lands, but each jurisdiction has its own requirements. This section will discuss land access issues for private landowners, State Trust Lands, Tribal access, Department of Defense access, National Park Service access, and access issues on public land administered by the Bureau of Land Management and the National Forests. In addition, special situations, such as recently burned areas, require additional access considerations.

Many of the issues described here are not unique to New Mexico but are also relevant to other States. They are described here for the purpose of documenting how this project dealt with those issues and the lessons that were learned. The aspects of the New Mexico forest inventory that are unique, relative to other States, is that the State Forester's office handled most requests and communicated extensively with private landowners and Tribal representatives; that the denied access rate was higher on private lands than it typically is in other States; and that the ARRA project manager, rather than Forest Service staff, was able to facilitate access to plots across all jurisdictions within New Mexico.

In keeping with the national FIA privacy policy, plot locations are not released. The first reason is to protect the privacy of landowners and the resources on their land. The second reason is to protect the plot location from being managed differently than the surrounding forests, so that the plot is representative of the surrounding area.

In the FY2000 Consolidated Appropriations Bill (PL 106-113), Congress included language that modified the Food Security Act of 1985 (7 U.S.C. 2276(d)) to add FIA data collection to a list of items requiring confidential treatment. Among other things, the law prevents FIA from disclosing sample locations in such a way that individual ownership can be determined, and specifies criminal penalties for violations. Current FIA policy (Forest Service Handbook Interim Directive number 4809.11-2003-1) permits public release of FIA

sample coordinates rounded to the nearest 1/2 to 1 mile with a random set of locations swapped within a State. Such inexact coordinates prevent association of individual sample locations with individual owners, but will still meet the needs of users looking for approximate geographical location of data.

The following principles have been developed to implement this policy:

- We obtain landowner permission prior to collecting data.
- We never release the name or address of private landowners to the general public.
- We require any person or organization providing products or services to FIA to protect the confidentiality of FIA information on our behalf through a data security certification process.
- We allow reporting of data only in such a manner that individual landowners cannot be identified.

One of the primary cooperator categories for the Forestry Division in New Mexico is private landowners. Foresters for the State also work closely with the State Land Office, the State's Department of Game and Fish, and the State Parks. The Forestry Division has also been directed to take a leadership role in coordinating multi-jurisdictional cooperation across the landscape. To maintain and enhance these relationships, the State decided to directly manage the landowner permission aspect of this project. State officials were optimistic that their long-term, positive history of working with private landowners, State and Federal agencies, and Tribes would pave the way for lower access denied percentages. On the contrary, the actual level of access denied plots (15% for all jurisdictions and 38% for private land³) ended up setting a regional record for highest rate of access denied in any of the western States. This situation is further considered in the discussion section of this report.

Access on Private Lands—The land ownership category is initially determined through GIS layers in the Ogden office and then sent to the field for verification. Federal crew leaders made visits to court houses and utilized online databases to build a spreadsheet of individual landowners and addresses. This spreadsheet and sample letters that the Forest Service had previously used were supplied to the State. In the

³ These figures represent the percentage of access denied with the plots that were sent to the field. FIA often reports the percentage of denied access out of all plots, including those that do not leave the office. In New Mexico, the overall percentages would be about 8% for all jurisdictions and 14% for private lands.

spring of 2010, the State sent letters from the State Forester to 1,250 private landowners requesting access to 1,460 plots (a sample letter and return permission form are provided in Appendix G and Appendix H). By August of 2010, landowners representing 39% of the plots had returned forms with 77% granting access to the plot. A second round of letters was sent in late summer to landowners who had not yet responded. Crew leaders were also encouraged to locate landowners in person to acquire necessary permission. A third set of permission request letters went out in the spring of 2011.

One of the primary conflicts crews encountered in the field were landowners unwilling to grant access permission during the fall hunting seasons. Elk hunting in particular is a primary source of income for New Mexico ranchers. This conflict was particularly problematic in 2011 when contracts were expiring and contractors had spent the summer on public plots that were easier to access. By the time they were tackling the private plots, landowners who were otherwise willing to participate needed to limit access to their ranch for hunting. Aware of this concern, many crews worked with landowners to operate on the land between 10 a.m. and 2 or 3 p.m. to insure that their operations did not upset a hunt.

When it became apparent that contractors were not going to finish by December of 2011, and that a large number of privately owned plots remained unsurveyed, the State extended the 2011 contracts and the work plans for two Tribes that had not completed their plots. Since the initial landowner permission letters had only asked for access up through December 31, 2011, landowners were sent letters in the spring of 2012. After May of 2012, no additional letters were sent to landowners, although crews continued to call and contact individuals in the field.

Throughout the 3 years of the project, employees from State Forestry, the Forest Service, and the contractors spent many hours with landowners discussing the program and the importance of gaining access. Here are some of the highlights of those discussions.

- There is generally little direct benefit for a private landowner in granting permission to the site. Landowners may benefit in the long run from having general information about the state's resources that can lead to funding programs that could possibly help the landowner down the road.
- Crew leaders are gathering specific information on forests, trees, and common plants. They are not looking for endangered species and are instructed not to record them (unless plant species exceed 5% cover, which did not happen) and not to share any

information with others on any resource related observations that they make on private land.

- When asked, crew leaders work directly with the landowner to schedule the visit and comply with any reasonable requests the landowner makes. In general, gates are left as they are found (open or shut) and vehicle traffic remains on established roadways.
- Landowners were offered the opportunity to request the State report and a report on their plot. Not all crew leaders were aware of this option and expressed regret towards the end of the program that they did not offer this service to the landowners they worked with. Thirty-eight reports were requested in 2010-2011 and three reports were requested in 2012.
- Several landowners, especially those with mesquite dominated lands, refused to participate in the program because they viewed the survey as a waste of taxpayer's money.
- Several landowners denied access because they preferred no unnecessary government involvement with their land.
- Sharpies were the preferred writing tool employed by landowners denying access.
- Several landowners were surprised to learn a previously measured FIA plot was on property that they owned at the time it had been measured.
- Several landowners denying access requested their plot be removed from our list. They were surprised to be told that it was not possible to remove the plot, and that the plot might be measured in the future after they were gone. This information invariably brought a different perspective to the conversation.
- The majority of landowners who asked for additional information about the program to determine whether to grant access or not, chose to grant access once all of their questions and concerns had been addressed.

There were only a few incidents of irate landowners contacting the State Forester in 3 years. Considering that crews interacted with thousands of landowners and land managers, this seems like a reasonable response rate. There were also a few instances where data was gathered on a plot that did not have permission. In one case, the State refused to pay for the data collection of the plot because of the implied trespass. The State requested that this data be expunged from the national database.

One non-profit organization sent an email to their membership urging members to deny access. When the State's ARRA project manager contacted the organization's executive director to explain the program and mitigate the situation, the executive director denied that the email had been sent. The State chose to drop the issue. Several landowners shared the email and explained they were denying access based on the email's advice.

Access on State Trust Lands—In New Mexico, State Trust Lands are managed by the State Land Office and do not have general public access. State Lands managed by other State agencies, such as State Parks or the New Mexico Department of Game & Fish, have different access protocols. Prior to this project, several crew leaders working for the Forest Service in other States had come to New Mexico assuming they had access to plots on all State lands. As a result, the State Land Office was aware of the trespass issue on State Trust Lands and wary about granting access permission. State Forestry employees and State Land Office employees worked together to resolve the issue.

The mission of the State Land Office is to generate revenue to beneficiaries. Although the agency recognized the benefit of the inventory for State management, a small fee was charged for a 3-year permit that included the contractors and the Forest Service crews. The permit required the crew leader to notify the surface lease owner of the day and location where they would be. If the plot had public access to the State Trust land, there were no other requirements. If accessing the plot required crossing private land on a private road, then the crew leader was required to secure access permission. State Land Office District Managers often assisted field crews with communicating with State Land Office lessees.

A form was developed to guide the crew leader through the permission process. Crew leaders were required to carry a copy of the permit and a permit amendment list that showed the plot they were working on. These lists were generated by the ARRA project manager and sent to the State Land Office each time a new panel was added to the inventory. Contractors were provided an initial listing of State Trust Land plots with surface landowners, but also were encouraged to look up lease holder contact information online through the State Land Office website. A copy of the State Land Office permit and a blank form is included in appendices H and I.

Access on Tribal Lands—The primary consideration when working with Tribes is that each Tribe is a sovereign nation and has its own way of conducting business. Many Tribes have their own natural resource management, forestry, and realty offices that oversee this type of access.

Unless the ARRA project manager had a working relationship with the forestry or natural resource management department, the initial contact with a Tribe was a letter from the State Forester to the Governor or Tribal Chairperson requesting access. In those cases where a previous relationship existed, the ARRA project manager contacted the Tribal employee to request the most appropriate pathway for securing permission. Usually, having a person working with the Tribe facilitated the permission request.

Prior to advertising the RFP, State officials reached out to Tribes to see if any Tribes were interested in collecting FIA data on their own lands, or in bidding to collect the data on other lands. The State viewed the project as an excellent capacity building opportunity for Tribal forestry programs. A meeting was held between interested Tribal officials at the Intertribal Timber Council meeting held in Ruidoso in April 2010. Initially there were four Tribes interested in collecting their own FIA data, and no Tribes actually bid on the RFP. However, in anticipation that some Tribes might wish to bid, plots on Tribal Lands were placed in two separate line items.

In 2010, SWCA Environmental Consultants received both of these line items based on their bids. The firm had worked with many of the Tribes in the past, and, in general, managed Tribal relationships well. Many lessons were learned, and contractors, crew leaders, and State officials worked with Tribal leaders to help facilitate the process. As with private landowners, the Tribes had the option to deny access. Several of the pueblos exercised this option. As additional panels were added to the project, it was necessary to contact Tribal officials again. SWCA had prepared a useful database of contacts that helped facilitate this process.

There was one incident on Tribal lands that resulted in the program discontinuing any attempts to access those plots. A crew had reached a plot towards the end of the day and established the center point. When they returned to the plot the next day, two Victor leg-hold traps had been set beneath their center pin. Fortunately the crew detected and set off the traps without injury. Through resulting cooperation with Tribal officials it was learned that a Tribal contract trapper had set the traps, rationalizing that coyotes were likely to investigate a place where humans had been. He claimed no mal intent towards the crew. All parties agreed though it was better to stop the data collection that year on that reservation.

Access on Department of Defense Facilities—There are several large facilities under the direction of the Department of Defense with FIA plots, including the White Sands Missile Range and Fort Bliss Military

Reservation. To reduce access burden on these installations, all military plots were assigned to one contracting firm. Chestnut Ridge Forestry worked closely with the base officials and had select crew leaders attend specialized training to be on the facilities and utilize escorts when necessary. Due to proximity of unexploded ordinance or scheduled bombing events, some plots were denied access.

Access on National Park Service Lands—The National Park Service has a rather lengthy permitting process that the FIA office adheres to under a nationwide Memorandum of Understanding between the FIA Program and the National Park Service. Therefore, Forest Service staff worked with the State and contractors to secure necessary permits for access to parks and monuments. Access to Bandelier Monument was complicated by the 2011 Las Conchas Fire (see additional access issues below.)

Access on Bureau of Land Management Lands—Although BLM lands are public and generally open to public access, some BLM lands require access through private land. Crews were required to get permission to cross private land on private roads. Crews were encouraged to check in with local BLM districts to get information on landowners, issues, and other information that would help them access their plots.

Access on National Forest Lands—Like BLM lands, National Forest lands also generally have public access, though crews may need to get access through private and Tribal lands in some cases. At the Silver City training, the Gila Zone Manager requested that crews check in with the local zone offices when they were working in the area. Although all crew leaders may not have followed this advice, throughout the course of the project there were no complaints about FIA contractors being on National Forest lands.

Access to Land Managed by Other Agencies—There were other agencies that had permitting processes and required various forms and authorization. These included the U.S. Fish and Wildlife Service, the New Mexico Department of Game & Fish, and the Middle Rio Grande Conservancy District.

Additional Access Issues—Both 2011 and 2012 posed additional access issues due to large wildfires burning in the State. Crew leaders stayed away from areas that were actively experiencing fire; but often after a large fire, vast regions were administratively closed because of hazard from falling trees, persistent hot spots, and flash flooding. The ARRA project manager generally contacted the appropriate resource manager of the burn site to determine if permission could be granted, and crew leaders were given safety briefings before entering these

recently burned lands. These plots were particularly challenging because existing roads were often compromised or impassable.

Only one incident was reported of a crew member being threatened with a gun. The individual did not wish to have the incident investigated, but wanted to be sure no one was sent out to the site.

Plot Assignments and Data Collection

Prior to each field season, Forest Service FIA staff determines which plots come to the field for inventory. Plots are reviewed in the office to determine if they are forest (timberland or woodland), non-forest, or needing a determination in the field. If the office crew can identify from interpretation of aerial imagery that the plot does not include any forest, the information for the plot is gathered in the office and the plot never reaches the field. Our ARRA project was devoted to only conducting surveys on those plots needing a field visit.

For plots needing a field visit, a plot packet was prepared by FIA staff. The packet included maps, aerial photos, and various forms used to record location and sketch a map, capture tree canopy information, take photos, and so forth. The packets were packaged in a specially sized manila envelope. Throughout the course of the project, the management of plot packets was a key activity for the State and the contractors. The penalty for contractors losing a packet was \$100; as a result, only a few packets were lost (and these were stolen along with the contractor's inventory gear). A few packets were also misplaced and so duplicate sets were made. Considering the handling of over 4,000 plot packets, the control protocol was quite successful.

The first set of plots considered for the ARRA project consisted of the 2005-2011 panels, including the remainder of the 2008 panel that had been partially completed by FS crews in 2008 and 2009. This provided a total pool of 4,412 plots needing field visits. At the start of the 2010 field season, 1,511 plots were retained for Forest Service crews to work on and 2,801 plots were assigned to contractors and Tribes. Each plot was identified by a code that consisted of a county code and plot number. Both the county code and the plot number are necessary, since plot numbers assigned for each county start at one. We used this unique combination identifier to assign plots to the contractors. If the crew leader failed to find the old plot and re-established a new plot center, a new plot number was assigned in MIDAS; however, for payment purposes the old plot number was used for invoicing.

In 2010, plots were split up among the contractors by the line items from the RFP with the exception of plots in wilderness areas, which

were assigned geographically adjacent to each contractor's other assignments. Most assignments followed New Mexico State Forestry District boundaries. Chestnut Ridge was assigned the eastern half of the State, including the Cimarron, Las Vegas, and Capitan District plots, and all of the Department of Defense plots. South Wind Conservation was assigned the Chama District and the Socorro District plots, and the bulk of the wilderness plots since these areas included the Gila, Aldo Leopold and Apache Kid wildernesses. The two Tribal line items (Western Pueblos and Rio Grande Pueblos) and the Bernalillo District plots went to SWCA. The Navajo Nation plots were assigned to the Navajo Tribal Forestry program, the Mescalero plots were assigned to the Mescalero Department of Resource Management Protection, and the Santa Clara plots were assigned to Santa Clara Tribal Forestry. The Ramah Navajo plots were not assigned, pending an agreement developing between the State and the Ramah Forestry program.

As plots were denied access, amendments to the contracts swapped out the original assignments with new plots. There was some flexibility between the plots assigned to the Forest Service and the State. For example, when a large landowner required crews to sign a specific liability release⁴, those plots were transferred from the Forest Service pool to the contractor pool because administratively the contractors were able to sign the release. Contract amendments require several weeks to a month to work through the State's administrative processes, so when a new RFP was issued in 2011, these contracts utilized administrative work orders for plot assignments that were processed within the division administration and could be executed in approximately 1 week. Therefore, the State chose to close out the 2010 contracts at the end of 2011, and only carry forward the 2011 contracts. Table 4 shows the contract documents and effective dates. More funds became available for field collection because the access denied rate was larger than expected and the State decided not to use funds originally targeted for analysis. Therefore, in the fall of 2010, project managers added the 2012 panel to the pool of plots. In 2011, the State determined it did not need the full allocation for administrative costs and moved more of the funding into contracting, so the 2013 panel was added to the pool. About the same time, Forest Service staff from the Southwest Region requested that approximately 57 plots that were included in large fires from the 2011 fire season be re-measured by the ARRA project.

⁴ The existing laws that protect landowners are the Federal Tort Claims Act (for damages incurred) and the Worker's Compensation Act (for liability). Collectively they offer the landowner liability protection, but in a Federally legislated form. The flexibility to transfer the plots to private contractors saved staff time that would have been needed to work out the details for both the landowner and the government.

Table 4—Contract Documents.

Contractor	Type	Change	Contract ID	Purpose	Contract Value	Value assigned	change in value	Signed by Contractor	Effective Date
Chestnut Ridge Forestry	PSA		10-521-9999-282	Initial PSA, assign value and plots to contract.	\$950,000.00	\$872,510.00		5/14/2010	6/7/2010
Chestnut Ridge Forestry	Amendment-PSA	Amend 1		Removed access denied plots (163) and added 2012 plots (249) & low elevation blind plots (49).	\$950,000.00	\$948,082.00	\$75,572.00	12/13/2010	12/23/2010
Chestnut Ridge Forestry	Amendment-PSA	Amend 2		Removed excess blind & access denied plots (47); added high elev. blind plots and new 2012 panel plots (42).	\$950,000.00	\$948,912.00	\$830.00	3/24/2011	4/15/2011
Chestnut Ridge Forestry	Amendment-PSA	Amend 3		Remove access denied and Singleton plots (47) and added "turn in" plots (47) from SWCA	\$950,000.00	\$948,334.00	\$422.00	10/5/2011	10/13/2013
South Wind Conservation, Inc.	PSA		10-521-40187-0281	Initial PSA, assign value and plots to contract.	\$950,000.00	\$779,910.81		5/18/2010	6/3/2010
South Wind Conservation, Inc.	Amendment-PSA	Amend 1		remove access denied and add blind plots	\$950,000.00	\$779,888.82	(\$21.99)	1/27/2011	2/7/2011
South Wind Conservation, Inc.	Amendment-PSA	Amend 2		remove access denied and add 2012 panel plots	\$950,000.00	\$780,164.22	\$275.40	3/22/2011	3/31/2011
SWCA Environmental	PSA		10-521-9999-280	Initial PSA, assign value and plots to contract.	\$950,000.00	\$709,991.04		5/14/2010	6/2/2011
SWCA Environmental	Amendment-PSA	Amend 1		remove access denied and add blind plots	\$950,000.00	\$707,456.00	(\$2,535.04)	1/26/2011	2/2/2011
SWCA Environmental	Amendment-PSA	Amend 2		remove access denied and add 2012 panel plots	\$950,000.00	\$780,005.00	\$72,549.00	4/7/2011	4/25/2011
SWCA Environmental	Amendment-PSA	Amend 3		remove turn in and access denied plots (145) and add tribal plots (6)	\$950,000.00	\$554,679.82	(\$225,325.18)	10/4/2011	10/13/2011
Mescalero Apache Tribe	JPA/work plan		10-521-2301-0304	Initial work plan, assign value and plots to contract.	\$47,400.00	\$47,400.00		6/23/2010	6/30/2010
Pueblo of Santa Clara	JPA/work plan		09-521-40042-0072	Initial work plan, assign value and plots to contract.	\$6,000.00	\$6,000.00		6/9/2010	6/10/2010
Pueblo of Santa Clara	Work plan modification	Mod 1		extend date	\$6,000.00	\$6,000.00	\$ -	12/29/2011	12/29/2011
The Navajo Nation	JPA/work plan		10-521-2301-0264	Initial work plan, assign value and plots to contract.	\$226,200.00	\$226,200.00		10/15/2011	1/6/2011
The Navajo Nation	Work plan modification	Mod 1		remove P3 assist and extend date	\$226,200.00	\$226,200.00		12/30/2011	12/31/2011
The Navajo Nation	Work plan modification	Mod 2		add 2012 field season plots and adjust budget		\$225,600.00	(\$600.00)	8/2/2012	8/13/2012
Chestnut Ridge Forestry	PSA		11-521-9999-0232	Initial PSA, assign value to contract	\$552,000.00			4/22/2011	5/9/2011
Chestnut Ridge Forestry	Amendment-PSA	Amend 1		extend date to 12/31/12	\$552,000.00			12/8/2011	12/16/2011
Chestnut Ridge Forestry	Amendment-PSA	Amend 2		added funds	\$727,510.00			3/29/2012	4/19/2012

Table 4—Contract Documents (Continued).

Contractor	Type	Change	Contract ID	Purpose	Contract Value	Value assigned	change in value	Signed by Contractor	Effective Date
Chestnut Ridge Forestry	Amendment-PSA	Amend 3		added funds	\$828,676.00			5/17/2012	5/30/2012
Chestnut Ridge Forestry	Work Order	wo #1		Initial Assignment of 656 plots.	\$552,000.00	\$547,323.00		5/16/2011	5/18/2011
Chestnut Ridge Forestry	Work Order	wo #2		remove access denied (30) and added FS transfer plots (32)	\$552,000.00	\$551,504.00	\$4,181.00	8/8/2011	8/16/2011
Chestnut Ridge Forestry	Work Order	wo #3		remove access denied (40) and add "turn in" plots (38)	\$552,000.00	\$551,801.00	\$297.00	9/7/2011	9/12/2011
Chestnut Ridge Forestry	Work Order	wo #4		remove all 2010-11 plots, first 2012 assignments	\$552,000.00	\$551,208.00	(\$593.00)	2/20/2012	2/24/2012
Chestnut Ridge Forestry	Work Order	wo #5		replace access denied	\$552,000.00	\$551,613.00	\$405.00	4/10/2012	4/12/2012
Chestnut Ridge Forestry	Work Order	wo #6		new assignments & replace access denied	\$727,510.00	\$727,063.00	\$175,450.00	4/24/2012	4/24/2012
Chestnut Ridge Forestry	Work Order	wo #7		replace access denied	\$727,510.00	\$727,473.00	\$410.00	5/10/2012	5/11/2012
Chestnut Ridge Forestry	Work Order	wo #8		new assignments & replace access denied	\$828,676.00	\$828,622.00	\$101,149.00	6/1/2012	6/5/2012
Chestnut Ridge Forestry	Work Order	wo #9		replace access denied	\$828,676.00	\$828,617.00	(\$5.00)	6/13/2012	6/25/2012
Chestnut Ridge Forestry	Work Order	wo #10		replace access denied	\$828,676.00	\$828,576.00	(\$41.00)	9/4/2012	9/11/2012
Chestnut Ridge Forestry	Work Order	wo #11		replace access denied	\$828,676.00	\$828,034.00	(\$542.00)	10/9/2012	10/16/2012
Chestnut Ridge Forestry	Work Order	wo #12		replace access denied	\$828,676.00	\$828,650.00	\$616.00	10/15/2012	10/18/2012
Chestnut Ridge Forestry	Work Order	wo #13		replace access denied	\$828,676.00	\$828,379.00	(\$271.00)	10/31/2012	11/2/2012
Chestnut Ridge Forestry	Work Order	wo #14		replace access denied	\$828,676.00	\$828,061.00	(\$318.00)	11/11/2012	11/21/2012
Chestnut Ridge Forestry	Work Order	wo #15		replace access denied	\$828,676.00	\$828,316.00	\$255.00	11/16/2012	11/27/2012
South Wind Conservation, Inc.	PSA		11-521-9999-2-0231	Initial PSA, assign value to contract.	\$102,570.00			4/19/2011	5/12/2011
South Wind Conservation, Inc.	Amendment-PSA	Amend 1		added funds	\$163,000.00		\$60,430.00	10/6/2011	10/25/2011
South Wind Conservation, Inc.	Amendment-PSA	Amend 2		extend date to 12/31/12	\$163,000.00			12/8/2011	12/22/2011
South Wind Conservation, Inc.	Amendment-PSA	Amend 3		added funds	\$339,275.00		\$176,275.00	4/1/2012	4/17/2012
South Wind Conservation, Inc.	Amendment-PSA	Amend 4		added funds	\$378,700.00		\$39,425.00	10/11/2012	10/17/2012
South Wind Conservation, Inc.	Work Order	wo #1		Initial assignment of 91 plots.	\$102,570.00	\$101,000.00		5/19/2011	5/25/2011
South Wind Conservation, Inc.	Work Order	wo #2		3 new Animas plots + wilderness plots	\$163,000.00	\$163,000.00	\$62,000.00	11/2/2011	11/4/2011

Table 4—Contract Documents (Continued).

Contractor	Type	Change	Contract ID	Purpose	Contract Value	Value assigned	change in value	Signed by Contractor	Effective Date
South Wind Conservation, Inc.	Work Order	wo #2		3 new Animas plots + wilderness plots	\$163,000.00	\$163,000.00	\$62,000.00	11/2/2011	11/4/2011
South Wind Conservation, Inc.	Work Order	wo #3		Move Ute Mtn plots	\$163,000.00	\$153,925.00	(\$9,075.00)	11/25/2011	11/28/2011
South Wind Conservation, Inc.	Work Order	wo #4		remove all 2010-11 plots, first 2012 assignments	\$163,000.00	\$161,825.00	\$7,900.00	2/16/2012	2/16/2012
South Wind Conservation, Inc.	Work Order	wo #5		replace access denied	\$163,000.00	\$163,000.00	\$1,175.00	3/19/2012	3/23/2012
South Wind Conservation, Inc.	Work Order	wo #6		new assignments	\$339,275.00	\$339,100.00	\$176,100.00	4/28/2012	5/4/2012
South Wind Conservation, Inc.	Work Order	wo #7		replace access denied	\$339,275.00	\$338,300.00	(\$800.00)	6/18/2012	6/25/2012
South Wind Conservation, Inc.	Work Order	wo #8		replace access denied	\$339,275.00	\$338,600.00	\$300.00	7/20/2012	7/26/2012
South Wind Conservation, Inc.	Work Order	wo #9		replace access denied	\$339,275.00	\$339,150.00	\$550.00	9/1/2012	9/13/2012
South Wind Conservation, Inc.	Work Order	wo#10		new assignments	\$378,700.00	\$378,700.00	\$39,550.00	10/26/2012	10/30/2012
South Wind Conservation, Inc.	Work Order	wo#11		replace access denied	\$378,700.00	\$378,467.00	(\$233.00)	11/7/2012	11/21/2012
South Wind Conservation, Inc.	Work Order	wo#12		replace access denied	\$378,700.00	\$378,725.92	\$258.92	11/26/2012	11/29/2012
SBH Contracting	PSA		11-521-9999-0239	Initial PSA, assign value to contract.	\$76,000.00			5/3/2011	5/23/2011
SBH Contracting	Amendment- PSA	Amend 1		added funds	\$110,000.00			10/14/2011	10/28/2011
SBH Contracting	Amendment- PSA	Amend 2		extend date to 12/31/12	\$110,000.00			12/5/2011	12/22/2011
SBH Contracting	Amendment- PSA	Amend 3		added funds	\$204,450.00			3/12/2012	4/4/2012
SBH Contracting	Work Order	wo #1		Initial plot assignments.	\$76,000.00	\$75,200.00		5/30/2011	6/3/2011
SBH Contracting	Work Order	wo #2		Remove 22 access denied plots and add 15 additional plots.	\$76,000.00	\$66,400.00	(\$9,800.00)	8/5/2011	8/16/2011
SBH Contracting	Work Order	wo #3		Remove 11 (Taos) plots and add 18 plots.	\$76,000.00	\$73,600.00	\$7,200.00	8/31/2011	9/2/2011
SBH Contracting	Work Order	wo #4		add plots for new funding	\$110,000.00	\$106,300.00	\$32,700.00	11/4/2011	11/8/2011
SBH Contracting	Work Order	wo #5		remove all 2010-11 plots, first 2012 assignments	\$110,000.00	\$109,950.00	\$3,650.00	2/14/2012	2/16/2012
SBH Contracting	Work Order	wo #6		new assignments	\$204,450.00	\$203,200.00	\$93,250.00	4/12/2012	4/17/2012

This study would be modeled after similar post-fire studies in other regions. In 2012, after determining that the special collection for post fire information was not ready to occur, project managers added approximately 90 plots from the 2014 panel into the pool. Therefore, the ARRA project and the combined efforts of the Forest Service FIA crews were able to collect 9 out of 10 panels and to start collections on the 10th panel. The plans are for the FS FIA crews to complete the 2014 panel and possibly the additional re-measurement of burned plots during the field seasons of 2013 and 2014. During the field season of 2015, crews will start the second cycle of measurements with the 2005 panel. This will put the State on the annual collections cycle in congruence with the rest of the nation's program.

Together, both agencies attempted data collection on 6,456 plots, and actually visited or attempted to visit 5,468 plots (access was denied on 988 plots)⁵. Contractors working for the State gathered data on 3,986⁶ plots (including 145 blind check plots) over the course of the 3-year program. Table 5 breaks out the accomplishments by year and by contractor or organization. Management of the program included the use of extensive databases. Although much specific information in those databases is not public information and protected by the Food and Drug Act, the databases are described in Appendix K along with the color coding that was used for tracking specific information.

Jobs Created/Retained

The primary objective for ARRA was to save and create jobs. Between the contractors hired and Tribal participation, there was a total of 50 different individuals that worked on this project. The requirement for reporting "Number of Jobs" was based on a formula used to avoid overstating the number of other than full-time, permanent jobs. The calculation converts part-time and temporary jobs into fractional "full-time equivalent" (FTE) jobs. The total number of hours worked by a person in the current reporting quarter was divided by a full-time schedule of 520 hours. Table 6 shows the total hours reported, by quarter as per the FTE calculation.

⁵ These numbers are presented from a State contracting perspective, and include plots that the State paid for (blind plots, nonforest plots, and hazardous plots) but does not include access denied plots for the plots visited value. There were 20 plots that were hazardous; following standard FIA conventions, they would be tallied with access denied plots for a non-sampled value. There were also 176 blind plots included.

⁶ This number follows the conventions described above with the exception of removing five plots that were paid for, but did not have data entered into the final database.

Table 5—Plots completed by year and contractor.

Contract company	2012	2011	2010
Chestnut Ridge Forestry	625	810	416
Mescalero Apache Tribe	0	37	4
Navajo Nation	31	158	0
Colorado State Forest Service	8	12	149
South Wind	313	678	227
Pueblo of Santa Clara	6	0	0
SBH	106	91	0
SWCA	0	329	156
USFS	56	371	645
Office entered nonvisits	509	330	120

Table 6—FTE grand totals for each quarter.

Quarter	FTE total
2010-Q1	0
2010-Q2	3.65
2010-Q3	19.77
2010-Q4	14.7
2011-Q1	19.18
2011-Q2	20.86
2011-Q3	26.64
2011-Q4	18.63
2012-Q1	4.71
2012-Q2	12.48
2012-Q3	6.14
2012-Q4	10.89
2013-Q1	0.02
2013-Q2	0

Discussion

Projects Considered But Not Implemented

When the State received the ARRA grant for developing the FIA database, the initial thought was that a portion of the data would be collected, and that part of the project would also work on some of the data analysis issues. Several additional projects were considered, but the final outcome was to prioritize the collection of P2 data and to get as much data collected as possible. These projects are briefly discussed here to document the need and thought process behind these ideas.

Collecting Additional Data Collection for Volume Tables for Woodland and Forest Species—Based on outside input, the State considered developing an RFP to address some deficiency issues of current volume equations for woodland species for estimating biomass and carbon sequestration. In the end, the decision was to support a similar process that was being planned by the FIA analysts in Ogden. The State considered paying for field analysis for some species (in particular one-seed juniper) that would not be done during the regional field process. However, the protocols necessary for developing an RFP were not ready in time to add this aspect to the ARRA project.

Revamping the NM Statewide Assessment Based on New Data—Much of the 2010 New Mexico Natural Resources Assessment was based on older FIA data. The hope was to develop an RFP that would take the data collected in the first 2 years of the ARRA project and re-run the analysis for the Statewide Assessment in the third year of the ARRA project. Delays at a national level in data processing, and delays in the field in completing the data collection, led the State to decide not to use ARRA funding for this task. We are hopeful that the State will find additional funding for this important step in overall natural resource management visioning for New Mexico.

Remeasuring and Gathering Fire Effects Data for Plots Recently Burned in Large Fires—In 2011 and 2012 New Mexico experienced several large landscape fires. In other regions, a procedure known as AREBA (Accelerated Re-measurement and Evaluation of Burned Areas) has been developed for re-measuring FIA plots and gathering immediate feedback on the fire's impact. Region 3 of the U.S. Forest Service contacted the State in 2011 and asked if AREBA plots could be incorporated into the ARRA project. State officials worked with the regional office to develop protocols, but by mid-2012 had been unable to produce a functional field procedure for adding the plots to the program. At that time, the decision was to add plots from the 2014 panel to the ARRA contracts, and ask the FIA crews to do the AREBA plots in 2013 once the field procedures had been confirmed.

New Mexico FIA User Group Participation

The State recognized that there was broad interest in FIA data among many natural resource managers and users. An informal group was created to keep informed on the progress of the FIA inventory and to solicit input. This group included Tribal representatives, industry representatives, representatives from the U.S. Forest Service, BLM, State Land Office, and Forest and Watershed Health Institute. A Users Group meeting was hosted in March 2012 to solicit input for the Interior West FIA report writing team.

State – Federal Partnership

This project truly manifested as wonderful collaboration between State and Federal agencies to achieve a shared goal. The teamwork and communication was invaluable. Specific individuals who were involved are included in the acknowledgment section of this report.

There were several elements of this project that required communication and coordination. At times, funding for one aspect of the job, such as purchasing additional equipment or funding part-time staff to help with administration, could not be administratively accomplished by one agency, but could be accomplished by the other agency. Federal employees often pitched in to help sort plot packets, manage databases, etc., when their own workloads were low. The outstanding cooperation among the partners involved in this study resulted in smooth project implementation.

Overall, the partnership was successful and could serve as a model for future collaborations. This project clearly demonstrated the opportunity to utilize alternative sources of funding to collect FIA data. To avoid future scenarios of data deficit where this extent of special effort is necessary, on-going (i.e. annual) data collection is required to maintain the temporal and spatial value of forest inventory information. This goal will require continued collaboration and support from Federal, State, Tribal and other partners.

Discussion of Access Denied Issues

The high rate of access denied for plots on private and State lands is disappointing. One of the primary reasons State Forestry was interested in the FIA data was for increased information on State and private lands. Typically landowner permission is handled by FIA staff. The State offered to take on this role, rationalizing that New Mexico landowners would be more comfortable dealing with a State agency that provides services to New Mexico landowners rather than the Federal government. Since there really is no comparable activity in the State, it is hard to say that the Federal government would have had a better or worse success rate had that responsibility remained with the Forest Service.

On a positive note, analysts were able to stratify the private land plots (Goeking and Patterson 2012) to allow measured plots to carry more weight for similar denied access plots, which provides meaningful analysis on private land on a State-wide level as well as for individual counties. There are some large properties where access was denied, which left some geographic gaps in the data. Unique and significant

parts of the State that were under-sampled include the boot heel region, and pieces of woodland in San Miguel, Torrance, Chaves, and Otero counties.

From a lesson learned standpoint, more aggressive outreach with landowner organizations and landowners may have been useful. We ended up responding to negative attitudes rather than proactively building partnerships initially. Interestingly, we believed that organizations that support ranchers had the most to gain from the survey to provide documentation for initiatives and grants and were quite surprised to find an adversarial attitude.

Some landowners in areas of grassland with mesquite expressed a sense of disbelief that we were interested in conducting forest inventory in those areas. In retrospect, we should have provided specific information in permission request letters that explained the need for data for these ecosystems.

Future FIA Data Needs for New Mexico

The 2008-2012 inventory has developed a solid baseline data set for tracking the effects of changing climates; impacts from insects, disease, and wildfires; fuel conditions; and many other forest attributes for New Mexico. The current plan is to have the USFS FIA crews finish the final panel and possibly do the AREBA plots that were planned for 2012 over the next two field seasons.

In 2015, there is an opportunity to help the State get started on the standard FIA data rotation by revisiting the plots in the 2005 panel; in 2016, revisit the plots in the 2006 panel, and so forth. Although that means the re-measurement interval may only be 3-5 years in 2015, the forests in the State are rapidly changing due to insects, disease, and wildfire. Data documenting these changes will help resource managers target limited funds to the most appropriate issues.

One benefit of the ARRA project has been the capacity for contracting that has been developed. Already, one company involved in the New Mexico ARRA project has submitted successful bids for at least three additional contracts for FIA plot inventories nationwide. There is a strong potential that qualified contractors would be available should the Forest Service decide to contract data collection in New Mexico in the future.

Potential Uses of New FIA Data

The new FIA data creates a comprehensive baseline for tracking the impact of changing climates on New Mexico forest resources. The data also provides relevant and current information for basing decisions on biomass and industry development. The forthcoming New Mexico forest resources report (Goeking and others 2014) identifies many of the changes that have been detected since 1999.

It is critical that other tools that utilize FIA data update their information with the new data. One important resource is the LANDFIRE program, which is used to model fire behavior and make fire management decisions⁷. These types of national programs need to be made aware of the unique situation in New Mexico where this new data set is not yet aligned with the annual inventories. If these programs do not update their tools, there may be an opportunity to develop functional work-around adjustments to calibrate the programs for better results based on the new inventory.

Acknowledgments

The accomplishment of implementing the New Mexico forest inventory was indeed a huge team effort. At the risk of overlooking any essential player, this section attempts to identify and thank those who helped this project succeed.

Leadership: Much credit goes to agency and political leaders that helped get this project off the ground. Former New Mexico State Forester, Butch Blazer, had the original vision to get this done, and his successor, New Mexico State Forester Tony Delfin, has continued to support the program and ensure its completion and success. Interior West FIA Program Manager Michael Wilson and Rocky Mountain Research Station Director Sam Foster have ensured Federal support for the project's success. The New Mexico congressional delegation, especially staff from Senator Tom Udall's and Senator Jeff Bingaman's offices, provided the initial support for applying for ARRA grant funding. Resource Management Bureau Chief Kim Kostelnik, succeeded by Eddie Tudor, provided invaluable direct project support. Mary Stuever served as the project manager.

⁷ The P2 down woody data, which is available from the Interior West FIA program, represents the largest fuels dataset ever collected in New Mexico. We strongly recommend an update of LANDFIRE's fuel layers utilizing this data.

State employees: Administratively, this program ran smoothly and efficiently under the capable eye of Natasha Ripple who ensured all ARRA requirements were met and processed invoices and purchasing documents. Doris Archuleta, Tammy Kessler, and Denise Zendel provided invaluable help processing the vast number of contracting documents involved. Andrew Frederick and Lindsey Quam provided capable back-up support on program management. In the field, District staff handled plot packets, supported contractors with landowner contacts, fielded inquiries from landowners, shuttled equipment, and provided other various help. At the risk of overlooking someone, thanks are extended to Doug Boykin, Nick Smokovich, Todd Haines, Joe Carrillo, Arnie Friedt, Ernie Lopez, Shannon Atencio, Carmen Austin, Eddie Tudor, and Susan Rich.

USFS FIA employees: Bob Rhoads, Data Collection Team Leader for the Interior West FIA program, provided amazing support and collaboration. John Capuano, Area Leader for Arizona and New Mexico, did much of the heavy lifting and in many ways provided essential interface between the State and Federal programs. The real heroes of the project are the inspectors Jim Dexter, Dave Herwig, and John Capuano. Several other inspectors came to New Mexico to help during the off-season as well. The Arizona-New Mexico FIA crew, including Juliet Wilhelm, Vernon Robinson, and others, provided necessary support, and often at a moment's notice. Many others in the Ogden office were also fantastic resources: Mark Rubey, Tom Wuenschell, and Jeremy Hamblin for MIDAS and database support; Bill Dunning for advice on all things contracting and field based; Sara Goeking succeeded by Jennifer Bakken for landowner access and permitting support and for plot packet preparation; John Shaw and team for analyst insight and user group outreach; and Michael Wilson and Renee O'Brien for problem solving.

Contractors: Obviously, the project would not have happened without the contractors: Joel and Esther Fyock of Chestnut Ridge Forestry; Ike Wennihan of South Wind Conservation, Inc.; Stuart Hart of SBH Contracting; and Coleman Burnett of SWCA Environmental Consultants. Our Tribal partners added richness to the program that was invaluable. From an administrative standpoint, we enjoyed working with Alexious Becenti, Frankie Thompson, and Sadie Johnson of the Navajo Nation; Thora Padilla and Earl Bell of the Mescalero Apache Tribe; and Michael Chavarria and Bruce Bauer with the Pueblo of Santa Clara. In addition, despite not getting a working project off the ground, we appreciate the interest of Mike Henio of Ramah Navajo Forestry and Sylvia Rains Dennis working with the War Chief of Taos Pueblo. The crew leaders were of course the major producers of the

project and Table 7 lists each crew leader, their employer, and the number of plots they are credited for in MIDAS.

Colorado State Forest Service Forest Inventory and Analysis Crew:

We wish to thank the FIA crews from the Colorado State Forest Service for assisting with data collection on plots as we wrapped up our field seasons each year

Landowners and Land Managers: In the spirit of privacy, we are not naming names, but our heartfelt gratitude goes out to those landowners, many who managed access to multiple plots, for participating with us on this project. This includes our Tribal partners, other agency contacts, as well as thousands of New Mexico landowners who recognized the greater value of completing this inventory and allowed access to their property.

User's Group: As stated previously, the New Mexico user's group is an informal network without formal membership; however, several people stepped up to assist with program direction and support including Wayne Robbie of the U.S. Forest Service Southwest Regional Office, Jeremy Kruger of the BLM's New Mexico State Office, and Mark Meyers with the State Land Office.

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Table 7—Plots by crew.

Crew	Contractor Company	Production + Blind Plots
Adelson	Chestnut Ridge Forestry	22
Ayotte	Chestnut Ridge Forestry	38
Bell	Chestnut Ridge Forestry	23
Bernhardt	Chestnut Ridge Forestry	34
Biasotti	Chestnut Ridge Forestry	24
Cziperle	Chestnut Ridge Forestry	118
Dolecek	Chestnut Ridge Forestry	296
Fyock	Chestnut Ridge Forestry	1
Gee	Chestnut Ridge Forestry	42
Gosack	Chestnut Ridge Forestry	39
Hastings	Chestnut Ridge Forestry	2
Hayes	Chestnut Ridge Forestry	250
Hutchinson	Chestnut Ridge Forestry	8
Landewe	Chestnut Ridge Forestry	4
Mamerow	Chestnut Ridge Forestry	11
McLelland	Chestnut Ridge Forestry	9
Mueller	Chestnut Ridge Forestry	152
Nowak	Chestnut Ridge Forestry	78
Oukrop	Chestnut Ridge Forestry	28
Parks	Chestnut Ridge Forestry	155
Quinion	Chestnut Ridge Forestry	97
Romero	Chestnut Ridge Forestry	190
Roth	Chestnut Ridge Forestry	83
Sommerville	Chestnut Ridge Forestry	42
Starn	Chestnut Ridge Forestry	40
Tumenas	Chestnut Ridge Forestry	44
Wagner	Chestnut Ridge Forestry	21
Bernhardt	South Wind	26
Brennan	South Wind	1
Brisbin	South Wind	193
Brown	South Wind	6
Cargill	South Wind	172
Dekoker	South Wind	2
Dolecek	South Wind	4
Hayes	South Wind	7
Howard	South Wind	6
Kesonie	South Wind	16
Macfarland	South Wind	19
North	South Wind	262
Quinion	South Wind	10
Reininger	South Wind	167
Simons	South Wind	13
Sommerville	South Wind	69
Tumenas	South Wind	31

Table 7—Plots by crew (Continued).

Crew	Contractor Company	Production + Blind Plots
Wagner	South Wind	125
Wennihan	South Wind	89
Allen	SWCA	111
Amato	SWCA	15
Nietupski	SWCA	95
Stropki	SWCA	148
Timmons	SWCA	116
Cziperle	Mescalero Apache Tribe	16
Dexter	Mescalero Apache Tribe	3
Mendez	Mescalero Apache Tribe	1
Parks	Mescalero Apache Tribe	10
Roth	Mescalero Apache Tribe	6
Starn	Mescalero Apache Tribe	5
Catron	Navajo Nation	2
Dennison	Navajo Nation	17
Fischer	Navajo Nation	1
H.Yazzie	Navajo Nation	37
Jim	Navajo Nation	1
Metteba	Navajo Nation	75
Quintana	Navajo Nation	55
Thomas	Navajo Nation	1
Robinson	Pueblo of Santa Clara	6
Hart	SBH	197
Arnold	USFS	57
Bellcock	USFS	109
Bialach	USFS	54
Conklin	USFS	3
Dexter	USFS	6
Green	USFS	240
Herwig	USFS	18
Holte	USFS	21
Kindt	USFS	69
Lagioia	USFS	40
Marshall	USFS	95
Mazzulla	USFS	27
Office Entered	USFS	959
Robinson	USFS	194
Scott	USFS	20

Table 7—Plots by crew (Continued).

Crew	Contractor Company	Production + Blind Plots
Steed	USFS	28
West	USFS	33
Wilhelm	USFS	16
Yazzie	USFS	42
Bell	Colorado State Forest Service	8
Clements	Colorado State Forest Service	17
Dilling	Colorado State Forest Service	34
Hanley	Colorado State Forest Service	23
Harrison	Colorado State Forest Service	7
Rector	Colorado State Forest Service	22
Stout	Colorado State Forest Service	35
Wykhuis	Colorado State Forest Service	23

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