Characteristics of Colorado Forestry Contractors and Their Role in Current Forest Health Issues

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Abstract

Overcrowded forests have allowed several catastrophic wildfires to burn in Colorado. Many of these fires have received national attention and inspired large public expenditures into community wildfire mitigation projects. Forestry projects in Colorado have shifted away from traditional logging and toward service-type projects, such as forest thinning and defensible space, and Colorado's forestry contractors are essential in realizing forest management objectives in the state. Many southeastern and northeastern states conduct regular surveys of forestry contractors to better understand their attributes and ability to adapt to changing conditions. This article presents results of a Colorado forestry contractor survey conducted in 2014. Objectives of this survey were to gain statistical information about the contractors, establish a baseline for future surveys, and determine the capacity of the workforce to address the state's forest health issues. The survey revealed a diminished workforce that has struggled to find identity following policy changes and economic events of the 21st century. This survey also revealed that with the current contractor capacity, Colorado will be unable to face the many threats to forest health and prevent catastrophic wildfire.

Colorado, like much of the western United States, faces increasingly serious forest health issues that include catastrophic wildfire and insect outbreaks. Reduced forest management and near-complete fire suppression have led to overcrowding and a deterioration of forest health (Swetnam 1990, Price 1991, Covington and Moore 1994, Brown et al. 1999). The forestry contractors who work in the state are essential to reversing this trend and improving the health of the forests. However, despite the key role that these contractors play, very little research has been done on the group as a whole. Unlike states such as Georgia and Maine, which keep closer tabs on their forestry contractors (Greene et al. 1988, Hoop et al. 2002), Colorado has had just one prior contractor survey.

In the last several decades, management of the national forests in Colorado has been focused more on watershed protection and recreation than on providing forest products (Price 1991). The ''Timber Harvest and Forest Products Industry'' reports produced by the US Forest Service (USFS) include Colorado in the ''Four Corners'' region, an area so low in timber harvests that it was necessary to group four states together in the publication (Hayes et al. 2007). Nevertheless, forest health is improved through proper management techniques (Covington et al. 1997), and if timber harvests are not being conducted, then some alternative should be used. Therefore, the forest management industry in the state is dominated by service-type work. These service contracts are typically thinning projects aimed at improving forest health and fire resistance or rehabilitation projects in which fire-burned or beetle-killed trees are removed from the land. While it is possible to recover forest products from these operations, material is generally chipped or used for firewood—if it is utilized at all. Colorado imports a staggering amount of wood products despite having such a wealth of timber. Lynch and Mackes (2001) estimated that Colorado imported between 95 and 100 percent of its wood products.

Given the current threats to forests in Colorado and the high cost of importing wood from outside sources, it becomes desirable to learn more about the contractors that serve the region. To address this gap in knowledge, a survey of harvesting contractors in the state of Colorado was conducted in the spring of 2014. The primary objectives of this survey included gaining statistical information about the contractors, establishing a baseline for the creation of future

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surveys, and determining if the workforce has the capacity to address the state's forest health issues. The population of interest, harvesting contractors, includes any business focusing on tree removals in the woods. Because of the small forest products industry in the state, too few of these contractors exist to further segment the population, so the general term ''forestry contractor'' is used throughout the article. This is a comprehensive term that includes businesses of varying size and function.

One emerging way to address forest health issues is by utilizing low-quality and small-diameter timber for producing biomass-energy. Currently, one large biomass plant operates in Colorado, located in Gypsum. Additionally, the Bioenergy Alliance Network of the Rockies (BANR) is a major project aimed at investigating the logistical feasibility of biomass-energy projects in the northern Front Range. The ability to supply feedstock for these biomass plants is determined in large part by the capacity of the forestry contractors in the area (G.C. and Potter-Witter 2011). Therefore, this survey investigated both contractor capacity (revenue, number of employees, equipment owned) and potential work interests (job type and size on which they are willing to bid, land ownership, etc.).

Background Information

Ecology and ownership

The forests of Colorado provide the ecological context for this study. Ponderosa pine (*Pinus ponderosa*) forests exist throughout the state and are a major resource for timber products, recreation, and water supply. These forests have traditionally exhibited a relatively short fire return interval that served to eliminate competition and clean out the understory (Brown et al. 1999). In the absence of fire, the shade tolerant Douglas-fir (*Pseudotsuga menziesii*) often overtakes the ponderosa and becomes the dominant species. Much of Colorado's Wildland Urban Interface (WUI) lands are in the ponderosa type, making these forests the target for many restoration and fuels reduction projects.

As elevation is gained and more moisture is available, lodgepole pine (*Pinus contorta*) begins to dominate. Lodgepole communities are subject to less frequent, stand-replacing fires. These fires allow a new generation to emerge by exposing mineral soil, increasing sunlight proliferation, and melting the resin of the tree's serotinous cones (Tackle 1961). Therefore, clear cuts and patch cuts are the preferred management method for lodgepole pine. As a result of the mountain pine beetle outbreak of the early 2000s, lodgepole pine forests have become the most important source for sawlogs in Colorado (Hayes et al. 2007).

The largest forest type in Colorado, with just over 5 million acres, is pinon-juniper (Colorado State Forest Service [CSFS] 2010). These communities primarily consist of pinon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) or oneseed juniper (*Juniperus monosperma*) and are found at elevations between 4,900 and 8,000 feet. Although not generally suitable as sawlogs, these species have been used for fuelwood, fence posts, and increasingly as biomass feedstock (CSFS 2010). Considerable evidence shows that pinon-juniper woodlands have dramatically expanded their range compared with that before European settlement (Romme et al. 2009). Consequently, many contractors do the majority of their fuels reduction work in this forest type.

Other species important to the forest products industry in the state according to the USFS Four Corners report (Hayes et al. 2007) are Engelmann spruce (*Picea engelmannii*) and quaking aspen (*Populus tremuloides*). Engelmann spruce, generally accompanied by subalpine fir (*Abies lasiocarpa*), grows at a higher elevation than lodgepole pine. Spruce is often used for sawlogs and is the most important species in the state for producing house logs. Aspen is widely distributed throughout Colorado and is found all along the elevation gradient. In 2007, the tree ranked second in the state as a source for sawlogs (Hayes et al. 2007).

Colorado forest land is mostly under federal ownership, with pockets of state, private, and other types mixed in. The largest land owner is the USFS with 11,295,708 acres, followed by private landowners with 7,278,351 acres, the Bureau of Land Management (BLM) with 4,251,739 acres, and the Colorado State Land Board with 589,367 acres (CSFS 2010). In many areas, especially heavily populated ones like the Front Range, the patchy land ownership creates management problems (CSFS 2010). Borders between national forest, national park, and individual private landowners serve as borders to forest management actions, reducing their effectiveness if cooperation between the entities is not achieved.

The USFS has reduced its emphasis on Colorado national forest management in the last several decades, instead focusing on recreation and watershed protection (Price 1991). USFS timber sales in Colorado have declined from 26,125 acres in 1990 to 7,389 acres in 2008 (CSFS 2010). Simultaneously, raw materials for sawmills sourced from the National Forests have declined from 83.1 million board feet (MMBF) in 1982 to 54.8 MMBF in 2012 (Sorensen et al. 2012). This change began after World War II, when increasing numbers of people moved to the state to enjoy its aesthetic and recreational qualities. It was only exacerbated by environmental factors in the 1970s and 1980s that made management more difficult to achieve without fear of litigation. Meanwhile, the wildfire danger has worsened, and an increasing number of large wildfires have burned on USFS land (Calkin et al. 2005). Recent years have seen larger and more destructive wildfires that have burned primarily on federal land, such as the High Park fire (2012) and the West Fork Complex fire (2013), as well as those that have burned on a mix of land ownerships, such as the Fourmile Canyon fire (2010) and the Black Forest fire (2013).

Recent history and policy influences

There has been one previous survey of forest harvesting contractors in Colorado (Mackes 2004). Conducted in 2002 by Stefan Reinold of the CSFS, that survey was used extensively as a reference for developing the present one. Results of the 2002 survey will be presented in this article and used for comparison when possible. The earlier survey was conducted by mail, and the major questions were as follows:

- Contact information.
- What type of forestry work are you willing to bid on?
- What counties are you willing to work in?
- What size projects are you willing to bid on?

The time since the previous survey has been a tumultuous era for forestry in Colorado and much of the country. Major economic events and policy changes have had a large

influence on the direction and composition of the forestry contractor community. Among these factors are federal actions to promote community wildfire prevention, the 2008 global financial crisis, and the introduction of stewardship contracting to the USFS and BLM.

Around the turn of the 21st century, several devastating fire years inspired a response from the federal government. The National Fire Plan of 2000 attempted to form a coordinated plan to reduce the threat of catastrophic wildfire (Kostishack and Rana 2002). The Healthy Forests Restoration Act (HFRA) of 2003 was a significant piece of legislation that addressed mitigation on federal land and at the community level. These efforts, among other things, emphasized community wildfire preparedness and dramatically increased the amount of public financial assistance available to state governments, local governments, communities, and landowners (Steelman et al. 2004). As a result, over US$15 million has been distributed to Colorado through State Fire Assistance to fund wildfire mitigation projects. Additionally, the HFRA encouraged neighboring landowners to group together and develop Community Wildfire Protection Plans (CWPPs) to address mitigation issues. Often, the existence of a CWPP is a prerequisite to applying for any financial assistance available from the federal or state governments. In addition to these federal funds, Colorado appropriated US$9.6 million through its Wildfire Risk Reduction Grant program in 2013/2014 and US$1 million annually (2007 to 2018) through the Forest Restoration Grant Program. The National Fire Plan and the HFRA continue having significant impacts on forest management in Colorado to this day.

The global recession of 2008 led to many mill closures and signaled significant difficulty for forestry contractors (Keegan et al. 2012). Speculation from the housing bubble fueled a rapid rise in lumber consumption, abruptly followed by a precipitous decline when the bubble burst. This resulted in the loss of 71,000 forestry jobs in the western United States (Keegan et al. 2012). As of 2012, very little recovery had been observed, and much of this area retained its pre-recession capacity. Small progress was made by 2014, with housing starts recovering slightly (National Association of Home Builders 2014) and log values in the western United States beginning to rise (Bureau of Business and Economic Research 2014, Texas A&M Forest Service 2014).

Stewardship end result contracting has restructured the way the USFS conducts timber sales in Colorado. Stewardship contracting pilot programs began in 1998 to allow the USFS and BLM to more effectively achieve land management objectives (Mattor 2013). In comparison to traditional timber sales, stewardship contracts allow larger acreages to be treated and longer contract lengths (up to 10 y). Following the pilot program, the 2003 Interior Appropriations Act authorized unlimited use of stewardship contracts by the USFS and BLM until September 2013 (Mattor 2013).

Milling capacity and markets

Like much of the western United States, Colorado's milling capacity has declined in the last several decades. While the state had 84 mills in 1982, only 31 existed in 2012 (Sorensen et al. 2012). This decline in mills has increased trucking distances and made it increasingly difficult to treat acres without grants and subsidies. Where a timber sale in the past may have been suitable to achieve restoration goals, many of these projects end up being service contracts today. In many areas, material from fire mitigation projects tends to be of smaller diameter and poorer quality. Thus, its end use is more likely to be a lower-value product, such as wood-energy, firewood, or post/pole rather than sawlogs or house logs. These factors help explain why it is difficult to recover profit from utilizing this material and why treatments can be so expensive.

In spite of this, Colorado has the necessary infrastructure and markets to produce and sell wood products. Facilities in the state processed 98 MMBF of timber in 2012, a significantly higher amount than the other states in the Four Corners region (Sorensen et al. 2012). This includes merchantable material from fire mitigation projects as well as timber sales and a net import of 7,116 board feet from neighboring states. Major product categories, in decreasing order, are sawlogs, ''other products,'' house logs, and post/pole material. ''Other products'' includes logs for wood-energy, firewood, and more. Sales of all primary wood products produced in Colorado totaled US$86.9 million in 2012.

Study Methods

Sample development

The population of interest in this study is forest harvesting contractors that work in Colorado. Some are based in neighboring states but do enough work in Colorado to be listed in local directories. This includes any business that derives a significant portion of its revenue from forest management operations, such as logging, fire mitigation, or land clearing. Therefore, arborists, consultants, and sawmills are excluded from the survey. All relevant businesses are included, from large operations with high capital investments down to one-person operations with minimal equipment.

Since Colorado lacks a comprehensive directory of forestry contractors, information from many different sources was sought in developing the sample. The most useful references were contractor lists provided by individual CSFS districts and the Reinold survey of 2002. Both sources included many contractors who have since gone out of business or changed their contact information; hence the 2014 sample is smaller than that in 2002. Other valuable sources for contact information were industry groups, such as the Colorado Timber Industry Association and the Wildfire Mitigation Professionals Association. After extensive searching, a list of 236 contractors was developed. As the survey progressed, additional contractors naturally came to the attention of the surveyors. However, to avoid bias, no further additions were made to the sample after the interviews began.

Question list development

The interview included a wide variety of questions so that results could have broad potential applications. Many of the questions were inspired by logger surveys in eastern states, such as Georgia, West Virginia, Virginia, and Michigan. However, the production issues that those surveys focused on are often not as relevant in the service-dominated industry of Colorado. Additional input was sought from CSFS foresters and research scientists about what information would help in their work. Major goals for the survey

were to create a baseline from which future surveys could be developed and test out some questions to see how much useful information they provide. The categories of questions were contact information, demographics and business attributes, project information, and community wildfire mitigation. All questions were quantitative in nature; however, comments and opinions were also solicited and recorded to be coded and analyzed later.

Data collection

Surveys were conducted via telephone interview. Although most logging surveys have been done by mail, telephone was chosen in this case for several reasons. With the lack of current contact information for the contractors, many mailing addresses were inaccurate. Therefore, a mail survey ran the risk of an unacceptably low response rate, especially considering the typically low response rate of mail surveys even with correct addresses. Also, phone surveys allow more open-ended questions, and opinions and comments can be shared more freely. These comments could be helpful in developing future surveys.

All contractors were called in alphabetical order until the end of the list, and then second and third attempts were made if necessary. Voicemails were not left because more callbacks resulted from contractors seeing an anonymous missed call than from a voicemail soliciting a survey. If a number had been disconnected or changed and no updated contact information could be found, the business was assumed to be defunct. If possible, out-of-business contractors were asked what caused them to leave the forestry business. See Figure 1 for a visual representation of the process.

Transcription and coding

Interviews were not recorded because that would have reduced the sample size and the participants' willingness to openly share opinions. Rather, interview notes were taken by hand and immediately entered into Microsoft Word as individual files corresponding to each business. All quantitative information was immediately entered into Microsoft Excel for summary statistics. At the end of the interview process, qualitative information was coded and entered into Excel.

The coding process was based on methods developed by Bogdan and Biklen (1998). The first step was to read all interview sheets and look for commonly voiced opinions and comments. Typical codes consist of a number to identify the question (dimension) and a letter to identify the answer (category; Gorden 1992). However, in this survey, interviewees freely shared information that did not necessarily correspond to the interview questions. Therefore, the initial coding served both to identify and number dimensions and to assign letters to specific comments that related to the various dimensions. For example, a code of ''7b'' was assigned to many of the contractors. The ''7'' represents dimension 7, or comments relating to grants, and the ''b'' means that contractors support grants rather than oppose them. Codes were entered into a spreadsheet where they were organized by respondent. After coding all the interviews, codes were examined to be eliminated, combined, or subdivided to arrive at a final set. One more read-through of interviews was conducted after all codes were finalized.

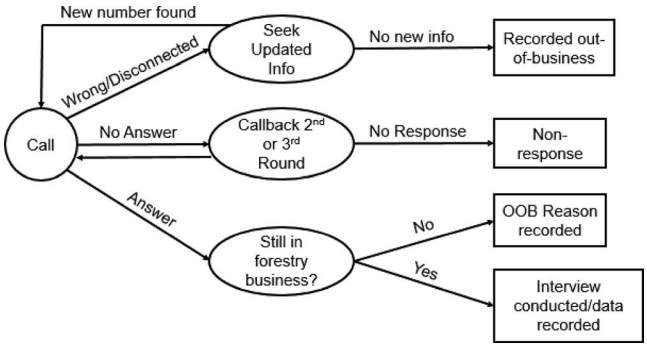

Figure 1.—The data collection process. Circles/ovals contain actions taken, corresponding arrows show results of the action, and squares contain the way that the data were recorded.

Data analysis and reporting

All data were entered into Microsoft Excel for calculation of descriptive statistics. Extra steps were taken to avoid bias in presenting comments and opinions in this article. Because this information was not solicited, it would be misleading to present their frequency of occurrence. However, no opinions are presented here that were not voluntarily shared by at least five contractors from different parts of the state. Additionally, any dissenting views are also reported.

Results and Discussion

Response rate

Of the initial sample of 236 contractors, 99 were successfully contacted. Because many respondents had gone out of business, 77 interviews were completed. An additional 24 contractors were assumed to be defunct because of phone numbers that had been disconnected or changed. The response rate of 32.6 percent for this survey is comparable with or higher than that in most of the logger surveys in the literature (Greene et al. 1988, Hoop et al. 2002, Milauskas and Wang 2006, G.C. and Potter-Witter 2011, Leon and Benjamin 2012). Table 1 shows this survey's sample size and results compared with Reinold's 2002 survey.

Demographics and business attributes

Most forestry contractors in Colorado are small businesses with relatively few employees. Figures 2 and 3 display the distribution of contractors in each employee and revenue class, respectively. Results seem consistent with those found in other reports, including that of Leon and Benjamin (2012), who found that the logging sector in their area (New

Table 1.—Response numbers for the 2014 survey compared with those of 2002.

	2002 Survey	2014 Survey
Sample size (*n*)	373	236
Responses (*n*)	151	99
Out of business (*n*)	35	22
Surveys completed (*n*)	116	77
% surveyed[a]	31.1	32.6

[a] Percent surveyed is derived from comparing surveys completed with sample size and does not include out-of-business contractors.

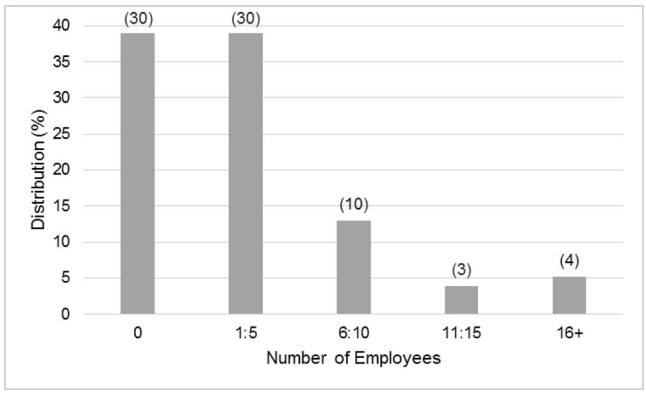

Figure 2.—Distribution of forestry contractors by employee count. Values on the y *axis represent percentage of workforce, and values presented in parentheses represent number of contractors.*

England) was dominated by businesses with fewer than five employees.

One potential problem with these data is that it was occasionally unclear if contractors were reporting information specific to their forest harvesting divisions or if the numbers included other revenue sources, such as sawmill operations, urban tree work, and so on. An effort was made to distinguish between these, but contractors often seemed unclear themselves or did not keep books that were accurate enough to differentiate them. A similar problem occurred in a survey of Swedish contractors, in which the authors reported that employee number class could be confounded by these issues (Häggström et al. 2012).

The business age for the respondents is displayed in Figure 4. To clarify responses, the question specifically asked how long the contractor had been operating under their current registered DBA, not how long the contractor had personally been in the logging business. Results showed a minimum of 3 months in business and a maximum of 50 years, with the average being 17.8 years.

An interesting finding here is the number of businesses that had been established both since the last survey in 2002 (40.2%) and since the turn of the century (50.6%). This shows a higher proportion of newer businesses compared

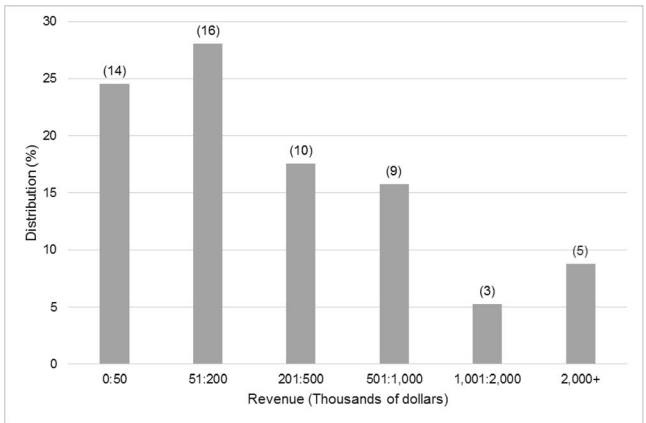

Figure 3.—Distribution of contractors in each revenue class. Because 20 interviewees declined to answer the revenue question, data are based on the 57 contractors who shared this information.

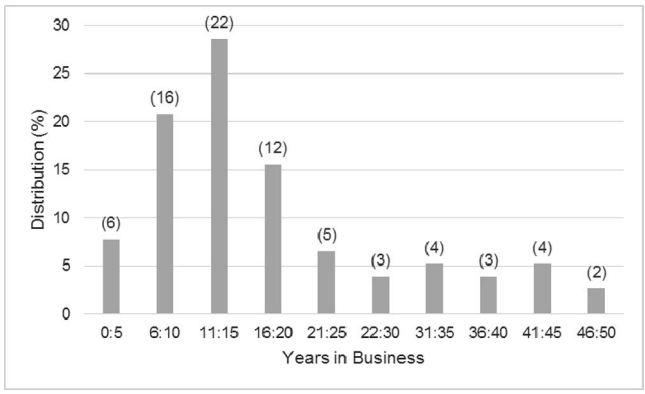

Figure 4.—Distribution of contractors by years in business.

with some of the other logger surveys, particularly that of Leon and Benjamin (2012), who reported that just 20 percent of respondents had started their business since the year 2000.

Services offered

All contractors were asked about the types of jobs on which they would be willing to bid. Eight job categories were included in the survey, but to simplify the results, only three are reported here: logging, fire mitigation, and wood processing. Because much crossover exists in the terminology and labels are often incorrectly applied (e.g., ''logging services'' is often used by contractors to describe activities like fire mitigation), the definitions used here are as follows:

- Logging: The contractor pays to harvest trees or is paid by a mill to supply logs.
- Fire mitigation: The contractor is paid by the landowner to remove trees, such as landscape-scale thinning or defensible space.
- Wood processing: The contractor has the capacity and willingness to produce and sell wood products other than firewood or furniture.

Generally, forestry contractors in Colorado are not specialists and are willing to work jobs in many of the above categories in order to turn a profit. Many respondents also work in industries other than forestry, including construction, fence building, excavation, and more. This broad business focus seems to be unique to Colorado; forestry businesses in other parts of the country have a more clearly defined scope. This is apparent in the depth of literature available that investigates ''loggers'' rather than ''forestry contractors'' (Greene et al. 1988, Hoop et al. 2002, Milauskas and Wang 2006, G.C. and Potter-Witter 2011, Leon and Benjamin 2012). Table 2 compares the results of this survey to that of the Reinold's 2002 survey.

Table 2.—Percentage of respondents willing to bid on different job types in the 2002 and 2014 surveys.[a]

	2002 ($n = 116$)	2014 ($n = 77$)
Logging	68.1 (79)	75.3 (58)
Wildfire mitigation	88.8 (103)	90.9 (70)
Wood processing		23.4 (18)

[a] Number of respondents is given in parentheses.

Results of the present survey show that most of the forestry contractors in the state are primarily in the business of wildfire mitigation. Many interviewees claimed that they had done more logging jobs in the past and were critical of the current lack of timber sales. Only one reported a recent increase in logging work. Several had recently sold lots of heavy logging equipment because it was not being used. Looking for a new business focus, these interviewees often felt forced into the fire mitigation and rehabilitation business despite lacking a background in them.

Project information

Equipment and harvesting systems.—Each interviewee was asked to disclose the equipment owned for harvesting, skidding, and processing. Answers ranged from walk-behind brush mowers to feller-bunchers to log trucks. Select results are displayed in Figure 5. To present the information more clearly, some allowances were taken with categorizing equipment. Hydro axes, mulchers, and masticators are all grouped into the category ''masticator.'' The skidder category includes both commercial skidders and tractor skidders. If a contractor had an excavator with a processing head, that was considered a harvester; an excavator with a mulching head was considered a masticator. ''Light'' includes skidding equipment such as mini-skidders and ATV/arch combinations.

A lot of information can be gleaned from these answers about the types of harvesting systems that each contractor is capable of providing. Only one respondent (1.3%) owns a forwarder, so only one is capable of a traditional cut-to-length system of harvesting. Thirty-three percent are capable of fully mechanized harvesting operations based on ownership of feller-bunchers, harvesters, or skid steer felling attachments. Seven percent own horses, a mini-skidder, or an ATV/skidding arch and are capable of light-on-the-land logging operations. Twenty percent own either a masticator, hydro ax, or mulching attachments and are therefore capable of mechanical mastication of standing trees.

Project size and land ownership.—Contractors were asked the size of jobs and the land ownership on which they are willing to bid. The most sought after projects are in the 10- to 100-acre class, with 81.8 percent of contractors willing to bid. For smaller jobs (up to 10 acres), 79.2 percent are willing to bid, and 50.6 percent are willing to bid on jobs over 100 acres. Private land is the most desirable for the contractors, with 93.5 percent willing to bid on these jobs. State land is next with 57.1 percent, and federal land falls last at 50.6 percent.

Figure 6 displays these results grouped into descriptive categories. ''Small private'' includes all private jobs up to 10 acres. The majority of work in the WUI is likely to fall into this category (Radeloff et al. 2005). For these small private jobs, much emphasis is being placed on wildfire mitigation, and financial assistance is often available. ''Medium private'' includes private jobs of 10 to 100 acres. Although less likely to be eligible for fire mitigation grants, land in this class may qualify for agricultural financial assistance, such as Colorado's Forest Agriculture Classification Program (Forest Ag) or the Natural Resources Conservation Service's Environmental Quality Incentive Program (EQIP). ''Large private'' is private land of over 100 acres. Because Colorado has no industrial private forest land (Eckhoff et al. 2007), these are all non-industrial private forests and may be eligible for Forest Ag or EQIP. ''Large federal'' refers to jobs on federal lands of over 100 acres. This is the class that currently supplies biomass for the Eagle Valley Clean Energy (ECVE) power plant in Gypsum and would likely provide feedstock for future biomass operations.

Community wildfire mitigation

HOA and CWPP projects.—All respondents were asked the percentage of their projects that take place on private land, such as a Homeowner Association (HOA) or land united under a CWPP. One potential shortcoming with these data is that the contractors sometimes do not know whether an HOA or CWPP is involved. If they deal directly with the landowner and not with a neighborhood ambassador, status of community organization may not enter the conversations. If the interviewee was unsure of this question, their answer was left out; therefore, results are based on a sample size of 68.

The average respondent performs 31.8 percent of work on HOA or CWPP land. Some contractors work almost exclusively on these lands (13%), and about 20 percent of them do half their work on these lands. Thirty percent of

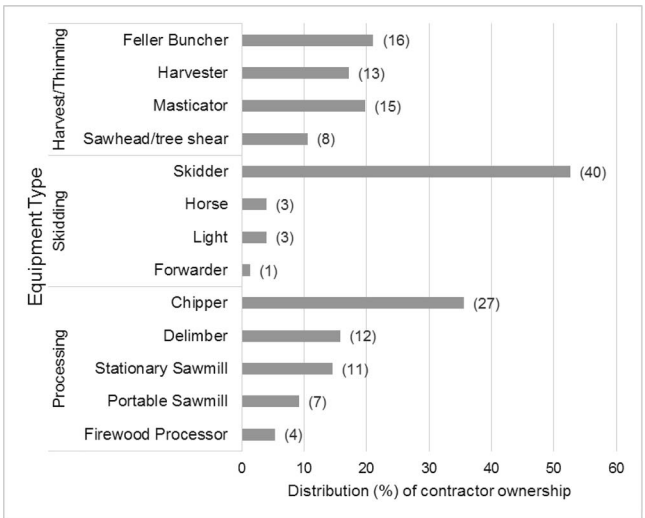

Figure 5.—Percentage of contractors owning different types of equipment. These data are based on results from 76 interviews.

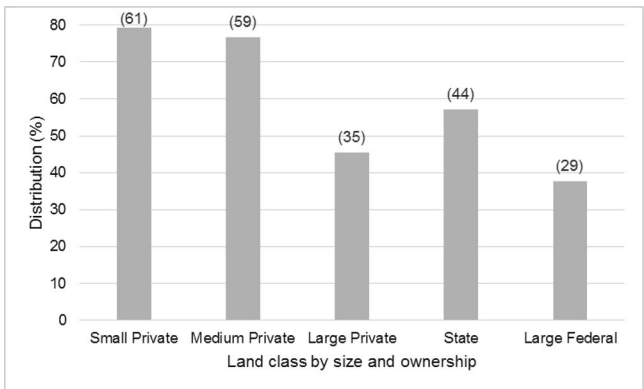

Figure 6.—Distribution of contractors by land class on which they are willing to bid.

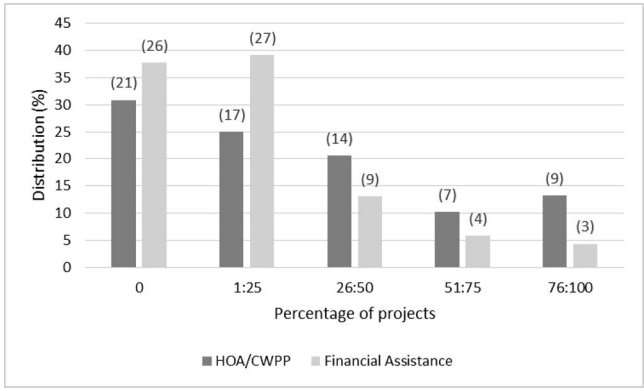

Figure 7.—Proportion of contractors' total projects that are on Homeowner Association/Community Wildfire Protection Plans (HOA/CWPP) land and that receive financial assistance.

contractors do no work on HOA/CWPP land. Full results are displayed in Figure 7.

Financial assistance.—State- and federal-sponsored financial assistance is available to many entities to help offset the costs of fuels reduction, forest health, and forest restoration treatments. These eligible entities include HOAs, rural landowners, state and local governments, municipalities, counties, non-profits, and others. As with the previous question, many contractors were unaware of the source of their client's funding and whether any financial assistance was involved, so the sample size for this question was reduced to 69 respondents. Thirty-eight percent of contractors denied working any projects that receive financial assistance, 40 percent reported that clients receive some assistance on many of their projects, and 4 percent worked almost exclusively financial assistance projects. Full results are displayed in Figure 7.

Given these numbers, it is not surprising that most respondents look favorably on the financial assistance programs, claiming that in their absence, significantly fewer mitigation projects would be implemented. Several of these contractors also articulated that the programs have an inherent educational value that promotes mitigation projects. As homeowners see their neighbors get work done and are exposed to the publicity surrounding financial assistance programs, they become persuaded to treat their own properties. However, many contractors opposed these programs, saying that they complicate the process and make landowners hesitate to get work done until they are assured of money. Also, recipients of funding often do not understand—or choose to ignore—the cost-share aspect, thinking that the money they receive will cover the entire cost of the job.

Major Issues Facing Forestry Contractors

Results from this study confirm other findings that the forestry industry has suffered in recent years (Keegan et al. 2012). This survey revealed a shrunken workforce of contractors, down from a sample size of 373 in 2002 to 236 in 2014. Additionally, of the 99 successful contacts in this survey, 22 contractors (22.2%) are no longer in the forestry business. Many of these surviving contractors are critical of the current forestry climate and unsure about their ability to remain profitable.

The major changes to the forestry industry over the last decade can help to explain the current unstable climate. However, it will be useful to hear the reasons from the viewpoint of the contractors interviewed. Although questions regarding major business problems were not specifically asked (except in the case of out-of-business contractors), plenty of respondents commented on this topic. Several of the same concerns were voiced by many different contractors from different parts of the state and of differing business attributes.

Fewer timber sales by the USFS

Many contractors had built their business around 2-year timber sale contracts and had been forced to restructure or go out of business for this reason. Several contractors were upset about millions of acres of spruce beetle-killed trees being closed off from salvage logging.

Competition with local fire districts

This was a concern of many fire mitigation companies who were being underbid by local fire districts. The fire districts often use off-duty firefighters or volunteer labor to offer mitigation services at a price that contractors cannot compete with. Additionally, fire districts are eligible for grants to purchase equipment such as chippers and curtain burners. One respondent, who formerly owned a large fire mitigation business, identified this as the principal reason for going out of business.

Landowners' understanding about the expense of mitigation work

According to many contractors, landowners do not understand the expenses involved in treatments and often are unwilling to pay a price that is high enough to sustain business. Many believe that the value of the wood removed should be able to cover the cost of treatments. Additionally, some landowners receive cost-share grants and think that the share portion of it should pay for the work in its entirety.

Illegitimate contractors

''Illegitimate contractors'' are those who cut corners by not having insurance, hiring illegal labor, not paying prevailing wages, or not following Best Management Practices. Because they cut costs in these ways, they can underbid legitimate contractors who provide higher-quality work in a more socially responsible way. Several contractors articulated that a ''level playing field'' must be created that prevents this from happening.

Summary and Conclusions

To achieve land management objectives, Colorado needs a large base of contractors willing to work on a variety of land types and job sizes. The pattern of land fragmentation means that isolated patches of private, state, and other lands are interspersed within federal lands (CSFS 2010). Although improved forest health provides many benefits, risk of high wildfire intensity serves as a convenient proxy for determining acres that are in need of treatment. According to the CSFS (2010), 1,177,121 acres of private land are at risk for a high or very high intensity wildfire, and 4,202,483 acres of federal forest land are in this category.

In the years since the last survey was conducted, many of the contractors have gone out of business and been replaced

by newer start-ups. However, a lot of the same issues that plagued the industry then persist today. A major shift has taken place in which traditional logging has given way more and more to forest health improvement service contracts. Despite the great need for this type of work and the amount of public financial assistance available, high operational costs and fragmented land ownership keep it from being a very profitable venture for many businesses. The future looks uncertain for many forestry contractors in the state. With a shortage of local contractors, one option is to look out of state when soliciting bids for Colorado projects. However, this may raise the cost of the jobs and is less likely to contribute positively to the local forest products industry in the long term.

The results of this study indicate that to achieve management objectives, land managers in Colorado must make better use of contractor resources. Better timing and coordination of treatments on small ownerships are necessary to treat the problem on a landscape scale rather than one 5-acre lot at a time. A majority of contractors are willing to work jobs that are 100 acres or more; this would not only increase efficiency but also be more profitable for the contractors and less costly for the landowners. One of the intents of CWPPs is to address this issue of scale. However, many CWPPs leave implementation up to individual landowners and do not attempt to group properties together into treatment areas. CWPPs should place more emphasis on larger treatment areas spanning property boundaries than on defensible space of individual homes.

Another way to make treatments more economical is increased utilization of the wood removed. This could be achieved by additional investments into infrastructure, such as sawmills and other processing facilities that would reduce trucking distances. As mentioned, one potential use for wood from thinning projects is feedstock for biomass-energy projects, such as the BANR Project is looking into or the EVCE plant in Gypsum. The EVCE uses 70,000 bone dry tons of woody biomass per year to produce 10 MWe of power. This directly leads to the treatment of 1,500 acres yearly, of which 1,000 acres are part of the White River Long Term Stewardship contract. Additionally, Boulder County uses about 1,500 tons of feedstock to supply thermal heat and hot water to several facilities, contributing to the treatment of 100 to 200 acres.

Significant opportunities exist for future research on this subject. This article focuses on harvesting contractors alone; therefore, a more complete picture of the forest business community could be painted by studying other groups, such as sawmill operators, consultants, and arborists. This survey is also very general and briefly touches on many broad topics, each of which could be a subject for future study. These include the effects of public financial assistance programs, the volume of wood removed or acres treated by harvesting contractors, and the local utilization versus imported wood products in the state. In particular, land managers would benefit from an analysis of how the use of federal stewardship contracting has affected the forestry contractor community and wood products industry in Colorado.

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