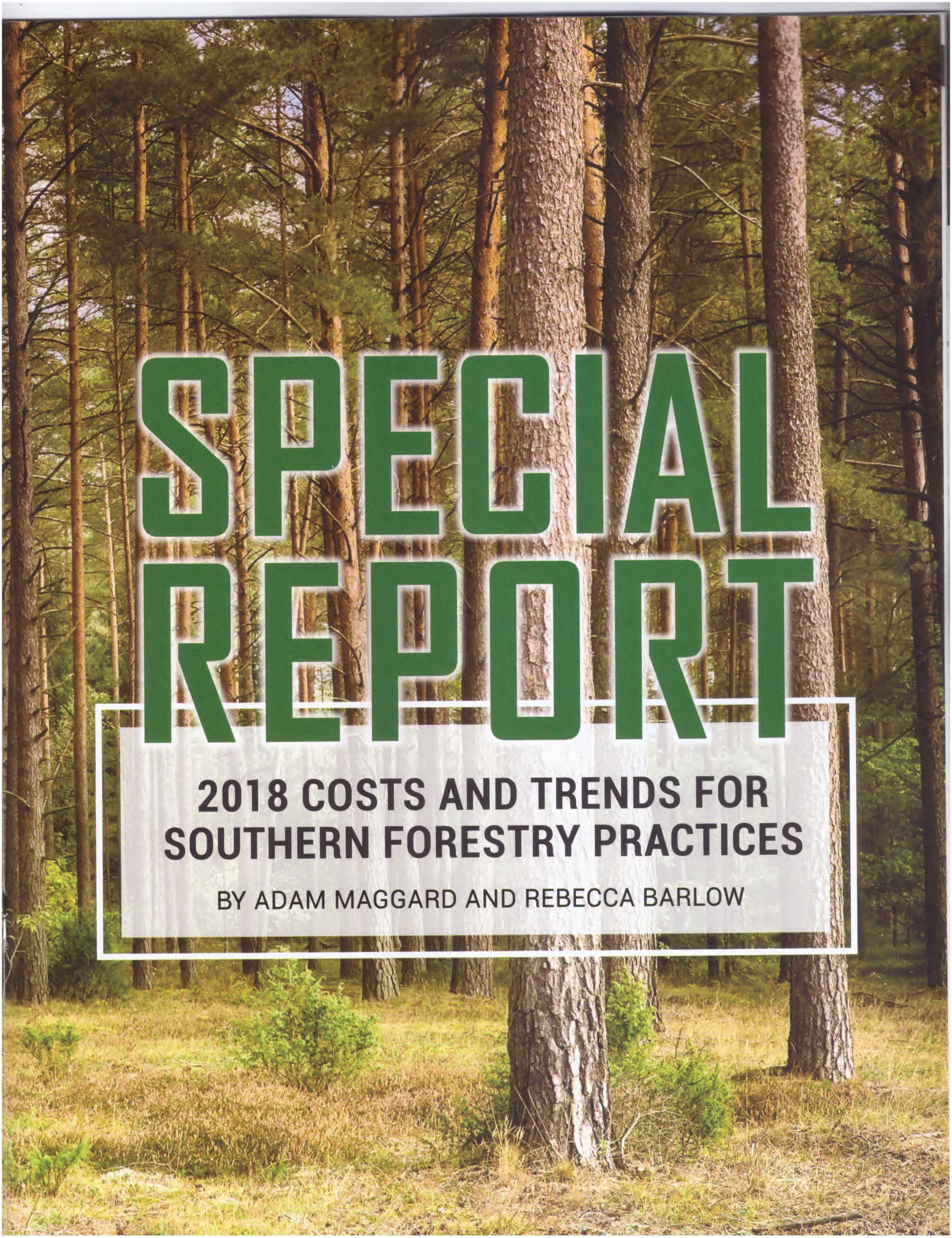

SPECIAL REPORT

2018 COSTS AND TRENDS FOR SOUTHERN FORESTRY PRACTICES

BY ADAM MAGGARD AND REBECCA BARLOW

Estimates for the cost of forestry practices in South have been reported since 1952 when Albert C. Worrell authored the original report titled "What does it Cost to Practice Forestry in the South?" published in 1953. Since 1982, the survey of cost of forestry practices in the South has been reported every two years. This report summarizes the results of the 2018 survey and compares them to costs reported by prior surveys. This is the twenty-fifth version of this report.

METHODS AND RESULTS

The tables presented here follow standards from previous reports and are based on the responses to a questionnaire asking respondents to provide a detailed breakdown of their costs for ten major forestry practices for 2018. In the winter of 2018, two hundred and ten questionnaires were mailed to private firms, public agencies, and individuals from 14 states in the southern United States. Additionally, the questionnaires were made available electronically using Qualtrics Survey Software. Of the mailed questionnaires, 18 were returned as undeliverable for a total of 192 questionnaires distributed. Of those, 28 completed questionnaires were returned, for a response rate of 15 percent. For electronic questionnaires, an unknown amount of links was distributed through various outlets. Of those, 57 questionnaires were completed while another 14 blank questionnaires were submitted.

Of the 85 questionnaires considered usable in this current survey, 39 percent were from private family landowners, 4 percent were from publicly funded organizations, 26 percent were from consulting firms, 14 percent were from private forestry firms, 9 percent of respondents reported "other" for their organizational type, and 8 percent did not list an organization type.

This is similar to the 2016 survey where 42 percent were private family landowners, 26 percent were consulting firms, 12 percent were private forestry firms, and 7 percent were from public agencies.

Tables 1 through 10 in this report summarize costs for forestry practices included in this survey. Average costs are presented by region and/or by treatment or method on a per acre basis, except for planting costs, which also are presented on a cost per seedling and seedlings planted per acre basis. Tables 11 through 13 summarize general cost trends of various forestry practices in the South. Table 11 summarizes the cost of forestry practices for selected years from 1952 to 2018. Table 12 shows the changes in cost from 2012 to 2018 and 2016 to 2018, including inflation. Table 13 compares the southern forestry practices costs indices for selected years from 1967 to 2018.

For this survey, three physiographic regions in the South were considered: the Southern Coastal Plain, Northern Coastal Plain, and Piedmont regions (Figure 1). Results designated with an asterisk mean that fewer than 10 percent of the respondents reported activities in this area.

MECHANICAL SITE PREPARATION

Survey respondents reported the use of mechanical site preparation of all types on 56,613 acres with an overall average cost per acre of $182.28 (Table 1). Fifty-one percent of respondents to the survey reported conducting some type of mechanical site preparation.

Some mechanical site preparation methods included but were not limited to, shear-rake-pile-bed, subsoiling, and drum chopping. The cost of mechanical site preparation of all types for the Piedmont was 72 percent greater than the Southern Coastal Plain and 11 percent greater than the Northern Coastal Plain, on average. Because of a low response rate, the average costs by the number of passes reported are not included for all regions.

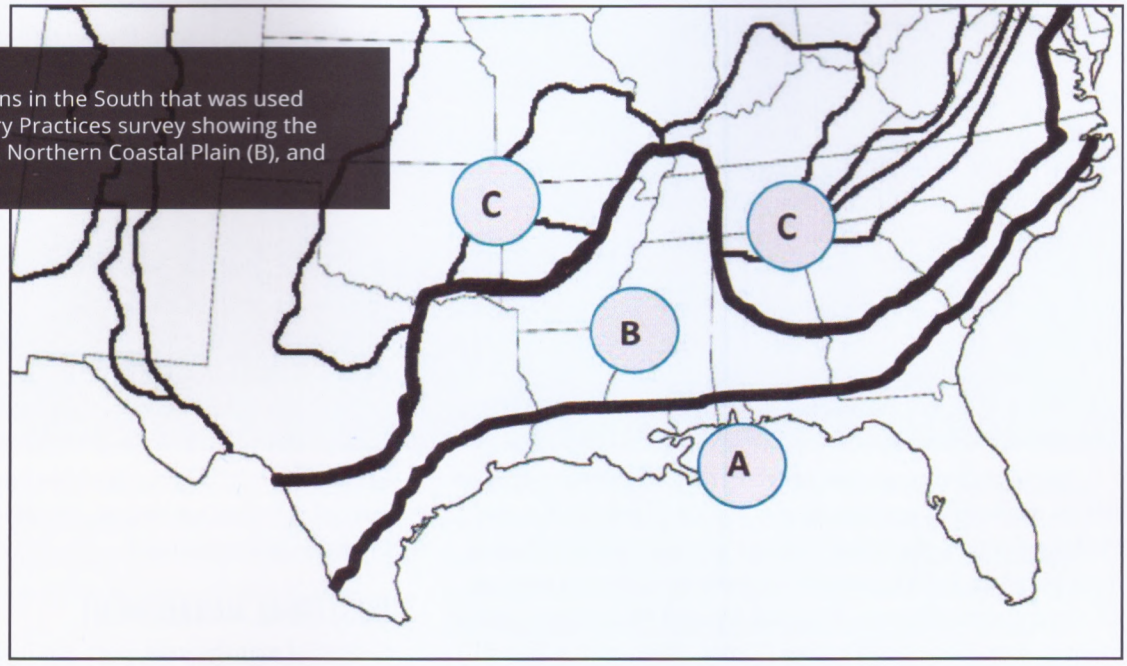

FIGURE 1.
Map of physiological regions in the South that was used in the 2018 Cost of Forestry Practices survey showing the Southern Coastal Plain (A), Northern Coastal Plain (B), and Piedmont (C).

Of the 41,457 acres that reported an amount for number of passes, the largest amount (48 percent) performed a double-pass with an overall average cost per acre of $195.50. The cost of single-pass mechanical site preparation of all types averaged 33 percent less than double-pass mechanical site preparation of all types and 54 percent less than triple-pass mechanical site preparation of all types. The increase in overall average price per acre in 2018 compared to 2016 can be explained, in part, by the difference in respondents reporting double-pass treatments compared to single pass treatments in 2018 and 2016. In 2016, single-pass treatments were most frequently reported.

PLANTING

Sixty-five percent of survey respondents reported planting pine seedlings in 2018, of which 53 percent reported only hand planting, 9 percent reported only machine planting, and 38 percent reported both methods. These respondents reported planting a total of 156,178 acres of pine seedlings. The majority of pine seedlings planted by hand and machine were bareroot loblolly pine (Pinus taeda), which made up 74 percent of the total acres reported for planting in 2018.

Hand planting consisted of 95,978 acres and machine planting consisted of 60,200 acres (Table 2). The average cost of hand planting all bareroot pine species on cutover land averaged 33 percent less than the average cost of hand planting all container pine species on cutover land. Respondents reported hand planting an average of 553 pine seedlings per acre in 2018 (Table 2). The average cost of machine planting all bareroot pine species on cutover land averaged 25 percent more than the average cost of hand planting all bareroot pine species on cutover land. Overall, pine seedlings machine planted per acre averaged 613 (Table 2).

Only 5.5 percent of respondents to the survey reported planting either by hand or machine on old-field sites. Because so few reported this activity, the average planting costs and seedlings planted per acre are not reported for this treatment type. Similarly, hand planting costs for loblolly pine, slash pine (Pinus elliottii), and longleaf pine (Pinus palustris), as well as machine planting costs for slash pine, are reported as overall average costs only and not by specific region, except for hand-planted longleaf pine for the Northern Coastal Plain.

PRESCRIBED BURNING

Fifty-five percent of survey respondents reported prescribed burning in 2018, all of which used a ground drip torch for treatments on a total of 74,545 acres (Table 3). Prescribed burning for site preparation and understory control accounted for over 82 percent of the total acres reported. The overall average cost per acre for all prescribed burning was $31.92 (Table 3). The overall average cost per acre for prescribed burning for site preparation was 17 percent more than the overall average cost per acre for prescribed burning for understory control.

The average cost per acre for prescribed burning for understory control in the Southern Coastal Plain region was 21 percent more than in the Northern Coastal Plain region and 14 percent more than in the Piedmont region. Prescribed burning

for site preparation is not available for the Southern Coastal Plain and Piedmont regions due to lack of responses. For all burning purposes, the cost per acre for the Southern Coastal Plain region was on average 8 percent less than the Northern Coastal Plain region and 1 percent less than the Piedmont region.

CHEMICAL APPLICATION

Seventy-two percent of respondents reported using chemical treatments of various application methods on a total of 122,995 acres in 2018 (Table 4). The primary chemical treatment purposes reported were site preparation, mid-rotation release, and herbaceous weed control, with site preparation accounting for 66 percent of all acres reported. The primary methods of application were ground and aerial, with the aerial method of application accounting for 52 percent of all acres reported.

The overall average cost per acre for all treatment purposes and all methods of application was $77.09 (Table 4). For the Piedmont region, the overall average cost per acre for all treatment purposes and all methods of application was on average 23 percent more than the Southern Coastal Plain region and 33 percent more than the Northern Coastal Plain region. For all treatment types and all regions, the aerial method of application had an overall average cost per acre of 8 percent less than the ground method of application.

FERTILIZATION

Only 12 percent of respondents reported using fertilizer on a total of 49,577 acres with an average cost per acre of $95.15 (Table 5). Due to the lack of responses, average costs per acre by region are not reported. Aerial application of fertilizer accounted for 63 percent of all acres reporting fertilization treatments in 2018. Sixty-six percent of all acres fertilized by all application methods used a combination of Diammonium Phosphate (DAP) and Urea at an overall average cost per acre of $105.90 (Table 5). None of the responses for fertilization were from the Piedmont region.

FIRE PROTECTION

Similar to fertilization, only 15 percent of respondents reported using some method of fire protection. Over 257,500 acres were reported as using fire protection (Table 6). Fire protection methods reported included firebreaks, fire plows, and tractors. Primary methods of fire detection included self-observation, forestry commissions, neighbors, and hunting clubs. The overall average cost per acre for fire protection was $12.21 (Table 6).

TIMBER CRUISING

Thirty-eight percent of survey respondents reported 546,289 acres cruised with an overall average cost per acre of $12.27 in 2018 (Table 7). Sixty-three percent of these respondents used variable radius sampling method for timber cruising at an overall average cost per acre of $10.53 (Table 7). Overall, variable radius sampling cost 32 percent less than fixed plot sampling.

TIMBER MARKING

Only 24 percent of survey respondents reported 15,086 acres of timber marked at an overall cost per acre of $48.81 in 2018 (Table 8). Sixty-two percent of acres reported for timber marking were for thinning purposes at an overall cost per acre of $41.20 (Table 8).

Due to the lack of responses, timber marking for thinning was not reported by region.

PRECOMMERCIAL THINNING

Survey respondents reported precommercial thinning on 6,233 acres at an overall average cost per acre of $149.98 in 2018 (Table 9). Only 18 percent of respondents conducted precommercial thinning operations. Therefore, the average cost per acre by region is not reported.

CUSTODIAL MANAGEMENT

Custodial management costs can include but are not limited to road construction and maintenance, boundary line maintenance, property line surveys, insect and disease management, or legal fees. Only 22 percent of survey respondents in 2018 reported custodial management costs for 943,941 acres with an overall average cost per acre of $13.73 (Table 10). Due to the low number of responses, the average cost per acre for all operation types per region is not reported.

CHANGES IN COST ESTIMATES BETWEEN 2016 AND 2018

In comparison to the 2016 survey, this survey had a 3.5 percent increase in usable surveys. Similar to the 2016 survey, this survey had the greatest response from family forest owners (39 percent) followed by private consulting firms (26 percent). In general, family forest owners tend to represent practices on smaller acreages and fewer tracts than those of professional organizations. The continued higher percentage of questionnaires received from family owners, but likely more so increased issues with liability and labor, specifically, concerning prescribed burning and tree planting can explain, in part, some of the costs changes from 2016 to 2018.

CHANGES 1952-2016

Costs of major forestry practices surveyed for selected years from 1952 to 2018 are presented in Table 11. (Note: Changes are reflected in current dollars). The majority of practices reported here were part of the original survey except for precommercial thinning costs, which have been reported since 1976, and fertilization costs, which were included for the first time in 1984.

These are average dollar costs from each survey and are based

on observations for all regions of the South. All costs are presented on a per-acre basis except planting costs, which are reported on a cost per seedling basis. The average cost of each practice has increased since 1952, as these costs do include inflation (Table 11).

Comparisons of the 2018 results to 2012 averages showed that the majority of practice costs increased except for prescribed fire, timber cruising, and machine planting, which all showed decreases in cost (Table 12). Comparison of the 2018 results to the 2012 results is highlighted instead of the 2014 results due to low participation in the 2014 survey.

From 2012 to 2018, precommercial thinning increased the greatest in overall average percent change, while machine planting decreased the greatest. Comparisons to 2016 averages show that the practice costs increased except for precommercial thinning which showed a decrease in cost (Table 12). From 2016 to 2018, timber marking increased the greatest in overall average percent change, followed by hand planting.

COST CHANGES RELATED TO PRICE CHANGES

Table 13 presents selected years costs from 1967 through 2018 relative to the general wholesale price level (Producer Price Index—PPI) and the softwood lumber index. These indices provide a basis for comparing the costs of selected forestry practices with both forest product prices and with general economic trends. The PPI increased by 9 percent from 2016 to 2018.

Forestry practices also increased during this time except for precommercial thinning, which decreased by 7 percent. Historically, the softwood lumber price index has been used in this report instead of stumpage prices, because this index is more broadly based and may give a more consistent representation of price trends. From 2016 to 2018, the softwood lumber index increased (22 percent) more than the PPI (9 percent) after decreasing from 2014 to 2016. This increase in both the PPI and softwood lumber index are reflected in the 2018 costs of forestry practices.

Costs of forestry practices in the South have been variable over the last decade. During much of this period, the forest industry as a whole has been impacted by suppressed housing markets and low stumpage values. Timberland ownership change and corporate restructuring have also impacted the industry. As of recent years, a strong economy and housing market have boosted demand for timber in the South. However, in many areas of the region stumpage values are still suppressed by a surplus of standing timber and weak markets. New mills are opening and others are starting to resume operation compared to earlier years within this decade, but more are needed in many areas across the region. As a result, the low stumpage values have likely influenced decisions of landowners and managers and may have played a role in the variability of the cost of forestry practices. Further, political issues such as labor and liability are likely impacting costs of forestry practices. The cost of prescribed burning per acre, for instance, has increased and will likely continue to do so, which is likely, in part, due to increased liability requirements for burn managers and/or landowners. It also appears labor issues have a role in increased planting costs in recent years. To what extent, remains to be seen, but it is something to monitor moving forward.

We appreciate those who participated in the 2018 questionnaire and past questionnaires. It is with your time and effort that this important report and resource is possible. If you would like to participate in the 2020 cost of forestry practices in the South questionnaire, or have ideas for improving future cost of forestry practices in South questionnaires, please contact Dr. Adam Maggard, Alabama Cooperative Extension Specialist and Assistant Professor, School of Forestry and Wildlife Sciences, Auburn University, by email: adm0074@auburn.edu or phone: 334.844.2401.

Adam Maggard and Rebecca Barlow are Alabama Cooperative Extension System Specialists and assistant professors in Auburn University's School of Forestry and Wildlife Sciences.

CHARTS
Representing Survey Results

TABLE 1.

Mechanical site preparation costs per acre reported as part of the 2018 Cost of Forestry Practices survey.

Site preparation treatment	Number of passes	Acres	Southern Coastal Plain	Northern Coastal Plain	Piedmont	Overall average
			Average cost per acre			
All	All	56,613	127.92	199.29	220.46	182.28
All	1	14,333	97.33	167.47	*	130.45
All	2	19,973	126.2	268.51	*	195.5
All	3	7,151	*	*	*	286.69

* Too few responses

TABLE 2.

Hand and machine planting costs per acre and costs per seedling to purchase reported as part of the 2018 Cost of Forestry Practices survey. Overall average planting costs do not include seedling costs.

Planting method	Acres	Southern Coastal Plain	Northern Coastal Plain	Piedmont	Overall average planting cost	Cost per seedling	Overall average Seedlings per acre
Hand planting		*Average cost per acre*					
Cutover land, all pine, bareroot	50,706	74.00	58.65	*	63.84	0.10	580
Cutover land, all pine, container	11,534	*	86.67	*	95.62	0.17	563
All land type, loblolly pine, bareroot	67,922	*	*	*	62.79	0.09	580
All land type, loblolly pine, container	7,045	*	*	*	79.68	0.16	522
All land type, longleaf pine, container	8,857	*	86.41	*	112.98	0.20	522
All hand methods, all pine	95,978	71.67	66.92	93.67	84.96	0.12	553
Machine planting							
Cutover land, all pine, bareroot	54,600	*	78.52	*	80.02	0.09	590
All land type, loblolly pine, bareroot	47,297	*	86.37	*	88.53	0.09	574
All land type, slash pine, bareroot	6,667	*	*	*	64.00	0.07	630
All machine methods, all pine	60,200	*	78.52	*	116.93	0.09	613

TABLE 3.

Prescribed burning treatment costs per acre by ignition type and burning purpose reported as part of the 2018 Cost of Forestry Practices survey.

Ignition type	Burning purpose	Acres	Southern Coastal Plain	Northern Coastal Plain	Piedmont	Overall average
			Average cost per acre			
Ground, drip torch	Site preparation	35,976	*	36.05	*	33.36
Ground, drip torch	Understory control	25,398	31.58	26.02	27.66	28.46
Ground, drip torch	All	74,545	29.94	32.70	30.28	31.92

* Too few responses

TABLE 4.

Chemical application costs per acre by treatment purpose and method of application reported as part of the 2018 Cost of Forestry Practices survey.

Treatment purpose	Method of application	Acres	Southern Coastal Plain	Northern Coastal Plain	Piedmont	Overall average
			Average cost per acre			
Site preparation	Ground	18,035	77.56	85.38	*	86.83
Site preparation	Aerial	47,057	*	76.2	94.04	79.41
Site preparation	All	81,712	76.65	81.98	98.66	83.89
Mid-rotation release	Aerial	7,766	*	55.36	*	59.62
Mid-rotation release	All	26,200	*	65.54	*	66.22
Herbaceous weed control	Ground	15,951	*	*	*	24.23
Herbaceous weed control	Aerial	6,904	*	*	*	60.99
Herbaceous weed control	All	22,854	*	33.15	*	40.94
All	Ground	39,570	74.72	76.37	122.58	80.73
All	Aerial	63,471	77.19	69.01	90.32	74.44
All	All	122,995	78.86	73.01	97.1	77.09

* Too few responses

TABLE 5.

Fertilization costs per acre by purpose of application, application method, and fertilizer type reported as part of the 2018 Cost of Forestry Practices survey.

Purpose of application	Application method	Fertilization type	Acres	Southern Coastal Plain	Northern Coastal Plain	Piedmont	Overall average
				Average cost per acre			
All	All	DAP	10,150	*	*	*	66.89
All	All	DAP+Urea	32,838	*	*	*	105.90
All	Ground	All	17,993	*	*	*	81.22
All	Aerial	All	30,996	*	*	*	97.60
All	All	All	49,577	*	*	*	95.15

* Too few responses

TABLE 6.

Fire protection costs per acre reported as part of the 2018 Cost of Forestry Practices survey.

Primary method of fire protection	Acres	Southern Coastal Plain	Northern Coastal Plain	Piedmont	Overall average
		Average cost per acre			
All	257,579	*	*	*	12.21

* Too few responses

TABLE 7.

Timber cruising costs per acre by inventory purpose and method used reported as part of the 2018 Cost of Forestry Practices survey.

Inventory purpose	Method used	Acres	Southern Coastal Plain	Northern Coastal Plain	Piedmont	Overall average
			Average cost per acre			
All	Fixed plot	76,169	18.80	8.51	*	15.55
All	Variable radius	466,420	11.41	9.65	*	10.53

* Too few responses

TABLE 8.

Timber marking costs per acre reported as part of the 2018 Cost of Forestry Practices survey.

Timber marking purpose	Acres	Southern Coastal Plain	Northern Coastal Plain	Piedmont	Overall average
		Average cost per acre			
Thinning	9,383	*	*	*	41.20

* Too few responses

TABLE 9.

Precommercial thinning costs per acre reported as part of the 2018 Cost of Forestry Practices survey.

Primary thinning method	Acres	Southern Coastal Plain	Northern Coastal Plain	Piedmont	Overall average
		Average cost per acre			
All	6,233	*	*	*	149.98

* Too few responses

TABLE 10.

Custodial management costs per acre by operation type reported as part of the 2018 Cost of Forestry Practices survey.

Operation type	Acres	Southern Coastal Plain	Northern Coastal Plain	Piedmont	Overall average
		Average cost per acre			
All	943,941	*	*	*	13.73

* Too few responses

TABLE 11.

Costs per acre of major forestry practices in the South for selected years from 1952 to 2018, in US dollars.

Forestry practice	1952	1967	1976	1982	1986	1990	1994	1998	2002	2004	2006	2008	2010	2012	2014	2016	2018
Prescribed burning	0.21	1.60	3.65	4.12	4.84	8.10	10.57	16.58	14.41	21.08	24.94	29.31	25.79	32.42	18.18	26.63	31.45
Removing undesirable trees (chemically)	5.01	10.17	23.41	40.65	65.61	63.70	67.41	72.32	70.18	69.45	79.41	48.82	47.68	55.12	28.89	69.53	77.09
Timber cruising	0.30	0.74	1.18	2.18	3.27	2.02	2.09	4.10	5.40	3.32	5.23	6.28	6.56	13.20	2.75	10.64	12.27
Marking trees for harvesting	0.60	3.09	8.05	14.02	10.57	8.47	14.19	15.06	65.09	14.62	58.26	86.99	48.40	43.48	29.64	29.25	48.81
Mechanical site preparation	5.25	23.52	73.33	114.04	94.21	87.45	100.74	122.14	166.50	105.23	119.72	157.32	139.95	168.13	95.78	140.99	184.67
Planting by hand	0.01	0.02	0.05	0.05	0.05	0.06	0.06	0.07	0.08	0.07	0.09	0.11	0.12	0.11	0.11	0.10	0.15
Planting by machine	0.01	0.02	0.04	0.05	0.04	0.05	0.06	0.06	0.11	0.12	0.12	0.14	0.15	0.24	0.14	0.14	0.19
Precommerical thinning			25.97	49.27	52.44	55.43	79.05	71.27	102.10	74.98	58.89	80.18	166.66	50.27	*	159.44	148.4
Fertilization				38.80	36.03	39.29	41.01	54.80	56.04	50.08	77.98	110.28	62.79	86.33	79.49	70.41	94.79

* Too few responses (All costs are in dollars per acre except for planting costs, which are dollars per seedling. Table does not include costs from the 1961, 1974, 1979, 1984, 1988, 1992, 1996, and 2000 surveys.)

TABLE 12.

Percent change in cost of forestry practices in the South from 2012 to 2018 and 2016 to 2018 by forestry practice.

Forestry practice	Overall average % change 2012 - 2018	Overall average % change 2016 - 2018
Prescribed burning	-3.0%	18.1%
Removing undesirable trees (chemically)	39.9%	10.9%
Timber cruising	-7.0%	15.3%
Marking trees for harvesting	12.3%	66.9%
Mechanical site preparation	9.8%	31.0%
Planting by hand	36.4%	50.0%
Planting by machine	-20.8%	35.7%
Precommerical thinning	195.2%	-6.9%
Fertilization	9.8%	34.6%

* Too few responses

TABLE 13.

Cost indices for forestry practices in the South for selected years from 1967 to 2018 by forestry practice.

Forestry practice	Survey year																
	1967	1976	1982	1986	1990	1994	1998	2000	2002	2004	2006	2008	2010	2012	2014	2016	2018
Prescribed burning	39	89	100	117	197	257	402	430	350	512	605	711	626	787	441	646	763
Removing undesirable trees (chemically)	25	58	100	161	157	166	178	168	173	171	195	120	117	136	74	171	190
Timber cruising	34	54	100	150	93	96	188	158	248	152	240	288	301	606	126	488	563
Marking trees for harvesting	22	57	100	75	60	101	107	183	464	104	416	620	345	310	211	209	348
Mechanical site preparation	21	64	100	83	77	88	107	119	146	92	105	138	123	147	84	124	162
Planting by hand	47	110	100	108	123	121	138	132	165	138	178	223	245	236	232	207	300
Planting by machine	29	71	100	81	84	110	110	143	204	215	216	257	272	446	259	259	380
Precommerical thinning	0	53	100	106	113	160	145	167	207	152	120	163	338	102	*	324	301
Fertilization	0	0	100	93	101	106	141	111	144	129	201	284	162	222	205	181	244
Producer price index	33	61	100	100	116	120	124	133	131	147	165	190	185	202	205	185	202
Softwood lumber index	31	77	100	108	124	198	183	179	171	210	189	156	161	172	205	199	242

* Too few responses