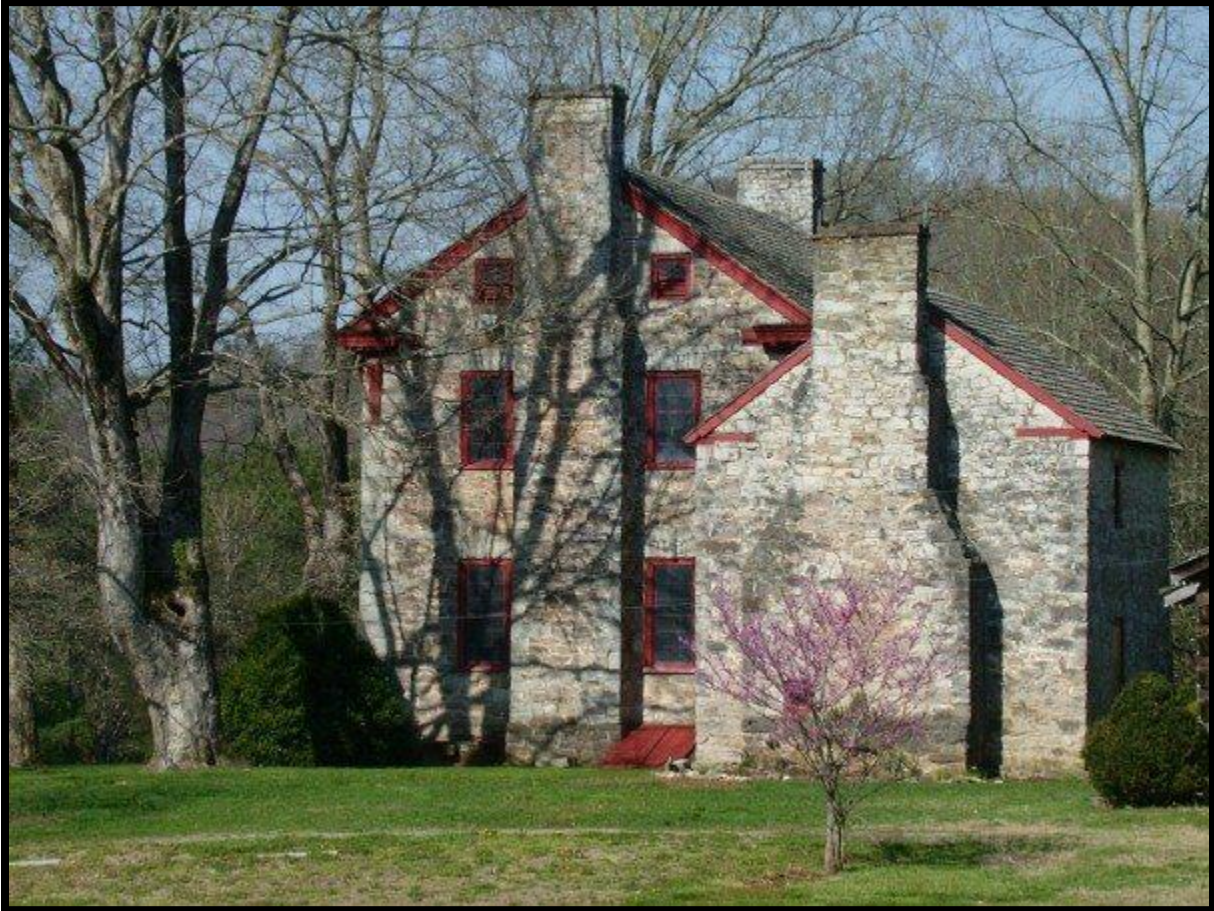


A Natural Resource Management Plan for the Historic Ramsey House



**University of Tennessee, Knoxville
Department of Forestry, Wildlife and Fisheries**

**FWF 416: Planning & Management of Forestry, Wildlife, and Fisheries
Resources**

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Mission Statement

Oak & Otter Consulting is committed to sustainably managing forest and wildlife resources in a manner that meets both the needs of clients and the environment. We will achieve this by conducting site evaluations and creating comprehensive land management plans that take into consideration the long-term needs of clients, wildlife, fish, vegetation, and the landscape.



Executive Summary

This document is a land management plan, formulated by Oak & Otter Consulting, for the Historic Ramsey House property. The property owner is Miss Melissa and the Executive Director is Mr. Sledziewski. The Ramsey house was built in 1979 and the land has been agricultural and dairy farms. Over the years, the land has experienced fragmentation and has remained relatively unmanaged in the past few decades. Today the property is used for education about the American historical lifestyle and events such as weddings, classical baseball, Spring Festival Market, and Boy Scouts of America gatherings. This management plan is an assessment of the property's cover types, soil, vegetation, forest, and wildlife to in turn recommend management practices to assist the property owner and manager achieve their objectives. The objectives of this management plan are to increase income for management practices through timber harvests while reducing forest basal area to 60 square feet per acre, establish a mile-long foot trail, achieve 70% native warm-season grasses in the grassland, and convert 5 acres of non-native fescue field to an early successional field of 70% flowering forbs.

Acknowledgments

Thank you Emma Willcox for providing instruction on how to structure and create this plan. Thank you to the Historic Ramsey House board of directors for allowing us to evaluate their property and thank you to the APTA for allowing us to contribute to their mission of preserving the Historic Ramsey House Chapter.

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Chapter 1: Introduction and Site Description

1.1 General Description

The Historic Ramsey House is a historic home sitting on 101.5 acres located at 2614 Thorngrove Pike in Knoxville, TN. There are four structures on the property: the Ramsey House, the visitor center, the blacksmith shop, and another building used for events and storage. The house was built in 1797 and is listed on the National Register of Historic Places and serves as a historic museum that is open to the public.

Thorngrove Pike divides the property in two with the north side being approximately 80 acres and the south side being approximately 21.5 acres. To the north, the property has industrial and commercial neighbors Dollar General, TEG Lease - Portable Storage, Willscot Knoxville, Cinder Lane Asphalt Plant, and Metro Trailers (Figure 1). To the south, a residential property the Brownlow Estate is adjacent to the property. The Association for the Preservation of Tennessee Antiquities (APTA) maintains the property, and the executive director is Mark Sledziewski. The land has not been managed in recent years, and there is no land manager.



Figure 1. A landscape view of the area surrounding the Historic Ramsey House located in Knoxville, Tennessee.

1.2 Physical Conditions

A majority of the property sits at about 860 ft in elevation with the west of the property consisting of wetlands. Northeast of the property is a ridge reaching about 950 ft in elevation. The wetland funnels into a channel called Sand Branch. Hydrology for the property includes about a 20-acre freshwater forested/shrub wetland where that is classified as a PFO5F (Figure 2 and Figure 3). The system for the wetland is Palustrine which includes wetlands that are dominated by trees, shrubs, persistent emergence, and emergent mosses or lichens. The class for the wetland is forested where there is woody vegetation that is 6 m tall or taller in the area. The subclass is dead where dead woody plants are less than 6 m tall and the wetlands are produced by long rises in the water table resulting from the impoundment of water either from humans, beavers, or landslides. The water regime is semi-permanently flooded where the surface water persists throughout growing seasons and when it is absent, the water table is still at the land surface.

Soil types on the property range from Swafford silt loam (SwB) 2 to 5% slopes which encompasses 25.1 acres or 27.2% of the property to pits, mines, and dumps (Pz) which encompasses 0.5 acres or 0.6% of the property (Figure 3 and Table 1). The top four soil types are Swafford silt loam with 2 to 5% slopes for 25.1 acres or 27.2 % of the property, Bloomingdale silt loam (Bd) with 0 to 2% slopes for 16.3 acres or 17.7% of the property, where it is occasionally flooded, Coghill-Corryton complex (CcC), 5 to 12 % slopes for 15.0 acres or 16.2% of the property, and Steadman silt loam (St), 0 to 3% slopes, where there are occasionally flooded for 9.5 acres or 10.3% of the property (Figure 3 and Table 1).

The climate for the property is the climate for the Knoxville area. The temperatures range from 26.7 °F in January to 83.2°F in August and 34 days out of the year the temperature is more than 90°F and 68 days out of the year the temperature is less than 32°F (Table 3 and Table 2). For precipitation, it ranges from 0.00 inches in October to 16.98 inches in January (Table 3). The average rainfall in Knoxville is 51.93 inches and the average snowfall is 4.6 inches (Table 2).

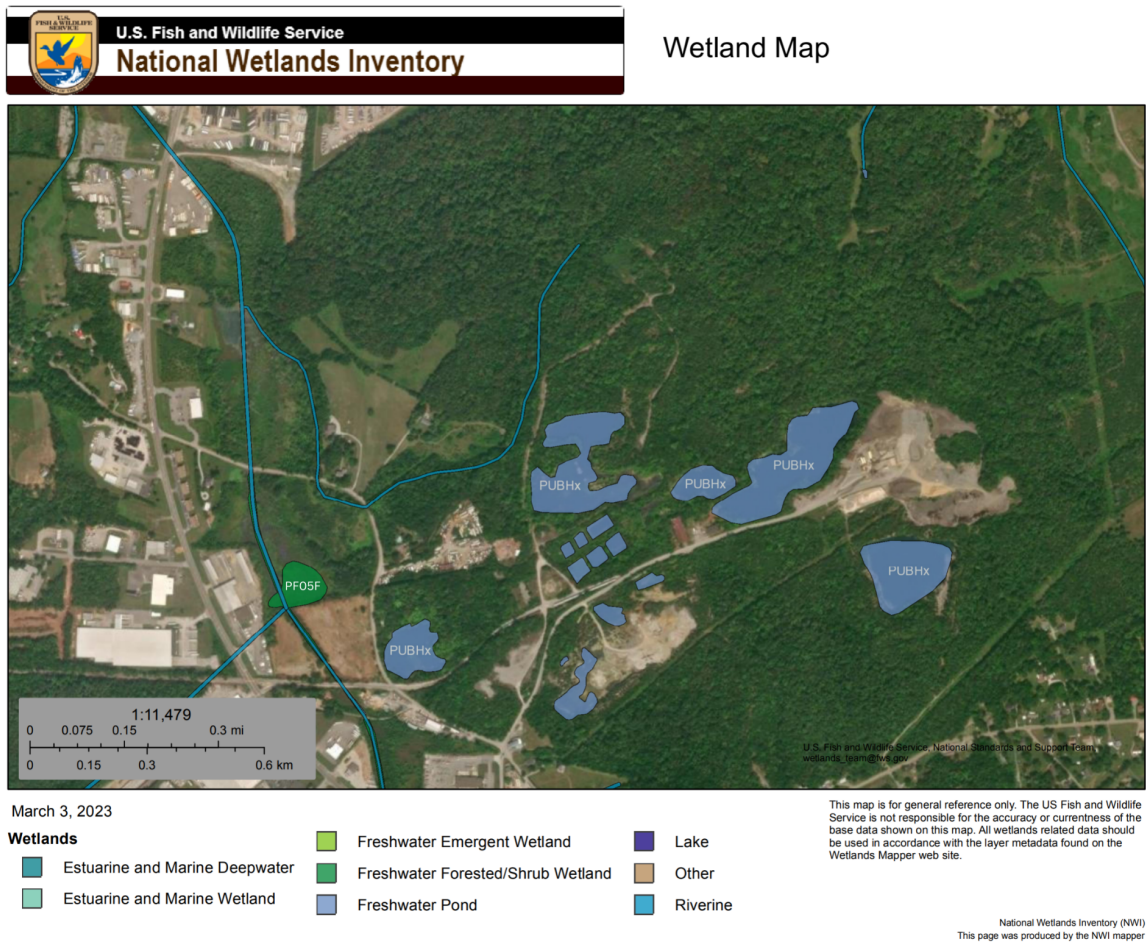


Figure 2. U.S. Fish and Wildlife Service National Wetlands Inventory Wetland Map of the Historic Ramsey House property in Knox County, Tennessee.



Figure 3. U.S. Geological Survey Topographic Map of the Historic Ramsey House and surrounding areas in Knox County, Tennessee.

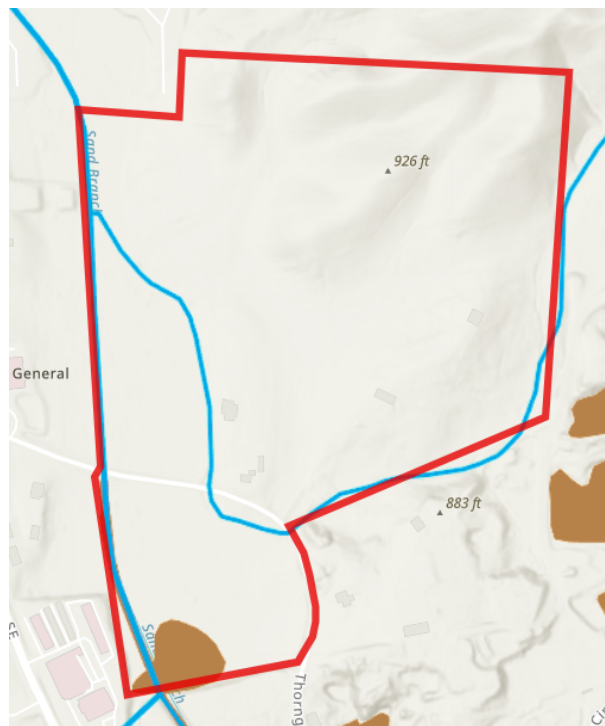


Figure 4. Property lines and wetlands map of the Historic Ramsey House in Knox County, Tennessee.

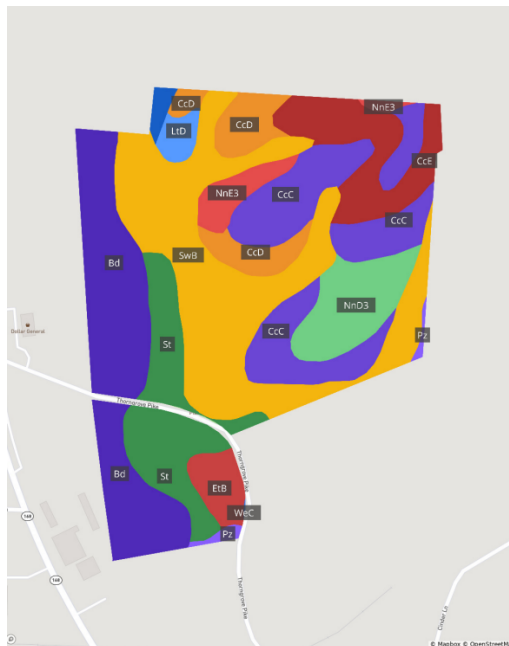


Figure 5. Soil types on the Historic Ramsey House property in Knox County, Tennessee.

Table 1. Soil Types, Descriptions, and acreage of the different soils on the Historic Ramsey House property in Knox County, Tennessee.

Code	Soil Description	% of Selection	Acres	NCCPI
● SwB	Swafford silt loam, 2 to 5 percent slopes	27.2%	25.1	72
● Bd	Bloomingdale silt loam, 0 to 2 percent slopes, occasionally flooded	17.7%	16.3	71
● CcC	Coghill-Corryton complex, 5 to 12 percent slopes	16.2%	15.0	68
● St	Steadman silt loam, 0 to 3 percent slopes, occasionally flooded	10.3%	9.5	86
Code	Soil Description	% of Selection	Acres	NCCPI
● CcE	Coghill-Corryton complex, 25 to 65 percent slopes, rocky	8.3%	7.7	14
● NnD3	Nonaburg channery silt loam, 12 to 25 percent slopes, severely eroded, rocky	6.7%	6.1	16
● CcD	Coghill-Corryton complex, 12 to 25 percent slopes	5.7%	5.3	55
● NnE3	Nonaburg channery silt loam, 25 to 60 percent slopes, severely eroded, rocky	2.7%	2.5	4
● EtB	Etowah silt loam, 6 to 12 percent slopes	2.6%	2.4	78
● LtD	Loyston-Talbott-Rock outcrop complex, 15 to 50 percent slopes	1.3%	1.2	6
● DgE3	Dewey-Coghill complex, 25 to 60 percent slopes, severely eroded	0.6%	0.6	14
● Pz	Pits, Mines, and Dumps	0.6%	0.5	0
● WeC	Waynesboro loam, 6 to 15 percent slopes	0.0%	0.0	70

Table 2. Knoxville, Tennessee Climatological Data from 1991-2020.

Knoxville Climatological Data(1991-2020 [normals](#) unless otherwise noted; POR is "Period of Record")

Average Rainfall 51.93"	Avg number of days max $\geq$ 90 F (POR)..... 34 days
Average Snowfall..... 4.6"	Avg number of days min $\leq$ 32 F (POR)..... 68 days
Median first frost..... October 24th	Median last frost..... April 14th
Median first freeze..... November 2nd	Median last freeze..... April 1st
Thanksgiving average temp (POR)..... 44.8 F	Thanksgiving average rainfall (POR)..... 0.08"
Easter average temp (POR)..... 57.0 F	Easter average rainfall (POR)..... 0.11"

Table 3. Knoxville, Tennessee Climate Data for monthly average temperatures and precipitation.

Warmest/Coldest Monthly Average Temperatures												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Warmest	52.0	51.9	60.4	65.1	74.0	81.4	83.0	83.2	79.7	68.9	56.8	54.1
	1950	1890	2012	2017	1962	1952	1993	2007	1925	1919	1985	1889
Coldest	26.7	30.5	36.8	51.2	60.9	69.1	71.8	72.0	65.1	52.4	40.2	29.5
	1940	1895	1960	1907	1917	1903	1967	1875	1918	1917	1872	1876
Wettest/Driest Monthly Precipitation Totals												
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Wettest	16.98	13.08	13.35	17.62	10.98	11.83	13.16	11.33	9.19	9.51	10.36	12.34
	1882	2019	1917	1874	1974	1928	1917	1920	1989	1925	1948	1901
Driest	0.95	0.56	0.72	0.39	0.71	0.20	0.33	0.77	0.03	0.00	0.17	0.45
	1986	1898	1910	1976	1941	1944	1995	1954	2019	2000	1890	1965

1.3 Biological Conditions

At the Ramsey House, there is an open, non-native fescue field used for parking and hosting events. North of the fescue field there are two adjacent fields primarily consisting of broomsedge. Along the perimeter of the broomsedge fields is an even-aged hardwood stand. East of the fescue field there is a wetland with abundant herbaceous vegetation and tall standing dead trees. Then south of the house crossing Thorngrove Pike the property continues where there are more wetlands and an even-aged loblolly pine stand with evidence of beaver activity to the East (Figure 6).

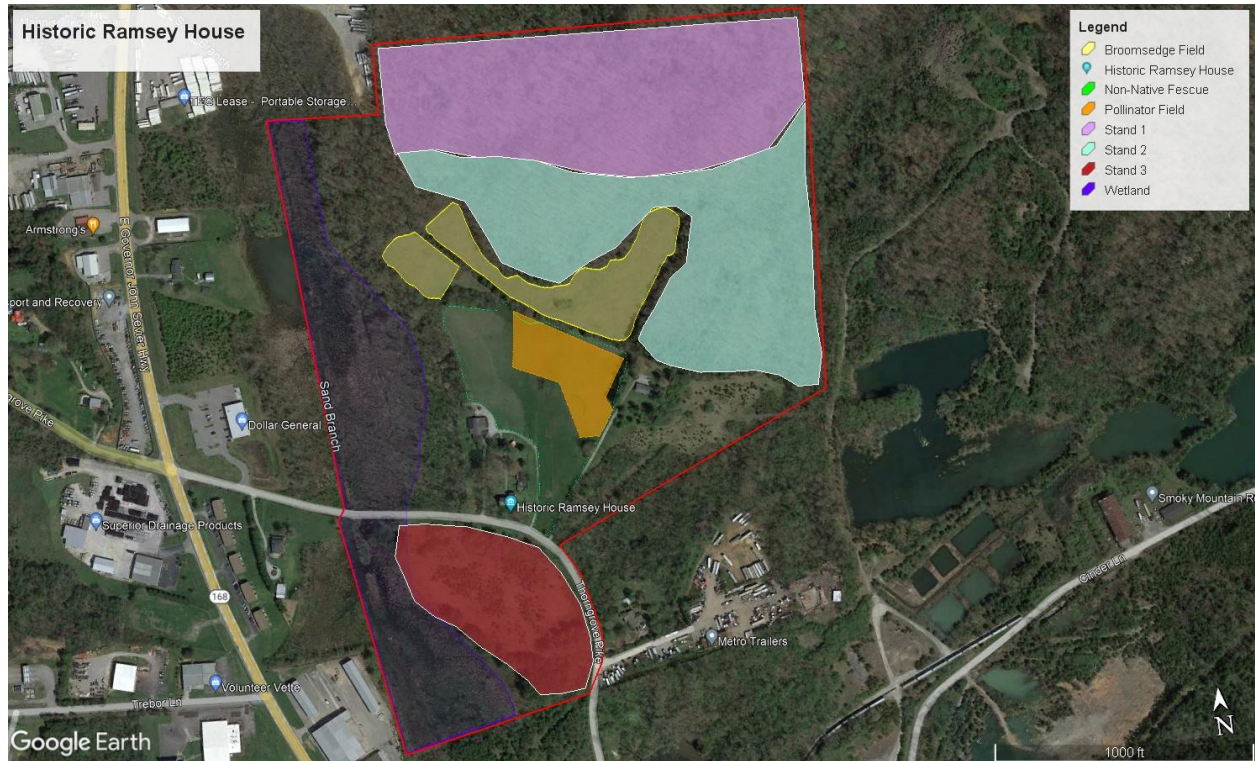


Figure 6. The delineations of different land cover types at the Historic Ramsey House in Knox County, Tennessee.

1.4 Socioeconomic Conditions

The Ramsey House was built in 1797 and was bought by the Association for the Preservation of Tennessee Antiquities (APTA) in 1952. This historic house is listed on the National Register of Historic Places to help protect its historical and archaeological heritage. The house was initially owned by Francis A. Ramsey which he occupied from 1797-1820. The house has been restored to reflect the period of Ramsey's occupation. During this time period, the house was surrounded on three sides by a water body known as Swan Pond which was fed by Sand Branch Creek. An array of beaver dams caused the wetland to spread out over 200 acres. The Ramseys owned around 2,000 acres. Their land during this time was used for agriculture and they grew a wide variety of crops to be a self-sustaining plantation. Later, the land changed hands around the 1850s and much of the property was used as a dairy farm. After the dairy farms closed, much of the area was allowed to grow up into unmanaged, even-aged forests. Since the Ramseys' ownership, their original property has been divided up into smaller properties. Additionally, the wetland has shrunk to about 20 acres. This reduction in size is likely due to the channelization of both the Sand Branch and Holston River in addition to the construction of John Sevier Highway.

Today, the property is primarily used for educational purposes, informing guests about the Ramsey family history and about life during that historical period. In addition, the property is used for events such as weddings, historical baseball games, a Spring Festival Market, and Boy Scouts of America gatherings. The barn next to the house is from the time when the land was a dairy farm. It has been renovated as a gift shop and event space. Visitors may also use the property for recreational activities such as animal viewing and nature walks. However, the lack of walking trails makes much of the land difficult for visitors to access. The property is open to the public Wednesday through Saturday during the months of March through December. However, during the winter months, the Ramsey House hosts workshops and its spaces are available for rent. The location's biggest threats today are the increased development of the surrounding area and pollution from its industrial and commercial neighbors.

The current manager of the Historic Ramsey House is the APTA. Established in 1951, the APTA is the oldest statewide non-profit historic preservation organization in Tennessee. The organization relies on donations to preserve and maintain historical sites across Tennessee. Their mission is to “promote and encourage active participation in the preservation of Tennessee's rich historic, cultural, architectural, and archeological heritage through restoration, education, advocacy, and statewide cooperation” (apta.org). The board for the Ramsey House consists of 16 members plus the executive director Mark Sledziewski and assistant Sue Jones. The board of directors must vote on any changes to the property and adhere to all APTA guidelines. The board and staff of the Ramsey House wish to educate visitors about the historical significance of the land and to make the land more accessible to the public for recreational activities. There are numerous stakeholders invested in the Historic Ramsey House. Public stakeholders include historic baseball players, local naturalists, vendors for the spring festival, and the community that visits the historic house. The private stakeholders include the APTA, the board and the staff of the Ramsey House, in addition to the current sponsors listed on the Ramsey House website.

Chapter 2: Management Objectives and Goals

2.1 Landowner Goals

The goals of the executive director Mark Sledziewski and the Historic Ramsey House Board are to restore and highlight the land's historical value and to make the land more accessible to visitors. They would like to construct a trail system throughout the property with recreational signs that educate visitors on the historical and natural features of the land.

2.2 Forest Objectives

1. Establish a nature trail of approximately one mile or more with signage at the trailhead discussing the various ecotypes, wildlife, and historical aspects of the property.
2. Reduce basal area to about 60 square feet per acre in order to increase the growth of native herbaceous ground cover by 60% percent and reduce overstory cover by 30-50% percent.
3. Reduce the coverage of invasive species by at least 50%.

2.3 Grassland Objectives

1. Promote grassland cover type in Grassland B to at least 60% native warm-season grasses.
2. Convert approximately one-third of the non-native fescue field Grassland C to an early successional field of approximately 30% native grass and 70% flowering forbs.

2.4 Economic Objectives

1. Increase income for the costs of management activities.

Chapter 3: Forest Inventory and Current Site Conditions

3.1 Forest Inventory

Sampling Description:

Within the Ramsey house property, there are 2 distinct areas of forest. These two units will be referred to as the north and south units. The north unit has been divided into two stands based on management objectives. Stand 1 is in the northern portion of the unit while stand 2 is in the southern portion of the unit. Stand 3 is the south unit. The north unit is around 48 acres and the south unit is roughly 2.5 acres. In order to get an accurate sampling we conducted a fixed plot radius of 1/10 acre in a random sampling method. Seven plots were taken from the units with plots 1 through 6 being in the north unit and plot 7 being in the south unit (Figure 7). Table 1 gives a brief overview of the entire north unit. Table 2 gives a brief overview of the south forest unit. Additionally, we conducted transect surveys to determine the ground vegetation composition. The transects were 20 m long with data points taken every 2 m. The species and ground composition were noted as fitting into the categories of grass, forb, woody, bare ground, and litter (Figure 8). The transects occurred at the same sampling locations as the timber inventory plots. Based on the data collected from the transect surveys, the coverage of invasive species in these units was also estimated (Figure 9).

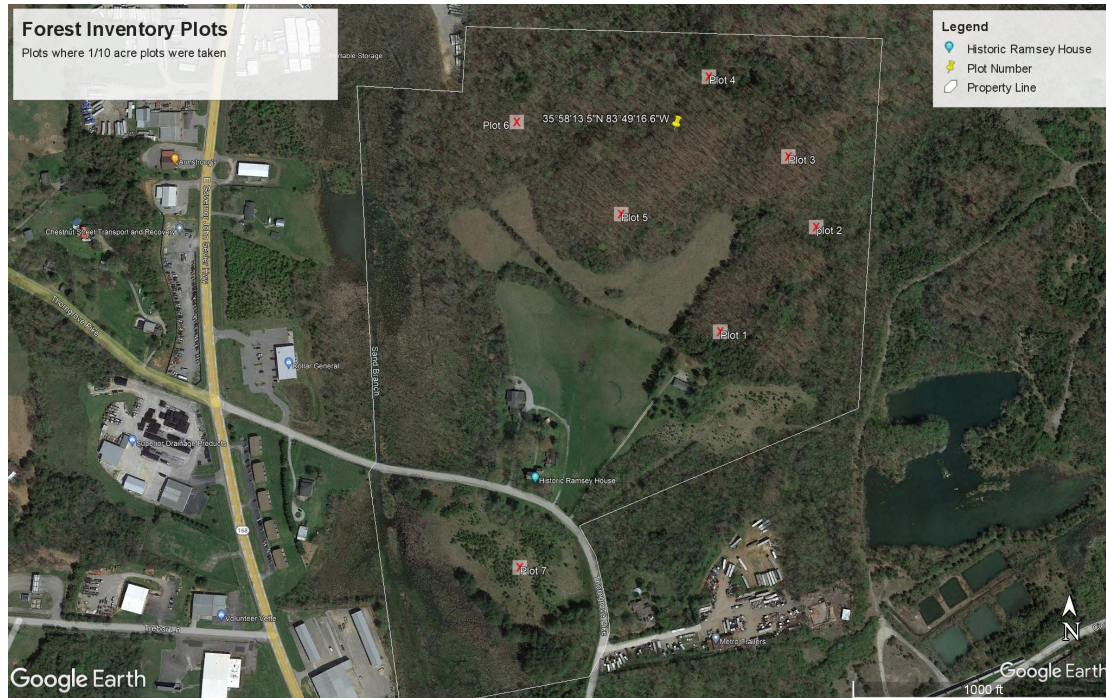


Figure 7. Map showing where inventory plots were taken at the Historic Ramsey House.

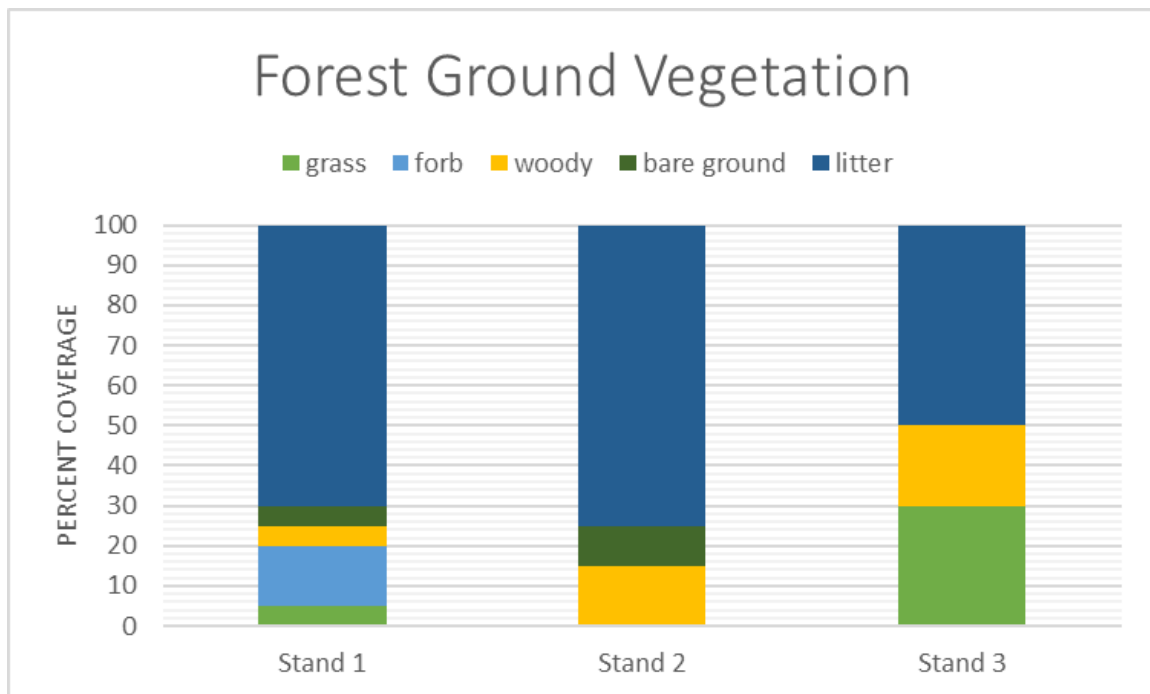


Figure 8. A graph showing the ground composition of the forest units on the Ramsey House property.

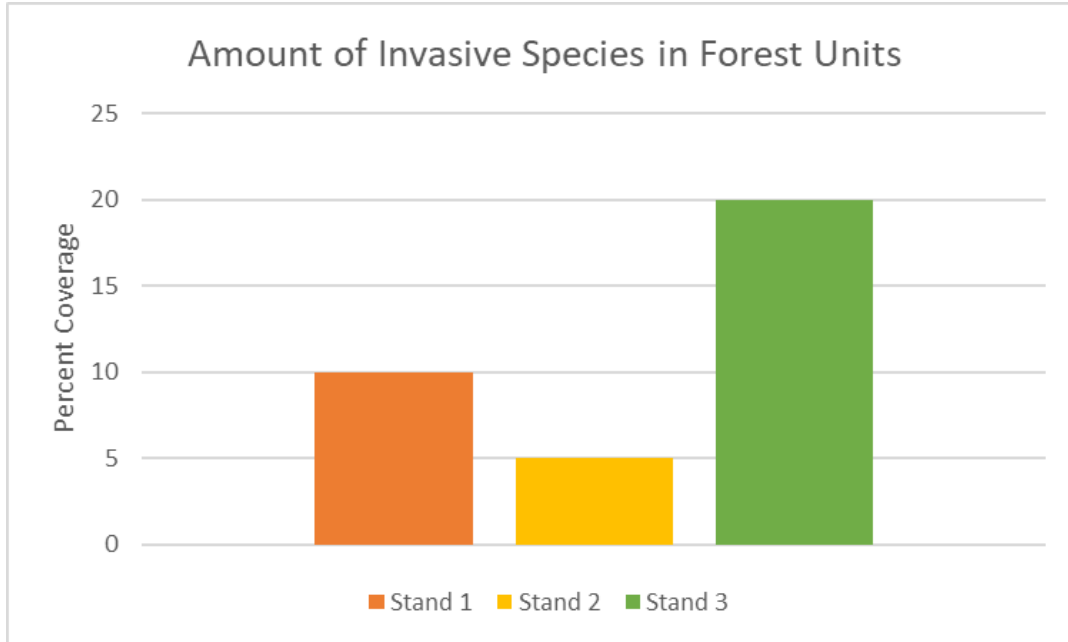


Figure 9. A graph showing the coverage of invasive species in the forest units on the Ramsey House property.

Table 4: A brief statistical description of the distribution of all diameters at breast height and tree heights in the north unit forest on the Ramsey House Property.

North Unit Forest Summary Statistics		
	DBH	Height
Mean	8.241726619	43.27338129
Median	7.4	35
Mode	8.8	17
Max	32.9	107
Min	2	12
Std dev	4.965940506	26.25758848
95% CI	0.832851278	4.403730994

Table 5. A brief statistical description of the distribution of all diameters at breast height and tree heights in the south unit forest on the Ramsey House Property.

	South Unit Forest Summary Statistics	
	DBH	Height
Mean	4.894117647	21.94117647
Median	4.6	21
Mode	4.6	20
Max	8.2	34
Min	1.7	15
Std dev	1.652199959	3.258292588
95% CI	0.464688727	0.916409558

Table 6. Trees per acre for the north forest unit on the Ramsey House Property.

North Forest Unit Trees Per Acre	
Plot	Trees/ac
1	260
2	280
3	270
4	190
5	210
6	180
Average	231.6666667

Table 7. Trees per acre for the south forest unit on the Ramsey House Property.

South Unit Forest Trees Per Acre	
Plot	Trees/ac
7	290
8	220
Average	255

Table 8. Trees Per acre by Species Group for the north forest unit on the Ramsey House Property.

Trees Per Acre by Species Group In North Unit Forest														
Plot	Amer. Beech	Blackgum	Black Locust	Chestnut Oak	E. Red Cedar	Ironwood	Red Maple	Red Oak	Shortleaf Pine	Sourwood	Sugar Maple	Sweetgum	White Oak	Yellow Poplar
1	0	10	20	0	40	0	0	180	0	0	10	0	0	0
2	0	50	0	0	70	0	10	10	0	100	0	0	40	0
3	10	0	0	10	0	0	20	110	0	0	30	0	90	0
4	10	20	0	0	0	10	20	0	30	40	10	20	0	30
5	0	10	0	0	0	20	0	130	0	10	10	0	0	30
6	20	0	0	0	0	0	0	140	0	10	0	0	0	10
Average	6.66666667	15	3.33333333	1.66666667	18.33333333	5	8.33333333	95	5	26.6667	10	3.33333333	21.66667	11.66666667

Table 9. Trees Per Acre by Species Group for the south forest unit on the Ramsey House Property.

Trees Per Acre by Species Group In South Unit Forest			
Plot Number	Ironwood	Loblolly Pine	Red Maple
7	10	260	20
8	10	190	20
Average	10	225	20

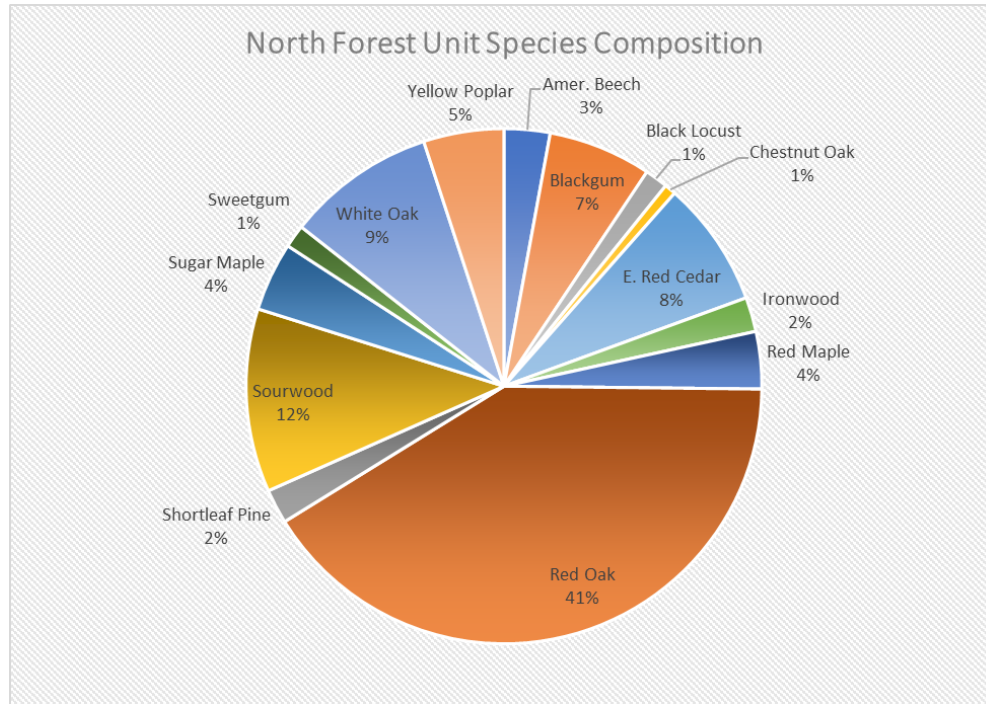


Figure 10. Species composition in percentage for the north forest unit on the Ramsey House Property.

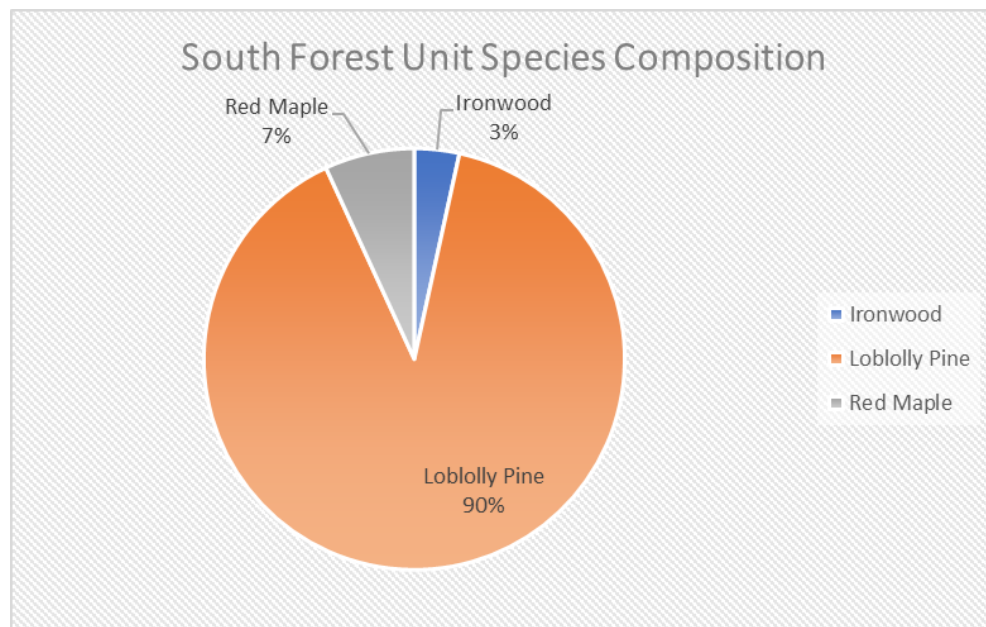


Figure 11. Species composition in percentage for the south forest unit on the Ramsey House Property.

Table 10. Basal Area per Acre by individual plots in the north forest unit on the Ramsey House Property.

Basal Area Per Acre by Individual Plots in North Forest Unit	
Plot Number	Basal Area per Acre (sq.ft)
1	94.77
2	62.63
3	218.71
4	140.56
5	82.72
6	101.18
Average	112.002

Table 11. Basal Area per Acre by individual plots in the south forest unit on the Ramsey House Property.

Basal Area Per Acre by Individual Plots in South Forest Unit	
Plot Number	Basal Area per Acre (sq.ft)
7	4.03
8	3.3746625
Average	3.70233125

Table 12. Basal Area per Acre by species group in the north forest unit on the Ramsey House Property.

Basal Area per Acre by Species Group for North Forest Unit														
Plot Number	Amer. Beech	Black gum	Black Locust	Chestnut Oak	E. Red Cedar	Ironwood	Red Maple	Red Oak	Shortleaf Pine	Sourwood	Sugar Maple	Sweetgum	White Oak	Yellow Poplar
1	0	0.42235776	0.1028079	0	0.24684804	0	0	8.67316896	0	0	0.03141504	0	0	0
2	0	1.11294324	0	0	1.4278572	0	0.18347256	0.58990464	0	1.75624254	0	0	1.19246256	0
3	0.021816	0	0	0.3940515	0	0	0.2140695	10.4127768	0	0	0.4011417	0	10.4269572	0
4	0.07068384	0.52325676	0	0	0	0.07875576	0.13945878	0	5.06098476	1.18537236	0.02885166	4.21970526	0	2.74865238
5	0	0.41281326	0	0	0	0.2467935	0	7.07536512	0	0.15903864	0.021816	0	0	0.3561462
6	0.19247166	0	0	0	0	0	0	9.63481824	0	0.10084446	0	0	0	0.18985374
Average	0.04749525	0.41189517	0.01713465	0.06567525	0.27911754	0.05425821	0.08950014	6.06433896	0.84349746	0.533583	0.0805374	0.70328421	1.93656996	0.54910872

Table 13. Basal Area per Acre by Species group in south forest unit on the Ramsey House Property.

Basal Area per Acre by Species Group for South Forest Unit			
Plot Number	Ironwood	Loblolly	Red Maple
7	0.049086	3.89748294	0.0856278
8	0.15903864	2.84475186	0.370872
Average	0.10406232	3.3711174	0.2282499

Table 14. Volume per Acre by individual plots in the north forest unit on the Ramsey House Property.

Volume Per Acre by Individual Plots In North Forest Unit	
Plot Number	Volume Per Acre (board ft./acre)
1	572.7920767
2	49.3295234
3	2792.069476
4	2123.374466
5	544.3915661
6	884.9437244
Average	1161.150139

Table 15. Volume per Acre by individual plots in the south forest unit on the Ramsey House Property.

Volume Per Acre by Individual Plots In South Forest Unit	
Plot Number	Volume Per Acre (board ft./acre)
7	0.368187806
8	26.1866219
Average	13.27740485

Table 16. Volume per Acre by species group in the north forest unit on the Ramsey House Property.

Volume Per Acre (Board ft./acre) by Species Group in North Forest Unit														
Plot Number	Amer. Beech	Blackgum	Black Locust	Chestnut Oak	E. Red Cedar	Ironwood	Red Maple	Red Oak	Shortleaf Pine	Sourwood	Sugar Maple	Sweetgum	White Oak	Yellow Poplar
1	0	118.5898715	5.973998829	0	-44.48858465	0	0	5680.281748	0	0	-32.43626751	0	0	0
2	0	-64.22594193	0	0	445.8371966	0	-13.36558155	214.2533695	0	-264.981506	0	0	175.7776975	0
3	-18.87922934	0	0	113.7454599	0	0	-110.2459282	14327.11546	0	0	9.706888019	0	13599.25211	0
4	25.7850678	5.783272016	0	0	0	-58.46068369	-150.5548789	0	11795.59448	114.3518298	-38.17197801	8041.511307	0	1497.906251
5	0	85.50286323	0	0	0	-82.05851994	0	5709.295129	0	-20.7835282	-38.28800757	0	0	-209.7522757
6	74.28670329	0	0	0	0	0	0	8889.274991	0	-41.87194591	0	0	0	-72.25250423
Average	13.53209029	24.27501081	0.995666472	18.95757665	66.89143532	-23.41986727	-45.69439811	5803.370116	1965.932413	-35.54752505	-16.53156085	1340.251885	2295.838301	202.6502452

Table 17. Volume per Acre by species group in the south forest unit on the Ramsey House Property.

Volume Per Acre (Board ft./acre) by Species Group in South Forest Unit			
Plot Number	Ironwood	Loblolly	Red Maple
7	-8.496088795	25.91722989	-17.05295329
8	-2.549020574	32.35987439	-3.624231918
Average	-5.522554685	29.13855214	-10.3385926

Table 18. Value per Acre by individual plots in the north forest unit on the Ramsey House Property.

Value Per Acre by Individual Plot in North Forest Unit	
Plot Number	Value Per Acre (\$/acre)
1	1281.233682
2	101.2437879
3	8674.274749
4	2017.065032
5	1223.743342
6	1987.881904
Average	2547.573749

Table 19. Basal Area per Acre by individual plots in the south forest unit on the Ramsey House Property.

Basal Area Per Acre by Individual Plots in South Forest Unit	
Plot Number	Basal Area per Acre (sq.ft)
7	4.03
8	3.3746625
Average	3.70233125

Table 20. Value per Acre by species group in the north forest unit on the Ramsey House Property.

Value Per Acre by Species Group in North Forest Unit														
Plot Number	Amer. Beech	Blackgum	Black Locust	Chestnut Oak	E. Red Cedar	Ironwood	Red Maple	Red Oak	Shortleaf Pine	Sourwood	Sugar Maple	Sweetgum	White Oak	Yellow Poplar
1	0	14.82373394	0.746749854	0	-2.669315079	0	0	1278.063393	0	0	-9.730880254	0	0	0
2	0	-8.028242742	0	0	26.75023179	0	-2.873600032	48.20700814	0	-33.12268825	0	0	70.31107899	0
3	-2.359903668	0	0	34.12363798	0	0	-23.70287456	3223.600979	0	0	2.912066406	0	5439.700844	0
4	3.223133474	0.722909002	0	0	0	-7.307585461	-32.36929897	0	707.7356686	14.29397873	-11.4515934	1005.188913	0	337.0289065
5	0	10.6878579	0	0	0	-10.25731499	0	1284.591404	0	-2.597941025	-11.48640227	0	0	-47.19426202
6	9.285837912	0	0	0	0	0	0	2000.086873	0	-5.233993239	0	0	0	-16.25681345
Average	1.691511286	3.034376351	0.124458309	5.687272996	4.013486119	-2.927483409	-9.824295594	1305.758276	117.9559448	-4.443440632	-4.959468254	167.5314856	918.3353205	45.59630517

Table 21. Value per Acre by species group in the south forest unit on the Ramsey House Property.

Value Per Acre by Species Group in South Forest Unit			
Plot Number	Ironwood	Loblolly	Red Maple
7	-10.62011099	15.55033793	-36.66384957
8	-3.186275718	19.41592463	-7.792098624
Average	-6.903193356	17.48313128	-22.2279741

Table 22. Summary statistics for the north forest unit on the Ramsey House Property.

Summary Statistics for North Forest Unit				
	Trees/ac	BA/ac (sq. ft/ac)	Vol/ac (cu. ft/ac)	Value (\$/ac)
Averages	231.6666667	116.7599592	2819.75861	2547.573749

Table 23. Summary statistics for the south forest unit on the Ramsey House Property.

Summary Statistics for South Forest Unit				
	Trees/ac	BA/ac (sq. ft/ac)	Vol/ac (cu. ft/ac)	Value (\$/ac)
Averages	255	37.0342962	201.7100417	-11.64803617

3.2 Forest Site Conditions

3.2a Stand 1

Stand one consists of older oak species that are starting to die and there are many dead standing trees. While there are many older oaks there is little to no advanced regeneration of oak. There is a fair amount of invasive species on the ground throughout this stand and with the amount being seen in Figure 9. Stand one also consists of lots of American beech trees with certain areas being only American beech. The topography of stand one consists mainly of shallow rolling hills and ridges. On these hills is where most of the oaks are and on the slopes of these ridges and hills are where the American beeches are. The soils in stand one are mainly clay soils like Coghill complexes. The water table of this stand is also low and stays moderately well drained.

3.2b Stand 2

Stand two is a more lowland area of the north section of the property. Unlike stand one, stand two is more lowland and has a higher water table. The soils in stand two are mainly dominated by silt. Swafford and nonaburg complexes are the two main soil complexes in stand 2. Because of this, stand two was likely agricultural land at one point given the presence of some small gullies as well. Within stand two, there is also a very high basal area and most trees are very tall but have small diameters and little to no timber value. Stand 2 is bordered by stand one, but has a vastly different topography and hydrology.

3.2c Stand 3

Stand three is in the south portion of the property off of thorn grove pike. The soils of stand three are primarily steadman and etowah complexes which are silt loams. Similar to stand two, stand three is better used for agriculture rather than timber. There has been no planting on stand three, but there is an even-aged loblolly pine stand. It is highly overcrowded and most trees are stunted. There are a few bottomland hardwoods present but they are small and will likely not experience any kind of release.

3.3 Grassland Site Conditions

3.3a Grassland Inventory

Sampling Description:

Transect surveys were conducted in each grassland unit. Grassland A had one plot, grassland B had two plots, and grassland C had two plots. Plots were randomly assigned. The transects were 20 m long with data points taken every 2 m. The species and ground composition were noted as fitting into the categories of grass, forb, woody, bare ground, and litter. The transects occurred at the same sampling locations as the timber inventory plots. Based on the data collected from the transect surveys, the coverage of invasive species in these units was also estimated. Furthermore, soil types were taken from the NRCS and Web Soil Survey.

3.3b Grassland A

Grassland A is a small 1 ac field located in the northwest section of the property at an elevation of 850 ft above sea level. It has a relatively flat topography with slopes ranging from 2-5%. The main soil type is Swafford silt loam (SwB). Grassland A sits in the floodplain of Sand Branch; because of this, it is periodically flooded during intense rain events. The field is used for recreational purposes most commonly by the Boy Scouts of America. The board mows the field regularly to keep the grass short for recreational activities. The composition of the field consists of almost entirely mowed tall fescue interspersed with patches of grass litter (Figure 12). The field is mostly nonnative grass (Figure 13).

3.3c Grassland B

Grassland B is a 3.8 ac field located in the northeast section of the property at 850 ft in elevation. The field has an approximate 2% grade with Swafford silt loam (SwB) and Cattaraugus channery silt loam soil types. This field is unmowed except for a mowed path going through for recreational activities. Grasses cover the majority of the field with a small amount of forbs, woody plants, and litter (Figure 12). The dominant grass is broomsedge with some tall fescue and velvet grass. Additionally, there are patches of blackberry brambles and saplings of sweetgum, callery pear, winged elm, and tulip poplar. There is also a small amount of forbs such as goldenrod. Nonnative plants such as tall fescue and callery pear cover about 30% of the field (Figure 13).

3.3d Grassland C

Grassland C is a 6.9 ac field adjacent to the historic house and sits between 850 to 880 ft elevation. The western portion has a grade of approximately 8% with a Swafford silt loam (SwB) soil type. The western portion has a grade of approximately 5-12% with Coghill-Corryton complex soil. This field is a mowed field used for recreational activities such as weddings, baseball games, and other large group activities. The field consists mainly of nonnative grass and forbs (Figure 12 and 13). The dominant grass is tall fescue, and the forbs consist mainly of plantains and small asters.

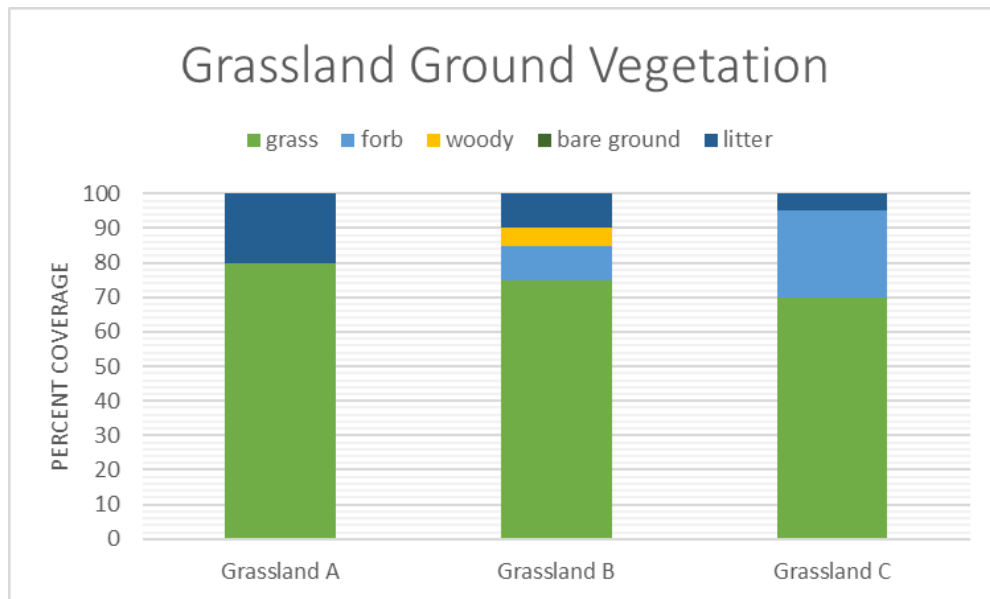


Figure 12. A graph showing the ground composition of the grassland units on the Ramsey House property.

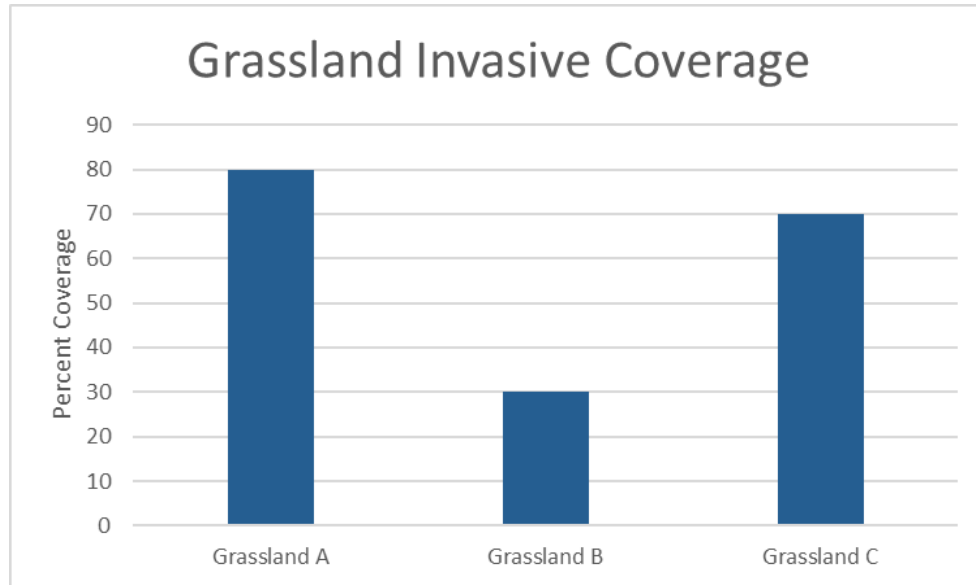


Figure 13. A graph showing the coverage of invasive species at the Ramsey House Property.

3.4 Fauna Inventory

3.4a Mammals

Tracks on the property indicate the presence of the common raccoon (*Procyon lotor*) and white-tailed deer (*Odocoileus virginianus*) (Figure 14). Likewise, an antler of white-tailed deer was also found on the property further indicating their presence (Figure 15). Appendix A has the list of all mammalian species documented in Knox County, Tennessee via research-grade observations through the science-based observation app, iNaturalist. All are possible species that can be found on the property.



Figure 14. Common Raccoon tracks found near Swan Pond at the Historic Ramsey House.



Figure 15. White-tailed deer antler found on the Historic Ramsey House Property.

3.4b Birds

The survey of birds was conducted using point count surveys where the 5 points were randomly selected (Figure 16). At each point, we sat for 10 minutes and recorded all bird species encountered with both auditory and visual observations within 50 m of the point. We encountered a total of 24 species (Figure 17). Additionally, there are signs that wild turkeys frequent the property as identified by tracks and landowner sightings (Figure 18). On eBird, a total of 64 species have been documented at the property. A list of species found in Knox County through eBird sightings that might possibly be found on the property is in Appendix B. Because the inventory occurred in the early spring, it is highly likely that there are more species present on the property as spring migrants had not arrived yet.

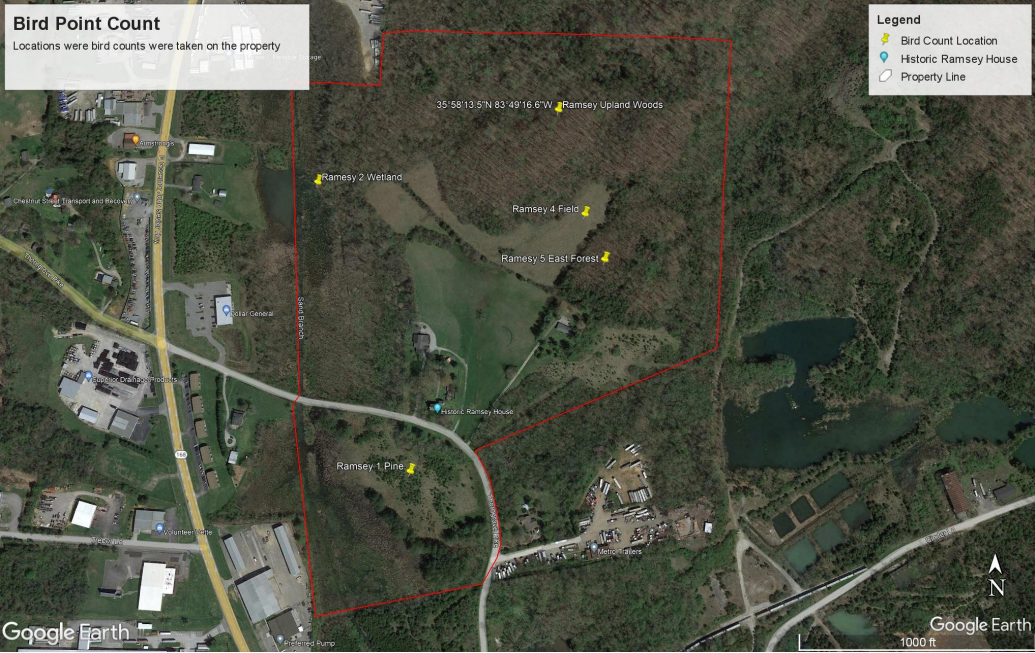


Figure 16. A map showing bird count locations at the Historic Ramsey House.

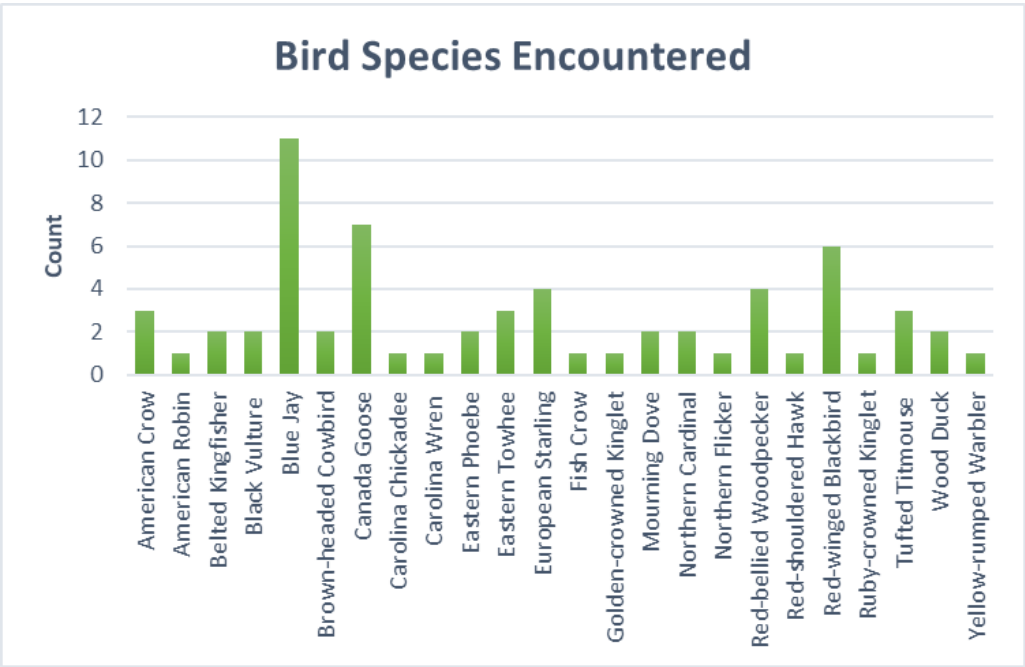


Figure 17. A table of bird species encountered at the Historic Ramsey House.



Figure 18. Image of wild turkey tracks seen at Swan Pond at the Historic Ramsey House.

3.4c Herpetofauna

Tennessee hosts a diverse collection of amphibians and reptiles. With multiple vegetation types and wetlands found on the property of the Historic Ramsey House, various species of each are expected to be found. Appendix C and D reference all of the amphibians and reptiles found in Knox County, Tennessee based on sightings collected from Austin Peay University's Atlas of Reptiles, Austin Peay University's Atlas of Amphibians, and the science-based observation app iNaturalist's research-grade observations. While the list is exhaustive, we do not expect every species to be present within the property. However, any of them could. Surveys were conducted according to plant community types and the species that correlate with them. Additionally, old records were assessed to determine what species of reptiles and amphibians are currently on the property.

TAMP protocol was used on Wednesday, April 5th, 2023 to survey frog and toad calls. The survey began 30 minutes after sunset at 8:31 pm and ended at 8:41 pm. Weather conditions were within TAMP requirements: 71 degrees, with a sky code of 1 and a wind code of 1. Spring peepers (*Pseudacris crucifer*) were observed at full chorus, with many individual calls overlapping constantly. No other species could be confirmed during the survey. Observations from iNaturalist show the presence of Green Tree Frogs (*Hyla cinerea*). Additionally, visual surveys will be conducted to account for salamanders species in or near wetlands and moist areas, in leaf litter, and under rocks and logs.

3.5 Recreation

The Historic Ramsey House has been listed on the National Registry of Historic Places since 1969. It is located on 101 acres and is known to host a variety of events throughout the year. Colonel Alexander Ramsey originally built the house in 1797. In 1952 the A.P.T.A. bought the property and conducts weekly tours through the house.

In addition, grassland A and C are host to a variety of events throughout the year such as tours and festivals. Grassland A commonly hosts events and meetings for the Boy Scouts of America. Grassland C is used as overflow parking and events such as historic baseball games, craft fairs, and weddings. The Ramsey House has been host to the historic baseball game for the past 9 years and will continue to host this event in the foreseeable future. The game follows the traditional play of the 1864 rules of Baseball and has teams named modeled after the originals. Another popular event occurring is the Spring Market Place which is known to host over 60 different stands containing everything from jewelry, clothes, pottery, and food.

The Historic Ramsey House does not have a system of trails or any signage on the property. The Ramsey House, gift shop, blacksmith shop, and picnic and indoor eating facilities are all used by visitors to learn about the Ramseys' occupation of the land. Furthermore, the Ramsey House is currently not certified as an arboretum although the board of directors desires to become one.

Chapter 4: Management Recommendations

4.1 Forest Recommendations

4.1a Stand 1

Objective 1: Harvesting For Value

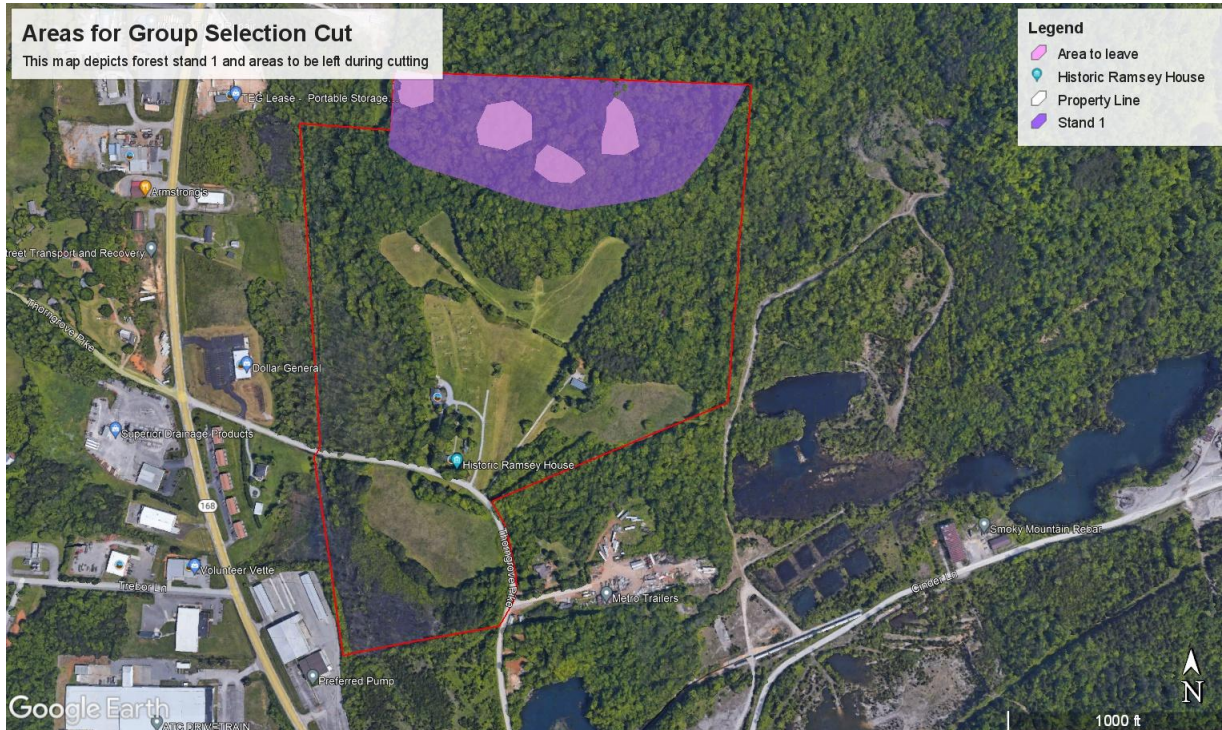


Figure 19. Map of areas selected for group selection cutting in stand 1 on the Ramsey House Property.

Stand 1 is located north of the property and is found mainly on the ridge. Currently, there is no easy way to access this area. Many large-diameter white and red oaks are starting to die out and will soon fall. We recommend a group selection cut of the 18ac stand. We have outlined a 13ac area for clear-cutting within stand 1. The remaining 5 acres will be separated into varying-sized plots designed to offer shade and a potential seed source for the future stand. Most high-value hardwoods are located within the 13ac clear cut but some remain within the 5ac plots. Based on the composition of the stand we expect trees to be removed proportionately. Many other valuable hardwoods will be extracted for additional value. This harvest should take place sometime between

mid-July and mid-October of year 1. The residual stand will have a good composition consisting mainly of red and white oak which will provide a good seed source to start seeding advanced oak regeneration. Once advanced oak regeneration occurs in about 10 to 15 years, we recommend clearcutting the residual stand to receive a return on investment. A logger would need to be convinced to come in and cut the residual stand.

Objective 2: Invasive Removal

On the borders of Stand 1 and within it, there are many invasive species such as privet, tree-of-heaven, mimosa, and honeysuckle. With cutting, the invasive species will likely become a problem, so we recommend doing an invasive species removal. For full-grown species like mimosa and tree-of-heaven, a hack and squirt will be the most effective. A hack and squirt treatment is taking a piece of equipment like an axe and making slashes in the trunk and squirting herbicide in the slashed area. The herbicide that will be used is triclopyr for the larger woody species. From there the species label should be followed to ensure correct herbicide application. We recommend conducting the invasive species removal in year one before the harvest occurs during July-October.

4.1b Stand 2

Objective 1: Thinning of Stand

Stand 2 is almost exactly 17 acres. It also has a very high basal area that is stunting the trees. Many of the trees within stand two are very tall but have a small dbh, meaning we can assume that they are older and will not see an increase of growth with a thinning. However, given the high basal area of this stand, we recommended thinning it



Figure 20. Map of the forest stands on the Ramsey House Property.

to about 50 trees per ac in year 2 from August to October. This will help promote ground vegetation for wildlife such as white-tailed deer and wild turkeys but also allow room for advanced regeneration to establish. Once advanced regeneration is established, we recommend another thinning to open up the areas to allow room for the trees to grow and have access to sunlight. Due to budget limitations, both thinnings should be done using a hack and squirt applying the herbicide known as triclopyr, a method recommended for stand 1, since there will be no income gained from this thinning. This is a long-term investment for the future growth of hardwoods such as white and red oak.

Objective 2: Invasive Removal

Similar to stand 1, stand 2 has several invasives that will likely cause a future problem whether any cutting is done or not. For this stand, hack and squirt will not be a viable option due to the small size of these invasives. Hand pulling will be recommended for the invasives in stand 2. Likely using volunteers such as the Boy Scouts of America for volunteer hours. We recommend performing an invasive removal in year 1 in July through October to prevent the widespread establishment of invasives throughout the stand.

4.1c Stand 3

Objective 1: Decrease basal area

Stand 3 is around 7 acres in total. This stand has not only been highly disturbed by beavers but also has an incredibly high basal area while holding a noticeable amount of ground plants such as blackberry and green briar making the area extremely difficult to walk through. This area also floods regularly and has very soft, water-logged soil. Because of this, cutting or herbicide is not recommended. However, the basal area could be lowered using a hack and squirt herbicide application if a thinning is desired. Using the herbicide triclopyr 4, a small group could be sent through with a hand axe and

squirt bottle with the herbicide mixture to implement this. We recommend conducting the thinning in year two during the months of August-October.

Objective 2: Invasive Removal

Stand 3 has invasive pieces such as honeysuckle throughout the stand. We recommend backpack spraying of invasive species using the herbicide glyphosate for herbaceous species and triclopyr for more woody species. We recommend performing the invasive species removal in year 1 during the months of July-October to prevent the further spread of invasive species in the stand.

4.2 Grassland Recommendations



Figure 21. A map showing the locations of the three grassland units on the Ramsey House Property.

4.2a Grassland A

Grassland A is located in the northwest of the property and has a firepit (Figure 21). It is a small field used primarily for recreation. The firepit is commonly used by the Boy Scouts of America. The field currently consists mainly of tall fescue. However, since this

field is used primarily for recreation, management of this field should not be as extensive as others. This field should be maintained with annual mowing, following Ramsey House's current recreational schedule to ensure short grass when the field is in use. This will occur in primarily warm seasons when most outdoor activities take place.

4.2b Grassland B

Grassland B is located in the northeast of the property (Figure 21). It largely consists of broomsedge with patches of blackberry and saplings of tulip-poplar and other trees. The primary goal in this field is to promote the growth of native warm-season grasses, as well as other native plants. By encouraging the growth of these grasses and other flora, we can improve cover and forage for grassland bird species and Wild Turkey, a common visitor to the property. Native warm-season grasses have a bunch-like structure that creates space between the bunches, allowing birds and small mammals to escape from predators. Furthermore, these bunches provide nesting cover for both residential and migratory bird species during the nesting season. While grass does provide some food to birds via seeds, it also aids in invertebrate attraction, a food source of many grassland birds, such as the migratory Grasshopper Sparrow. Managing for native flowering or fruiting plants that are present in the seed bank will provide both adequate cover and forage for birds.

We recommend the use of disking to efficiently and cost-effectively maintain native warm-season grass coverage and improve habitat for grassland birds and Wild Turkey. This technique increases available ground space for birds to move around while still providing brood cover for chicks. Additionally, it enhances insect abundance which is crucial for chicks' development. Initial disking should occur in year 1 during the late growing season from late August to October to reduce woody encroachment. We recommend disking every 4 years to stimulate the native seed bank and prevent further encroachment by woody plants so the next disk should occur in year 5. The invasive species should be sprayed with 1.5 quarts per acre (7.5 quarts total) of glyphosate with a mix of a surfactant with a backpack or hand sprayer, such as diesel. We recommend

spraying in year one in the months of September through November because this will specifically target the tall fescue in the field.

To achieve these goals, we recommend using a 25-45 horsepower tractor to properly tow a 5-ft disk. The Ramsey House Executive Director can provide the tractor and the disk can either be purchased or rented. We recommend keeping the disking depth at 3 in and limiting the number of passes to one or two per field. This approach will maintain native warm-season grasses and prevent further encroachment by woody plants. We suggest considering heavier disking if the persistence of woody plants continues.

4.2c Grassland C

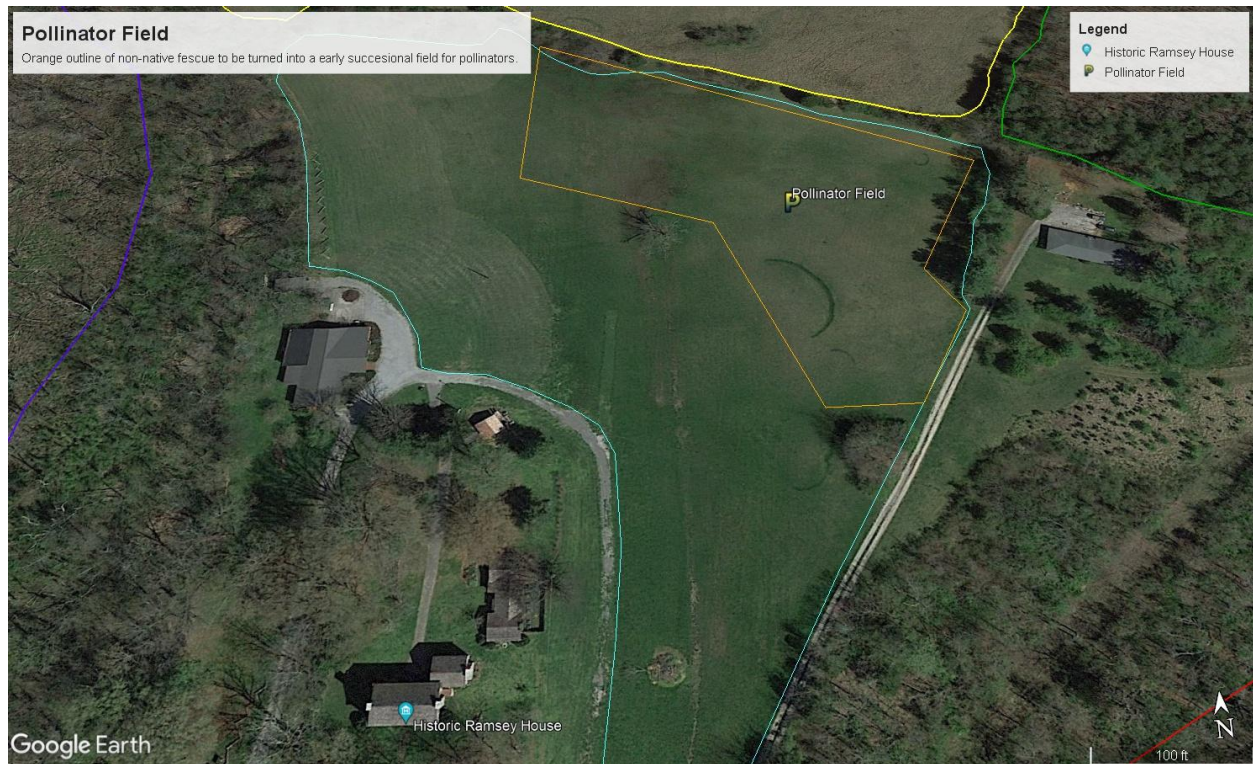


Figure 22. The suggested location of the pollinator field in Grassland C at the Historic Ramsey House.

Grassland C is located adjacent to the house and mainly consists of non-native tall fescue grass (Figure 22). Since Grassland C is used for a variety of recreational events such as weddings, baseball games, and other large group activities, the Ramsey house

has requested that some of the area continue to serve as a mowed field for events. Approximately 2.3 ac of the nearly 7 ac plot will be converted into an early successional field that will provide the legumes and flowering plants for pollinators. This will provide adequate space for the regular events taking place in this field. Additionally, the pollinator garden will provide an attractive aesthetic that people will enjoy seeing during their events.

The pollinator field will consist of 70% forbs and 30% native grasses. To achieve this pollinator field, we recommend weekly to bi-weekly mowing of the area through summer into October. This will remove old growth and prevent thick thatches of fescue. Since non-native tall fescue is a cool season grass, it grows best in the fall. In year 1 in early October or November when the grass has reached 6 to 10 inches, spray the tall fescue with 1.5 quarts per acre (3.45 quarts total) of glyphosate with a mix of a surfactant with a backpack or hand sprayer, such as diesel. Glyphosate works well at killing tall fescue down to the root which a simple burn might not achieve but glyphosate is also easily accessible, less costly, and does not remain in the soil as long unlike other herbicides.

Through the winter the field will be dormant and brown, but may have some germinating winter annuals. The next step is to burn this field 2 weeks after the herbicide spray. Then in year 2 in February the landowner may use a tractor to disc the field approximately 2-3 inches deep to expose the native seed bank, giving it a chance to germinate during spring. When spring rolls around, assessments can be done on the field to see what plants come up from spring green-up. During these assessments, glyphosate can be spot-sprayed using a backpack sprayer on remaining invasive plants and fescue to ensure desirable plants are unaffected. We recommend placing the pollinator field on a 2 year disc rotation so discing will occur again in year 5 during February again to promote annual herbaceous plants that pollinators prefer.

The seedbank is expected to contain species such as partridge pea, goldenrod, native lespedezas, beggars lice, pokeweed, and ragweed species. These forbs are flowering plants that will have multiple benefits for wildlife, as they provide food for many

pollinators, while also providing great forage and fawning cover for deer. If the budget allows, we recommend mulching this area to prevent the growth of undesirable plants.

These steps above may need to be repeated for 2-3 years. However, the amount of herbicide used will be very minimal to kill any invasives. It is easier to control a few invasive species than a whole lot of them. Prescribed burning should be used every other year or two to maintain what should soon be an early successional field. If plants desired for a pollinator field are few or absent, planting of native species can be implemented cheaply through seed shares or other programs.

4.2d Additional Options for Grassland C Pollinator Field

While native seed-bank grasses and forbs can be beneficial additions to a pollinator field, these plants may not be in the seed bank and if present may not be considered aesthetically pleasing by the landowners and manager. Since the pollinator field will be in the proximity of the outdoor event area, it is safe to assume that people will be observing the pollinator field, and possibly even using it for background photos or other recreational uses. Because of this, alternative options will be recommended to provide a more visually appealing pollinator area through planting and mulching.

The Ramsey House has a limited budget, but these are relatively low-cost options. However, as they are alternative options, they are not required to have a successful pollinator garden. The first alternative recommendation is mulching around desirable plants to prevent grasses and weeds from springing up. While grasses and weeds do not deter pollinators and may even provide some benefit, a public venue may not be going for this type of pollinator field. There are ways to acquire large amounts of mulch for little to no money by picking up mulch from companies that mulch trees—they will usually let you take mulch for free—this will require a truck, and possibly a tarp or other containers. Depending on what resources Ramsey House has available, these may also be free or very cheap. The second alternative management recommendation is planting more seeds in addition to what is found in the native seed bank. Through planting, you

have a choice on what flowers, and in many cases what pollinators, will be seen in your pollinator garden. For example, milkweed may be planted to attract Monarch butterflies, a popular, well-known, and endangered species. Seeds can be quite costly, but there are seed trades and shares where seeds can be acquired for free or greatly discounted prices. For example, milkweed seeds can be ordered for free through Project Milkweed. The third alternative management recommendation is to only disc the field and not burn. Because of the close proximity of the pollinator field to the historic house and other residential properties, the board may not be comfortable with burning. In this case, herbicide application and disking following the recommended schedule above will be a good alternative.

4.3 Recreation Recommendations

4.3a Trail System

The Historic Ramsey House currently does not have an established trail system and the board wishes to create a trail running throughout the property that would allow visitors to interact with a larger portion of the property.

The following guidelines are referenced from the Tennessee Department of Environment and Conservation's "Pathway to Trail Building." It will be necessary to survey the property to construct the trail along mild slopes and to include any desired points of interest such as historical, geologic, or hydrologic features. Additionally, if the Ramsey House becomes an arboretum, the identified trees should be located along the trail for visitors to enjoy. The optimal grade for the trail is less than 10% as gradients steeper than this are more prone to soil erosion. Nature trails are double file trails with a tread of 3 ft wide or wider and may be either naturally covered or have a mulch covering. Mulch can be acquired for free or very cheap from tree mulching companies that will provide large quantities of mulch to people who ask. Furthermore, the trail should be located at least 25 ft from a flowing water source to prevent flooding of the pathway and at least 100 ft from any property borders. Tall plants and branches should be cleared in 3-4 ft on either side of the trail. Trails can be created using hand tools

such as lopping shears or clippers, pruning saw, pulaskis or forester's axe, mattock or shovel, fire rakes, and others. The beginning of the trail should be marked with a trailhead sign(18"x24" Omega-Bond) indicating at a minimum the name and length of the trail. It is recommended to additionally include trail facilities, a map, and any rules or regulations. Paint blazes should be placed every 200 to 300 yards along the trail to assure users they are using the correct pathway. The standard paint blaze is a white, vertical rectangle approximately 2 in by 6 in placed on a tree less than 2 ft from the trail at a height of 5 ft.

We recommend that trail surveying occurs in year one and mark the pathway based on trees for the arboretum and other desired landscape features. In year 2, trail construction should occur during the dormant season to more easily construct the trail and to spray the pathway with glyphosate. Figure 23 is an example of a trail pathway that the Ramsey House may use. After that, annual trail maintenance should occur following the guidelines.



Figure 23. A rough estimation of the location of the 1-mile trail on the Historic Ramsey House.

4.3b Arboretum Certification

To become certified as an Arboretum, the Ramsey House has to meet requirements proposed by the Tennessee Urban Forestry Council. We have identified approximately 20 distinct tree species and need 30-59 distinct species to be classified as a level 1 arboretum. A minimum of 10 new species of trees need to be planted to meet this qualification. Following the planting of these trees, a list of both common and scientific names of all tree species on the property must be developed. We recommend developing a map of the trees as well. The list and map can then be submitted to the Tennessee Urban Forestry Council for approval. The Tennessee Urban Forestry Council will visit the site once the application is complete to inspect the property. Once they are approved as a level 1 arboretum, they will receive a sign proclaiming their status. Additionally, labels can be added to trees along the developed trail showing the common and scientific names. The property should be surveyed for more tree species. If there are insufficient trees to become a certified arboretum, planting of required tree species should occur. We recommend that if necessary, tree planting should occur in year 3 in January after the construction of the trail system is finished. Signage can then be installed in year 4 in the springtime. After that, yearly maintenance and upkeep will occur as per the guidelines.

4.4 Management Timeline

4.4a Year 1

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Herbicide Grassland B									x	x	x	
Herbicide Stands 1-3							x	x	x	x		
Harvest Stand 1							x	x	x	x		
Mowing Grassland C					x	x	x	x	x	x		
Herbicide Grassland C										x	X	
Disc Grassland B		x										
Trail Surveying												X

4.4b Year 2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Thinning Stand 2								x	x	X		
Thinning Stand 3								x	x	X		
Burn Grassland C		x										
Disc Grassland C		x										
Trail Construction											x	

4.4c Year 3

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

4.4d Year 4

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Burn Grassland C										X		
Arboretum Signage Installation				x								

4.4e Year 5

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Disc Grassland C		X										
Disc Grassland B		X										

4.5 Economic Recommendations

The Ramsey House will need income in order to pay for land management practices. There are many land grants and funds available in Tennessee that the property may apply for. One of the recommended funds is the Historic Preservation Fund. Since the Ramsey House is a historic property, they should be eligible for this fund as long as the plan is approved as property improvement. The fund will provide between \$3,500 and \$6,500 for the improvement of historic properties and can be used in combination with other funds and grants. An application can be submitted to the Department of Housing and Neighborhood Development. Our plan and budget can be included in the application. Additionally, the property manager may choose to apply for the Heritage Conservation Trust Fund. This fund tends to fund projects that provide outdoor recreation and historic properties. Since the Ramsey house is historic and would be implementing a trail, they may be approved for this funding. The application for this fund

is done through the Tennessee government and considered in a meeting among the members. For the pollinator garden, we recommend that the Ramsey House use Project Milkweed via Tennessee's Pollinator Habitat Program to acquire free milkweed seeds.

Chapter 5: Monitoring Protocol

5.1 Forest Monitoring

5.1a Harvest/Regrowth

If a harvesting or a thinning is done seedling monitoring will be absolutely necessary in stand 1. Seedling monitoring can be done by running a transect at plots and counting the seedlings and taking note of the species along the transect. This should be done about once a year. In order to make sure we are getting desired species back on site for any long term future harvest. After about 10 to 15 years of growth, if the desired species such as oaks and other hardwoods have reached advanced regeneration, another harvest should be done to extract the remaining trees in the 5 acres to extract a bit more value. With stand 2, tree growth progress should be measured using plots to see if there has been progress on the tree growth after about 10 years. In these plots, what should be noted is the tree diameter and height of these trees compared to previous plots. In all 3 stands invasive species transects should be done to see if there has been any regrowth.

5.1b Arboretum Certification and Monitoring

For the site to become a certified arboretum, the Tennessee Urban Forestry Council has certification requirements and levels. After creating the list and the map, we submit the list to the TUFC and then wait for approval and receive the application. Once the application is completed, TUFC will inspect and determine if the site will be certified. When the certification is complete, there will be yearly recertification of the area and a possible level move-up if the site contains more than the required species number. The recertification is yearly from March through July with a fee of \$125 and can include yearly inspections to update the certification for the site.

After the initial construction, the trail will need yearly upkeep to keep the pathway clear of vegetation. Clearing vegetation and debris in the spring and fall will proactively remove vegetation and prevent plant establishment along the trail. If time allows, trail maintenance should also occur in the summer. Additionally, staff and volunteers should frequently walk the trail to prevent plant sprouting. As the trail is used more, the soil will compact and help prevent plant growth. Maintaining a consistent vegetation removal schedule will require less overall effort as the trail becomes established. The main species to target are herbaceous and woody plants because they can quickly dominate the area. Grasses and other small plants do not need to be completely removed and

may aid in stabilizing the trail. Likewise, invasive species such as amur honeysuckle and privet should be targeted and eradicated as quickly as possible because they can quickly encroach upon the trail making it unusable. Removal of plants can be managed using the same maintenance tools listed in the management recommendations section while invasive species should be sprayed with Glyphosate. Trail blazes should also be inspected annually and repainted every 3-4 years. Overall, regular maintenance will prevent the need for more laborious maintenance by preventing the establishment of plants that overtake the trail. Appendix E has additional resources for trail construction for arboretums. Appendix G has additional information on the maintenance of arboretum trees.

5.2 Grassland Monitoring

5.2a Grassland A

This field will remain the same after management is implemented because this field is extensively used for recreational meetings of large groups. There will be nothing to monitor since they will be making no management changes and will maintain their current mowing schedule. Monitoring the grass height daily by eye will determine the best mowing schedule based on the seasons and weather conditions.

5.2b Grassland B

Grassland B consists of broomsedge with patches of blackberry and saplings. The primary goal in this field is to promote the growth of native warm-season grasses with a target of achieving at least 60% coverage. Doing this will improve cover for grassland bird species and Wild Turkey. For maintenance, disking the field should be completed every 3-4 years in the late growing season (August-October). After the first disking, walking the field and conducting presence/absence surveys to document new species is recommended. To measure the coverage of native warm-season grasses, we recommend conducting 2 to 3, 20 m transect surveys in mid to late Summer. At every 2 m note the species occurring there. From this data, the percent coverage of native grasses can be determined. We are expecting the desired grass coverage to be reached around year 3 or year 4. If woody plants and other undesirable species remain such as tall fescue and velvet grass, use individual spot treatments of Glyphosate on a yearly basis.

In order to monitor improvement in cover for grassland bird species, we recommend conducting species counts. Conducting point count surveys of 10-minute intervals and

documenting all birds heard and seen within a 50 m radius during this time period while remaining in one place. Obtaining average species counts before and after management practices take place is recommended. Surveys should occur at least 2 months after management activities such as discing, planting, burning, or herbicide application. Comparing pre and post-management bird species counts will indicate if there is an increase in grassland birds. In addition, comparing the yearly species counts on eBird that are documented by birders may also assist in monitoring changes in bird species present on the property.

5.2c Grassland C

Two-thirds of the grassland will remain on their current mowing schedule to be used for recreation activities held here including parking, old-fashioned baseball, and pop-up tent events. The ultimate size of this area will depend on the budget and the amount needing to be mowed for event space. Monitoring the grass height daily by eye will determine the best mowing schedule based on the seasons and weather conditions.

The other third of this grassland will be converted into a pollinator field with approximately 30% native grass and 70% native forbs. To measure the coverage of native forbs and grasses, we recommend conducting 2 to 3, 20 m transect surveys. At every 1 m note the species occurring there. From this data, the percent coverage of native grasses can be determined. We are expecting the desired grass coverage to be reached around year 3 or year 4. If undesired plants remain such as tall fescue, use individual spot treatments of Glyphosate on a yearly basis. Additionally, after the initial discing or prescribed burn, conducting presence/absence surveys on an annual basis to document new species is recommended by walking through the field and writing down all species seen. Desirable pollinator-friendly forbs species we are looking for include partridge pea, goldenrod, native lespedezas, beggars lice, pokeweed, and ragweed species.

Chapter 6: Budget Proposals

6.1 Development of Budget

The development of the budget had been conducted in several ways. Some recommendations have easily accessible and fixed costs while others are estimated using the best available sources. All budget items that involve labor costs may have their costs reduced through volunteer work. Likewise, all budget items involving materials may have their costs reduced through donations or cost-share programs.

6.2 Forest Budget

6.2a Trail Construction and Maintenance

The budget for the trail system is based on the cost of initial construction, signage, and yearly maintenance. The cost of construction is based on the Natural Resources Conservation Services's "Field Office Technical Guide" (FOTG) for the state of Tennessee. The FOTG estimates that a trail with an earthen or vegetated surface will cost approximately \$0.27 per square foot of trail. The estimated cost by FOTG includes construction, labor materials, and other associated costs. The proposed trail is 1 mile long and three feet wide, covering an estimated 15,280 square feet. Multiplying the square footage by the cost figure provided, the construction of the trail will be about \$427.68. For yearly maintenance costs, the Rails-to-Trails Conservancy's "Rail Trail Maintenance and Operation Manual" notes that the average cost of trail maintenance is \$1,200 per mile. We are expecting the maintenance costs to be less because of the small trail width and natural surfacing of the trail. The sign at the start of the trail will cost about \$47 for a 18" x 24" Omega-Bond sign. Appendix F has additional information on the maintenance of recreational trails.

6.2b Discing

Discing will be accomplished with a tractor and the appropriate equipment attachments including a 5-ft disc. Discing will need to take place on approximately 9.21 (2.3 acres pollinator field and 6.91 acres of grassland c) acres with projected tractor costs at a minimum of \$40 an acre worth of gas. The total cost for gas would be approximately \$368.40. The costs for tractor rental were estimated from Dozr US (dozr.com) which comes out to be \$295 for the actual rental of the 25 horsepower tractor, \$650 total for delivery and return (calculated for Ramsey House location), \$53.10 for rental protection and \$5.90 for environmental fees. The 5ft disk is available upon request when renting the tractor at no additional cost.

6.2c Herbicide

The recommended herbicide to use for the hack and squirt operations done in the forest stands is Alligare Triclopyr 4. Since it is a hack and squirt and not a broadcast spray only one jug of the Triclopyr 4 is required. A jug of Alligare Triclopyr 4 is 2.5 gallons which can make a little more than 6 gallons of mixed herbicide which will be enough for hack and squirt operations in the stand. For a hack and squirt the Triclopyr 4 does not need to be diluted. The cost for the jug of Alligare Triclopyr(2.5gal) is about \$183.75 and the cost for two 16 oz squirt bottles is \$8.96.

The recommended herbicide to use for spray operations on grassland C is a Quali-Pro Glyphosate Plus. Other herbicides with Glyphosate will also suffice, however, pricing and amount used for application will be different than recommended here. For Quali-Pro Glyphosate Plus the recommended application for ground broadcast is 2-10 qts/acre of product or in total with water mixed in 10-60 gal/acre. For backpack sprayer, the recommended ratio is 5%-10% by volume. For example, if you have a 25 gallon backpack then you would use 5 qts of Glyphosate Plus. A jug of Quali Pro Glyphosate Plus cost around \$125 for 2.5 gallons of product. This will give you 10 qts of product to use. Since we will be using this spray to kill 5 acres worth of cool season fescue then from the recommended use of the spray we will be needing around 50 qts of Glyphosate Plus. Therefore the equivalent of 5 jugs of Glyphosate plus which would cost about \$625.

Table 24. Quali-Pro Glyphosate Plus Herbicide Application Table

APPLICATION	QUALI-PRO GLYPHOSATE PLUS HERBICIDE	SPRAY VOLUME (GAL/A)
BROADCAST		
Aerial	2 to 10 qts./A	5 to 30
Ground	2 to 10 qts./A	10 to 60
SPRAY-TO-WET		
Handgun, Backpack, Mistblower	¾% to 2% by volume	Spray-to-wet
LOW VOLUME DIRECTED SPRAY		
Handgun, Backpack, Mistblower	5% to 10% by volume	Partial coverage*
*For low volume directed spray applications, coverage should be uniform with at least 50 percent of the foliage contacted. Coverage of the top one-half of the plant is important for best results.		

The herbicide being used in the forest stand thinnings will be Alligare Triclopyr 4.

6.2d Fire

The prescribed fire will be the cheapest operation to be done on the property. However, cost will come from fuel and labor/monitoring of the burn from professionals. For a small area burn like this the cost will be very minimal. For a 5 acre burn of just grass, it is estimated that 10 tons of grass will be burned in this area. With that, it is estimated to be \$225 total for the burn, \$45 per acre. This is just an estimate from TN.gov.

6.3 Total Budget Breakdown

The budget is broken down into projected costs and revenue. Projected and actual cost can vary depending on the item, where it was purchased or rented, fluctuating prices, and many other factors. Logger charges are not included in this budget because each logger company varies in charges depending on site accessibility, value of timber, and machinery needed for harvest.

The projected timber harvest revenue is calculated from the estimated value of saw timber from white oak, red oak and the miniscule amount of short leaf pine in stand 1 that will be clear cut. The projected income for pulpwood is also calculated from the value of pulpwood timber in stand 1.

Grassland operations projected costs include all costs required to perform each grassland recommended treatment. The costs of tractor rental with a disc and sprayer tank is taken from DOZR Equipment Rental's website and calculated for delivery at the Ramsey House Address. The tractor rental does not charge extra for tractor attachments, such as a disc or sprayer, so they can be use with no additional cost. However, this benefit may change with time, and costs have the potential to increase.

The timber operations costs are calculated for estimated costs on trail construction, signage and arboretum certification cost. The Historic Ramsey House managers would like to have the property certified as an arboretum. However, to do so, 10 or more species of trees likely need to be planted, based on our species observations. The cost to plant these trees is not included in the budget because additional surveying is needed to determine if the property has the required number of species to meet certification standards.

Projected Timber Harvest Income

Saw Timber(Stand #1 WO, RO)	\$4,201.92
Pulpwood	\$435.65
Total income	\$4,637.57

Grassland Ops

	Projected cost	Actual cost	Difference
Tractor Rental	\$295.00		\$295.00
5ft Disk/Sprayer Rental	\$0.00		\$0.00
Quali-Pro Plus Glyphosate	\$625.00		\$625.00
Gas	\$368.40		\$368.40
Delivery	\$325.00		\$325.00
Return	\$325.00		\$325.00
Rental Protection	\$53.10		\$53.10
Enviroment protection	\$5.90		\$5.90
Taxes	\$92.87		\$92.87
Subtotal			\$2,090.27

Timber Ops

	Projected cost	Actual cost	Difference
Triclopyr 4	\$183.75		\$183.75
Spray Bottles(16oz Two Pack)	\$8.96		\$8.96
Kobalt Steel Camp Axe	\$21.98		\$21.98
Other			\$0.00
Other			\$0.00
Other			\$0.00
Subtotal			\$214.69

Trail Ops/Arboretum

	Projected cost	Actual cost	Difference
Construction estimate	\$427.68		\$427.68
Signage	\$47.00		\$47.00
Certification	\$175.00		\$175.00
Other			\$0.00
Subtotal			\$649.68

Total projected cost	\$2,954.64
Total actual cost	\$0.00
Total difference	\$2,954.64

Projected balance (Projected income minus expenses)	\$1,682.93
Actual balance (Actual income minus expenses)	\$0.00
Difference (Actual minus projected)	(\$1,682.93)

Appendix

Appendix A: A list of all mammal species documented in Knox County, Tennessee according to iNaturalist.

Common Name	Scientific Name
American Beaver	<i>Castor canadensis</i>
American Black Bear	<i>Ursus americanus</i>
American Mink	<i>Neogale vison</i>
Big Brown Bat	<i>Eptesicus fuscus</i>
Black Rat	<i>Rattus rattus</i>
Bobcat	<i>Lynx rufus</i>
Brown Rat	<i>Rattus norvegicus</i>
Common Raccoon	<i>Procyon lotor</i>
Coyote	<i>Canis latrans</i>
Domestic Cat	<i>Felis catus</i>
Eastern Red Bat	<i>Lasiurus borealis</i>
Eastern Chipmunk	<i>Tamias striatus</i>
Eastern Cottontail	<i>Sylvilagus floridanus</i>
Eastern Gray Squirrel	<i>Sciurus carolinensis</i>
Eastern Mole	<i>Scalopus aquaticus</i>
Eastern Woodrat	<i>Neotoma floridana</i>
Evening Bat	<i>Nycticeius humeralis</i>
Gray fox	<i>Urocyon cinereoargenteus</i>
Groundhog	<i>Marmota monax</i>
Hispid Cotton Rat	<i>Sigmodon hispidus</i>
House Mouse	<i>Mus musculus</i>
Meadow Vole	<i>Microtus pennsylvanicus</i>

Mexican Free-tailed Bat	<i>Tadarida brasiliensis</i>
Muskrat	<i>Ondatra zibethicus</i>
North American River Otter	<i>Lontra canadensis</i>
Northern Short-tailed Shrew	<i>Blarina brevicauda</i>
Red Fox	<i>Vulpes vulpes</i>
Southern Flying Squirrel	<i>Glaucomys volans</i>
Striped Skunk	<i>Mephitis mephitis</i>
Tricolored Bat	<i>Perimyotis subflavus</i>
Virginia Opossum	<i>Didelphis virginia</i>
White-footed Mouse	<i>Peromyscus leucopus</i>
White-tailed Deer	<i>Odocoileus virginianus</i>
Wild Boar	<i>Sus scrofa</i>
Woodland Vole	<i>Microtus pinetorum</i>

Appendix B: A list of all bird species documented on eBird in Knox County, Tennessee.

• Acadian Flycatcher	• Blackpoll Warbler	• Cliff Swallow
• Alder Flycatcher	• Black-throated Blue Warbler	• Common Gallinule
• Allen's Hummingbird	• Black-throated Green Warbler	• Common Goldeneye
• American Avocet	• Blue Grosbeak	• Common Grackle
• American Bittern	• Blue Jay	• Common Loon
• American Black Duck	• Blue-gray Gnatcatcher	• Common Merganser
• American Coot	• Blue-headed Vireo	• Common Nighthawk
• American Crow	• Blue-winged Teal	• Common Raven
• American Golden-Plover	• Blue-winged Warbler	• Common Tern
• American Goldfinch	• Bobolink	• Common Yellowthroat
• American Kestrel	• Bohemian Waxwing	• Connecticut Warbler
• American Pipit	• Bonaparte's Gull	• Cooper's Hawk
• American Redstart	• Brant	• Dark-eyed Junco
• American Robin	• Brewer's Blackbird	• Dickcissel
• American Tree Sparrow	• Broad-winged Hawk	• Double-crested Cormorant
• American White-Pelican	• Brown Creeper	• Downy Woodpecker
• American Wigeon	• Brown Pelican	• Dunlin
• American Woodcock	• Brown Thrasher	• Eared Grebe
• Bachman's Sparrow	• Brown-headed Cowbird	• Eastern Bluebird
• Baird's Sandpiper	• Brown-headed Nuthatch	• Eastern Kingbird
• Bald Eagle	• Buff-breasted Sandpiper	• Eastern Meadowlark
• Baltimore Oriole	• Bufflehead	• Eastern Phoebe
• Bank Swallow	• Cackling Goose	• Eastern Screech-Owl
• Barn Owl	• Canada Goose	• Eastern Towhee
• Barn Swallow	• Canada Warbler	• Eastern Whip-poor-will
• Barred Owl	• Canvasback	• Eastern Wood-Pewee
• Bay-breasted Warbler	• Cap May Warbler	• Eurasian Collared-Dove
• Belted Kingfisher	• Carolina Chickadee	• European Starling
• Bewick's Wren	• Carolina Wren	• Evening Grosbeak
• Black Scoter	• Caspian Tern	• Field Sparrow
• Black Tern	• Cattle Egret	• Fish Crow
• Black Vulture	• Cedar Waxwing	• Forster's Tern
• Black-and-white Warbler	• Cerulean Warbler	• Fox Sparrow
• Black-bellied Plover	• Chestnut-sided Warbler	• Franklin's Gull
• Black-billed Cuckoo	• Chimney Swift	• Gadwall
• Blackburnian Warbler	• Chipping Sparrow	• Golden Eagle
• Black-crowned Night-Heron	• Chuck-will's-widow	• Golden-crowned Kinglet
• black-headed Grosbeak	• Clay-colored Sparrow	• Golden-winged Warbler
		• Grasshopper Sparrow

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• Gray Catbird
• Gray-cheeked Thrush
• Great Blue Heron
• Great Egret
• Great Horned Owl
• Great-crested Flycatcher
• Greater Scaup
• Greater White-fronted Goose
• Greater Yellowlegs
• Green Heron
• Green-winged Teal
• Hairy Woodpecker
• Harris's Sparrow
• Henslow's Sparrow
• Hermit Thrush
• Herring Gull
• Hooded Merganser
• Hooded Warbler
• Horned Grebe
• Horned Lark
• House Finch
• House Sparrow
• House Wren
• Indigo Bunting
• Kentucky Warbler
• Killdeer
• King Rail
• Kirtland's Warbler
• Lapland Longspur
• Lark Sparrow
• Laughing Gull
• Least Bittern
• Least Flycatcher
• Least Sandpiper
• Least Tern
• LeConte's Sparrow
• Lesser Black-backed Gull
• Lesser Scaup
• Lesser Yellowlegs
• Lincoln's Sparrow

• Little Blue Heron
• Little Gull
• Loggerhead Shrike
• Long-billed Dowitcher
• Long-tailed Duck
• Louisiana Waterthrush
• Magnolia Warbler
• Mallard
• Marsh Wren
• Merlin
• Mississippi Kite
• Mourning Dove
• Mourning Warbler
• Nashville Warbler
• Nelson's Sparrow
• Northern Bobwhite
• Northern Cardinal
• Northern Flicker
• Northern Goshawk
• Northern Harrier
• Northern Mockingbird
• Northern Parula
• Northern Pintail
• Northern Rough-winged Swallow
• Northern Saw-whet Owl
• Northern Shoveler
• Northern Waterthrush
• Olive-sided Flycatcher
• Orange-crowned Warbler
• Orchard Oriole
• Osprey
• Ovenbird
• Painted Bunting
• Palm Warbler
• Pectoral Sandpiper
• Peregrine Falcon
• Philadelphia Vireo
• Pied-billed Grebe
• Pileated Woodpecker
• Pine Siskin

• Pine Warbler
• Piping Plover
• Prairie Warbler
• Prothonotary Warbler
• Purple Finch
• Purple Gallinule
• Purple Martin
• Red Crossbill
• Red-bellied Woodpecker
• Red-breasted Merganser
• Red-breasted Nuthatch
• Red-eyed Vireo
• Redhead
• Red-headed Woodpecker
• Red-necked Grebe
• Red-necked Phalarope
• Red-shouldered Hawk
• Red-tailed Hawk
• Red-throated Loon
• Red-winged Blackbird
• Ring-billed Gull
• Ring-necked Duck
• Rock Pigeon
• Rose-breasted Grosbeak
• Ross's Goose
• Rough-legged Hawk
• Ruby-crowned Kinglet
• Ruby-throated Hummingbird
• Ruddy Duck
• Rufous Hummingbird
• Rugged Grouse
• Rusty Blackbird
• Sage Thrasher
• Sanderling
• Sandhill Crane
• Savannah Sparrow
• Scarlet Tanager

• Scissor-tailed Flycatcher	• White-rumped Sandpiper
• Sedge Wren	• White-throated Sparrow
• Semipalmated Plover	• White-winged Dove
• Semipalmated Sandpiper	• White-winged Scoter
• Sharp-shinned Hawk	• Wild Turkey
• Short-billed Dowitcher	• Willet
• Snow Bunting	• Willow Flycatcher
• Snow Goose	• Wilson's Phalarope
• Snowy Egret	• Wilson's Snipe
• Solitary Sandpiper	• Wilson's Warbler
• Song Sparrow	• Winter Wren
• Sora	• Wood Duck
• Spotted Sandpiper	• Wood Stork
• Stilt Sandpiper	• Wood Thrush
• Summer Tanager	• Worm-eating Warbler
• Surf Scoter	• Yellow Warbler
• Swainson's Thrush	• Yellow-bellied Flycatcher
• Swainson's Warbler	• Yellow-bellied Sapsucker
• Swallow-tailed Kite	• Yellow-billed Cuckoo
• Swamp Sparrow	• Yellow-breasted Chat
• Tennessee Warbler	• Yellow-crowned Night-Heron
• Townsend's Solitaire	• Yellow-rumped warbler
• Tree Swallow	• Yellow-throated Vireo
• Tufted Titmouse	• Yellow-throated Warbler
• Tundra Swan	
• Turkey Vulture	
• Upland Sandpiper	
• Veery	
• Vesper Sparrow	
• Virginia Rail	
• Warbling Vireo	
• Western Meadowlark	
• Western Sandpiper	
• Whimbrel	
• White Ibis	
• White-breasted Nuthatch	
• White-crowned Sparrow	
• White-eyed Vireo	
• White-faced Ibis	

Appendix C: A list of reptile species found in Knox County, Tennessee according to Austin Peay University's Atlas of Reptiles.

Reptile Species found in Knox County	
Order: Squamata – Lizards and Snakes	
Family: Anguidae – Glass Lizards and Alligator Lizards	
Slender Glass Lizard	<i>Ophisaurus attenuates</i>
Family: Phrynosomatidae – Spiny and Horned Lizards	
Eastern Fence Lizard	<i>Sceloporus undulatus</i>
Family: Scincidae – Skinks	
Common Five-lined Skink	<i>Plestiodon fasciatus</i>
Southeastern Five-lined Skink	<i>Plestiodon inexpectatus</i>
Broad-headed Skink	<i>Plestiodon laticeps</i>
Family: Teiidae – Whiptails and Tegus	
Six-lined Racerunner	<i>Aspidoscelis sexlineata</i>
Family: Colubridae – Colubrid Snakes	
Eastern Wormsnake	<i>Carphophis amoenus</i>

Scarletsnake	<i>Cemophora coccinea</i>
North American Racer	<i>Coluber constrictor</i>
Ring-necked Snake	<i>Diadophis punctatus</i>
Eastern Hog-nosed Snake	<i>Heterodon platirhinos</i>
Yellow-bellied Kingsnake	<i>Lampropeltis calligaster</i>
Scarlet Kingsnake	<i>Lampropeltis elapsoides</i>
Black Kingsnake	<i>Lampropeltis nigra</i>
Milksnake	<i>Lampropeltis triangulum</i>
Northern Mole Kingsnake	<i>Lampropeltis thombomaculata</i>
Northern Watersnake	<i>Nerodia sipedon</i>
Rough Greensnake	<i>Opheodrys aestivus</i>
Red Cornsnake	<i>Pantherophis guttatus</i>
Gray Ratsnake	<i>Pantherophis spiloides</i>
Queen Snake	<i>Regina septemvittata</i>
DeKay's Brownsnake	<i>Storeria dekayi</i>
Red-bellied Snake	<i>Storeria occipitomaculata</i>

Southeastern Crowned Snake	<i>Tantilla coronate</i>
Common Gartersnake	<i>Thamnophis sirtalis</i>
Smooth Earthsnake	<i>Virginia valeria</i>
Family: Viperidae - Vipers	
Eastern Copperhead	<i>Agkistrodon contortrix</i>
Order: Testudines – Turtles	
Family: Chelydridae – Snapping Turtles	
Snapping Turtle	<i>Chelydra serpentina</i>
Family: Emydidae – Box and Water Turtles	
Southern Painted Turtle	<i>Chrysemys dorsalis</i>
Painted Turtle	<i>Chrysemis picta</i>
Eastern Box Turtle	<i>Terrapene Carolina</i>
Pond Slider	<i>Trachemys scripta</i>
Family: Kinosternidae – Musk and Mud Turtles	
Eastern Musk Turtle	<i>Sternotherus odoratus</i>
Family: Trionychidae – Softshell Turtles	

Spiny Softshell	<i>Apalone spinifera</i>
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Appendix D: A list of amphibian species found in Knox County, Tennessee via Austin Peay University's Atlas of Amphibians and research grade accounts from iNaturalist.

Amphibian Species found in Knox County	
Order: Anura – Frogs and Toads	
Family: Bufonidae - Toads	
American Toad	<i>Anaxyrus americanus</i>
Fowler's Toad	<i>Anaxyrus fowleri</i>
Family: Hylidae – Tree Frogs	
Northern Cricket Frog	<i>Acris crepitans</i>
Upland Chorus Frog	<i>Pseudacris feriarum</i>
Spring Peeper	<i>Pseudacris crucifer</i>
Squirrel Tree Frog	<i>Hyla squirella</i>
Green Treefrog	<i>Hyla cinerea</i>
Cope's Gray Treefrog	<i>Hyla chrysoscelis</i>
Family: Microhylidae – Narrowmouth Toads	
Eastern Narrow-mouthed Toad	<i>Gastrophryne carolinensis</i>
Family: Ranidae – True Frogs	

American Bullfrog	<i>Lithobates catesbeianus</i>
Green Frog	<i>Lithobates clamitans</i>
Pickerel Frog	<i>Lithobates palustris</i>
Wood Frog	<i>Lithobates sylvaticus</i>
Family: Scaphiopodidae – American Spadefoot Toads	
Eastern Spadefoot	<i>Scaphiopus holbrookii</i>
Order: Caudata – Salamanders	
Family: Ambystomatidae – Mole Salamanders	
Tiger Salamander	<i>Ambystoma tigrinum</i>
Marbled Salamander	<i>Ambystoma opacum</i>
Spotted Salamander	<i>Ambystoma maculatum</i>
Family: Plethodontidae – Lungless Salamanders	
Northern Slimy Salamander	<i>Plethodon glutinosus</i>
Southern Zigzag Salamander	<i>Plethodon ventralis</i>
Spotted Dusky Salamander	<i>Desmognathus conanti</i>
Southern Two-lined Salamander	<i>Eurycea cirrigera</i>
Long-tailed Salamander	<i>Eurycea longicauda</i>

Cave Salamander	<i>Eurycea lucifuga</i>
Brownback Salamander	<i>Eurycea aquatica</i>
Red Salamander	<i>Pseudotriton ruber</i>
Berry Cave Salamander	<i>Gyrinophilus gulolineatus</i>
Spring Salamander	<i>Gyrinophilus porphyriticus</i>
Family: Proteidae – Mudpuppies and Olm	
Common Mudpuppy	<i>Necturus maculosus</i>
Family: Salamandridae – Newts	
Eastern Newt	<i>Notophthalmus viridescens</i>

Appendix E: Additional resources for arboretum trail construction.

Sevier County High School—Sevier, TN

Students at Sevier County High School made the mounting devices for their labels. They wanted to label trees but also provide an opportunity for visitors to test their knowledge prior to viewing the tree label.

Their signs are constructed of treated pine:

- Sign base is on a 4"x 4" post, cut at a 45-degree angle to accept the sign
- Top cover is a 1 inch thick, 6"x 6" piece mounted at the back with a six-inch piano hinge onto a 2-inch-thick piece of the same size (the 2-inch piece mounted to the 4"x 4" post)
- Information sign is mounted into a routed recess of the 1-inch piece (about 3.5" x 5.25")
- The actual sign is a printed plate, mounted onto a plastic plate, and then both of those mounted into the recess of the pine base. The sign is close to the routed recess in size (3.5"x 5.25")



Solutions for Vandalism Problems:

Many arboreta located on greenway or walking trails experience frequent vandalism problems. The City of Chattanooga resolved their problem by hanging their labels higher in the tree and placing indicators on the asphalt walking trails to bring to the visitor's attention of a labeled tree.



Purchased Labels:

There are several companies where arboreta can purchase labels or markers. These labels or markers come in various sizes, styles and materials.



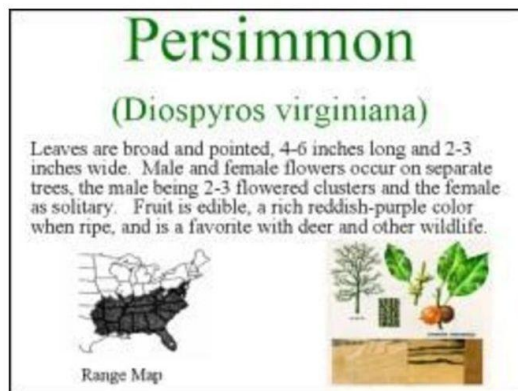
Other labels are inserted into the ground or mounted onto other material that is in the ground as demonstrated by East Tennessee State University. (Note: Stakes need to be set in quick-cement for security reasons.)

Handmade Labels:

Several arboreta have constructed their own labels or made their own mounting devices.

Packaging Corporation of America Arboretum---Counce, TN

The signs on their environmental trail are mounted on 4" x 4" treated posts. The tops are cut at a 45-degree angle for easy viewing. The posts are approximately 4' tall. The signs are encased in Plexiglas and attached to the posts by small screws. The signs are put together on 8.5" x 11" paper in PowerPoint. They used the booklet "Important Trees of the Eastern Forests", published by the United States Forest Service, for the pictures of the trees and their ranges, which are displayed below. This booklet provides information for the more common, native trees.



Appendix F: Additional resources for the maintenance of recreational trails.

USDA - Natural Resources Conservation Service

New Jersey

Practice: 575 - Trails and Walkways**Scenario:** #1 - Walkway, earth or vegetated

Scenario Description: Layout and construct an earth or vegetated trail to facilitate the movement of animals, people, or off-road vehicles to provide or improve access to forage, water, working/handling facilities, and/or shelter. Improve grazing efficiency and distribution, and/or protect ecologically sensitive, erosive and/or potentially erosive sites, pedestrian or off-road vehicle access to agricultural, construction, or maintenance operations, provide trails for recreational activities or access to recreation sites and address the resource concerns of soil erosion and water quality degradation. Costs include excavation, shaping, grading, earth and or vegetated surfaces and all equipment, labor and incidental materials necessary to install the practice.

Before Situation: This practice applies on all lands where management of animal or human movement is needed to address soil erosion and water quality resource concerns. This practice applies to a trails or walkways constructed for use by off-road vehicles, such as All-Terrain Vehicles or snowmobiles, which are not designed for use on public roads. It does not apply to roads constructed for movement of equipment or vehicles. Use NRCS Conservation Practice Standard Access Road (Code 560).

After Situation: The typical trail will be a 12 foot wide 300 foot long, 3600 square foot lane of earth and vegetation. All excavation, grading and shaping necessary to provide a smooth permanent travel surface for livestock or people is included. Included is 45 CY of excavation, vegetation of 1800 square foot for surfacing, 1800 square foot of earthen surfacing and vegetation of 900 square foot of disturbed areas. Consider the adequacy of natural surfacing. If the lane requires planting, the vegetation is provided. Where earth and or vegetation is not practical, adequate surface protection is provided under a different scenario. Stream Crossing, Code 578, will be used when the trail or lane crosses streams or shallow water areas. Shaping of needed water bars to control and direct water flow in the trail is part of this scenario. All culverts will be applied under Structure for Water Control (587). Use Access Road, Code 560 and Diversion (362) as appropriate. Fencing, Code 382, will be used when needed to control animal movement.

Scenario Feature Measure: Area of trail**Scenario Unit:** Square Foot**Scenario Typical Size:** 3600**Total Scenario Cost:** \$971.63**Scenario Cost/Unit:** \$0.27**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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Materials

Lime, ENM	75	Fertilizer: Limestone Spread on field.	Ton	\$91.39	0.2	\$18.28
Nitrogen (N), Urea	71	Price per pound of N supplied by Urea. Price is not per pound of total product applied, no conversion is needed.	Pound	\$0.49	3	\$1.46
One Species, Warm Season, Introduced Perennial Grass (seed or sprigs)	2323	Introduced, warm season perennial grass seed or sprig. Includes material and shipping only.	Acre	\$62.40	0.041	\$2.56
Phosphorus, P2O5	73	Price per pound of P2O5 supplied by Superphosphate. Price is not per pound of total product applied, no conversion is needed.	Pound	\$0.63	6	\$3.80
Potassium, K2O	74	K2O supplied by Muriate Of Potash. Price is not per pound of total product applied, no conversion is needed.	Pound	\$0.35	6	\$2.11

Labor

Equipment Operators, Heavy	233	Includes: Cranes, Hydraulic Excavators >=50 HP, Dozers, Paving Machines, Rock Trenchers, Trenchers >=12", Dump Trucks, Ag Equipment >=150 HP, Scrapers, Water Wagons.	Hour	\$40.70	4	\$162.80
General Labor	231	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$23.46	4	\$93.84
Supervisor or Manager	234	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$42.06	2	\$84.12

Equipment Installation

Fertilizer, ground application, dry bulk	950	Dry bulk fertilizer application performed by ground equipment. Includes equipment, power unit and labor costs.	Acre	\$6.52	0.1	\$0.65
Seeding Operation, Broadcast, Ground	959	Broadcast seed via ground operation. May require post tillage operation to incorporate seed. Includes equipment, power unit and	Acre	\$12.42	0.1	\$1.24

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		labor costs.				
Tillage, Light	945	Includes light disking (tandem) or field cultivator. Includes equipment, power unit and labor costs.	Acre	\$10.98	0.1	\$1.10
Track Loader, 95HP	935	Equipment and power unit costs. Labor not included.	Hour	\$86.89	4	\$347.55

Mobilization

Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$252.13	1	\$252.13
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Appendix G: Additional information for the maintenance of trees in arboretums.

Arboretum Maintenance Guidelines

Developed 9/15/10; Revised 12/19; Approved ©TUFC 2020

The main goal of this document is to establish minimum maintenance expectations for Certified Arboreta. These guidelines include widely accepted practices and standards used by professional arborists, urban and community foresters, and other tree care professionals.

Newly Planted Trees (less than 3 years)

Inspection

- All trees should be inspected visually on a regular basis for evidence of disease, insects, deadwood, or other damage.

Tree Rings/ Mulching

- Trees in turf areas should be maintained with a bare ring of earth around each tree that has been mulched for protection from mower and string trimmer damage
- The mulch ring surrounding the tree should not be more than 4 inches and not less than 2 inches in depth. Mulch should not be in contact with trunk and extend a minimum of 2 feet from center of trunk
- Mulch should be of a natural material (pine bark, pine straw, wood chips, composted leaves, etc.)
- Trees with mower or string trimmer damage will be assessed for exclusion from consideration in the number of trees needed to meet minimum standards for recertification

Tree Staking

- If newly planted trees have stakes, they should not be left in place for more than one growing season
- Stakes should be driven into soil outside the planting hole area and not driven through the root ball
- Straps should be made of a soft, flexible material that will not damage the bark of the tree
- Straps should be somewhat loose to provide the tree an opportunity to give slightly with the wind

Tree Pruning

- Trees shall be pruned in accordance with the latest ANSI A300 (Part 1) and ANSI Z60.1 standards
- Pruned branches will be removed at the branch ridge collar following the three cut method.
- Major limbs removals shall be properly cut at the base of the limb and shall not include collar removal (Flush cutting)
- Trees that have been 'Topped', 'Pollarded' or otherwise excessively pruned will be assessed for exclusion from consideration in the number of trees needed to meet minimum standards for recertification
- Pruning debris should not be present within general area of the tree(s)
- Use of any wound dressings on tree cuts will be assessed for exclusion from consideration in the number of trees needed to meet minimum standards for recertification
- Trees where more than one-third of the total canopy has been removed will be assessed for exclusion from consideration in the number of trees needed to meet minimum standards for recertification

Cabling, Bracing and Guying

- All trees that have been guyed, braced, or contain cabling must adhere to the latest ANSI A300 (Part 3) standards and may be assessed for exclusion from consideration in the number of trees needed to meet minimum standards for recertification

Watering

- Newly planted trees should be monitored for no less than two years after planting for supplemental watering needs
- Trees in areas receiving water from an automatic irrigation system should be checked for over-watering

Fertilization

- Trees should be fertilized as per the latest ANSI A300 (Part 2) standards for their proper growth and health

Insect & Disease Control

- The use of an Integrated Pest Management System (IPM) is encouraged. If a tree is found to have an untreated insect or disease problem, it may be assessed for exclusion from consideration in the number of trees needed to meet minimum standards for recertification

Replacement

- Any changes to the number or types of trees approved at the time of certification must be noted and replacements correctly labeled.

Mature Trees

Inspection

- All trees should be inspected visually on a regular basis for evidence of disease, insects, deadwood, or other damage.

Tree Rings/Mulching

- Trees less than 12 inch dbh that are located in turf areas should be maintained with a bare ring of earth around each tree that has been mulched for protection from mower and string trimmer damage
- Ring of mulch depth should not be more than 4 inches and not less than 2 inches of material. Mulch should not be in contact with trunk, and should extend a minimum of 3 feet from center of trunk, or out to dripline
- Mulch should be of an organic nature (pine bark, pine straw, etc.)
- Where trees are larger than 12 inches in diameter and not mulched, weeds may be controlled through a chemical herbicide or otherwise protected from trunk and root damage that could be caused by mower and string trimmers
- Any trunk or root damage will be assessed for exclusion from consideration in the number of trees needed to meet minimum standards for recertification

Tree Staking

- Any tree that is staked or needs staking after being planted for 5 years, will be assessed for exclusion from consideration in the number of trees needed to meet minimum standards for recertification

Tree Pruning

- Trees shall be pruned in accordance with the latest ANSI A300 (Part 1) and ANSI Z133.1 standards
- Pruned branches will be removed at the branch ridge collar following the three cut method.
- Major limb removals shall be properly cut at the base of the limb and shall not include collar removal (Flush cutting)
- Trees that have been 'Topped', 'Pollarded' or otherwise excessively pruned will be assessed for exclusion from consideration in the number of trees needed to meet minimum standards for recertification
- Pruning debris should not be present within general area of the tree(s)
- Use of any wound dressings on tree cuts will be assessed for exclusion from consideration in the number of trees needed to meet minimum standards for recertification
- Any tree where more than one-third of the total canopy has been removed will be assessed for exclusion from consideration in the number of trees needed to meet minimum standards for recertification

Cabling, Bracing and Guying

- All trees that have been braced or cabled must adhere to the latest ANSI A300 (Part 3) standards and may be assessed for exclusion from consideration in the number of trees needed to meet minimum standards for recertification

Watering

- Mature trees should not require supplemental watering except in extreme drought conditions
- Trees in areas receiving water from an automatic irrigation system should be checked for overwatering

Fertilization

- Trees should be fertilized as per the latest ANSI A300 (Part 2) standards for their proper growth and health

Insect & Disease Control

- The use of an Integrated Pest Management System (IPM) is encouraged. If a tree is found to have an untreated insect or disease problem, it may be assessed for exclusion from consideration in the number of trees needed to meet minimum standards for recertification

Removal

- Any on site tree deemed a "hazardous tree" based on ISA Hazardous Evaluation will be noted and must be removed prior to recertification
- Trees that have been removed must have had stumps removed or in some manner be returned to a safe condition prior to recertification

Replacement

- Any changes to the number or types of trees approved at the time of certification must be noted and replacements correctly labeled.

Appendix H: Triclopyr 4 Specimen Label

TRICLOPYR 4 Specimen Label

A Herbicide for Control of Woody Plants, Annuals and Perennial Broadleaf Weeds in Forests, Grass Pastures, Rangeland, CRP acres, Rights-of-Way, and in Non-Crop Areas and Ornamental Turf, Industrial Sites and Non-Irrigation Ditch Banks

ACTIVE INGREDIENT: % BY WT. *Triclopyr BEE: (3,5,6 Trichloro-2-Pyridinyl)

oxyacetic acid, butoxyethyl ester 61.6% **OTHER INGREDIENTS:**
38.4% TOTAL: 100.0% Contains petroleum distillates

*Contains 4 pounds of triclopyr acid equivalent per gallon (44.3%) EPA Reg. No. 81927-11

KEEP OUT OF REACH OF CHILDREN CAUTION / PRECAUCION

usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

FIRST AID	
If swallowed:	• Call a poison control center or doctor immediately for treatment advice. • Do not induce vomiting unless told to do so by a poison control center or doctor. • Do not give anything by mouth to an unconscious person. • Do not give liquid to the person.
If in eyes:	• Hold eye open and rinse slowly and gently with water for 15-20 minutes. • Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. • Call a poison control center or doctor for treatment advice.
If on skin or clothing:	• Take off contaminated clothing. • Rinse skin immediately with plenty of water for 15-20 minutes. • Call a poison control center or doctor for treatment advice.
HOT LINE NUMBER	
Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact 1-800-424- 9300 for emergency medical treatment information.	
NOTE TO PHYSICIAN	
May pose an aspiration hazard. Contains petroleum distillates.	

Manufactured for:
 Alligare, LLC
 13 N. 8th Street
 Opelika, AL 36801

PRECAUTIONARY STATEMENTS HAZARDS TO HUMANS AND DOMESTIC ANIMALS

CAUTION: Harmful if swallowed. Causes moderate eye irritation. Avoid contact with eyes or clothing. Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Some materials that are chemical-resistant to this product are listed below. If you want more options, follow the instructions for category E on an EPA chemical resistance category selections chart.

Applicators and other handlers who handle this pesticide for any use covered by the Worker Protection Standard (40 CFR Part 170) – in general, agricultural-plant uses are covered – must wear:

- Long-sleeved shirt and long pants
- Chemical-resistant gloves such as barrier laminate, nitrile rubber, neoprene rubber, or viton
- Shoes plus socks

Applicators and other handlers who handle this pesticide for any use not covered by the Worker Protection Standard (40 CFR Part 170) – in general, only agricultural-plant uses are covered by the WPS – must wear:

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- Long-sleeved shirt and long pants
- Shoes plus socks

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables are given, use detergent and hot water. Keep and wash PPE separately from other laundry.

4

ENGINEERING CONTROLS

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240(d)(4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

User Safety Recommendations

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.
- Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

ENVIRONMENTAL HAZARDS

This pesticide is toxic to fish. Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters or rinsate.

This chemical has properties and characteristics associated with chemicals detected in groundwater. The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination.

Physical or Chemical Hazards

Combustible: Do not use or store near heat or open flame. Do not cut or weld container.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulation.

AGRICULTURAL USE REQUIREMENTS

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR Part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry interval (REI). The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 12 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

- Coveralls
- Chemical-resistant gloves such as barrier laminate, nitrile rubber, neoprene rubber, or Viton
- Protective eyewear
- Shoes plus socks

NON-AGRICULTURAL USE REQUIREMENTS

The requirements in this box apply to uses of this product that are NOT within the scope of the Worker Protection Standard for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forest, nurseries, or greenhouses.

Do not enter or allow others to enter the treated area until sprays have dried, unless applicator and other handler PPE is worn.

Product Information

Alligare Triclopyr 4 is a herbicide used to control unwanted woody plants and annual and perennial broadleaf weeds

- in forests
- on permanent grass pastures, rangelands, and conservation reserve program (CRP) acres (including non-irrigation ditch banks and fence rows within these areas)
- on non-crop areas including industrial manufacturing and storage sites
- on rights-of-way such as electrical power lines, communication lines, pipelines, roadsides, and railroads
- on fence rows
- on non-irrigation ditch banks
- around farm buildings
- on perennial bluegrass, perennial ryegrass, and tall fescue ornamental turf (including sod farms, commercial turf, and golf courses)

Alligare Triclopyr 4 use on these sites may include application to grazed areas as well as for the establishment and maintenance of wildlife openings.

Use Precautions

- Local conditions may affect the use of herbicides. Consult your local specialist for advice in selecting treatments from this label to best fit local conditions.
- Avoid direct application to Christmas trees as conifer injury may result. When treating unwanted vegetation in Christmas tree plantations, use sprays directed away from conifers.
- While Alligare Triclopyr 4 is formulated as a low volatile ester, the combination of spray contact with impervious surfaces (such as roads and rocks) and increasing ambient air temperatures may result in an increase in the volatility potential for this herbicide, increasing a risk for off-target injury to sensitive crops such as grapes and tomatoes.
- Use of this product in certain portions of California, Oregon, and Washington is subject to

TRICLOPYR 4 Specimen Label

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the January 22, 2004 Order for injunctive relief in Washington Toxics Coalition, et. al. v. EP, C01-0132C, (W.D. WA). For further information, please refer to <http://www.epa.gov/esp/ptwc>.

Use Restrictions

- Agricultural Use Requirements for Forestry Uses: For use of this product on forestry sites, follow PPE and Reentry restrictions in the Agricultural Use Requirements section of this label
- Use Requirements for Non-Cropland Areas: No worker protection Standard worker entry restrictions or worker notification requirements apply when this product is applied to non-cropland.
- Alligare Triclopyr 4 may injure certain turfgrass species. Do not apply to bahiagrass, bentgrass, bermudagrass, centipedegrass, St. Augustine grass, or zoysiagrass, unless turf injury can be tolerated.
- Do not apply Alligare Triclopyr 4 to exposed roots of shallow rooted trees and shrubs.
- Do not apply Alligare Triclopyr 4 to golf course greens.
- Do not apply more than 2 qts. of Alligare Triclopyr 4 per acre in a single application when spot treating.
- On use sites other than grazable areas and forestry sites, do not apply more than 8 lbs. ae per acre per year of triclopyr (8 qts./A/yr Alligare Triclopyr 4).
- On use sites that may be grazed, including rights-of-way, pasture, fence rows, and range land, do not apply more than 2 lbs. ae per acre per year of triclopyr (2 qts./A/yr of Alligare Triclopyr 4).
- On forestry use sites, do not apply more than 6 lbs. ae per acre per year of triclopyr (6 qts./A/yr of Alligare Triclopyr 4).
- In Arizona:** The state of Arizona has not approved Alligare Triclopyr 4 for use on plants grown for commercial production; specifically on designated grazing areas or use on sod farms.
- Do not apply this product through any type of irrigation system.
- Do not apply to ditches used to transport irrigation water. Do not apply where runoff or irrigation water may flow onto agricultural land as injury to crops may result. • It is permissible to treat non-irrigation ditch banks, seasonably dry wetlands, flood plains, deltas, marshes, swamps, bogs and transitional areas between upland and lowland sites. Do not apply to open water such as lakes, reservoirs, rivers, streams, creeks, salt water bays, or estuaries.
- Do not apply this product through mist blowers unless a drift control additive, high viscosity inverting system, or equivalent is used to control spray drift.
- Do not make direct applications or allow spray mists to drift onto cotton, fruit or orchard trees, shrubs, grapes, peanuts, soybeans, tobacco, vegetable crops, flowers, citrus, or other desirable broadleaf plants.
- Many forbs (herbaceous broadleaves) are susceptible to Alligare Triclopyr 4. Unless injury or loss of such plants can be tolerated, do not spray pastures containing desirable broad leaf forbs (especially legumes such as clover). After applications the stand and growth of established grasses is usually improved, especially when rainfall is adequate and grazing is deferred.
- While established grasses are tolerant to this product, newly seeded grasses may be injured until well established (as indicated by vigorous growth, tillering and the development of a secondary root system). Do not reseed treated areas for a minimum of three weeks after treatment.
- Portions of grazed areas that intersect treated non-cropland, rights-of-way and forestry sites may be treated at up to 8 lbs. ae per acre if the area to be treated on the day of application comprises no more than 10% of the total grazable area.

Grazing and Haying Restrictions

Except for lactating dairy animals, there are no grazing restrictions following application of this product.

- Grazing Lactating Dairy Animals:** Do not allow lactating dairy animals to graze treated areas until the next growing season following application of this product. • Do not harvest hay for 14 days after application.

Slaughter Restrictions:

Withdraw livestock from grazing treated grass or consumption of treated hay at least 3 days before slaughter. This restriction applies to grazing during the season following treatment or hay harvested during the season following treatment.

APPLICATION DIRECTIONS

RATES

This table assists in determining proper volumes of Alligare Triclopyr 4 in the spray tank to avoid exceeding the maximum use rates listed:

Spray Volume Per Acre	Alligare Triclopyr 4 Quarts per 100 gallons of spray volume		
	2 quarts/acre	6 quarts/acre	8 quarts/acre
400	Do not use	1.5	2
300	Do not use	2	2.7
200	Do not use	3	4
100	2	6	8

50	4	12	16
20	10	30	40
10	20	60	80

Spray Additives

Surfactants - If a standard agricultural surfactant is used, use at a rate of 1 to 2 quarts per acre.

Drift Control Agents – Agriculturally registered spray thickening drift control agents or high viscosity invert systems may be used with Alligare Triclopyr 4. When using these agents, follow all use directions and precautions on the product label. Do not use a thickening agent with the Microfoil boom, Thru Valve boom, or other systems that cannot accommodate thick sprays.

Mixing Directions

Apply Alligare Triclopyr 4 foliarly by diluting with water or as an oil-water emulsion. NOTE: An oil-water emulsion performs more dependably under a broader range of conditions than a straight water dilution for woody plant control and is recommended for aerial applications.

Oil-Water Emulsions

NOTE: Prior to preparing oil-water emulsion sprays in the mixing tank, conduct a jar test to check spray mix compatibility.

Prepare the oil-water emulsion using diesel fuel, fuel oil, or kerosene plus an emulsifier such as Sponto 712 or Triton X-100.

- Ground Application:** Add oil at a rate of 5 to 10% of the total to the spray mix (up to a maximum of 1 gallon of oil per acre) and use an agricultural spray emulsifier according to mixing instructions below.
- Aerial Application:** Add a 1:5 ratio of oil and water (1 part oil to 5 parts water) to the spray mixture (up to a maximum of 1 gallon of oil per acre) according to the mixing instructions below.

Oil Mixture Sprays for Basal Treatment

When preparing an oil mixture, be sure to read and follow the use directions and precautions on the manufacturer's product label. Prepare oil-based spray mixtures using either diesel fuel, No. 1 or No. 2 fuel oil, kerosene or a commercially available basal oil. Substitute other oils or diluents only as recommended by the oil or diluent's manufacturer. Add Alligare Triclopyr 4 to the required amount of oil in the spray tank or mixing tank and mix thoroughly. Reagitate if the mixture stands for over 4 hours.

Water Dilutions

To provide improved wetting of foliage using water dilutions, an agricultural surfactant at the manufacturer's recommended rate may be added to the spray mixture. To help minimize spray drift, a drift control and deposition aid cleared for application to growing crops is recommended.

Tank Mixing

Alligare Triclopyr 4 may be applied in combination with labeled rates of other herbicides provided:

- The tank mix product(s) are labeled for the timing and method of application for the use site to be treated; and,
- Tank mixing is not prohibited by the label of the tank mix product(s).

NOTE: The following compatibility test (jar test) should be conducted prior to mixing ingredients in the spray tank when tank mixing Alligare Triclopyr 4 with other materials: 1. Use a clear glass quart jar with lid and mix the tank mix ingredients in the required order and their relative proportions.

- Invert the jar containing the mixture several times and observe the mixture for approximately ½ hour.
- If the mixture balls-up, forms flakes, sludges, jells, oily films or layers, or other precipitates, it is not compatible and the tank mix combination should not be used.

Mixing Order for Tank Mixes: Add one-half of the needed water to the mixing tank and begin agitation. Add the tank mix partners in the order indicated below, allowing time for complete dispersion and mixing after the addition of each product.

- Water soluble herbicide (if used)
- Premix of oil, emulsifier, Alligare Triclopyr 4 and other oil-soluble herbicide (if used); see below

Add the remaining water. During the final filling of the tank, a drift control and deposition aid cleared for application to growing crops may be added, as well as an agricultural surfactant if a water dilution rather than an oil-water emulsion spray is used. To ensure spray uniformity, maintain continuous agitation of the spray mixture during mixing, final filling and throughout application.

Premixing: Prepare a premix of oil, emulsifier (if oil-water emulsion), and Alligare Triclopyr 4 plus other oil-soluble herbicides if used (for example 2,4-D ester). **Note:** Do not allow water or mixtures containing water to get into the premix or Alligare Triclopyr 4 since a thick "invert" (water in oil) emulsion may form that will be difficult to break. An emulsion may also be formed if the premix or Alligare Triclopyr 4 is put into the mixing tank prior to the addition of water.

Tank Mixing Precautions:

- Read carefully and follow all applicable use directions, limitations and precautions in the respective product labels.
- Do not exceed specified application rates. If products containing the same active ingredient are tank mixed, do not exceed the maximum allowable active ingredient use rates.
- When using spray equipment where the product formulations will be mixed in undiluted form (such as direct injection), special care should be taken to ensure tank mix compatibility.

Mixing with Liquid Fertilizer for Broadleaf Weed Control

For weed control and fertilization of grass pastures, Alligare Triclopyr 4 may be tank mixed with liquid nitrogen fertilizer and applied foliarly. Use Alligare Triclopyr 4 according to the use directions in this label for grass pastures, and apply at the rates recommended by your supplier or Extension Service Specialist provided that no maximum application rates specified on this label are exceeded. **Note:** Because foliage burn caused by liquid fertilizer may reduce herbicide effectiveness on woody plants, Alligare Triclopyr 4 is not recommended for use with liquid fertilizer on woody plants (brush).

Test for mixing compatibility using the desired procedure and spray mix proportions in clear glass jar before mixing in spray tank. A compatibility aid such as Unite or Compex may be needed in some situations, and in difficult situations premixing Alligare Triclopyr 4 with 1 to 4

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parts water may help. **NOTE: Compatibility is best with straight liquid nitrogen fertilizer solutions. Mixing with N-P-K solutions or suspensions may not be satisfactory even with the addition of a compatibility aid.**

Fill the spray tank approximately half full with the liquid fertilizer, then begin agitating and add the herbicide. Complete filling the tank with fertilizer and apply immediately maintaining continuous agitation in the spray tank during application. **Do not store liquid fertilizer spray mixtures.** Because the likelihood of mixing or compatibility problems with liquid fertilizer increases under cold conditions, application during very cold weather (near freezing) is not recommended.

Note: Do not use spray equipment for other applications to land planted (or to be planted) to susceptible crops or desirable plants **unless** it has been determined that all phytotoxic herbicide residue has been removed by thoroughly cleaning the equipment.

APPLICATION EQUIPMENT AND TECHNIQUES

Avoid drift. Very small quantities of spray may seriously injure susceptible plants. Do not spray when wind is blowing toward susceptible desirable vegetation. The applicator may detect the potential for drift by producing smoke at or near the spray site and observing for a temperature inversion or for potential of off-site movement. If the smoke layers or indicates a potential of hazardous spray drift, do not spray.

Broadcast Applications

Alligare Triclopyr 4 may be applied aerially by fixed wing aircraft or helicopter to rangeland, permanent grass pastures, and conservation reserve program acres. For all other use sites listed on this label, Alligare Triclopyr 4 may only be applied aerially by helicopter.

For aerial application to rangeland, permanent grass pastures, and conservation reserve program acres:

Air (Fixed wing aircraft or Helicopter) – For aerial applications to rangeland, permanent grass pastures, and conservation reserve program acres, apply Alligare Triclopyr 4 through a Microfoil or Thru-Valve boom, or use an agriculturally labeled drift control additive. Do not use a thickening agent with the Microfoil or Thru-Valve booms, or other systems that cannot accommodate thick sprays. Keep spray pressures low enough to provide coarse spray droplets and spray only when the wind velocity is low (follow state regulations). Avoid application during air inversions.

Air (Helicopter Only) – When making aerial applications on rights-of-way or other areas near susceptible crops, efforts should be made to minimize drift. Applications should be made with nozzles and pressures which provide adequate plant coverage, but minimize the production of fine spray particles. Drift can be minimized by applying through the Microfoil boom or Thru-Valve boom. Drift control agents or high viscosity invert systems can also be used to minimize drift. Do not use the high viscosity invert system unless it is as effective as the booms listed or as effective as available drift control agents. Use of low pressure nozzles; and operating these nozzles in the lower end of the manufacturer's recommendations is advised. To minimize drift, use a spray boom that is no longer than ¾ the rotor length, spray when wind velocities are low; or by using an approved drift control system.

Note: Reference within this label to equipment produced by or available from other parties is provided without consideration for use by the reader at its discretion and subject to the reader's independent circumstances, evaluation, and expertise. Such reference by Alligare, LLC is not intended as an endorsement of such equipment, shall not constitute a warranty (express or implied) of such equipment, and is not intended to imply that other equipment is not available and equally suitable. Any discussion of methods of use of such equipment does not imply that the reader should use the equipment other than as advised in directions available from the equipment's manufacturer. The reader is responsible for exercising their own judgment and expertise, or consulting with sources other than Alligare, LLC, in selecting and determining how to use its equipment.

Spray Drift Management

Avoiding spray drift at the application site is the responsibility of the applicator. The interaction of many equipment and weather related factors determine the potential for spray drift. The applicator and the grower are responsible for considering all these factors when making decisions.

The following drift management requirements must be followed to avoid off-target drift movement from aerial applications:

1. The distance of the outer most nozzles on the boom must not exceed ¾ the length of the wingspan or rotor.
2. Nozzles must always point backwards parallel with the air stream and never be pointed downwards more than 45 degrees.

Where states have more stringent regulations, they must be observed.

The applicator should be familiar with and take into account the information covered in the following **Aerial Drift Reduction Advisory**. [This section is advisory in nature and does not supersede the mandatory label requirements]

Aerial Drift Reduction Advisory

Information on Droplet Size

The most effective way to reduce drift potential is to apply large droplets. The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent drift if applications are made improperly, or under unfavorable environmental conditions (See Wind, Temperature and Humidity, and Temperature Inversions).

Controlling Droplet Size

- Volume – Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with higher rated flows produce larger droplets.
- Pressure – Do not exceed the nozzle manufacturer's recommended pressures. For many nozzle types lower pressure produces larger droplets. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.
- Number of nozzles – Use the minimum number of nozzles that provide uniform coverage.
 - Nozzle Orientation – Orienting nozzles so that the spray is released parallel to the air stream produces larger droplets than other orientations and is the recommended practice. Significant deflection from horizontal will reduce droplet size and increase drift potential.
 - Nozzle Type – Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid stream nozzles oriented straight back produce the largest droplets and the lowest drift.

Boom Length

For some use patterns, reducing the effective boom length to less than ¾ of the wingspan or rotor length may further reduce drift without reducing swath width.

Application Height

Applications should not be made at a height greater than 10 feet above the top of the largest plants unless a greater height is required for aircraft safety. Making applications at the lowest height that is safe reduces exposure of droplets to evaporation and wind.

Swath Adjustment

When applications are made with a crosswind, the swath will be displaced downwind. Therefore, on the up and downwind edges of the field, the applicator must compensate for this displacement by adjusting the path of the aircraft upwind. Swath adjustment distance should increase with increasing drift potential (higher wind, smaller drops, etc.)

Wind

Drift potential is lowest between wind speeds of 2-10 mph. However, many factors, including droplet size and equipment type determine drift potential at any given speed. Application should be avoided below 2 mph due to variable wind direction and high inversion potential. **Note:** Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect spray drift.

Temperature and Humidity

When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is most severe when conditions are both hot and dry.

Temperature Inversions

Applications should not occur during a local, low level temperature inversion because drift potential is high. Temperature inversions restrict vertical air mixing, which causes small-suspended droplets to remain in a concentrated cloud. This cloud can move in unpredictable directions due to the light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a

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concentrated cloud (under low wind conditions) indicates an inversion, while smoke that moves upward and rapidly dissipates indicates good vertical air mixing.

Sensitive Areas

The pesticide should only be applied when the potential for drift to adjacent sensitive areas (e.g. residential areas, bodies of water, known habitat for threatened or endangered species, non-target crops) is minimal (e.g. when wind is blowing away from the sensitive areas).

Ground – Applications should be made with nozzles and pressures which provide adequate plant coverage, but minimize the production of fine spray particles. Large droplet producing equipment, such as the Radiarc sprayer may aid in reducing off-target drift. Drift control agents or high viscosity invert systems can also be used to minimize drift. Use of low pressure nozzles; and operating these nozzles in the lower end of the manufacturer's specified rates is advised. To minimize drift, keep the spray boom as low as possible, apply in ≥ 20 gallons of spray volume per acre, spray when wind velocities are low; or use an approved drift control agent.

High Volume Leaf-Stem Treatments: Make applications no higher than brush tops with low pressure and coarse spray droplets to minimize spray drift. A drift control agent may be used to reduce spray drift.

Application Directions for Rights-of-Way, Industrial Sites, Non-Crop Areas, Non

Irrigation Ditch Banks, Forests, and Wildlife Openings including Grazed Areas on these Sites

Refer to Tables 1 and 2 of this label for a list of woody plants and broadleaf weeds that are controlled by Alligare Triclopyr 4.

Foliar Applications

Apply Alligare Triclopyr 4 at rates of 1 to 8 quarts per acre for the control of broadleaf weeds and woody plants. Do not exceed the maximum use rate for the use site being treated. Consult the Use Restrictions section of this label for maximum use rates. Apply in enough water to provide uniform and complete coverage of the plants to be controlled. For best results make applications when woody plants and weeds are actively growing. Use higher doses within the range when brush averages 15 feet or more in height or when brush covers > 60% of the area to be treated.

For hard-to-control species such as ash, black gum, choke cherry, elm, maples (other than vine or big leaf), oaks, pines, or winged elm; during late summer applications when plants are mature; or during drought; use higher rates of Alligare Triclopyr 4 alone or use in combination with Tordon* 101 Mixture or Tordon* or Picloram K. If lower rates are used on hard-to-control species, re-sprouting may occur in the year following treatment.

If easy to control brush species dominate, rates less than those specified may be effective. Consult state or local extension personnel for information.

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When making applications of Alligare Triclopyr 4 in a tank mix with 2,4-D low volatile ester herbicide, use higher rates of Alligare Triclopyr 4 within the range for satisfactory brush control.

When tank mixing, refer to the individual product labels for precautionary statements, restrictions, specified rates, approved uses, and a list of weeds and woody plants controlled.

Foliar Applications with Ground Equipment

High Volume Foliar Applications

For control of woody plants, apply Alligare Triclopyr 4 at 1 to 3 quarts per 100 gallons of spray mixture. Coverage should be thorough to wet all leaves, stems, and root collars. See Table in **RATES** section for relationship between mixing rate, spray volume and maximum application rate.

Tank Mixing: 1 to 3 quarts of Alligare Triclopyr 4 may be tank mixed with labeled rates of 2,4-D low volatile ester herbicide, Tordon* or Picloram K, or Tordon* 101 Mixture diluted to make 100 gallons of spray. These applications should be made in 100 to 400 gallons of total spray per acre depending on size and density of woody plants. When tank mixing, refer to the individual product labels for precautionary statements, restrictions, specified rates, approved uses, and a list of weeds and woody plants controlled.

Low Volume Foliar Applications

For control of woody plants, mix up to 20 quarts of Alligare Triclopyr 4 in 10 to 100 gallons of spray solution. Adjust the spray concentration of Alligare Triclopyr 4 and total spray volume per acre to match the size and density of target woody plants and kinds of spray equipment used. With low volume sprays, use sufficient spray volume to obtain uniform coverage of target plants including the surfaces of all foliage, stems, and root collars. For best results, a surfactant should be added to all spray mixtures. See the **SPRAY ADDITIVES** section for a rate recommendation.

Match equipment and delivery rate of spray nozzles to height and density of woody plants. When treating tall, dense brush, a truck mounted spray gun with spray tips that deliver up to 2 gallons per minute at 40 to 60 PSI may be required. Backpack or other types of specialized spray equipment with spray tips that deliver less than 1 gallon of spray per minute may be appropriate for short, low to moderate density brush. See Table in **RATES** section for relationship between mixing rate, spray volume and maximum application rate.

Tank Mixing: Up to 12 quarts of Alligare Triclopyr 4 may be applied in tank mix combinations with labeled rates of Tordon* or Picloram K, or Tordon* 101 Mixture as a low volume foliar spray. These applications should be made in 10 to 100 gallons of spray solution. When tank mixing, refer to the individual product labels for precautionary statements, restrictions, application rates, approved uses, and a list of weeds and woody plants controlled.

Broadcast Application With Ground Equipment

Use equipment that will assure thorough and uniform coverage at spray volumes applied.

Woody Plant Control

Foliage Treatment: Apply 4 to 8 quarts of Alligare Triclopyr 4 in a minimum of 5 gallons of spray solution per acre. Alligare Triclopyr 4 at 1.5 to 3 quarts per acre may be tank mixed with labeled rates of 2,4-D low volatile ester, Tordon* 101 Mixture, or Tordon* or Picloram K in a minimum of 5 gallons of spray solution per acre. When tank mixing, refer to the individual product labels for precautionary statements, restrictions, application rates, approved uses, and a list of weeds and woody plants controlled.

Broadleaf Weed Control

Apply 1 to 4 quarts of Alligare Triclopyr 4 in a minimum of 5 gallons of spray solution per acre. Apply at any time weeds are actively growing. Alligare Triclopyr 4 at 0.25 to 3 quarts per acre may be tank mixed with labeled rates of 2,4-D amine or low volatile ester, Tordon* or Picloram K, or Tordon* 101 Mixture to improve the spectrum of activity. For thickened (high viscosity) spray mixtures, Alligare Triclopyr 4 can be mixed with diesel oil or other inverting agent. When using an inverting agent, read and follow the use directions and precautions on the product label. When tank mixing, refer to the individual product labels for precautionary statements, restrictions, application rates, approved uses, and a list of weeds and woody plants controlled.

Aerial Application (Helicopter Only) - Aerial sprays should be applied using suitable drift control. See the **SPRAY ADDITIVES** and the **APPLICATION EQUIPMENT AND TECHNIQUES** section.

Foliage Treatment (Utility and Pipeline Rights-of-Way) – Apply 4 to 8 quarts of Alligare Triclopyr 4 alone per acre or tank mix 3 to 4 quarts per acre of Alligare Triclopyr 4 with labeled rates of 2,4-D low volatile ester; Tordon* 101 Mixture; or Tordon* or Picloram K. Do not apply more than 2 quarts per acre of Alligare Triclopyr 4 alone or in tank mix to areas that may be grazed unless the requirements specified in the Use Restrictions section are followed. Apply in total spray volume of 1 to 30 gallons per acre. Use the higher rates and volumes when plants are dense or under drought conditions. When tank mixing, refer to the individual product labels for precautionary statements, restrictions, application rates, approved uses, and a list of weeds and woody plants controlled.

Basal Bark and Dormant Brush Treatments

To control woody plants in rights-of-way, in other non-crop areas, forests, rangeland and permanent grass pastures; use Alligare Triclopyr 4 in oil or oil-water mixtures prepared and applied as described in the "Mixing Directions – Oil Mixture Sprays for Basal Treatment" section of this label. Do not graze treated areas following use of oil or oil-water mixtures.

For non-foliar applications on rangeland and permanent grass pastures, apply no more than 2 quarts of Alligare Triclopyr 4 (2 lb. ae of triclopyr) per acre per year.

Oil Mixture Sprays - Add Alligare Triclopyr 4 to the required amount of oil in the spray tank or mixing tank and mix thoroughly. If the mixture is allowed to stand for more than 4 hours, agitation is required.

Oil-Water Mixture Sprays - Prepare a premix of Alligare Triclopyr 4, oil, and surfactant in a separate container. Do not allow any water or mixtures containing water to get into the Alligare Triclopyr 4 or the premix. Mix in spray tank as follows:

1. Fill spray tank $\frac{1}{2}$ full with water.
2. Begin tank agitation and continue throughout mixing and spraying.
3. Add premix
4. Continue moderate agitation.
5. Fill remainder of spray tank.

Note: If the premix is put in the tank without any water, the first water added may form a thick "invert" (water in oil) emulsion which will be hard to break.

Oil - Water Mixtures of Alligare Triclopyr 4 and Tordon* or Picloram K: When mixed together in oil, these herbicides are incompatible and will not form a stable mixture. Stable tank mixtures of Alligare Triclopyr 4 and Tordon* or Picloram K for basal bark application can be made if each product is first combined with a compatibility agent prior to final mixing in oil in the desired ratio. (See product bulletin for mixing instructions.)

Basal Bark Treatment - To control susceptible woody plants with stems less than 6 inches in basal diameter, mix 1 to 5 gallons of Alligare Triclopyr 4 in enough oil to make 100 gallons of spray solution. Apply with knapsack sprayer or power spraying equipment using low pressure (20-40 PSI). Spray the basal parts of brush and tree trunks to a height of 12 to 15

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inches from the ground. Thorough wetting is necessary for good control. Spray until runoff at the ground line is noticeable. Old or rough bark requires more spray than smooth young bark. Apply at any time, including the winter months, except when snow or water prevents spraying to the ground line.

Low Volume Basal Bark Treatment - To control susceptible woody plants with stems less than 6 inches in basal diameter, mix 20 to 30 gallons of Alligare Triclopyr 4 in enough oil to make 100 gallons of spray solution. Apply with a backpack or knapsack sprayer using low pressure and a solid cone or flat fan nozzle. Spray the basal parts of brush and tree trunks in a manner which thoroughly wets the lower stems, including the root collar area, but not to the point of runoff. Herbicide concentration should vary with size and susceptibility of species treated. Apply at any time, including the winter months, except when snow or water prevents spraying to the ground line or when stem surfaces are saturated with water.

Alligare Triclopyr 4 Plus Tordon* or Picloram K in Oil Tank Mix – Alligare Triclopyr 4 and Tordon* or Picloram K may be applied as a low volume basal bark treatment to improve control of certain woody species such as ash, elm, maple, poplar, aspen, hackberry, oak, oceanspray, birch, hickory, pine, tanoak, cherry, locust, sassafras, and multiflora rose. (See product bulletin for mixing instructions.)

Streamline Basal Bark Treatment - To control or suppress susceptible woody plants, mix 20 to 30 gallons of Alligare Triclopyr 4 with 10% penetrant such as Cide-Kick or similar penetrant in enough oil to make 100 gallons of spray solution. Apply with a backpack or knapsack sprayer using equipment which provides a directed straight stream spray. For stems less than 3 inches in basal diameter, apply sufficient spray to one side of the stems to form a treated zone that is 6 inches in height. When the optimum amount of spray mixture is applied, the treated zone should widen to encircle the stem within approximately 30 minutes.

Treat both sides of stems which are 3 to 4 inches in basal diameter. Direct the spray at bark that is approximately 12 to 24 inches above the ground. Pines (loblolly, slash, shortleaf, and Virginia) up to 2 inches in diameter breast height (dbh) can be controlled by directing the spray at a point approximately 4 feet above ground. Vary spray mixture concentration with size and susceptibility of the species being treated.

Best results are achieved when applications are made to young vigorously growing stems which have not developed the thicker bark characteristic of slower growing, under-story

trees in older stands. This technique is not recommended for scrub and live oak species, including blackjack, turkey, post, live, bluejack and laurel oaks, or bigleaf maple. Apply from approximately 6 weeks prior to hardwood leaf expansion in the spring until approximately 2 months after leaf expansion is completed. Do not apply when snow or water prevent spray ing at the desired height above ground level.

Low Volume Stem Bark Band Treatment (North Central and Lake States) - To control susceptible woody plants with stems less than 6 inches in basal diameter, mix 20 to 30 gallons of Alligare Triclopyr 4 in enough oil to make 100 gallons of spray mixture. Apply with a backpack or knapsack sprayer using low pressure and a solid cone or flat fan nozzle. Apply the spray in a 6 to 10 inch wide band that completely encircles the stem. Spray in a manner that completely wets the bark, but not to the point of runoff. The treatment band may be positioned at any height up to the first major branch. For best results apply the band as low as possible. Spray mixture concentration should vary with size and susceptibility of species to be treated. Applications may be made at any time, including winter months.

Thinline Basal Bark Treatment - To control susceptible woody plants with stems less than 6 inches in diameter, apply Alligare Triclopyr 4 either undiluted or mixed at 50-75% v/v with oil in a thin stream to all sides of the lower stems. The stream should be directed horizontally to apply a narrow band around each stem or clump. Use a minimum of 2 to 15 milliliters of Alligare Triclopyr 4 or oil mixture with Alligare Triclopyr 4 to treat single stems and from 25 to 100 milliliters to treat clumps of stems. Use an applicator metered or calibrated to deliver the small amounts required.

Dormant Stem Treatment

Dormant stem treatments can be used to control susceptible woody plants and vines with < 2 inch diameter stems. Plants with > 2 inch diameter stems may not be controlled and resprouting may occur. This application method works best in dense areas with small diameter brush. Dormant stem treatments of Alligare Triclopyr 4 can also be used as a chemical side-trim to control lateral branches of larger trees that encroach onto roadside, utility, or other rights-of-way.

Mix 4 to 8 quarts of Alligare Triclopyr 4 in 2 to 3 gallons of crop oil concentrate or other recommended oil. Add this mixture to enough water to make 100 gallons of spray solution. Use continuous agitation to maintain mix. Apply in 70 to 100 gallons per acre with Radiarc,

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conditions are favorable and the weeds are actively growing.

OC or equivalent nozzles, or handgun to ensure uniform stem coverage. In western states, apply anytime after woody plants are dormant. In other areas, apply anytime within 10 weeks of bud break, generally February through April. Do not apply to wet or saturated bark as poor control may result.

For improved control of black cherry, mix Alligare Triclopyr 4 with 4 quarts of Weedone 170 herbicide. When tank mixing, refer to the individual product labels for precautionary statements, restrictions, application rates, approved uses, and a list of weeds and woody plants controlled.

For root suckering species such as sumac, sassafras and locust, also spray the ground under the plant to cover small root suckers which may not be visible above the soil surface.

Cut Stump Treatment

Resprouting of cut stumps of susceptible species can be controlled by mixing 20 to 30 gallons of Alligare Triclopyr 4 in enough oil to make 100 gallons of spray solution. Apply at low pressure with a backpack or knapsack sprayer; using either solid cone or flat fan nozzles. Apply to the root collar area, sides of the stump, and the outer portion of the cut surface including cambium. The treated area should be thoroughly wet, but do not apply to the point of runoff. Vary spray mixture concentration according to size and susceptibility of treated species. Applications can be made at any time of the year, including in winter months. Do not apply when snow or water prevent application to the ground line.

Cut Stump Treatment in Western States

Resprouting of cut stumps of salt-cedar and other *Tamarix* spp., bigleaf maple, tanoak, Oregon myrtle, and other susceptible species can be controlled by treating the cambium and adjacent wood around the circumference of the cut stump to wet. Applications may be made at any time during the year, however, reduced control may occur during periods of moisture stress as can occur in late summer. Use an applicator which can be calibrated to deliver small amounts.

Note: All basal bark and dormant brush treatments may be used on grazed range and permanent pasture land provided that no more than 2 quarts/acre/year of Alligare Triclopyr 4 are applied. Large plants or species requiring higher rates of Triclopyr may not be completely controlled. See the **Use Restrictions** section for grazing restrictions.

Chemical Mowing on Non-Cropland Sites Infested with Annual and Perennial Broadleaf Weeds or Woody Plants

To control annual and perennial broadleaf weeds and for suppression and stem density reduction of woody plants that occur on rights-of-way, airport grounds, petroleum tank farms or other industrial sites, Alligare Triclopyr 4 may be applied to the cut surfaces of weed or brush stubble under the deck of a rotary mower such as the Lucas "64" System or other approved equipment that is designed to uniformly apply the herbicide. Apply when growing

Broadleaf Weed Control: Using a minimum spray volume of 3 gallons per acre, apply the rate specified in the "Broadcast Applications with Ground Equipment – Broadleaf Weed Control" section of this label. To improve weed control or broaden the spectrum of weeds controlled, follow the label directions for herbicides that may be applied in tank mix combination with Alligare Triclopyr 4.

Woody Plant Control: For suppressing and reducing stem density of woody species, use 3 to 6 quarts of Alligare Triclopyr 4 in a minimum spray volume of 5 gallons per acre. To improve woody plant control or broaden the spectrum of woody plants controlled, follow label directions for herbicides that may be applied in tank mix combination with Alligare Triclopyr 4.

Forest Management Applications

For broadcast applications, apply the specified rate of Alligare Triclopyr 4 in a total of 5 to 25 gallons per acre by air or in 10 to 100 gallons per acre by ground. Use sufficient spray volumes to provide thorough coverage of treated foliage. Use application systems designed to prevent spray drift to off-target sites. Nozzles or additives used for drift minimization that produce larger droplets may require higher spray volumes to provide adequate plant coverage.

Conifer Plant Back Interval – Conifer injury may occur if conifers are planted sooner than 1 month after Alligare Triclopyr 4 treatments at rates up to 4 quarts per acre; or if conifers are planted sooner than 2 months after treatment with rates of 4 to 6 quarts per acre. When herbicide tank mixtures are used for forest site preparation, use the longest plant back waiting period recommended on any tank mix partner.

Forest Site Preparation (Not For Conifer Release)

Broadcast Applications in Southern States (Alabama, Arkansas, Delaware, Florida, Georgia, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia) - To control susceptible woody plants and broadleaf weeds, apply 4 to 6 quarts per acre of Alligare Triclopyr 4. Alligare Triclopyr 4 may be applied at a rate of 2 to 4 quarts per acre in a tank mix combination with labeled rates of Tordon* 101 Mixture or Tordon* or Picloram K to broaden the spectrum of woody plants and broadleaf weeds controlled. Tordon* 101 Mixture and Tordon* or Picloram K are not registered for use in California and Florida. For grass control, Alligare Triclopyr 4, alone or in combination with Tordon* or Picloram K or Tordon* 101 Mixture, may be tank mixed with other herbicides registered for grass control in forests.

Refer to the individual product labels for precautionary statements, restrictions, application rates, approved uses, and a list of weeds and woody plants controlled.

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Broadcast Applications in All Other States (Except those listed as Southern States) - To control susceptible woody plants and broadleaf weeds, apply 3 to 6 quarts per acre of Alligare Triclopyr 4. Alligare Triclopyr 4 may be applied at a rate of 1.5 to 3 quarts per acre in a tank mix combination with labeled rates of Tordon* 101 Mixture, Tordon* or Picloram K, or 2,4-D low volatile ester to broaden the spectrum of woody plants and broadleaf weeds controlled. Tordon* 101 Mixture and Tordon* or Picloram K are not registered for use in California and Florida. For grass control, Alligare Triclopyr 4, alone or in combination with Tordon* or Picloram K or Tordon* 101 Mixture, may be tank mixed with other herbicides registered for grass control in forests.

Refer to the individual product labels for precautionary statements, restrictions, application rates, approved uses, and a list of weeds and woody plants controlled.

Site Preparation in Southern Coastal Flatwoods - To control susceptible broadleaf weeds and woody species such as gallberry and wax-myrtle, and for partial control of saw-palmetto, apply 2 to 4 quarts per acre of Alligare Triclopyr 4. To control species such as fetterbush, staggerbush, titi, and grasses, apply Alligare Triclopyr 4 at 2 to 3 quarts per acre in a tank mix combination with labeled rates of Arsenal Applicator's Concentrate or Imazapyr 4SL herbicide. To control gallberry, wax-myrtle, broadleaf weeds, and grasses, 2 to 3 quarts per acre of Alligare Triclopyr 4 may be applied in tank mix combination with labeled rates of Glyphosate 4 herbicide.

Apply as broadcast applications during site preparation of flat planted or bedded sites; or as bands over the tops of beds on bedded sites. Best results will occur if applications are made in late summer or fall. Efficacy may not be satisfactory for early season applications made prior to August.

Note: Do not apply after planting pines.

Conifer Release Applications

Note: Conifer release applications may cause temporary damage and growth suppression of conifers where direct contact occurs; however, injured conifers should recover and grow normally. Over-the-top spray applications can kill pines.

Directed Sprays

To release conifers from competing hardwoods and brush such as red maple, sugar maple, striped maple, sweetgum, red and white oaks, ash, hickory, alder, birch, aspen, pin cherry, *Ceanothus* spp., blackberry, chinquapin, and poison oak, mix 4 to 20 quarts of Alligare Triclopyr 4 in enough water to make 100 gallons of spray mixture. Direct the spray onto foliage of competitive hardwoods using knapsack or backpack sprayers with flat fan nozzles or equivalent. Make applications any time after the hardwoods and brush have reached full leaf size, but before autumn coloration. The majority of treated hardwoods and brush should be less than 6 feet in height to ensure adequate spray coverage. Care should be taken to direct the spray solution away from conifer foliage, particularly foliage of desirable pines. See the **RATES** Table in the **APPLICATIONS DIRECTIONS** section for relationship between mixing rate, spray volume and maximum application rate.

Mid-Rotation Understory Brush Control in Southern Coastal Flatwoods Pine Stands (Ground Equipment Only)

Make broadcast applications of Alligare Triclopyr 4 at 2 to 4 quarts per acre for control of broadleaf weeds and susceptible woody plant species such as gallberry and wax-myrtle. To broaden the spectrum of woody plants controlled to include fetterbush, staggerbush, and titi, apply 2 to 3 quarts per acre of Alligare Triclopyr 4 in a tank mix with labeled rates of Arsenal Applicators Concentrate. Saw-palmetto will be partially controlled by use of Alligare Triclopyr 4 at 4 quarts per acre or by a tank mix of Alligare Triclopyr 4 at 2 to 3 quarts per acre with either Arsenal Applicator's Concentrate, Imazapyr 4SL, Escort, or Metsulfuron Methyl 60DF herbicide.

These mixtures should be broadcast applied over target understory brush species, **but to prevent injury to pines, make applications underneath the foliage of pines.** For best results, apply 30 or more gallons per acre of spray solution. Make applications in late summer or fall. Efficacy may not be satisfactory when applications are made in early season prior to August.

Refer to the individual product labels for precautionary statements, restrictions, application rates, approved uses, and a list of weeds and woody plants controlled.

Broadcast Applications for Conifer Release in the Pacific Northwest and California

Dormant Conifers Before Bud Swell (Excluding Pines) -To control or suppress deciduous hardwoods such as vine maple, bigleaf maple, alder, scotch broom, or willow **before leaf-out** or evergreen hardwoods such as madrone, chinquapin, and *Ceanothus* spp., use Alligare Triclopyr 4 at 1 to 2 quarts per acre. Diesel or fuel oil may be used as diluents. If applying in water, add 1 to 2 gallons per acre of diesel oil, a suitable surfactant, or an oil substitute at manufacturer's recommended rates.

Conifer Plantations (Excluding Pines) Before Conifer Bud Break and After Hardwoods Begin Growth ("Early Foliar" Hardwood Stage) – Apply Alligare Triclopyr 4 at 1 to 1.5 quarts per acre alone or in a tank mix with 2,4-D low volatile ester herbicide in water carrier. Apply no more than 3 pounds acid equivalent per acre from both products. After conifer bud break, these sprays may cause more serious injury to the crop trees. Use of a surfactant may cause unacceptable injury to conifers especially after bud break.

Conifer Plantations (Excluding Pines) After Conifers Harden Off in Late Summer and While Hardwoods Are Still Growing Actively – Apply Alligare Triclopyr 4 at 1 to 1.5 quarts per acre alone or in a tank mix with 2,4-D low volatile ester in water carrier. Apply no more than 3 pounds acid equivalent per acre from both products. Treat as soon after conifer bud hardening as possible so that hardwoods and brush are actively growing. Use of oil, oil substitute, or surfactant may cause unacceptable injury to the conifers.

Broadcast Applications for Conifer Release in the Eastern United States To release spruce, fir, red pine, and white pine from competing hardwoods such as red maple, sugar maple, striped maple, alder, birch (white, yellow, and grey), aspen, ash, pin cherry, and *Rubus* spp. and perennial and annual broadleaf weeds, apply Alligare Triclopyr 4 at 1.5 to 3 quarts per acre alone or in a tank mix with 2,4-D amine or low volatile ester. Apply no more than 4 pounds acid equivalent per acre from both products. Make applications in late summer or early fall after conifers have formed their overwintering buds; and hardwoods are in full leaf prior to autumn coloration.

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Broadcast Applications for Conifer Release in the Lake States Region To release spruce, fir, and red pine from competing hardwoods such as aspen, birch, maple, cherry, willow, oak, hazel, and *Rubus* spp. and perennial and annual broadleaf weeds, apply Alligare Triclopyr 4 at rates of 1.5 to 3 quarts per acre. Make applications in late summer or early fall after conifers have formed their overwintering buds and hardwoods are in full leaf prior to autumn coloration.

Application Directions for Rangeland, Permanent Grass Pastures, and Conservation Reserve Program (CRP) Acres

Refer to Tables 1 and 2 of this label for a list of woody plants and broadleaf weeds that are controlled by Alligare Triclopyr 4.

Florida: Alligare Triclopyr 4 may be applied to non-irrigation ditch banks and fencerows on farms and ranches in addition to those uses listed in this section of the label.

Application Methods

Foliage Treatment with Ground Equipment

Use sufficient spray volume to completely and uniformly cover foliage using 10 or more gallons of total spray volume per acre. To ensure adequate coverage of plants with increased depth and density of foliage, and particularly for treatment of woody plants, use higher spray volumes.

High-Volume Foliage Treatment

To control susceptible woody plants, use the specified rate of Alligare Triclopyr 4 alone or in a tank mix to make 100 gallons of spray mixture. For rangeland and permanent pasture

sites, make 1 application per year and apply no more than 2 quarts of Alligare Triclopyr 4 (2 lbs. ae of triclopyr) per acre. Alligare Triclopyr 4 may be tank mixed with other herbicides at directed rates (see application rates table below) to control a broader spectrum of woody plants and broadleaf weeds. Be sure to follow all applicable use directions, precautions, and limitations on the respective product labels when tank mixing.

Apply sufficient spray volume to thoroughly wet all leaves, stems, and root collars. Minimize spray drift by using the minimum spray pressure that provides adequate plant coverage without forming a mist and direct sprays no higher than the top of the target plants. A drift control additive cleared for application to growing crops may also be used to reduce spray drift. For best results, apply when woody plants and weeds are actively growing.

Application Rates per 100 Gallons of Spray		
Alligare Triclopyr 4	Plus Tank Mix Product	Rate (qt)
1-4 qt	—	—
1-2 qt	Grazon* P+D specialty herbicide	4
1-2 pt	2,4-D low volatile ester herbicide	1-2
1-2 qt	Tordon* or Picloram 22K specialty herbicide	1-2
2 qt	Reclaim* specialty herbicide ^{1,2}	2

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¹ Reclaim[®] is registered for use only in Arizona, Texas, Oklahoma and New Mexico.
²See directions for Mesquite Control Using High Volume Foliage Treatment below.

Mesquite Control Using High Volume Foliage Treatment: To control low to moderate density mesquite infestations, apply a tank mixture of Alligare Triclopyr 4 and Reclaim[®] to individual plants with a backpack or hand-held sprayer or a vehicle-mounted sprayer with hand-held spray wand or spray gun. For individual plant treatment, use 2 quarts of Alligare Triclopyr 4 with 2 quarts of Reclaim[®] per 100 gallons of total spray solution (1/2 % v/v of each product). Apply in water or as an oil-water emulsion as described in the Mixing Directions Section. If an oil-water emulsion is used, add the oil at a rate of 5% of the total spray volume.

Apply as a complete spray-to-wet foliar application, including all leaves. Thorough coverage is necessary for good results, but do not spray to the point of runoff. This application method works best for brush less than 8 feet tall since efficient treatment and thorough coverage of taller brush is difficult to achieve using this method. Do not apply when mesquite foliage is wet. The total amount of Reclaim[®] applied should not exceed 1 1/3 pints per acre. For best results, follow information given elsewhere in this label concerning effect of environmental conditions and application timing on control. To minimize drift, select a spray nozzle and pressure that generates a coarse spray and provides good coverage. Drift may be reduced by directing sprays no higher than the top of target plants and by using the minimum pressure necessary to obtain plant coverage without forming a mist. If desired, a spray dye may be added to the spray mixture to mark the treated plants.

Broadcast Application With Aerial or Ground Equipment

Brush and weed control results are influenced by environmental conditions and application timing; for best results, apply when woody plants and weeds are actively growing. For woody species, apply when leaf tissue is fully expanded and terminal growth has slowed after the rapid growth period of early spring. To ensure adequate foliage for herbicide absorption, brush regrowth should be at least 4 ft. high prior to treatment. The presence of healthy foliage at the time of application as well as adequate soil moisture before and after treatment are important factors contributing to optimal herbicidal activity.

Apply sufficient spray volume to completely and uniformly cover foliage using 10 or more gallons of total spray volume per acre for ground applications and at least 2 gallons of total spray volume per acre for aerial applications. To ensure adequate coverage of plants with increased depth and density of foliage, and particularly for treatment of woody plants, use higher spray volumes.

Mesquite: The herbicidal response of mesquite is strongly influenced by foliage condition, growth stage and environmental conditions. For best results, apply when soil moisture is adequate for plant growth, the soil temperature is above 75°F at a depth of 12 to 18 inches, and new growth foliage has turned from light to dark green. Apply within 60 days after the 75°F minimum soil temperature at the 12 to 18 inch depth has been reached (the rate of soil warm-up at the 12 to 18 inch depth may vary with soil texture and drainage with coarse-textured (sandy) soils warming up sooner than fine-textured (clay) soils and dry soils warming up more quickly than wet soils). If the application is made before mesquite foliage has turned

from light to dark green or if foliage has been injured or removed by late frost, insects, hail or plant diseases, product performance may be adversely affected. Do not treat if mesquite exhibits new (light green) terminal growth in response to recent heavy rainfall during the growing season and to ensure adequate foliage for herbicide absorption, mesquite regrowth should be at least 4 ft. high prior to treatment.

Mesquite Only

Apply 1/2 to 1 pint of Alligare Triclopyr 4 per acre in combination with 2/3 to 1 1/3 pints per acre of Reclaim[®]. Refer to the Reclaim[®] label for additional treatment recommendations and information on mesquite control. Apply as an oil/water emulsion in 4 gallons or more total volume per acre for aerial applications or in 10 gallons or more total volume per acre for ground applications. Use no more than 1 gallon of oil per acre for both aerial and ground application.

Mesquite and Prickly Pear Cactus

For prickly pear cactus in association with mesquite, apply a tank mix of 1/2 to 1 pint of Alligare Triclopyr 4 with 1 to 2 pints of Tordon[®] or Picloram 22K per acre. For a higher and more uniform plant kill of prickly pear, use the 2 pint per acre rate of Tordon[®] or Picloram 22K. To control prickly pear while providing improved control of mesquite, Tordon[®] or Picloram 22K may also be applied in combination with Reclaim[®]. Refer to the Tordon[®] or Picloram 22K and Reclaim[®] labels for additional information and treatment

recommendations. Apply as an oil/water emulsion in 4 gallons or more total volume per acre for aerial applications or in 10 gallons or more total volume per acre for ground applications. Use no more than 1 gallon of oil per acre for both aerial and ground application.

South Texas Mixed Brush (Mesquite, Prickly Pear Cactus, Blackbrush, Twisted Acacia and Granjeno)

If prickly pear is a problem, apply 1 to 2 pints of Alligare Triclopyr 4 in a tank mixture with 2 pints of Tordon[®] or Picloram 22K per acre. If mesquite is the prevalent species apply 1 to 2 pints of Alligare Triclopyr 4 with 2/3 to 1 1/3 pints of Reclaim[®] per acre. Alligare Triclopyr 4 contributes to the control of non-legume species such as granjeno and oaks; however, for improved control if primarily woody legume species are present, apply 2 pints of Tordon[®] or Picloram 22K per acre in combination with 2/3 to 1 1/3 pints of Reclaim[®] per acre. Refer to the Tordon[®] or Picloram 22K and Reclaim[®] labels for additional information and treatment recommendations. Apply as an oil/water emulsion in 4 gallons or more total volume per acre for aerial applications or in 15 gallons or more total volume per acre for ground applications. Use no more than 1 gallon of oil per acre for both aerial and ground application. For acceptable brush control, an oil/water emulsion and good spray coverage is critical.

Sand Shinnery Oak Suppression

In Texas, New Mexico and Oklahoma, for suppression of shinnery oak growing on sandy soils apply Alligare Triclopyr 4 alone at a rate of 1/2 to 2 pints per acre. Following suppression, grass response may be significant if rainfall is adequate. Deferring grazing after application together with proper grazing management is recommended to allow for the reestablishment of grass stands.

Post Oak and Blackjack Oak – Regrowth Stands

Apply when oak leaves are fully developed (expanded) in late spring to early summer (May-July). Use 2 quarts of Alligare Triclopyr 4 alone or in tank mix combination with 0.5 to 1 pint of 2,4-D low-volatile ester herbicide per acre. Apply as an oil/water emulsion or water surfactant dilution in at least 5 gallons per acre total volume by fixed-wing aircraft or helicopter or 15 to 25 gallons per acre total volume by ground equipment. Use no more than 1 gallon of oil per acre for both aerial and ground application. For suppression only, lower rates may be used. Control will require at least 3 consecutive treatments. **Note:** Because regrowth plants have a large root mass relative to top growth, delay broadcast treatment until top growth is at least 4 ft. tall in order for the top growth to intercept and translocate sufficient herbicide to control the roots.

High Volume Foliage Treatment: For regrowth less than 4 ft tall, apply 2 quarts of Alligare Triclopyr 4 per 100 gallons of water and 2 quarts of ag surfactant alone or in tank mix combination with 1 gallon of Grazon[®] P+D or 1 quart of Tordon[®] or Picloram 22K. Apply to individual plants as a high volume leaf-stem treatment using ground equipment.

Post Oak and Blackjack Oak – Mature Stands

To control mature stands (greater than 5 ft tall), apply 2 quarts of Alligare Triclopyr 4 per acre when oak leaves are fully developed (expanded) in late spring to early summer (May-July). When using Alligare Triclopyr 4 alone, some understory species such as winged elm, buck brush, tree huckleberry and ash occurring in some areas will be suppressed or defoliated but not controlled. Where these understory species occur, control may be improved by tank mixing 2 quarts of Alligare Triclopyr 4 with 1 quart of Tordon[®] or Picloram 22K or 4 quarts of Grazon[®] P+D per acre. For best results, apply using fixed-wing aircraft or helicopter as an oil/water emulsion in a total volume of 5 or more gallons per acre.

Other Susceptible Woody Plants

Apply 2 to 4 pints of Alligare Triclopyr 4 alone or in combination with 2 to 3 quarts of 3.8 lb/gal 2,4-D low volatile ester or amine formulation per acre. If applications are made when plants are mature late in the summer, during drought conditions, or if difficult to control species such as ash, choke cherry, elm, maple or oaks are prevalent on the site, use the higher rates of Alligare Triclopyr 4, alone or with 2,4-D. For increased control of certain species, Alligare Triclopyr 4 may also be applied in a tank mixture with Grazon[®] P+D or Tordon[®] or Picloram 22K, refer to the labels for Grazon[®] P+D and Tordon[®] or Picloram 22K for additional information and treatment recommendations. Apply in 4 gallons or more total volume per acre aerially or in 10 gallons or more total volume per acre when using ground equipment. Apply during or after bloom for best results on blackberry. For management of kudzu, use 1 quart of Alligare Triclopyr 4 per acre. To achieve the desired level of control, repeat applications may be necessary.

Susceptible Broadleaf Weeds

When weeds are actively growing, apply 2 pints of Alligare Triclopyr 4 per acre as a broadcast spray in a total volume of 10 or more gallons per acre by ground equipment or in a total volume of 2 or more gallons per acre aerially. Alligare Triclopyr 4 at a rate of 1/2 to 3 pints may be tank mixed with 1 to 2 quarts of 3.8 lb/gal 2,4-D amine or low volatile ester.

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Conservation Reserve Program (CRP) for Established Permanent Grass Stands

NOTE: Use Alligare Triclopyr 4 on CRP acres only after perennial grasses are well established.

Broadcast Application Ground or Aerial: For small weed control, apply 1 to 2 pints of Alligare Triclopyr 4 per acre. For deep-rooted perennial and susceptible woody species control apply up to 1 1/2 quarts of Alligare Triclopyr 4 per acre. Apply in 2 gallons or more

Growing Point and Leaf Base (Crown) Treatment of Yucca

Prepare a 2% v/v solution of Alligare Triclopyr 4 in diesel or fuel oil (13 fl oz of Alligare Triclopyr 4 in 5 gallons of spray mixture). Thoroughly wet the center of the plant including growing point and leaf bases to the soil surface. Complete coverage of leaves is not necessary.

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total volume per acre for aerial applications or in 10 gallons or more total volume per acre for ground applications.

Restrictions:

- Apply no more than 1 ½ quarts of Alligare Triclopyr 4 per acre per growing season on CRP acres.
- When applying to CRP lands, follow all applicable state and federal regulations. Follow the most severe grazing restriction imposed by the pesticide label or by the USDA Acreage Conservation Reserve Program. After that time period, follow local (CRP) guidelines regarding cropping and haying restrictions. If legumes are a desired cover crop during CRP, do not use Alligare Triclopyr 4.

Application Directions for Ornamental Turf

Refer to Table 2 for a list of broadleaf weeds controlled by Alligare Triclopyr 4.

For spot treatments, do not apply more than 2 qts. of Alligare Triclopyr 4 per acre in a single application.

Foliar sprays should be applied during warm weather, from early spring through fall, when weeds are actively growing. Broadleaf weeds germinate at different times. Only emerged weeds present at the time of application will be controlled. Newly seeded turf should be mowed 2 or 3 times before being treated. When making applications to mature plants, hard-to-control species, or during drought conditions, use higher rates. Application under drought conditions may provide less than desirable results. Use low pressure sprays to minimize spray drift. Do not water for 24 hours after application.

Mixing Instructions

When Alligare Triclopyr 4 is mixed with water it forms an emulsion (not a solution) and separation may occur unless the spray mixture is agitated continuously.

Add about one-half the required amount of clean water to the spray tank. Start agitation and add the specified amount of Alligare Triclopyr 4. Provide moderate agitation while completing the addition of water and during application.

Reseeding Precaution: Do not reseed for 3 weeks after application. (This precaution does not apply when bermudagrass turf is overseeded with perennial ryegrass at a minimum reseeding of 400 lbs. per acre.)

Broadcast Treatment of Ornamental Turf

Apply ½ to 1 quart per acre of Alligare Triclopyr 4 in enough water to provide uniform coverage of the target area to control actively growing broadleaf weeds growing in perennial bluegrass, perennial ryegrass, or tall fescue. Do not use on other turfgrass species (see Use Precautions section of this label) unless injury can be tolerated. To minimize turf injury, do not treat if turf is under heat-or drought-stress and make repeat applications at least 4 weeks apart.

Tank Mixing: To improve the spectrum of activity, Alligare Triclopyr 4 may be tank mixed at a rate of ½ to 1 pint per acre with directed rates of low volatile amine or ester formulations of 2,4-D, MCPP, or other labeled postemergence broadleaf herbicides. Refer to tank mix product labels for specific use directions, precautions, and limitations before use.

Spot Treatment of Ornamental Turf

Mix 3/8 to ¾ fluid ounces of Alligare Triclopyr 4 per 1000 square feet in enough water to provide uniform coverage of the target area and apply at any time broadleaf weeds are susceptible. **Note:** Do not apply more than 2 quarts per acre or 1.5 fluid ounces per 1000 square feet of Alligare Triclopyr 4 in a single application.

Control of Kikuyu Grass

Apply Alligare Triclopyr 4 at a rate of 1/2 to 1 quart per acre. To improve activity, MSMA herbicide may be tank mixed with the ½ quart per acre rate of Alligare Triclopyr 4. Three to four additional applications at 4 to 6 week intervals may be required to achieve control of kikuyu grass.

Suppression of Bermudagrass

Apply Alligare Triclopyr 4 at the rate of 1 quart per acre. Three to four additional applications at 4 week intervals will be required to give adequate suppression of bermudagrass and allow fescue or other desired turfgrass species to dominate. To improve suppression and control of bermudagrass, 1 quart per acre of Alligare Triclopyr 4 may be tank mixed with a postemergence grass herbicide registered for this use pattern. Three to four additional applications of this tank mix at 4 week intervals should be made to achieve control. Reseeding following application will accelerate the transition to cool season turf (see Reseeding Precautions above).

Table 1
Woody Plants Controlled by Alligare Triclopyr 4

Alder Locust
Arrowwood Madrone
Ash Maples
Aspen Milkweed Vine³
Bear Clover (Bearnat) Mulberry
Beech Oaks
Birch Osage Orange
Blackberry Pepper Vine³
Blackbrush Persimmon
Black gum Persimmon, Eastern
Boxelder¹ Pine
Brazilian Pepper Poison Ivy
Buckthorn Poison Oak
Cascara Poplar
Ceanothus Salmonberry
Cherry Saltbush (*Braccharis spp.*) Chinquapin Saltbush (silver myrtle)³
Choke Cherry Salt Cedar¹
Cottonwood Sassafras
Crataegus (hawthorn) Scotch Broom
Dogwood Sumac
Douglas fir Sweetbay Magnolia
Elderberry Sweet Gum
Elm Sycamore
Gallberry Tan Oak
Gorse Thimbleberry
Granjeno Tree-of-Heaven (*Ailanthus*)¹ Guajillo Trumpet Creeper³
Guava² Tulip Poplar
Hawthorn Twisted Acacia
Hazel Virginia Creeper³
Hickory Wax Myrtle
Hornbeam Wild Rose
Huisache (suppression) Willow
Kudzu² Winged elm
¹ For best control, use either a basal bark or cut stump treatment.
² For complete control, retreatment may be necessary.
³ Basal or dormant stem applications only

Table 2
Annual and Perennial Broadleaf Weeds Controlled by Alligare Triclopyr 4

Black Medic Matchweed
Bull Thistle Mustard
Burdock Oxalis
Canada Thistle Plantain
Chicory Purple Loosestrife
Cinquefoil Ragweed
Clover Sericea Lespedeza (1)
Creeping Beggarweed Smartweed
Curly dock Sulfur Cinquefoil (2)
Dandelion Sweet Clover
Dogfennel Tropical Soda Apple (3)
Field Bindweed Vetch
Goldenrod Wild Carrot (Queen Anne's Lace) Ground Ivy Wild Lettuce
Lambsquarters Wild Violet
Lespedeza Yarrow
(1) **Sericea lespedeza:** Apply 1 to 2 pints of Alligare Triclopyr 4 per acre. For best results, apply after maximum foliage development in the late spring to early summer, but prior to bloom.
(2) **Sulfur cinquefoil:** Apply 1 to 2 pints of Alligare Triclopyr 4 per acre. For best results, apply to plants in the rosette stage.
(3) **Tropical soda apple:** When plants reach the first flower stage, apply 2 pints of Alligare Triclopyr 4 per acre. For best results, apply using ground equipment in a total spray volume of 40 gallons per acre. To provide more complete wetting and coverage of the foliage, an agricultural surfactant may be added at the manufacturer's recommended rate. To control sparse plant stands, use spot treatments. For spot treatment use a 1 to 1.5% solution of Alligare Triclopyr 4 in water (1 to 1 ½ gallons of Alligare Triclopyr 4 in 100 gallons total spray mixture) and spray the entire plant to completely wet the foliage. **In Florida,** control of tropical soda apple may be improved by using the following management practices:

- Mow plants to a height of 3 inches every 50 to 60 days or whenever they reach flowering. Continue mowing on this schedule through April.
- In late May to June (50 to 60 days after the April mowing), apply a broadcast treatment of Alligare Triclopyr 4.
- To control any remaining plants or to thin stands of plants that germinate following a broadcast treatment, use spot treatments.

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STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.

PESTICIDE STORAGE: Store above 28°F or agitate before use.

PESTICIDE DISPOSAL: Wastes resulting from the use of this product (that cannot be used according to label instructions) must be disposed of on site or at an approved waste disposal facility.

CONTAINER DISPOSAL:

[NON REFILLABLE CONTAINERS:]

Nonrefillable container. Do not reuse or refill this container. Offer for recycling, if available. Triple rinse container (or equivalent) promptly after emptying.

(Nonrefillable container ≤ 5 gallons): Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container ¼ full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. Then offer for recycling if available, or puncture and dispose of in a sanitary landfill or by incineration. Do not burn unless allowed by state and local ordinances.

(Nonrefillable > 5 gallons): Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container ¼ full with water. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedure two more times. Then offer for recycling if available, or puncture and dispose of in a sanitary landfill or by incineration. Do not burn unless allowed by state and local ordinances.

[REFILLABLE CONTAINERS:]

Refillable container. Refill this container with pesticide only. Do not reuse this container for any other purpose. Cleaning the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller. To clean the container before final disposal, empty the remaining contents from this container into application equipment or mix tank. Fill the container about 10 percent full with water. Agitate vigorously or recirculate water with the pump for 2 minutes. Pour or pump rinsate into application equipment or rinsate collection system. Repeat this rinsing procedure two more times. Then offer for recycling if available, or puncture and dispose of in a sanitary landfill or by incineration. Do not burn unless allowed by state and local ordinances.

LIMITED WARRANTY, TERMS OF SALE, AND LIMITATION OF LIABILITY

Upon purchase or use of this product, purchaser and user agree to the following terms:

Warranty: Alligare, LLC (the Company) warrants that this product conforms to the chemical description on the label in all material respects and is reasonably fit for the purpose referred to in the directions for use, subject to the exceptions noted below, which are beyond the Company's control. To the extent consistent with applicable law, the Company makes no other representation or warranty, express or implied, concerning the product, including no implied warranty of merchantability or fitness for a particular purpose. No such warranty shall be implied by law, and no agent or representative is authorized to make any such warranty on the Company's behalf.

Terms of Sale: The Company's directions for use of this product must be followed carefully. It is impossible to eliminate all risks inherently associated with use of this product. Crop injury, ineffectiveness or other unintended consequences may result because of such factors as weather conditions, presence of other materials, and the manner of use or application (including failure to adhere to label directions), all of which are beyond the Company's control. To the extent consistent with applicable law, all such risks are assumed by the user.

Limitation of Liability: To the extent consistent with applicable law, the exclusive remedy against the Company for any cause of action relating to the handling or use of this product is a claim for damages, and in no event shall damages or any other recovery of any kind exceed the price of the product which caused the alleged loss, damage, injury or other claim. To the extent consistent with applicable law, under no circumstances shall the Company be liable for any special, indirect, incidental or consequential damages of any kind, including loss of profits or income, and any such claims are hereby waived. Some states do not allow the exclusion or limitation of incidental or consequential damages.

The Company and the seller offer this product, and the purchaser and user accept this product, subject to the foregoing warranty, terms of sale and limitation of liability, which may be varied or modified only by an agreement in writing signed on behalf of the Company by an authorized representative.

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