Waynesville Watershed Proposed Harvest Plan for White Pine Stands
November 19, 2009

This plan was prepared by staff from Forest Stewards, Inc., and is designed to comply with conditions identified in Article II, Section H(v) of the Conservation Easement for the Waynesville watershed.

i. We, Peter Bates and Robert Lamb, registered foresters in the State of North Carolina, acknowledge that the management activities identified in this harvest plan follow the terms of the Easement, and that we will supervise the activities described in this plan.

_____ _____
Peter C. Bates (NC registered forester #1292) Date

_____ _____
Robert Lamb (NC registered forester #1614) Date

ii. ***Silvicultural objectives and goals from the harvest:*** Much of the white pine planted around the reservoir has matured to the point that its growth is stagnating due to overcrowding. This makes these trees more susceptible to pine beetle and other stresses. In some cases wide spread white pine mortality has already occurred. These dense stands are also shading out native hardwoods that typically occupy these sites.

There are 2 conditions within the white pine stands, and this plan proposes different treatments for each (Figure 1). About 80% of the area consists of dense, white pine that are generally healthy, but are beginning to stagnate. The plan is to thin in these areas to increase the vigor of the residual (remaining) trees and to allow more sunlight to reach the forest floor. Increasing the vigor of residual trees will decrease their susceptibility to pine beetle attack and other stresses. Allowing more light to reach the forest floor will accelerate the re-establishment and growth of native hardwood species.

The remaining 20% of the area consists of larger, more widely spaced white pine where natural hardwood regeneration has already become established in the understory. The plan calls for the removal of the majority of the white pine in these areas in order to release the hardwood regeneration that is present.

Overall, we believe these objectives are consistent with the Grantor's goals of promoting the development of healthy and natural forest communities within the watershed.

iii. **Timber inventory:** A detailed timber inventory of the white pine stands was conducted during the summer of 2009. The inventory was summarized separately for the thinning areas and the hardwood regeneration areas, and the results showing stocking and volumes are presented in tables 1 and 2. Anticipated yields are described in Tables 3 and 4 in Section v of this document.

Table 1. Detailed forest inventory results for planned thinning areas showing per acre estimates for stem density, basal area, sawtimber volume, and pulpwood.

Diameter (in)	White Pine	Yellow Poplar	Black Locust	Sweet Birch	Fire Cherry	Sassafras	Red Maple	Silverbell	Total
Stems/acre									
4-6	24	11	11	6	0	2	0	0	**54**
6-12	142	15	12	4	3	0	2	1	**178**
12-18	65	0	0	0	0	0	0	0	**65**
18-24	3	0	0	0	0	0	0	0	**3**
Total	**233**	**26**	**23**	**10**	**3**	**2**	**2**	**1**	**299**
Basal area (ft^2/acre)									
4-6	3	1	2	1	0	0	0	0	**8**
6-12	64	5	4	1	1	0	1	0	**77**
12-18	69	0	0	0	0	0	0	0	**69**
18-24	5	0	0	0	0	0	0	0	**5**
Total	141	7	7	2	1	0	1	0	**159**
Sawtimber volume (BF/acre)									
4-6	0	0	0	0	0	0	0	0	**0**
6-12	303	13	6	0	0	0	1	0	**323**
12-18	4319	15	5	0	0	0	0	0	**4339**
18-24	609	0	0	0	0	0	0	0	**609**
Total	**5231**	**28**	**11**	**0**	**0**	**0**	**1**	**0**	**5270**
Pulpwood (tons/ac)									
4-6	2	1	1	1	0	0	0	0	**5**
6-12	37	4	3	1	1	0	1	0	**46**
12-18	17	0	0	0	0	0	0	0	**17**
18-24	1	0	0	0	0	0	0	0	**1**
Total	**57**	**5**	**5**	**2**	**1**	**0**	**1**	**0**	**70**

Table 2. Detailed forest inventory results for planned regeneration areas showing per acre estimates for stem density, basal area, sawtimber volume, and pulpwood.

Diameter (in)	White Pine	Red Maple	Yellow Poplar	Silverbell	Black Locust	Black Cherry	Sweet Birch	Buckeye	Total
Stems/acre									
4-6	8	13	0	13	0	0	0	0	**33**
6-12	73	5	3	0	0	0	0	0	**81**
12-18	66	2	8	1	3	1	2	0	**84**
18-24	30	1	2	0	0	1	0	0	**35**
24-30	3	0	1	0	0	0	0	0	**3**
30-36	0	0	0	0	0	0	0	0	**0**
36-42	0	0	0	0	0	0	0	0	**0**
Total	**178**	**22**	**15**	**13**	**4**	**2**	**2**	**0**	**237**
Basal area (ft^2/acre)									
4-6	1	2		1	0	0	0	0	4
6-12	34	2	2	0	0	0	0	0	39
12-18	82	3	10	1	4	1	2	0	104
18-24	63	3	4	0	1	2	0	0	74
24-30	9	0	2	0	0	0	0	0	11
30-36	0	0	1	0	0	0	0	0	1
36-42	0	0	1	0	0	0	0	1	2
Total	**190**	**11**	**21**	**2**	**6**	**3**	**2**	**1**	**237**
Sawtimber volume (BF/acre)									
4-6	0	0	0	0	0	0	0	0	**0**
6-12	209	8	22	0	0	0	0	0	**239**
12-18	7793	103	842	21	178	16	64	0	**9018**
18-24	9126	65	384	0	22	117	0	0	**9714**
24-30	1696	0	351	0	0	0	0	0	**2046**
30-36	0	0	181	0	0	0	0	0	**181**
36-42	0	0	192	0	0	0	0	277	**469**
Total	**18824**	**175**	**1972**	**21**	**200**	**133**	**64**	**277**	**21667**
Pulpwood (tons/ac)									
4-6	1	1	0	1	0	0	0	0	**3**
6-12	20	1	1	0	0	0	0	0	**22**
12-18	21	1	3	0	1	0	1	0	**26**
18-24	16	1	1	0	0	1	0	0	**19**
24-30	2	0	1	0	0	0	0	0	**3**
30-36	0	0	0	0	0	0	0	0	**0**
36-42	0	0	0	0	0	0	0	0	**1**
Total	**59**	**4**	**6**	**1**	**1**	**1**	**1**	**0**	**73**

iv. **Inventory for the presence of rare, threatened or endangered species and other unique resources:** We did not conduct a separate inventory for these species or resources, though none were observed during the forest inventory that was conducted. Furthermore, due to the fact that these plantations were created in areas that had undergone significant ground disturbance activities during the creation of the reservoir, we believe there is very little likelihood that they will be present.

v. **Prescribed activities and precautions:** The prescriptions to be carried out under this plan include a thinning to increase the vigor of the residual white pine and an overstory removal to stimulate and release natural hardwood regeneration (see Figure 1 for areas where each will be accomplished).

The thinning will approximate a geometric thinning strategy where the main objective will be removing approximately ½ of the white pine basal area in these areas in order to create a relatively even spacing between the residual trees. Marking will be done to ensure that the highest quality trees will be left following the thinning. These include trees with a healthy live-crown ratio (ratio of live crown: total tree height is about 25% or more), well-formed boles, and free from vines and other factors that might affect tree quality. An additional goal will be to favor any hardwood trees that occur in these areas. In the thinning areas, we will mark trees to be removed with blue paint. Anticipated volumes to be removed during the thinning are presented in Table 3.

In the overstory removal areas, the goal will be to remove most of the white pine in the overstory in order to release the hardwood regeneration that is present. Hardwood trees already in the overstory will be left unless they are of poor health or vigor. Overall a residual basal area of about 50 ft^2/ac will remain following harvest. The residual basal area will be made up of hardwoods and high quality white pine with stout boles and vigorous healthy crowns. It should be noted that in areas where there are less than 50 ft^2 BA/ac of desirable trees, the stand will be more open. In the overstory removal areas, the residual trees will be marked with red flagging and chalk. Anticipated volumes to be removed during the overstory removal are presented in Table 4.

Site protection requirements are listed in Section vi, below.

vi. **Description of access and constraints to access:** In order to minimize soil disturbances and other site impacts the amount of new logging trail construction will be minimized. This will be accomplished by utilizing existing logging trails for yarding operations, and allowing equipment to operate without skid trails in areas where slopes are less than 30%. This plan calls for 2 short sections of new logging trails to be constructed in the western corner of the stands (Figure 1). Equipment will be restricted from operating on slopes greater than 30%, and these areas are identified in Figure 1.

vii. **Descriptive maps:** See Figures 1 and 2.

viii. **Stream buffers and streamside management zones:** One hundred foot streamside management zones will be established around all perennial and intermittent streams (Figure 1). Harvesting and equipment operability will be greatly restricted in these areas to include, no equipment will be

permitted to operate within 50 feet of streams (except for stream crossings), and no trees will be felled with 25 feet of streams. Fifty-foot buffers will be clearly marked with yellow and black flagging.

In addition, this plan allows for only 2 stream crossings (Figure 1), and temporary bridges will be used at these locations.

ix. **Aesthetics and recreation:** This harvest will have a minimal impact on aesthetics and essentially no impact on recreation. Since the majority of the harvesting will be done as thinnings, most of the area will maintain a continuous forest cover. In addition, due to the location of the harvest unit at the base of the watershed and away from the Blue Ridge Parkway, it will not be seen or utilized by Parkway visitors. A viewshed analysis from the Blue Ridge Parkway confirms this analysis (Figure 2).

Table 3. Estimated number of trees, basal area, and volumes removed in proposed thinning areas per acre and for the harvest unit as a whole		
Diameter (in)	**Per acre**	**Harvest unit**
Density		
0-6	8	326
6-12	75	3,075
12-18	32	1,314
18-24	0	20
Total	115	4,735
Basal area (ft^2)		
4-6	1	
6-12	34	
12-18	34	
18-24	1	
Total	70	
Sawtimber volume (BF)		
4-6	0	0
6-12	160	6,554
12-18	2,143	87,873
18-24	117	4,813
Total	2,420	99,240
Pulpwood (tons)		
4-6	1	23
6-12	19	795
12-18	9	349
18-24	0	10
Total	29	1,177

Table 4. Estimated number of trees, basal area, and volumes removed in proposed overstory removal areas per acre and for the harvest unit as a whole

Diameter (in)	White Pine	Hardwood	Total	
Density (stems/ac)				**Harvest total**
0-6	7	6	13	108
6-12	63	2	65	537
12-18	60	5	65	530
18-24	26	1	27	222
24-30	1	0	2	13
30-36	0	0	0	0
36-42	0	0	0	0
Total	157	14	172	1,410
Basal area (ft^2/ac)				
4-6	1	1	2	
6-12	30	1	31	
12-18	75	6	81	
18-24	55	3	58	
24-30	5	1	6	
30-36	0	0	0	
36-42	0	0	0	
Total	166	11	177	
Sawtimber volume (BF/ac)				**Harvest total**
4-6	0	0	0	0
6-12	182	7	190	1,555
12-18	7,109	306	7,415	60,801
18-24	7,925	147	8,072	66,191
24-30	954	88	1,042	8,540
30-36	0	0	0	0
36-42	0	0	0	0
Total	16,170	548	16,718	137,087
Pulpwood (tons/ac)				**Harvest total**
4-6	1	0	1	9
6-12	17	1	18	145
12-18	19	1	20	165
18-24	14	1	14	118
24-30	1	0	1	11
30-36	0	0	0	0
36-42	0	0	0	0
Total	51	3	55	449

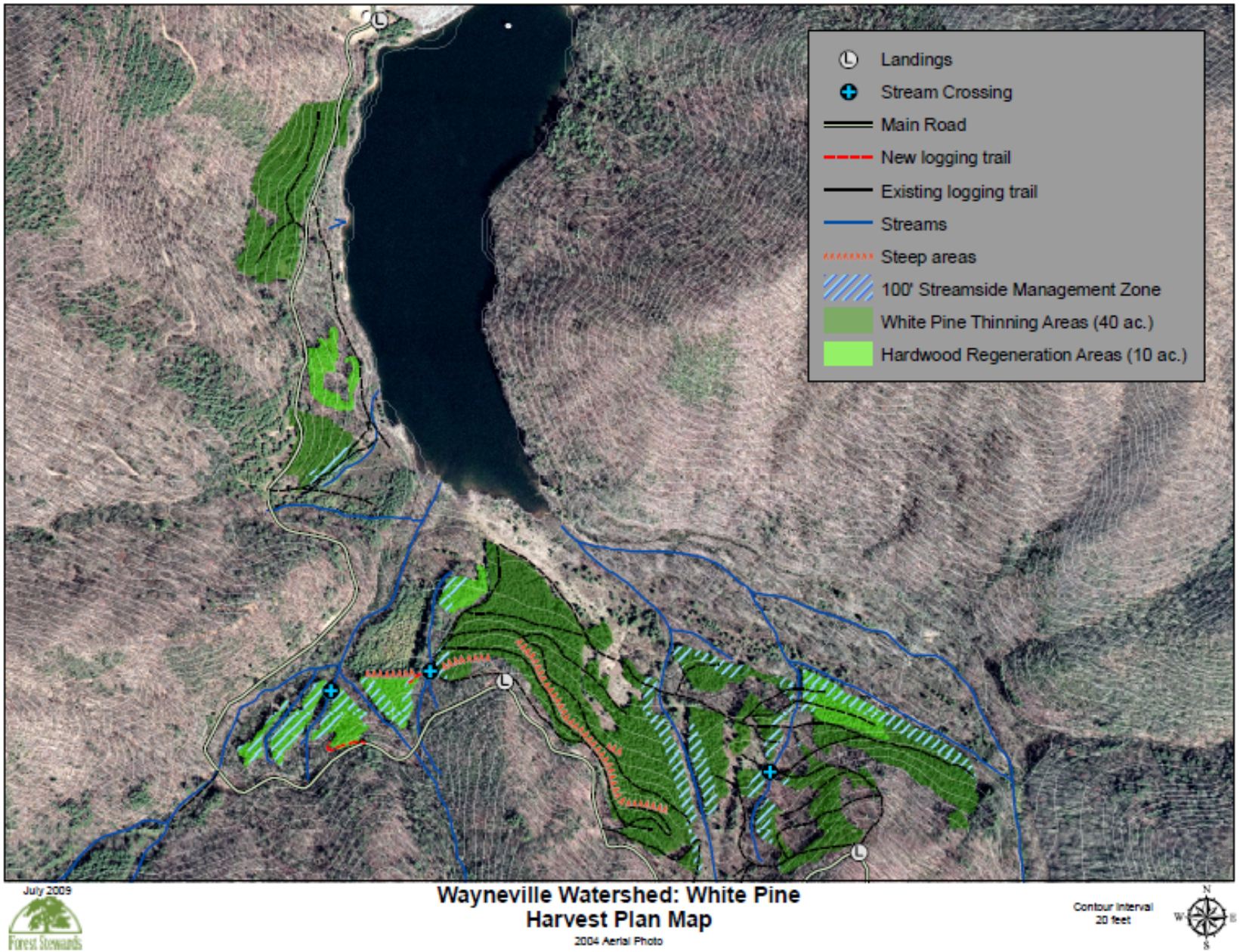

Figure 1. Harvest plan map for white pine stands in the Waynesville watershed

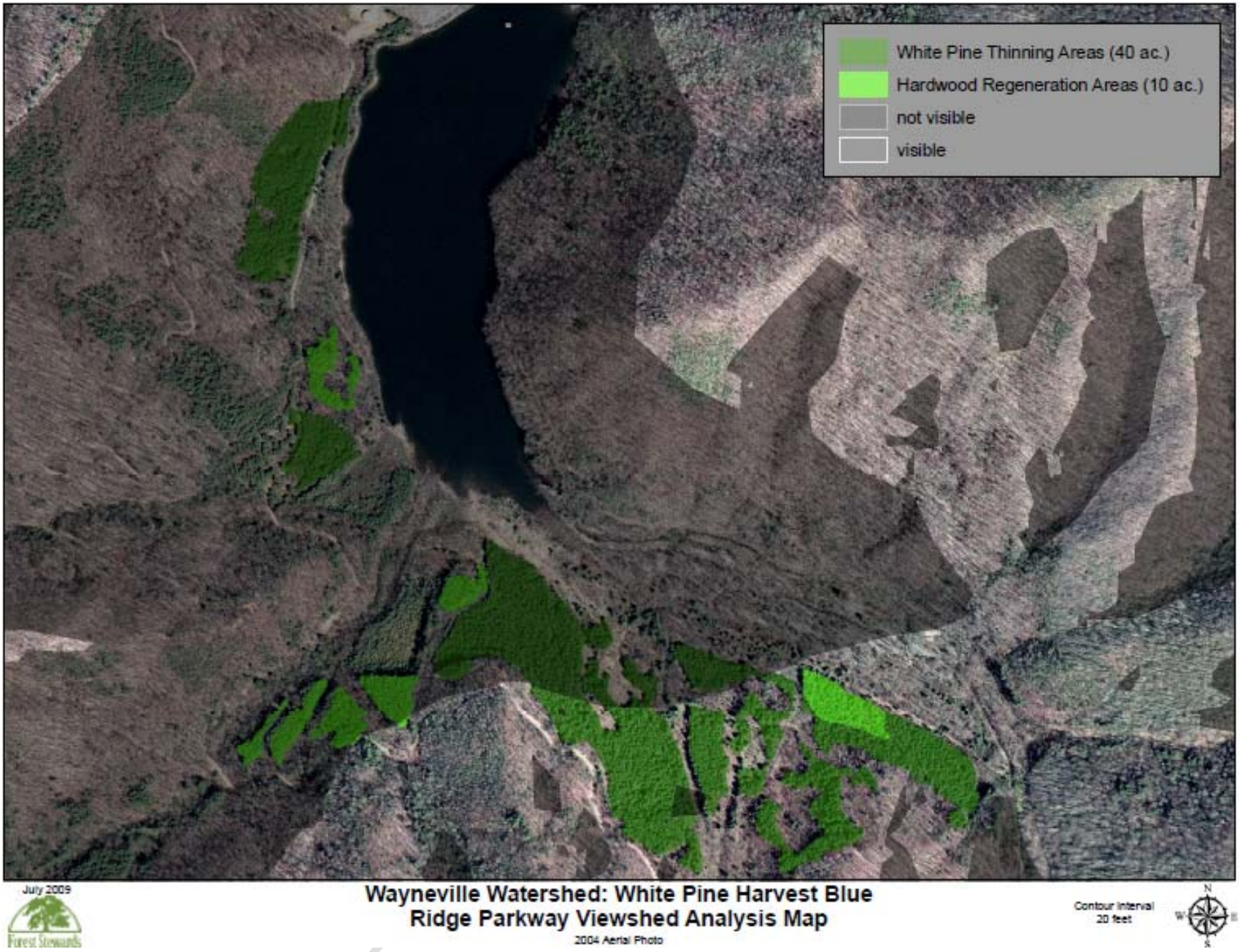

Figure 2. Viewshed analysis for white pine stands in the Waynesville watershed.