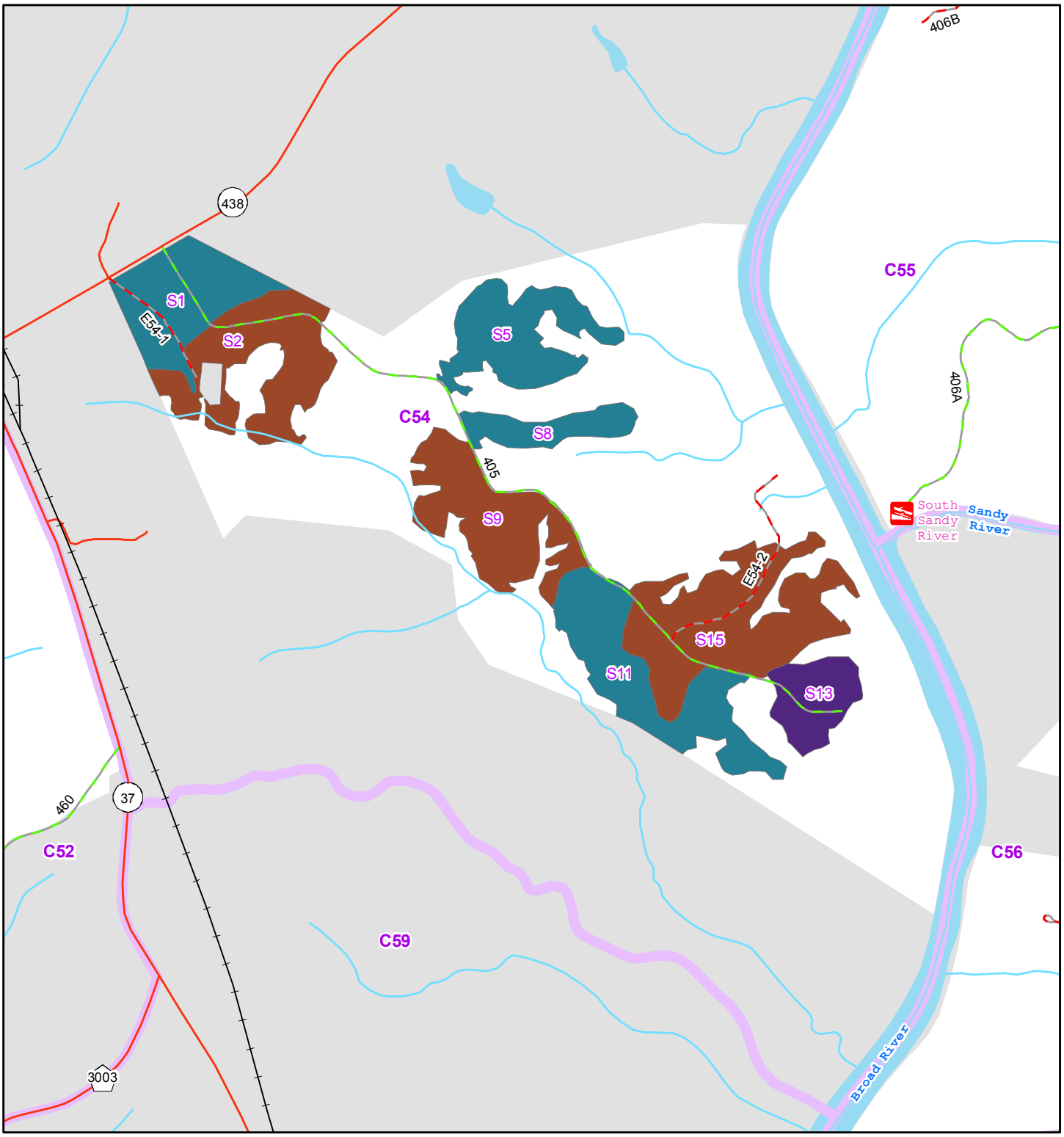


0 0.125 0.25 0.5 Miles

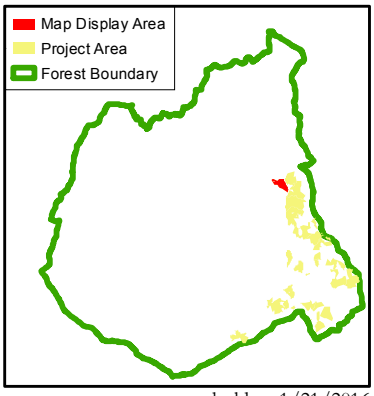
- First Thin
- Intermediate Thin
- Shelterwood
- Private Land
- Forest Service Land
- Forest Boundary
- Forest Compartment
- Other Public Road
- Open Forest Service Road
- Closed Forest Service Road
- Railroad

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 2
Compartment: 0054
Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

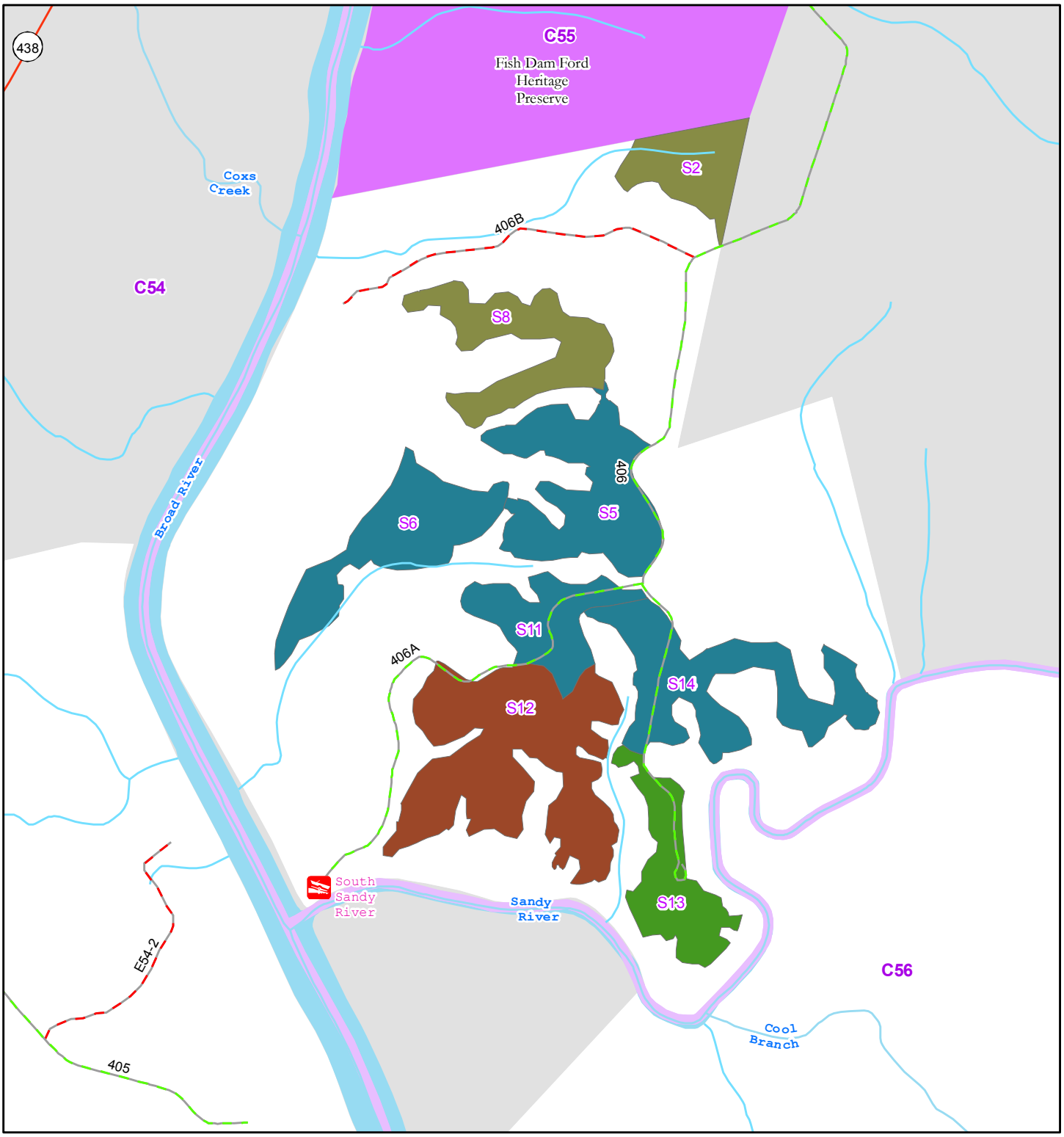
Data Source: USFS, USGS, SCDOT, SCDNR

Disclaimer: The USDA Forest Service makes no warranty, expressed or implied, regarding the data displayed on the map, and reserves the right to correct, update, modify, or replace this information without notification.



N

gholden, 1/21/2016



Clearcut with Reserves
First Thin
Intermediate Thin
Shortleaf Pine Restoration
Private Land
Forest Service Land
State Land
Forest Boundary
Forest Compartment
Other Public Road
Open Forest Service Road
Closed Forest Service Road

0 0.125 0.25 Miles

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 2
Compartment: 0055
Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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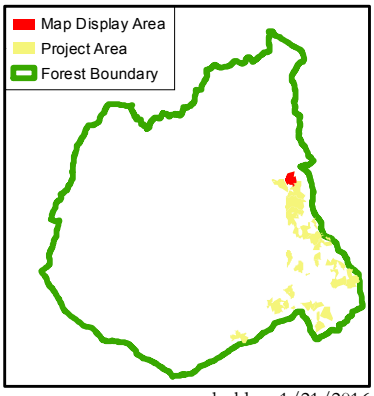
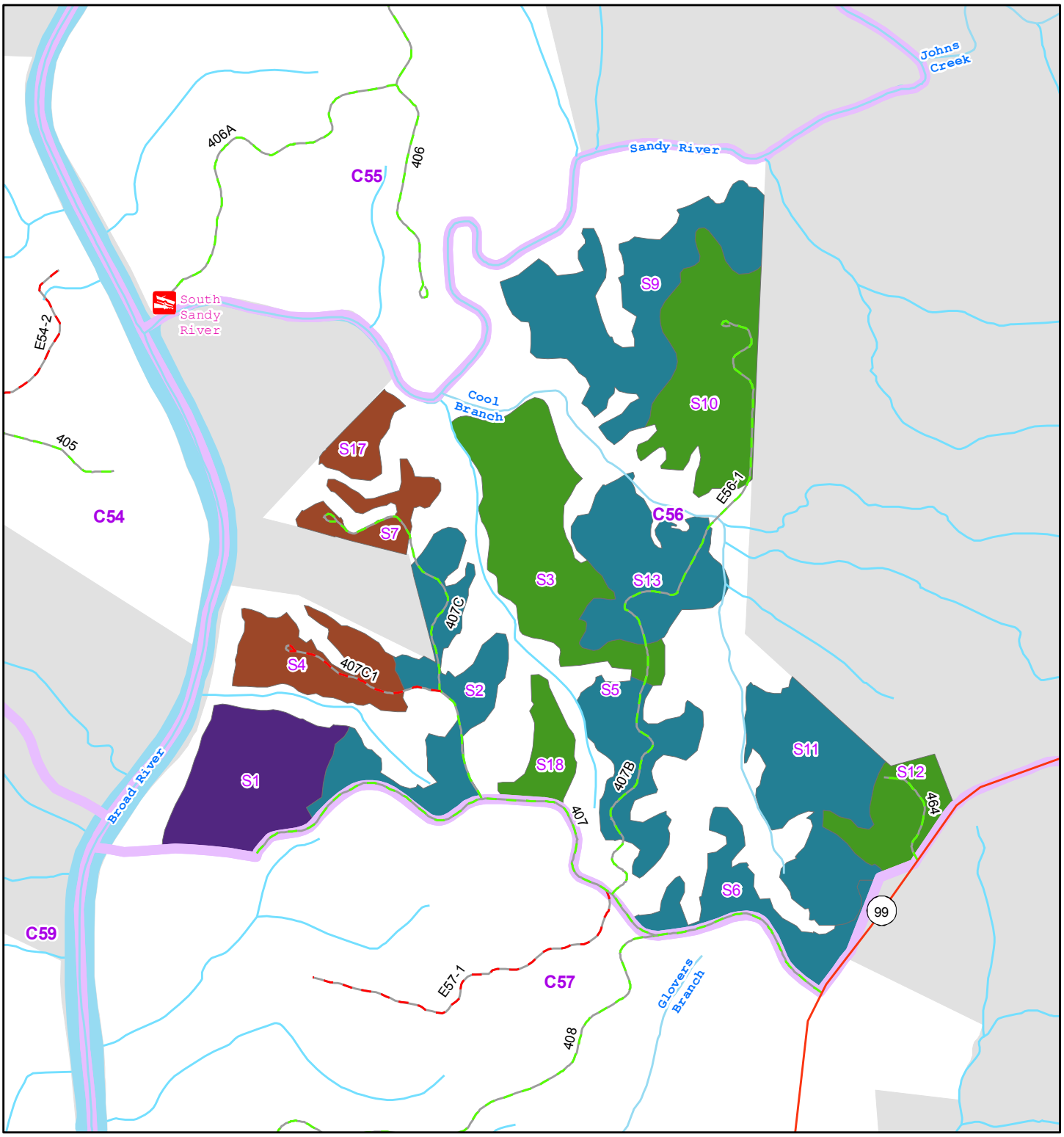


N

gholden, 1/21/2016



0 0.125 0.25 0.5 Miles

- Clearcut with Reserves
- First Thin
- Intermediate Thin
- Shelterwood
- Private Land
- Forest Service Land
- Forest Boundary
- Forest Compartment
- Other Public Road
- Open Forest Service Road
- Closed Forest Service Road

Lower Broad Analysis Area EA

Treatment Unit Map - Alternative 2

Compartment: 0056

Sumter National Forest

Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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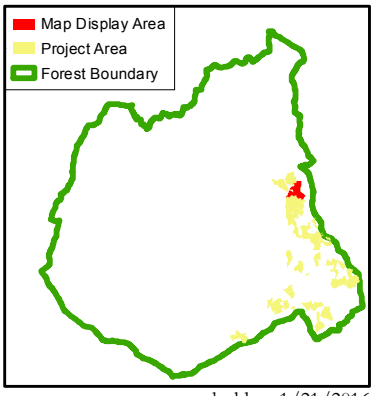
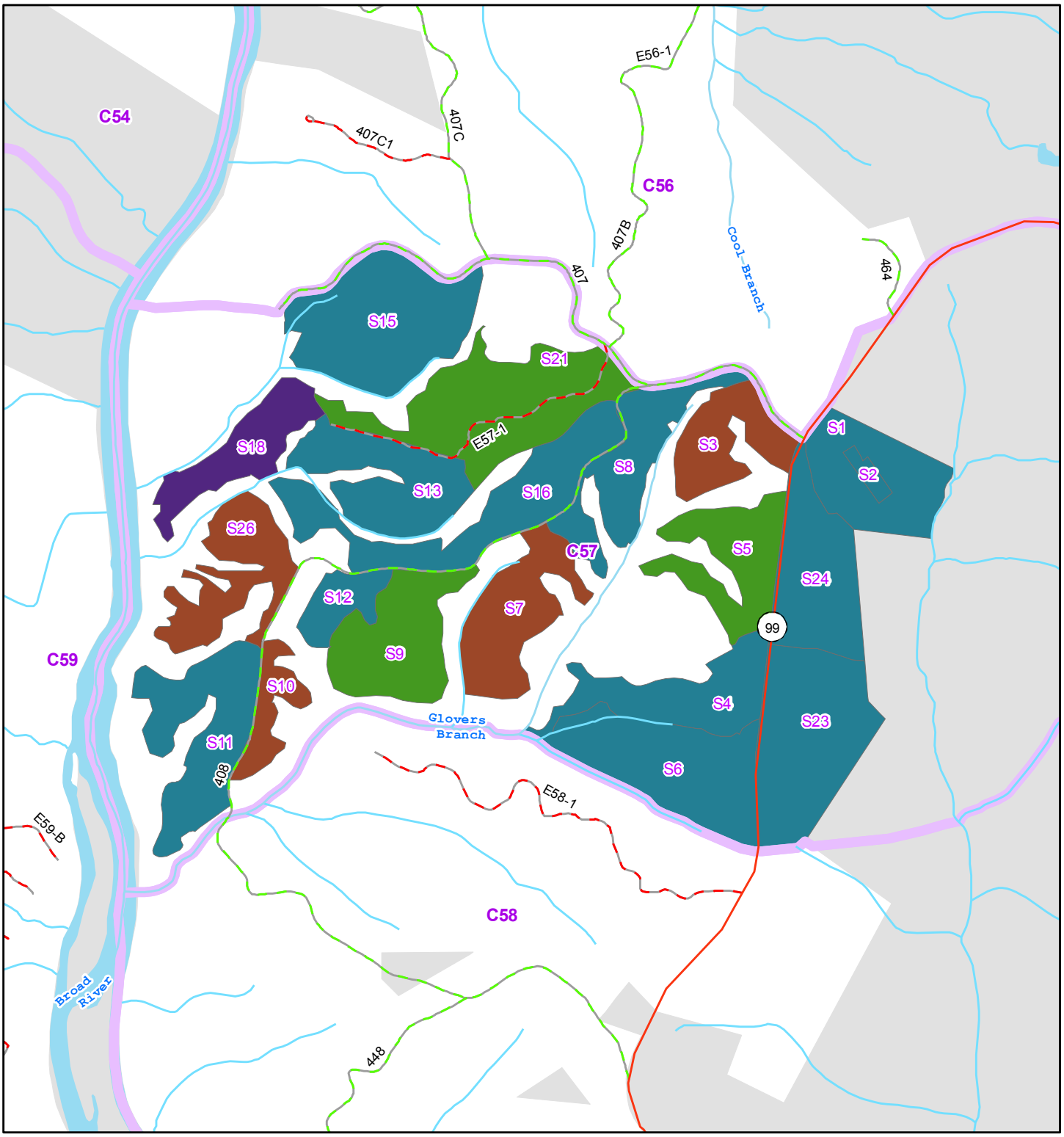


N

gholden, 1/21/2016



0 0.125 0.25 0.5 Miles

Clearcut with Reserves
First Thin
Intermediate Thin
Shelterwood
Private Land
Forest Service Land
Forest Boundary
Forest Compartment
Other Public Road
Open Forest Service Road
Closed Forest Service Road

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 2
Compartment: 0057

Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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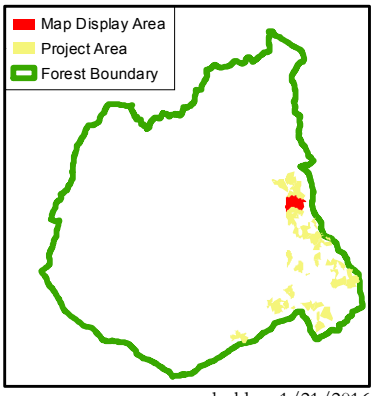
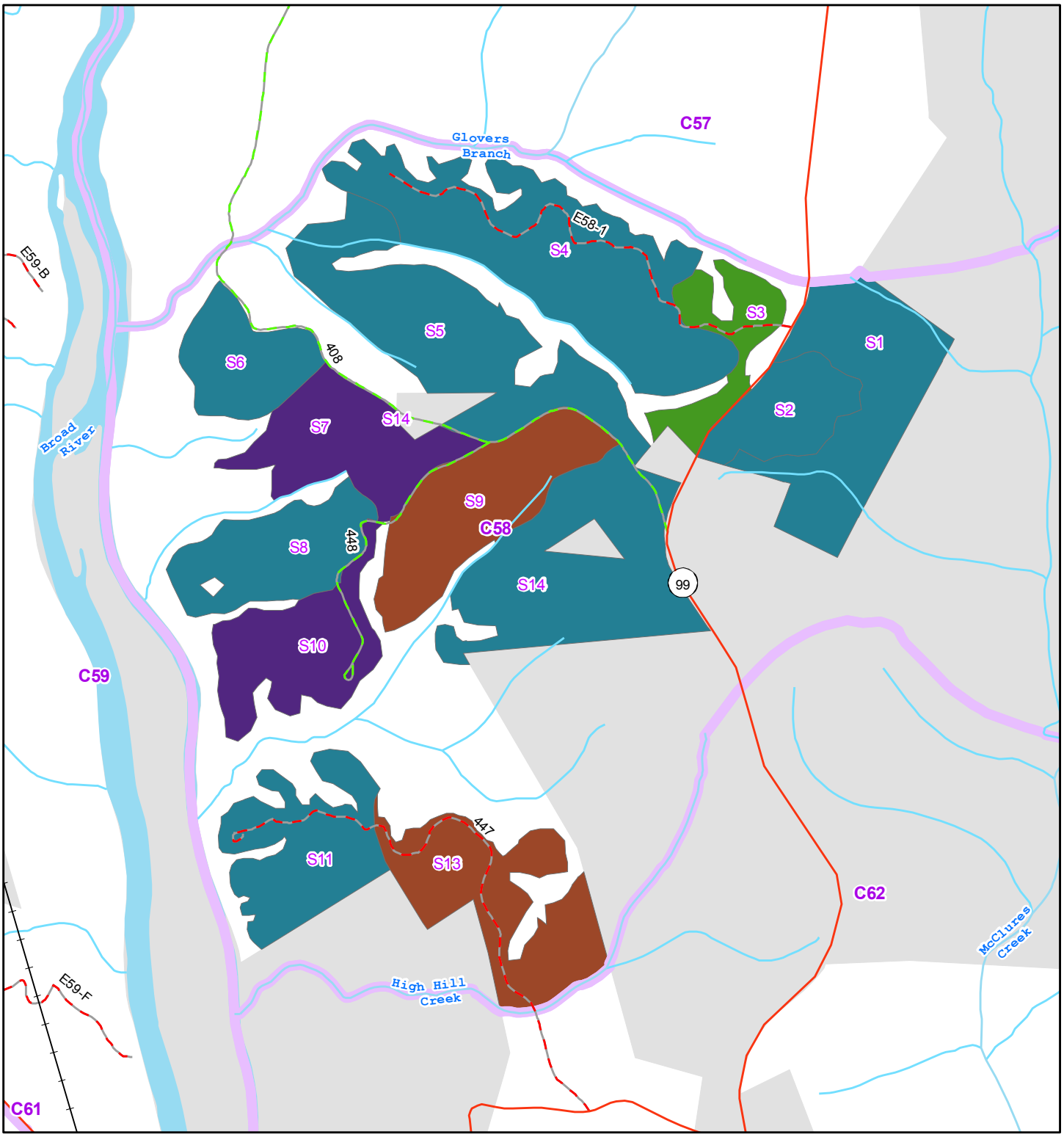


N

gholden, 1/21/2016



Clearcut with Reserves
First Thin
Intermediate Thin
Shelterwood
Private Land
Forest Service Land
Forest Boundary
Forest Compartment
Other Public Road
Open Forest Service Road
Closed Forest Service Road
Railroad

0 0.125 0.25 0.5 Miles

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 2

Compartment: 0058

Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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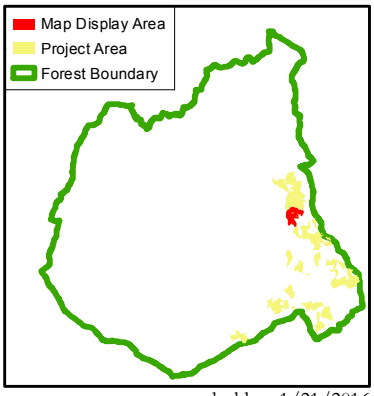
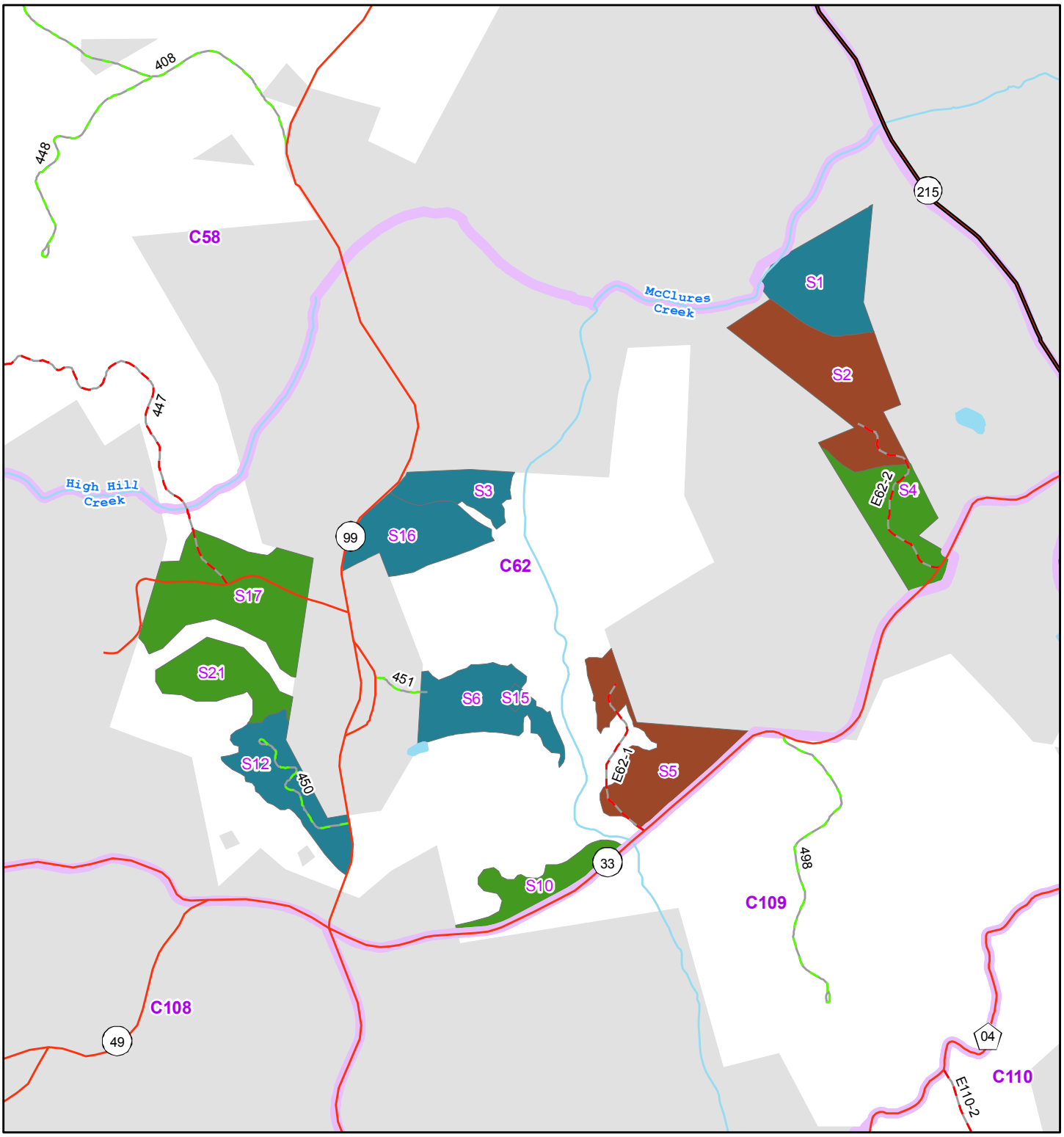


N

gholden, 1/21/2016



0 0.125 0.25 0.5 0.75 Miles

- Clearcut with Reserves
- First Thin
- Intermediate Thin
- Private Land
- Forest Service Land
- Forest Boundary
- Forest Compartment
- US/State Highway
- Other Public Road
- Open Forest Service Road
- Closed Forest Service Road

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 2

Compartment: 0062

Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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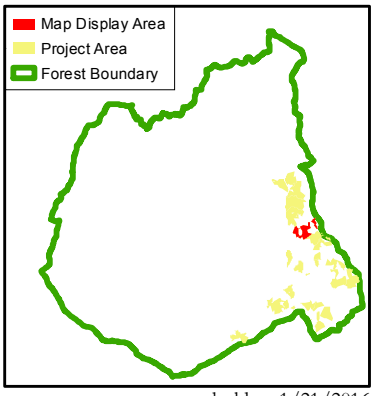
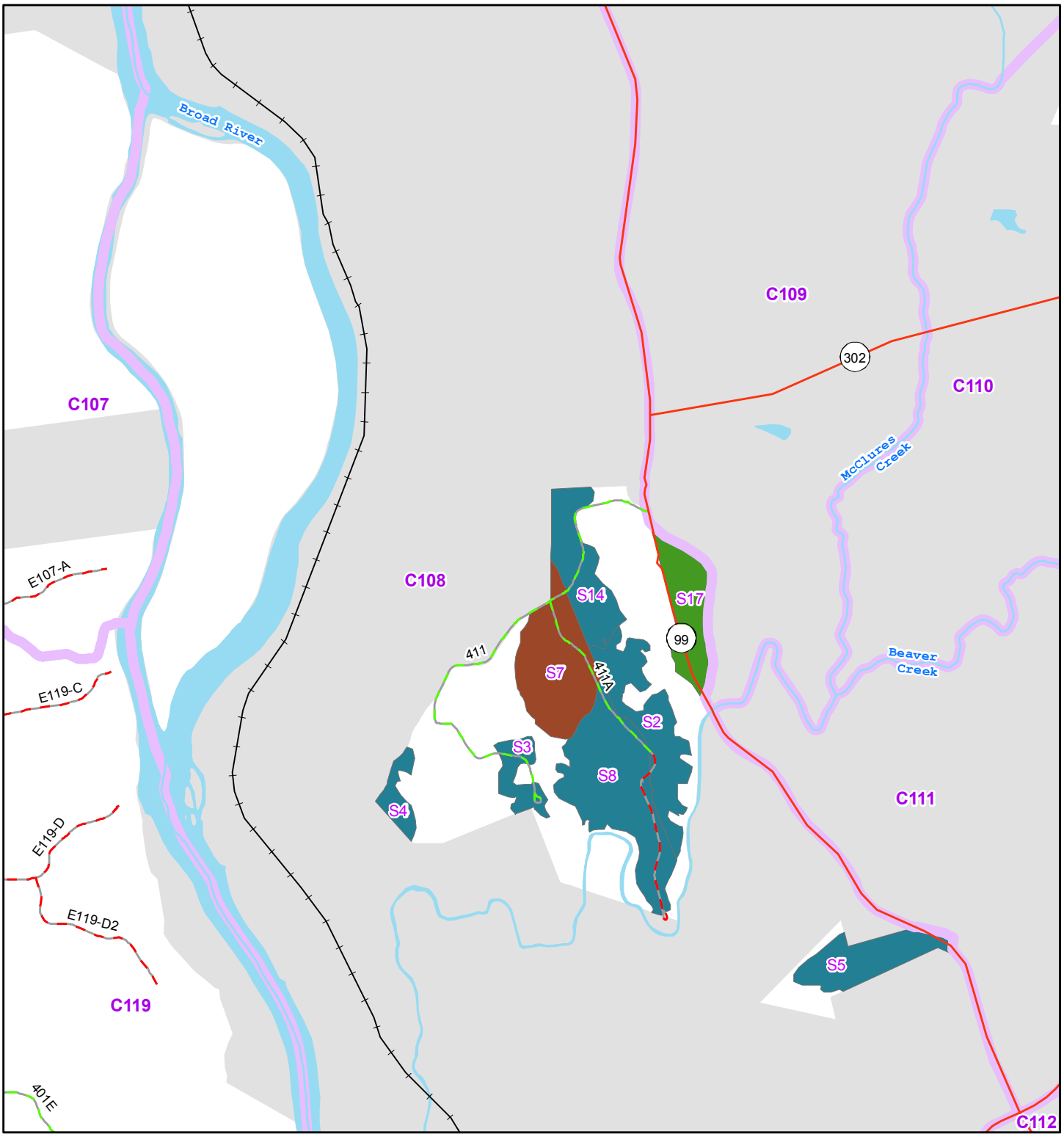


N

gholden, 1/21/2016



0 0.125 0.25 0.5 0.75 Miles

- Clearcut with Reserves
- First Thin
- Intermediate Thin
- Private Land
- Forest Service Land
- Forest Boundary
- Forest Compartment
- Other Public Road
- Open Forest Service Road
- Closed Forest Service Road
- Railroad

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 2
Compartment: 0108

Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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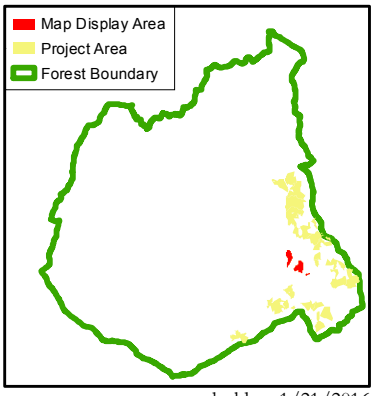
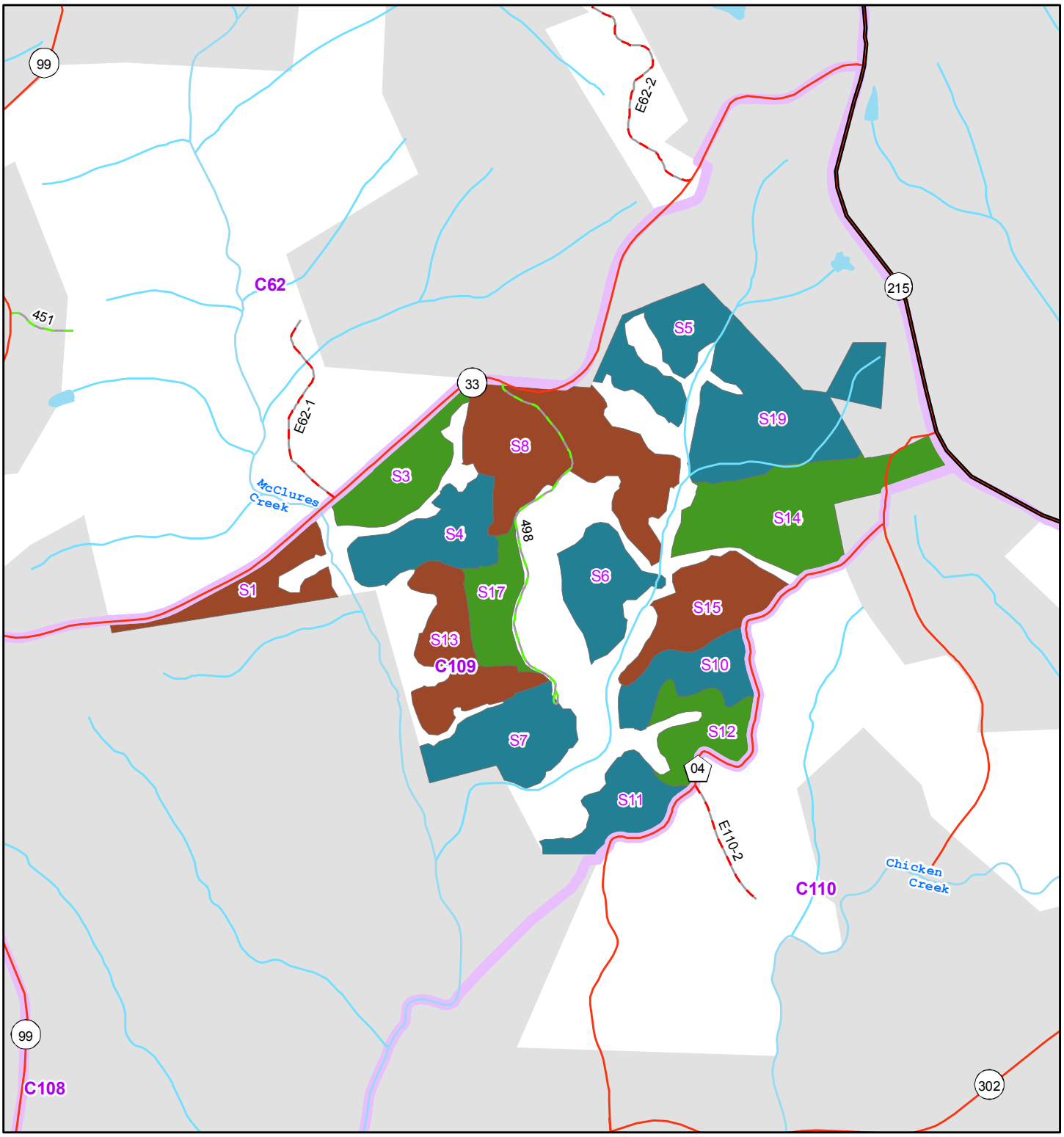


N

gholden, 1/21/2016



0 0.125 0.25 0.5 Miles

- Clearcut with Reserves
- First Thin
- Intermediate Thin
- Private Land
- Forest Service Land
- Forest Boundary
- Forest Compartment
- US/State Highway
- Other Public Road
- Open Forest Service Road
- Closed Forest Service Road

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 2
Compartment: 0109

Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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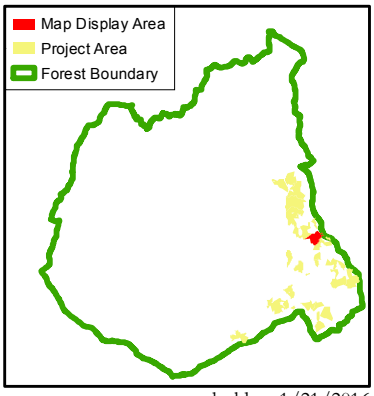

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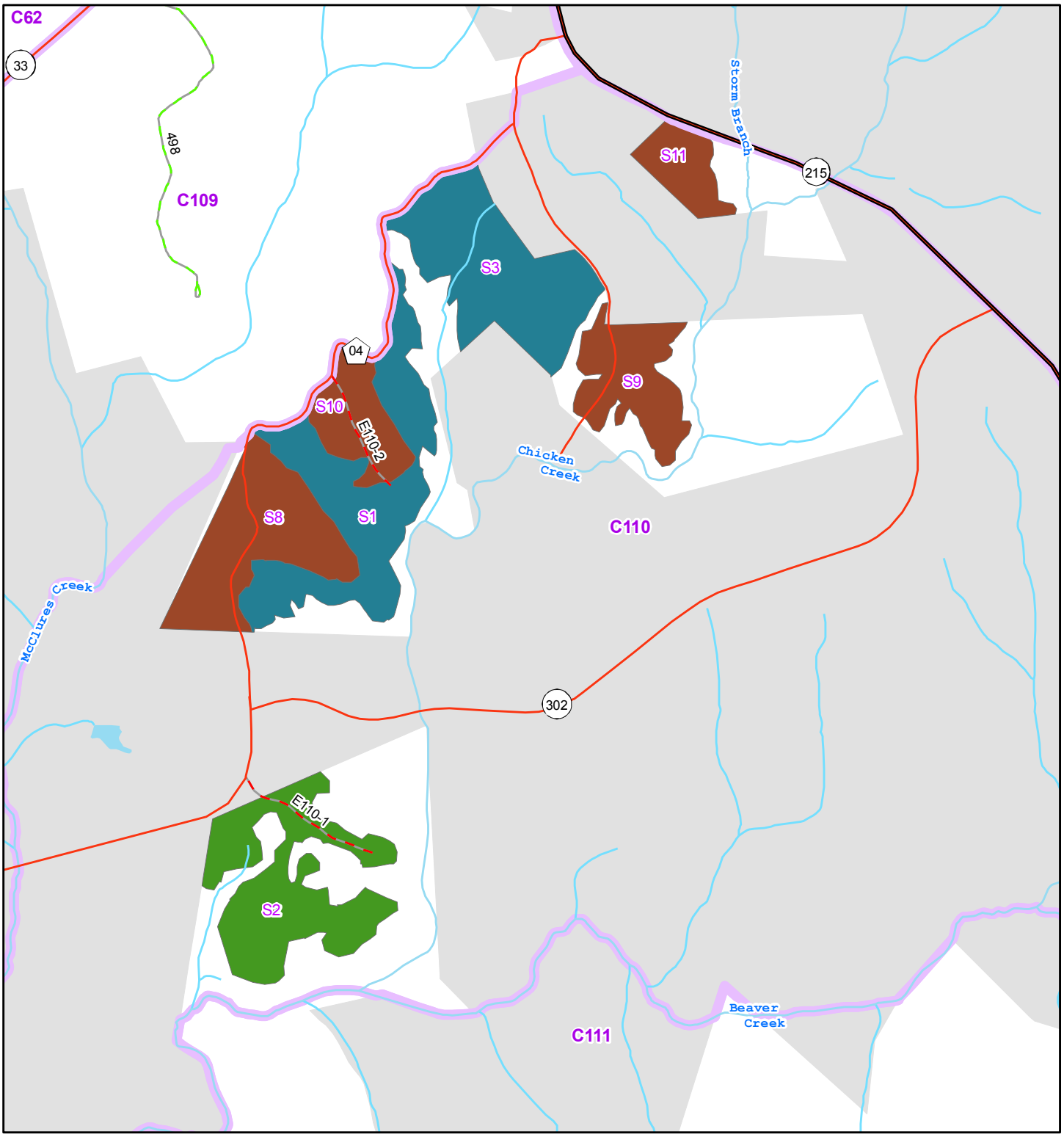
gholden, 1/21/2016



0 0.125 0.25 0.5 Miles

- Clearcut with Reserves
- First Thin
- Intermediate Thin
- Private Land
- Forest Service Land
- Forest Boundary
- Forest Compartment
- US/State Highway
- Other Public Road
- Open Forest Service Road
- Closed Forest Service Road

Lower Broad Analysis Area EA

Treatment Unit Map - Alternative 2

Compartment: 0110

Sumter National Forest

Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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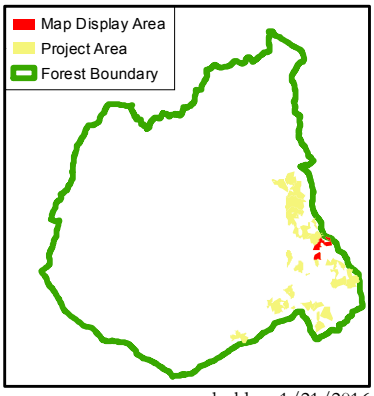
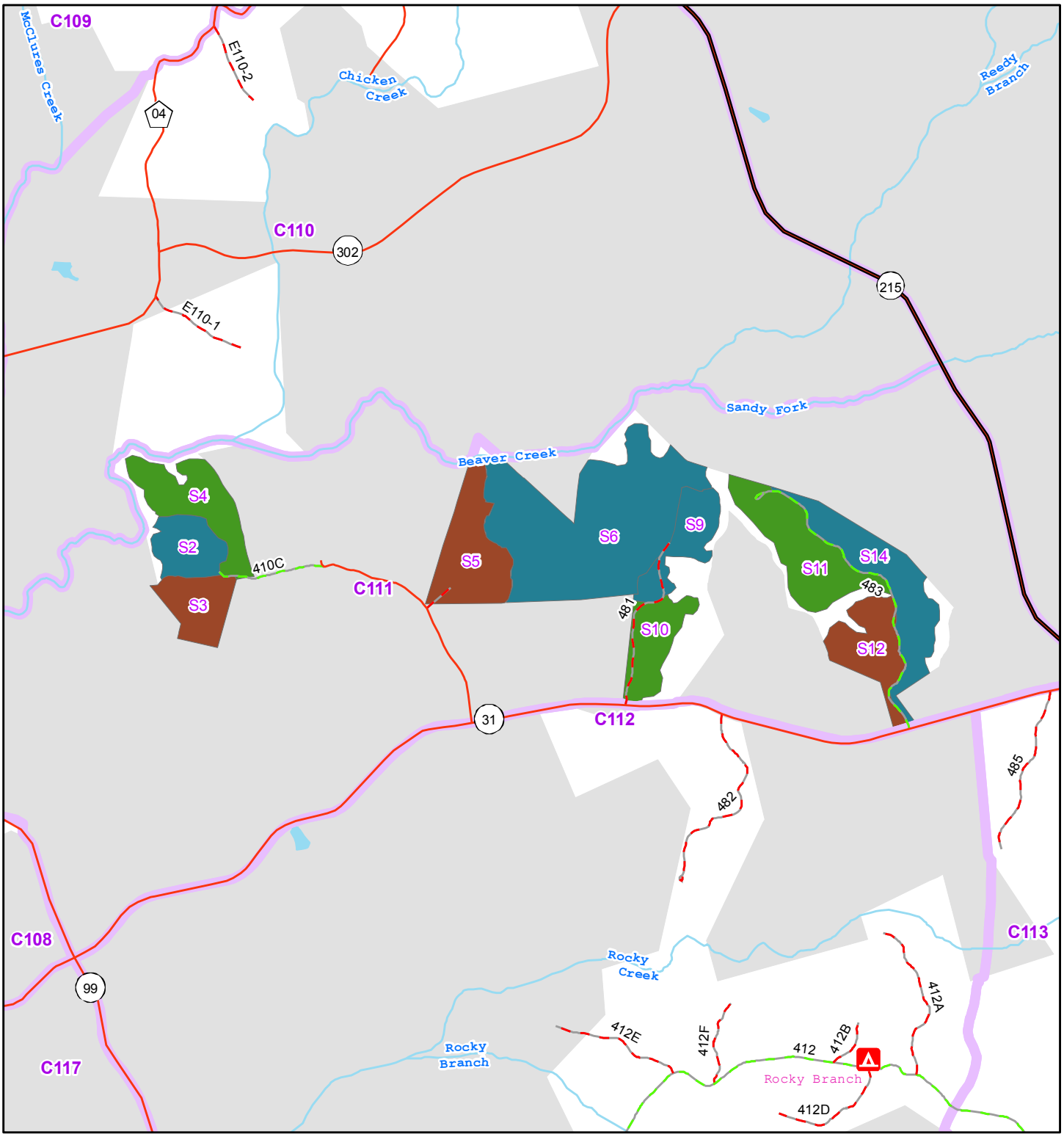


N

gholden, 1/21/2016



0 0.125 0.25 0.5 0.75 1 Miles

Clearcut with Reserves
First Thin
Intermediate Thin
Private Land
Forest Service Land
Forest Boundary
Forest Compartment
US/State Highway
Other Public Road
Open Forest Service Road
Closed Forest Service Road

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 2

Compartment: 0111

Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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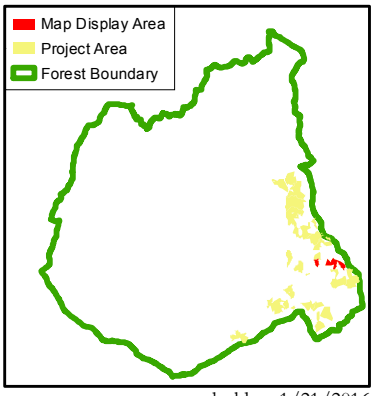
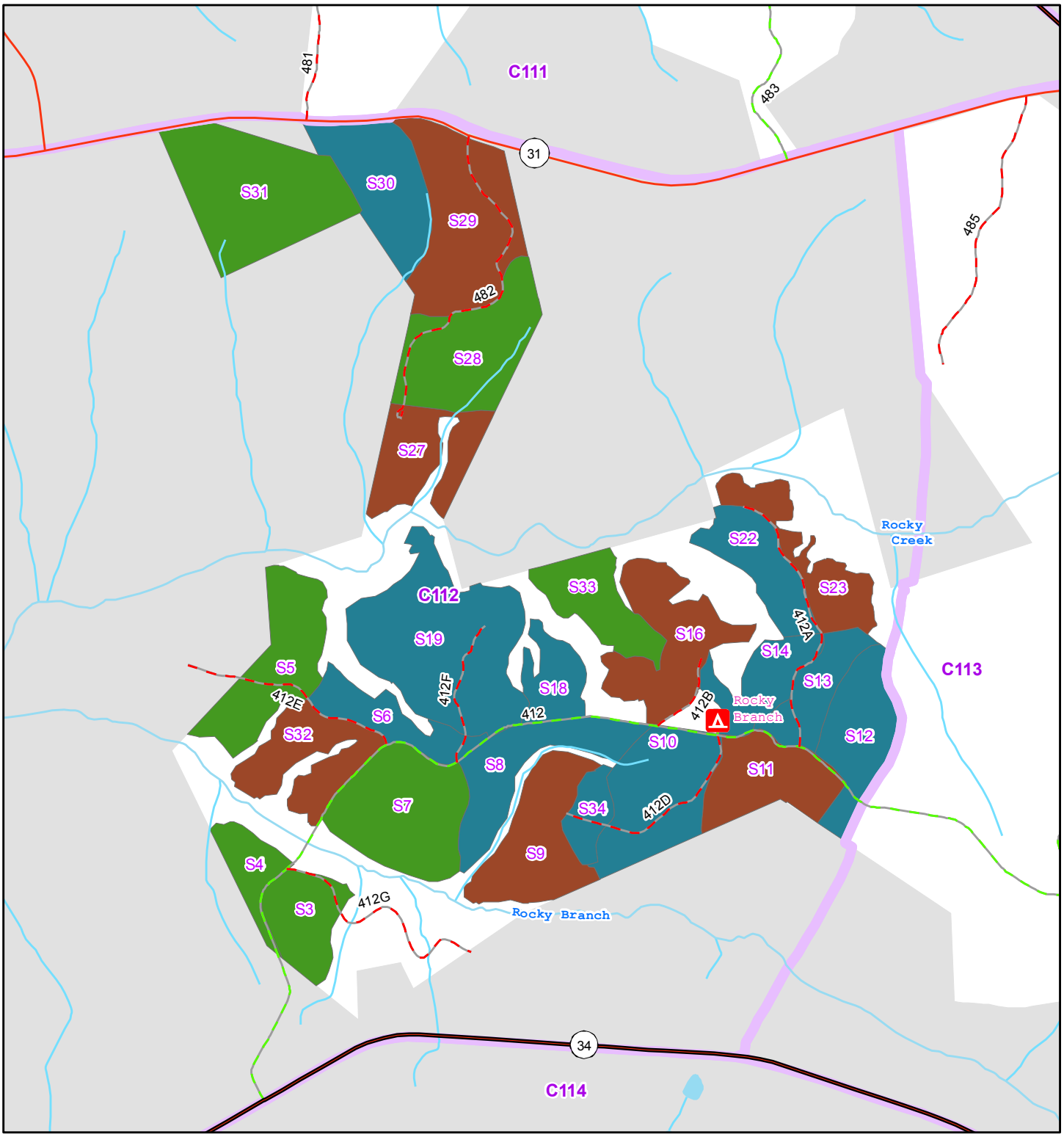


N

gholden, 1/21/2016



0 0.125 0.25 0.5 Miles

- Clearcut with Reserves
- First Thin
- Intermediate Thin
- Private Land
- Forest Service Land
- Forest Boundary
- Forest Compartment
- US/State Highway
- Other Public Road
- Open Forest Service Road
- Closed Forest Service Road

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 2
Compartment: 0112

Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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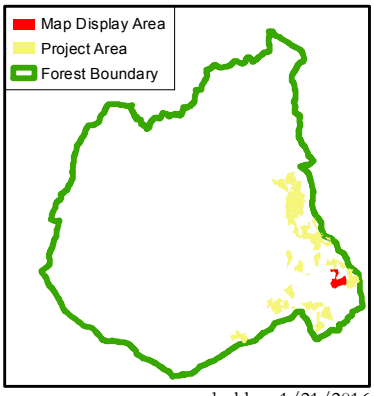
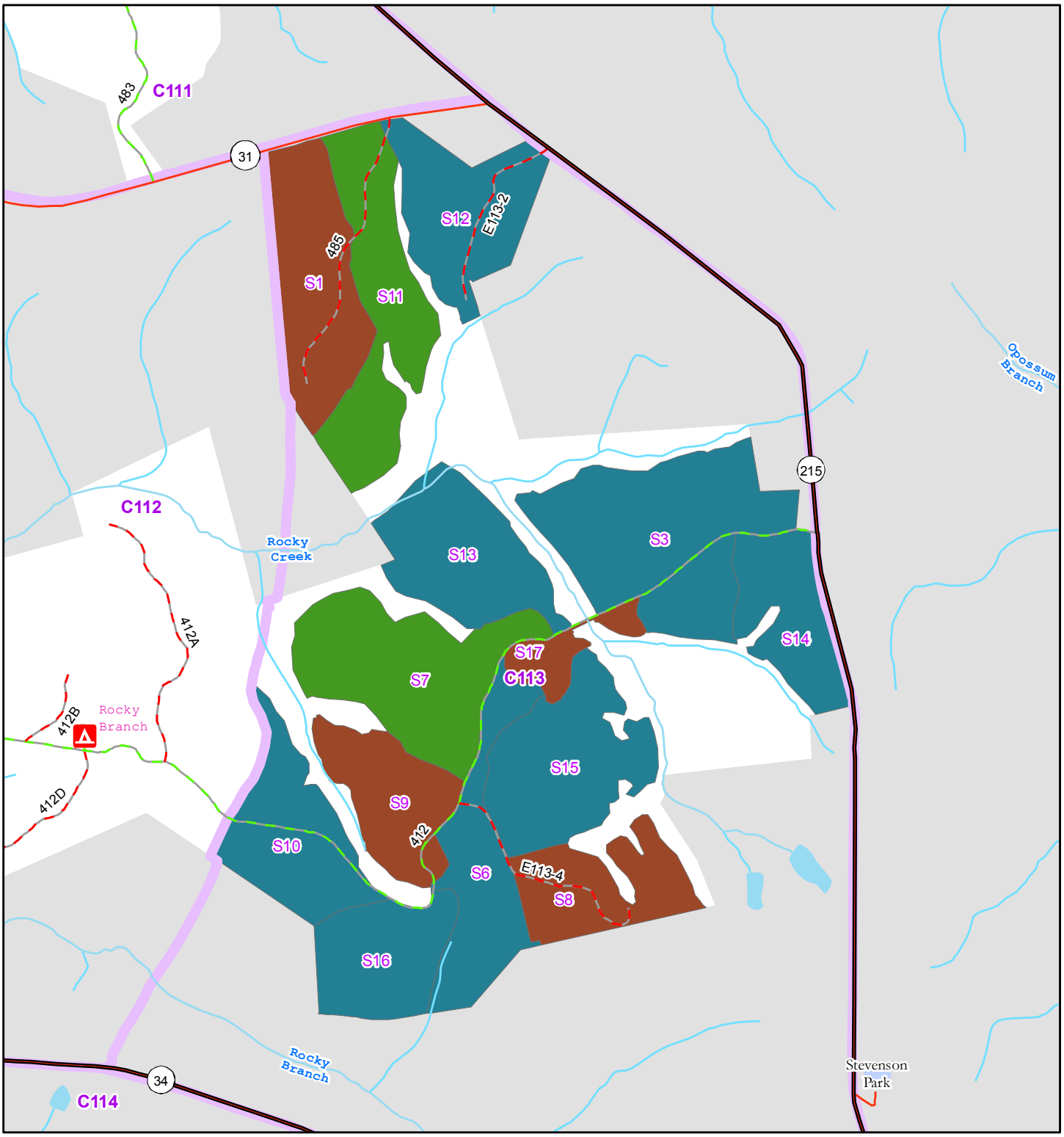


N

gholden, 1/21/2016



Clearcut with Reserves
First Thin
Intermediate Thin
Private Land
Forest Service Land
County/Municipal Land
Forest Boundary
Forest Compartment
US/State Highway
Other Public Road
Open Forest Service Road
Closed Forest Service Road

0 0.125 0.25 0.5 Miles

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 2

Compartment: 0113

Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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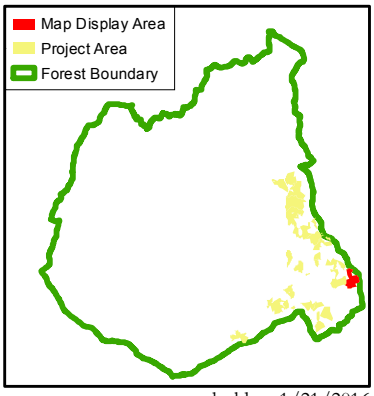

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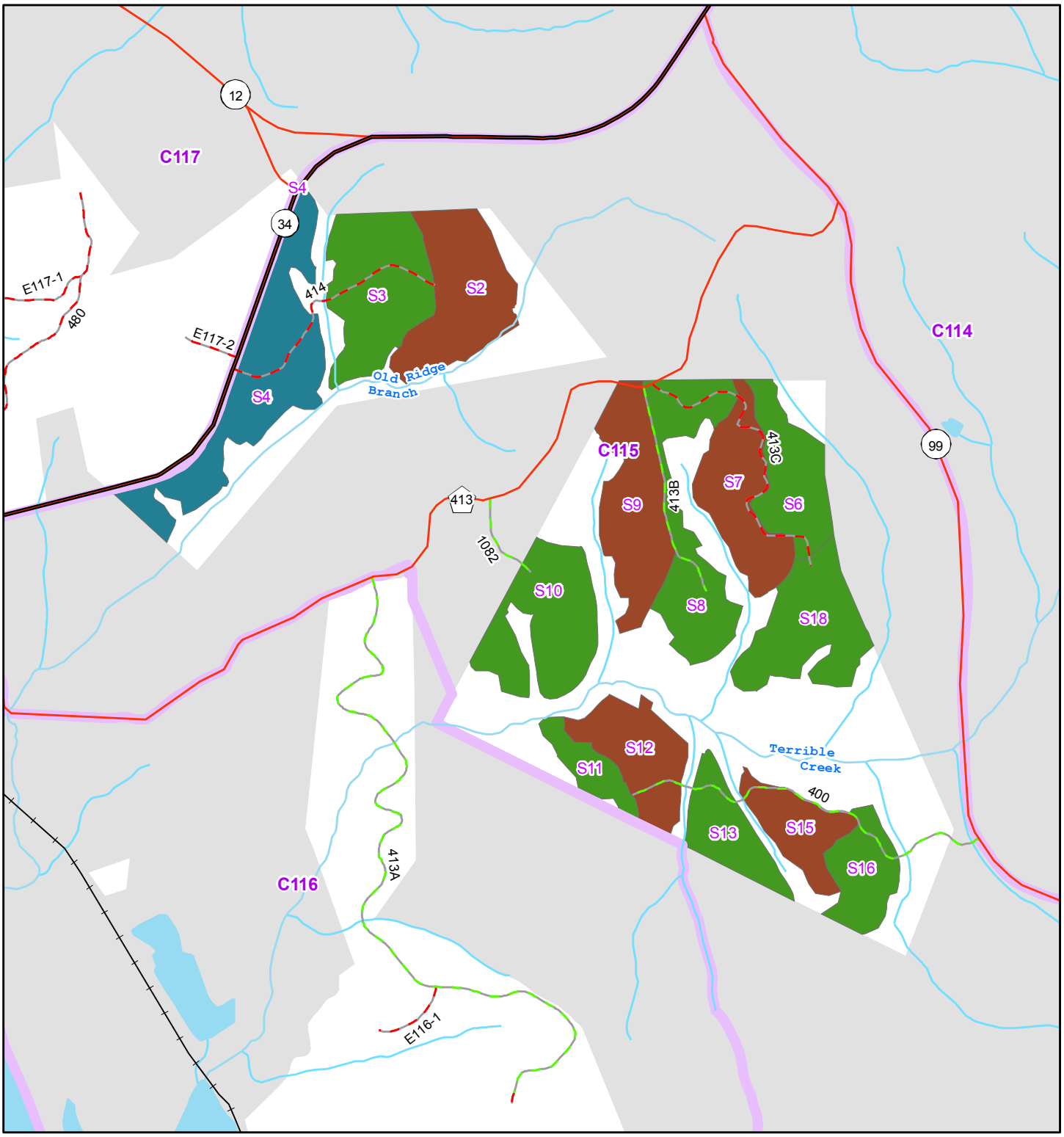
gholden, 1/21/2016



0 0.125 0.25 0.5 Miles

- Clearcut with Reserves
- First Thin
- Intermediate Thin
- Private Land
- Forest Service Land
- Forest Boundary
- Forest Compartment
- US/State Highway
- Other Public Road
- Open Forest Service Road
- Closed Forest Service Road
- Railroad

Lower Broad Analysis Area EA

Treatment Unit Map - Alternative 2

Compartment: 0115

Sumter National Forest

Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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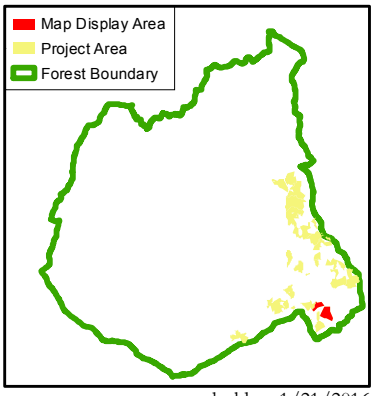
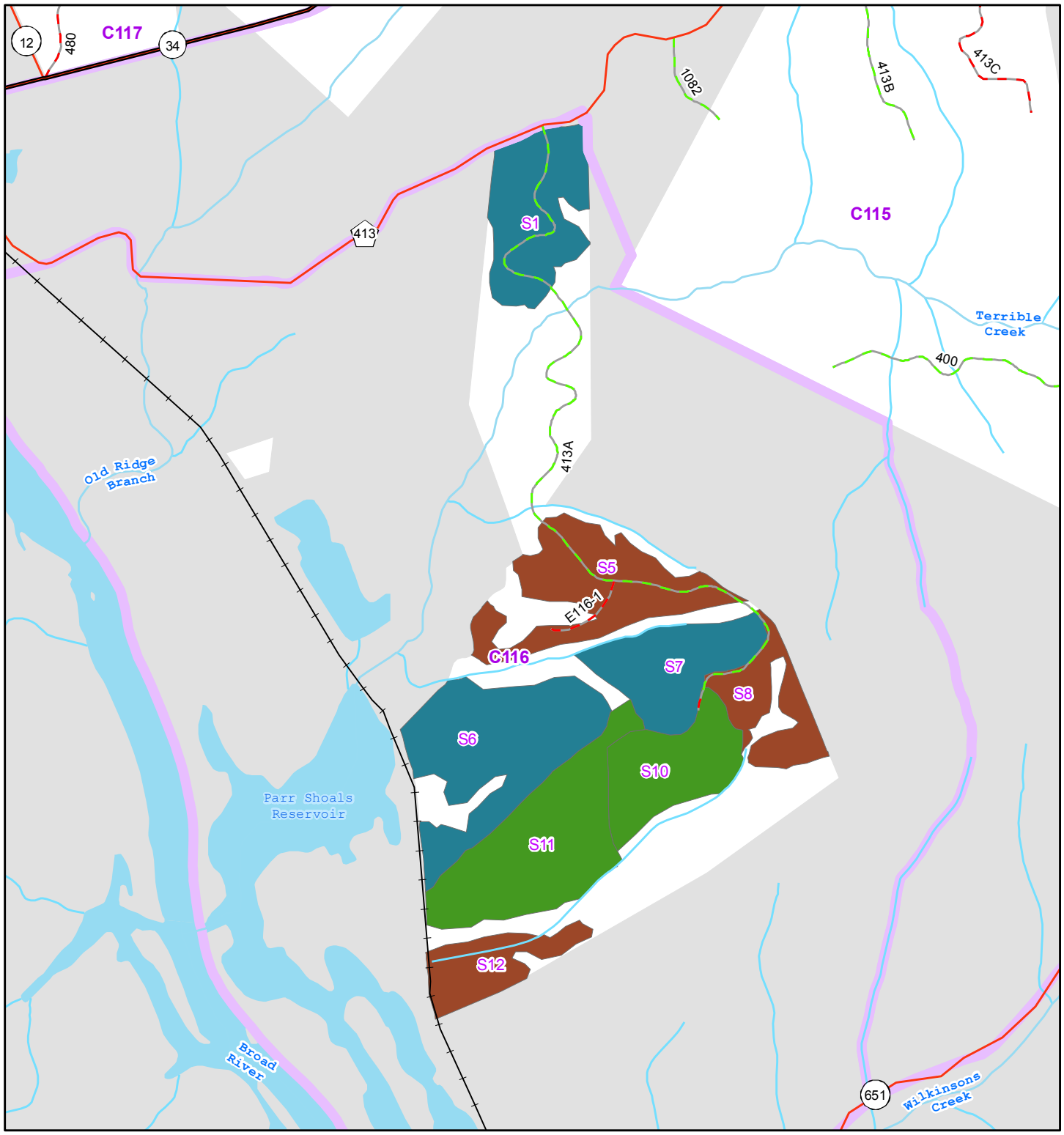


N

gholden, 1/21/2016



Clearcut with Reserves
First Thin
Intermediate Thin
Private Land
Forest Service Land
Forest Boundary
Forest Compartment
US/State Highway
Other Public Road
Open Forest Service Road
Closed Forest Service Road
Railroad

0 0.125 0.25 0.5 Miles

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 2

Compartment: 0116

Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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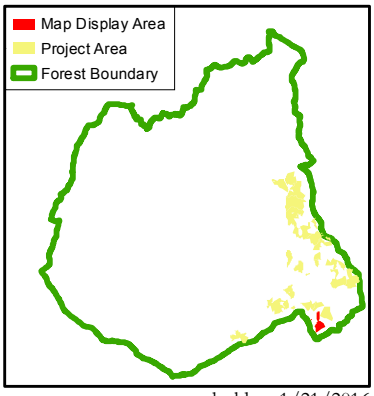

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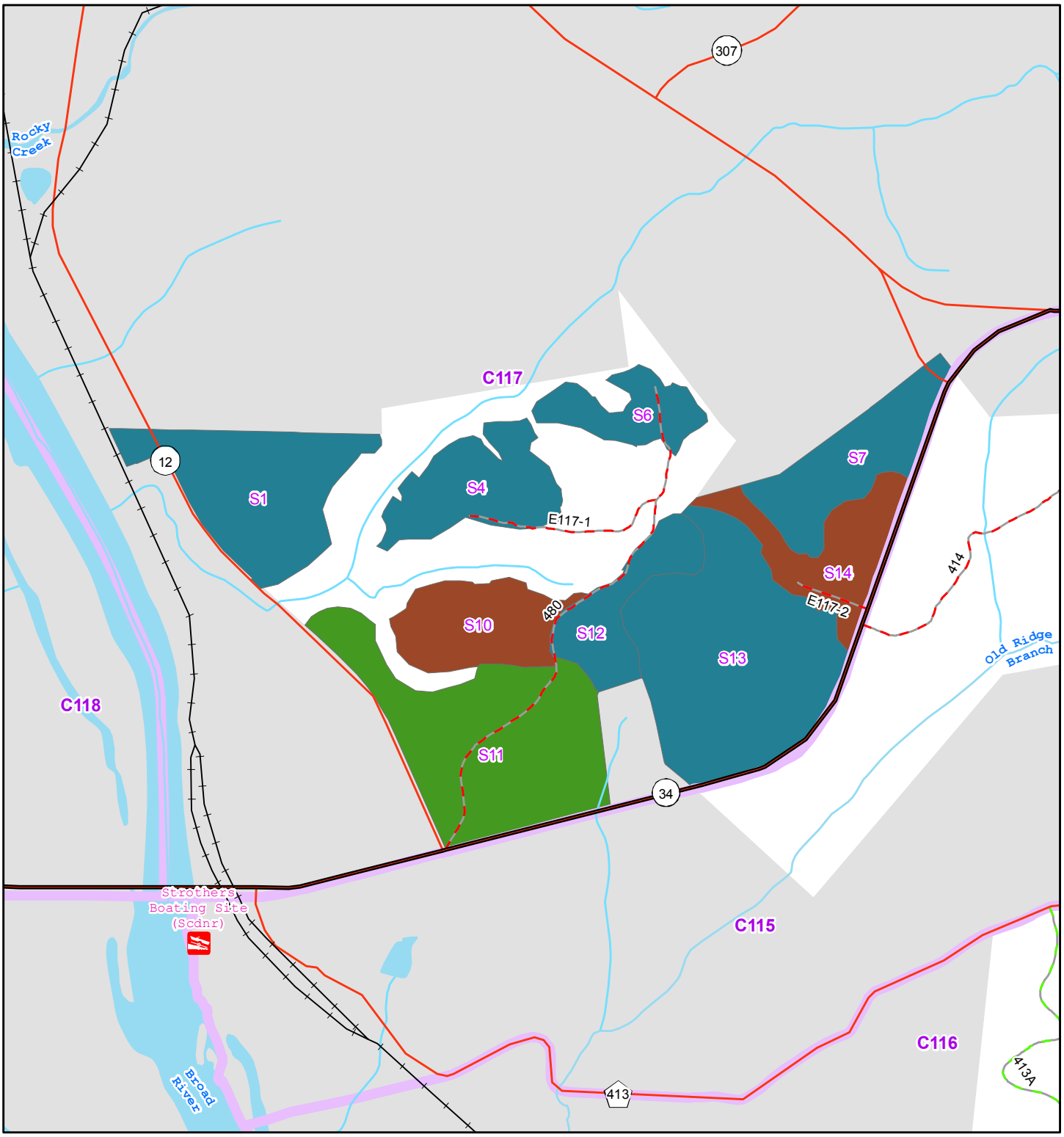
gholden, 1/21/2016



0 0.125 0.25 0.5 Miles

- Clearcut with Reserves
- First Thin
- Intermediate Thin
- Private Land
- Forest Service Land
- Forest Boundary
- Forest Compartment
- US/State Highway
- Other Public Road
- Open Forest Service Road
- Closed Forest Service Road
- Railroad

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 2

Compartment: 0117

Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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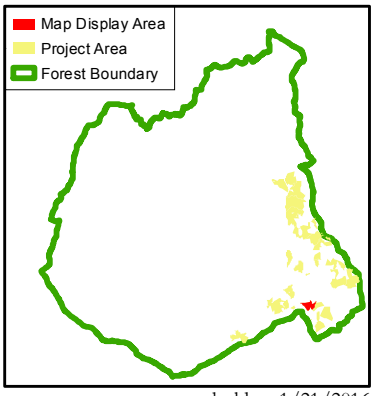

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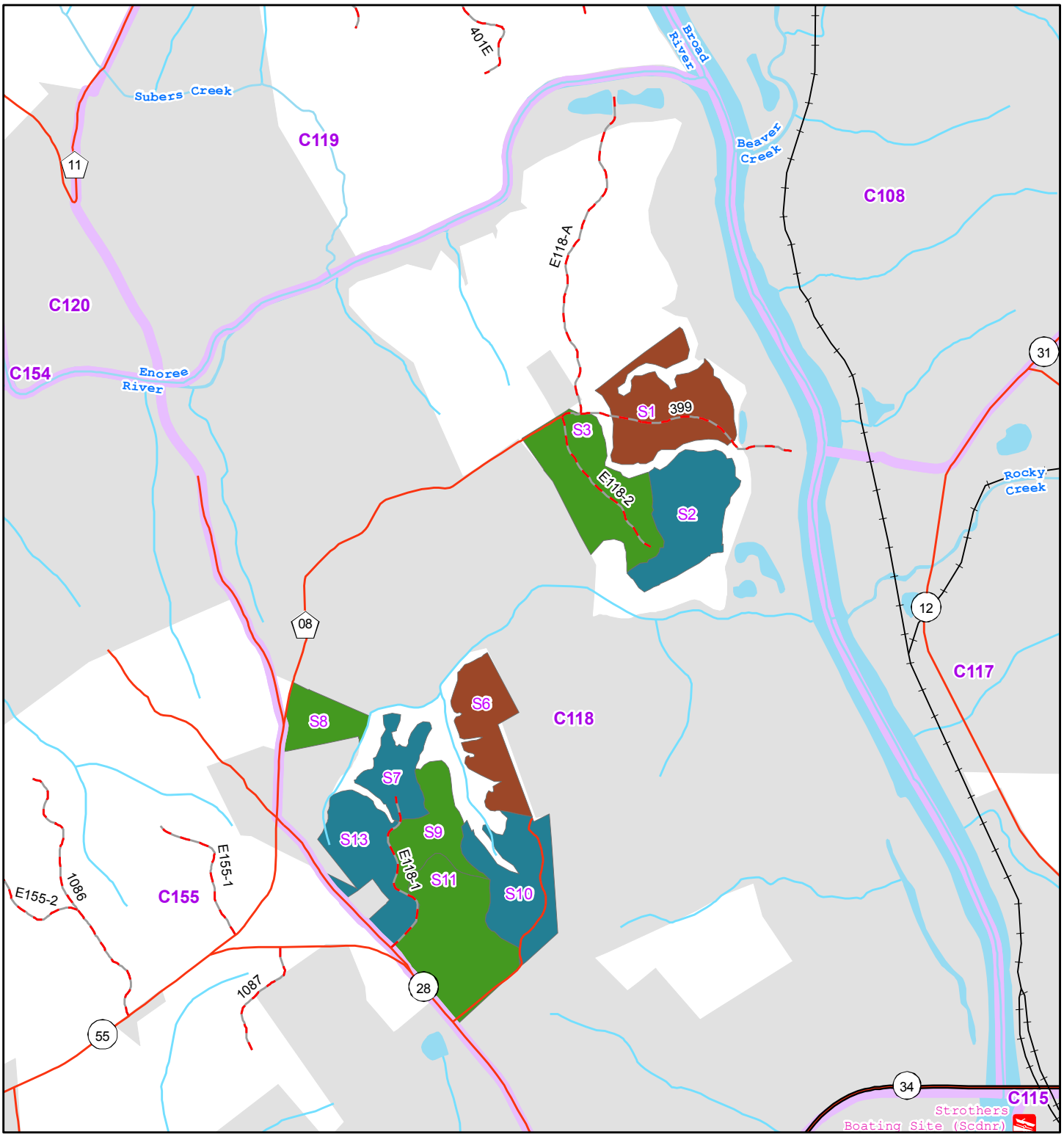
gholden, 1/21/2016



0 0.125 0.25 0.5 0.75 Miles

- Clearcut with Reserves
- First Thin
- Intermediate Thin
- Private Land
- Forest Service Land
- Forest Boundary
- Forest Compartment
- US/State Highway
- Other Public Road
- Closed Forest Service Road
- Railroad

Lower Broad Analysis Area EA

Treatment Unit Map - Alternative 2

Compartment: 0118

Sumter National Forest

Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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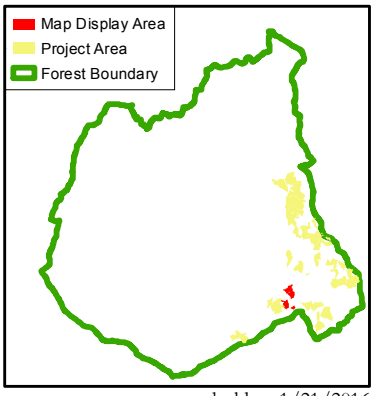

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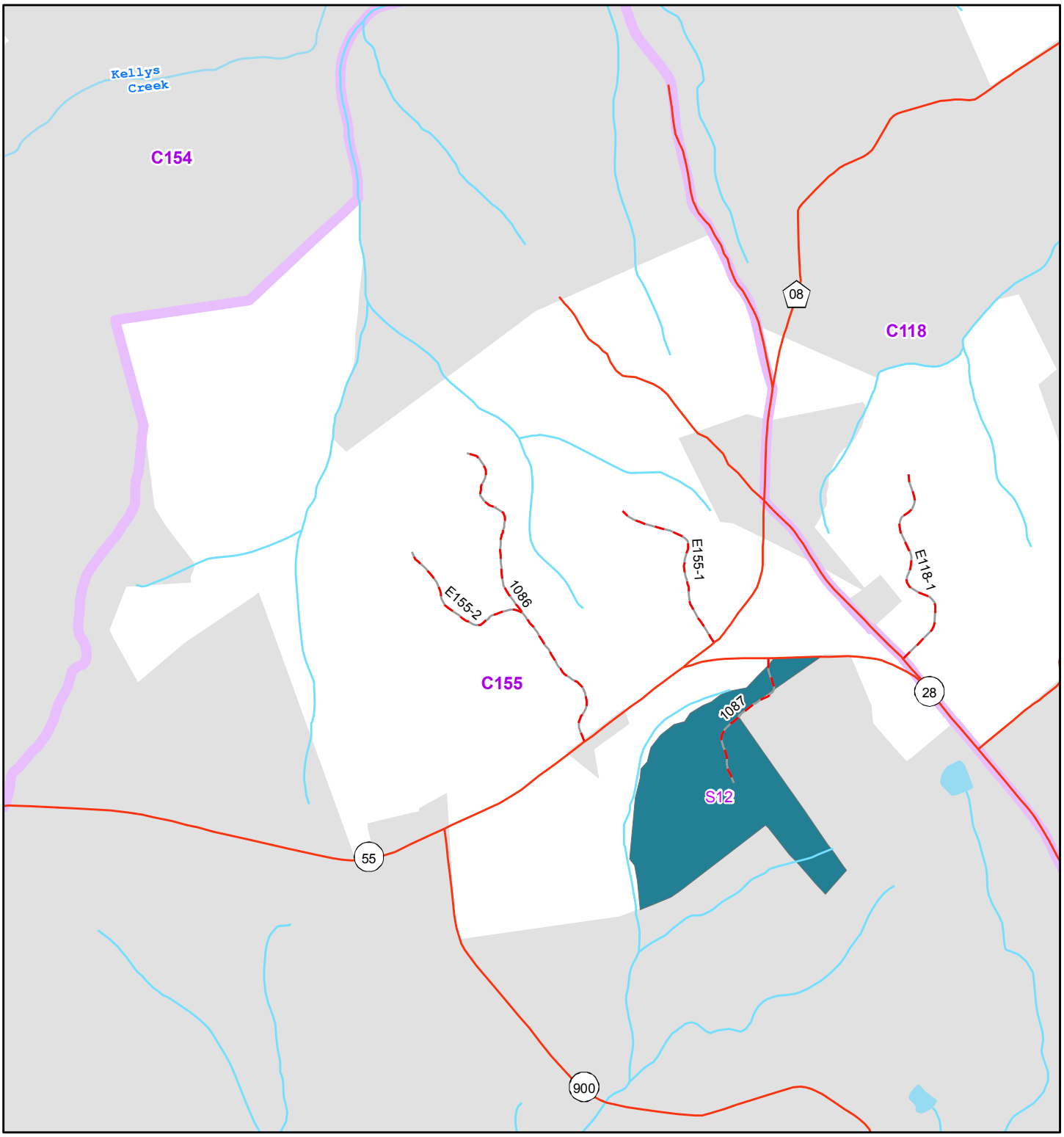
gholden, 1/21/2016



0 0.125 0.25 0.5 Miles

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 2

Compartment: 0155

Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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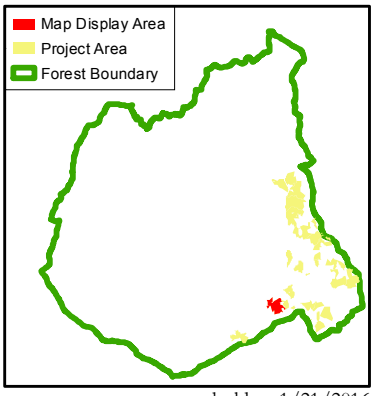
- Intermediate Thin
- Private Land
- Forest Service Land
- Forest Boundary
- Forest Compartment
- Other Public Road
- Closed Forest Service Road



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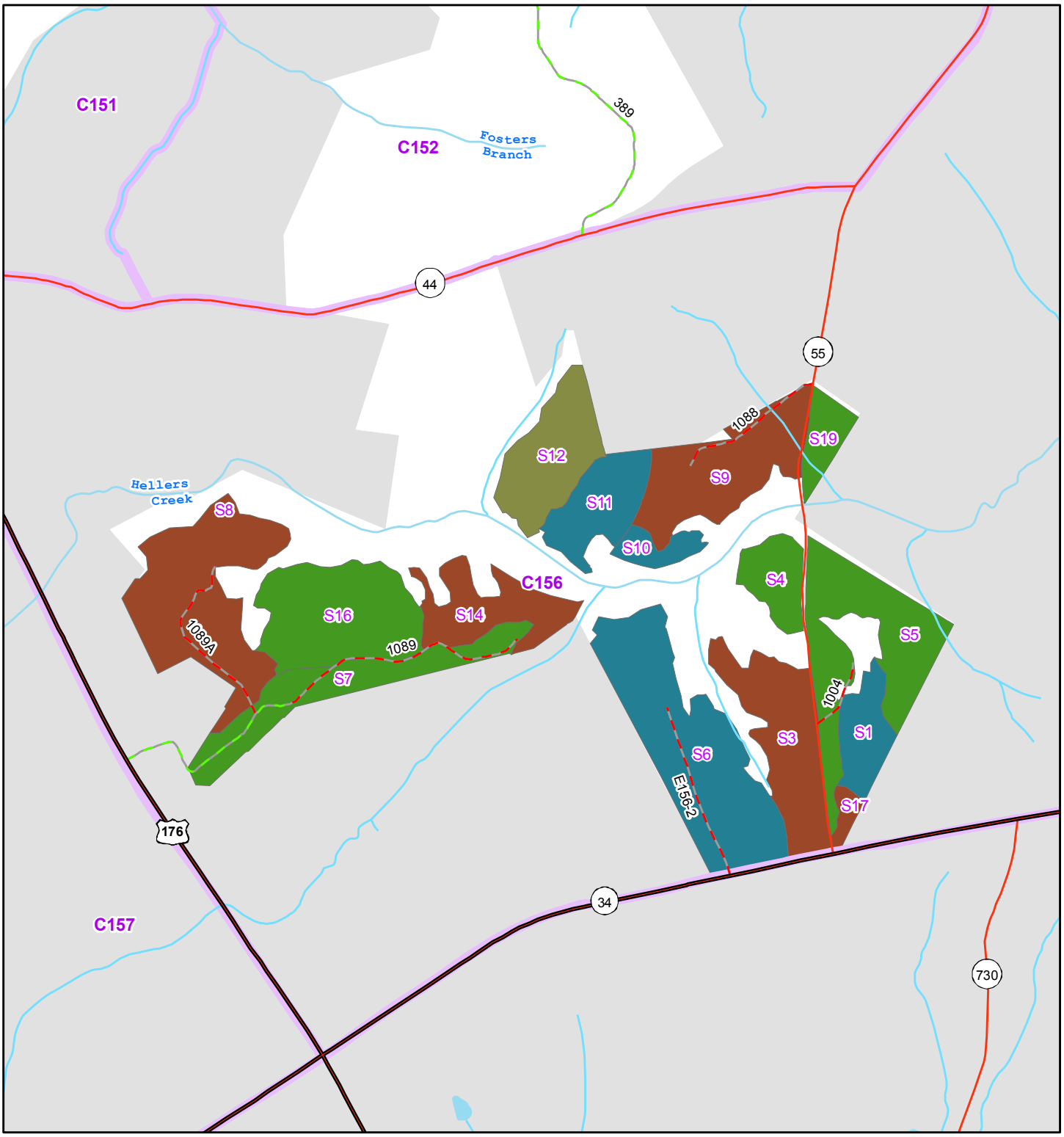
gholden, 1/21/2016



Clearcut with Reserves
First Thin
Intermediate Thin
Shortleaf Pine Restoration
Private Land
Forest Service Land
Forest Boundary
Forest Compartment
US/State Highway
Other Public Road
Open Forest Service Road
Closed Forest Service Road

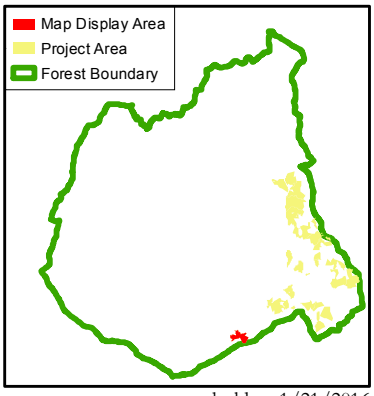
0 0.125 0.25 0.5 Miles

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 2
Compartment: 0156
Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

Disclaimer: The USDA Forest Service makes no warranty, expressed or implied, regarding the data displayed on the map, and reserves the right to correct, update, modify, or replace this information without notification.



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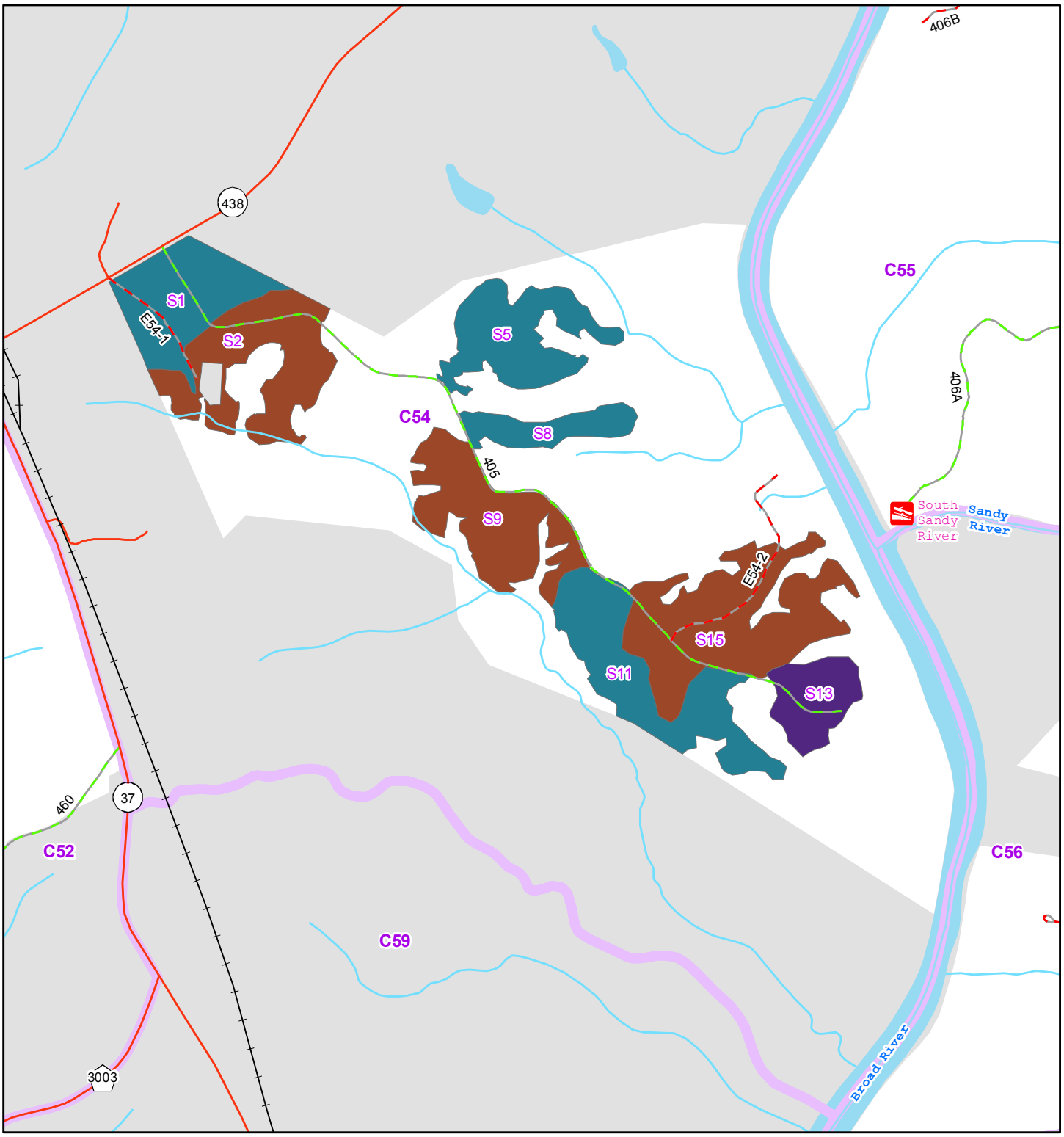
gholden, 1/21/2016



0 0.125 0.25 0.5 Miles

First Thin
Intermediate Thin
Shelterwood
Private Land
Forest Service Land
Forest Boundary
Forest Compartment
Other Public Road
Open Forest Service Road
Closed Forest Service Road
Railroad

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 3
Compartment: 0054
Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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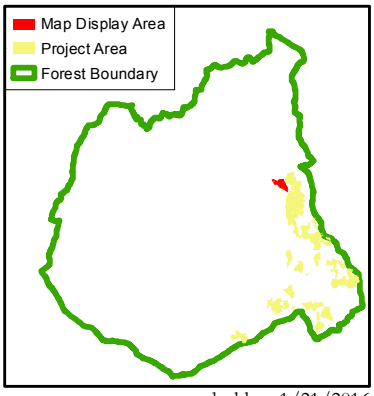

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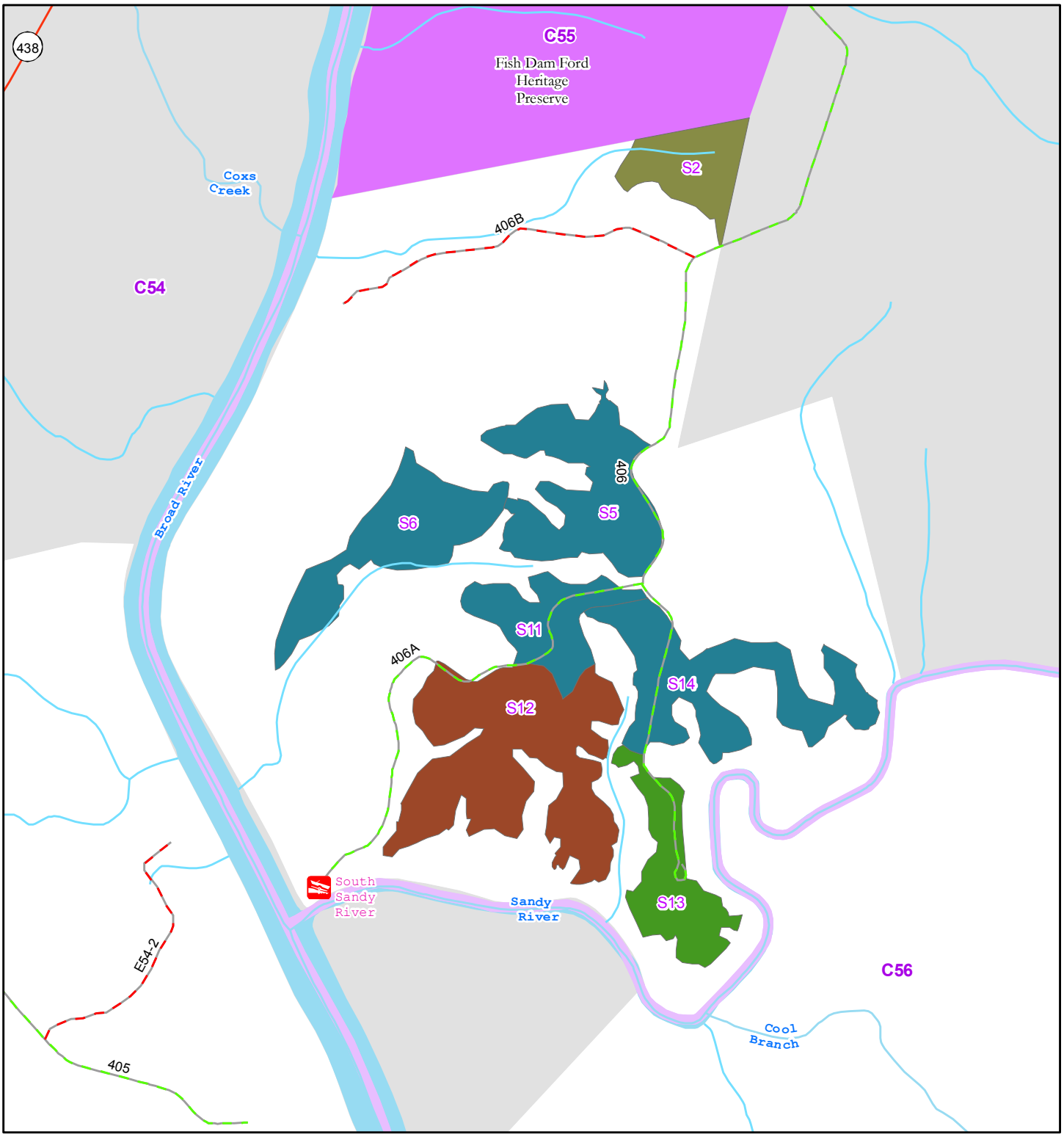

First Thin
Intermediate Thin
Seedtree with Reserves
Shortleaf Pine Restoration
Private Land
Forest Service Land
State Land
Forest Boundary
Forest Compartment
Other Public Road
Open Forest Service Road
Closed Forest Service Road

0 0.125 0.25 Miles

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 3
Compartment: 0055
Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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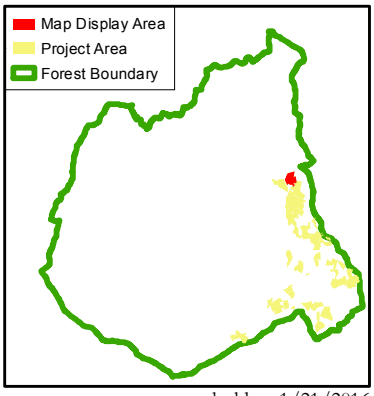

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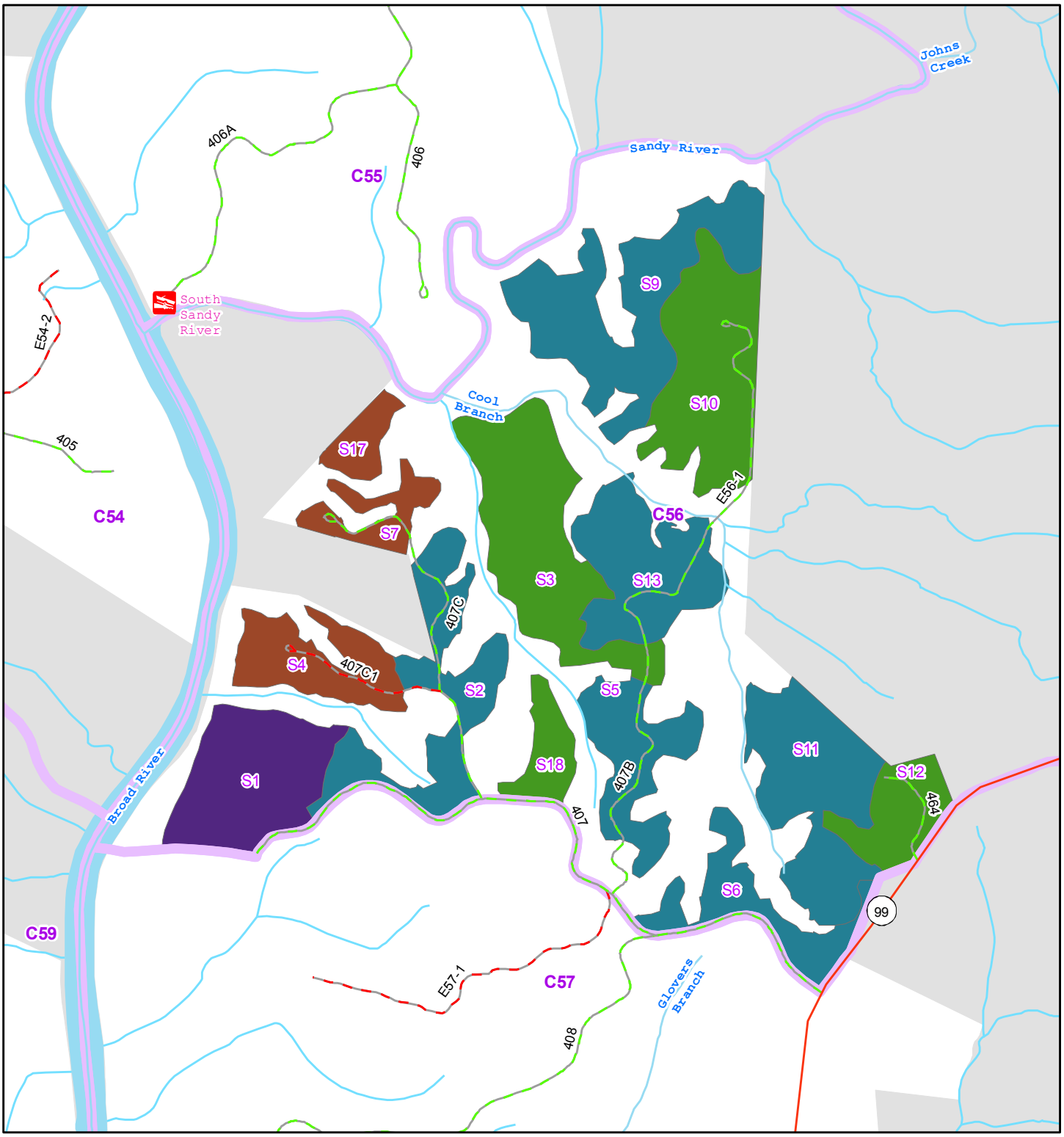

0 0.125 0.25 0.5 Miles

- First Thin
- Intermediate Thin
- Seedtree with Reserves
- Shelterwood
- Private Land
- Forest Service Land
- Forest Boundary
- Forest Compartment
- Other Public Road
- Open Forest Service Road
- Closed Forest Service Road

Lower Broad Analysis Area EA

Treatment Unit Map - Alternative 3

Compartment: 0056

Sumter National Forest

Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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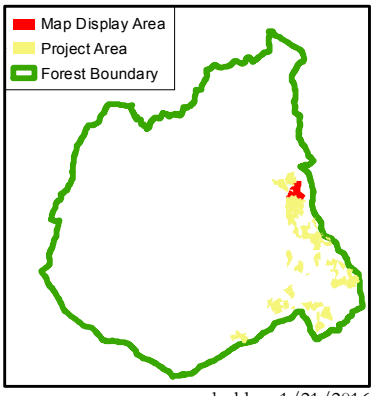

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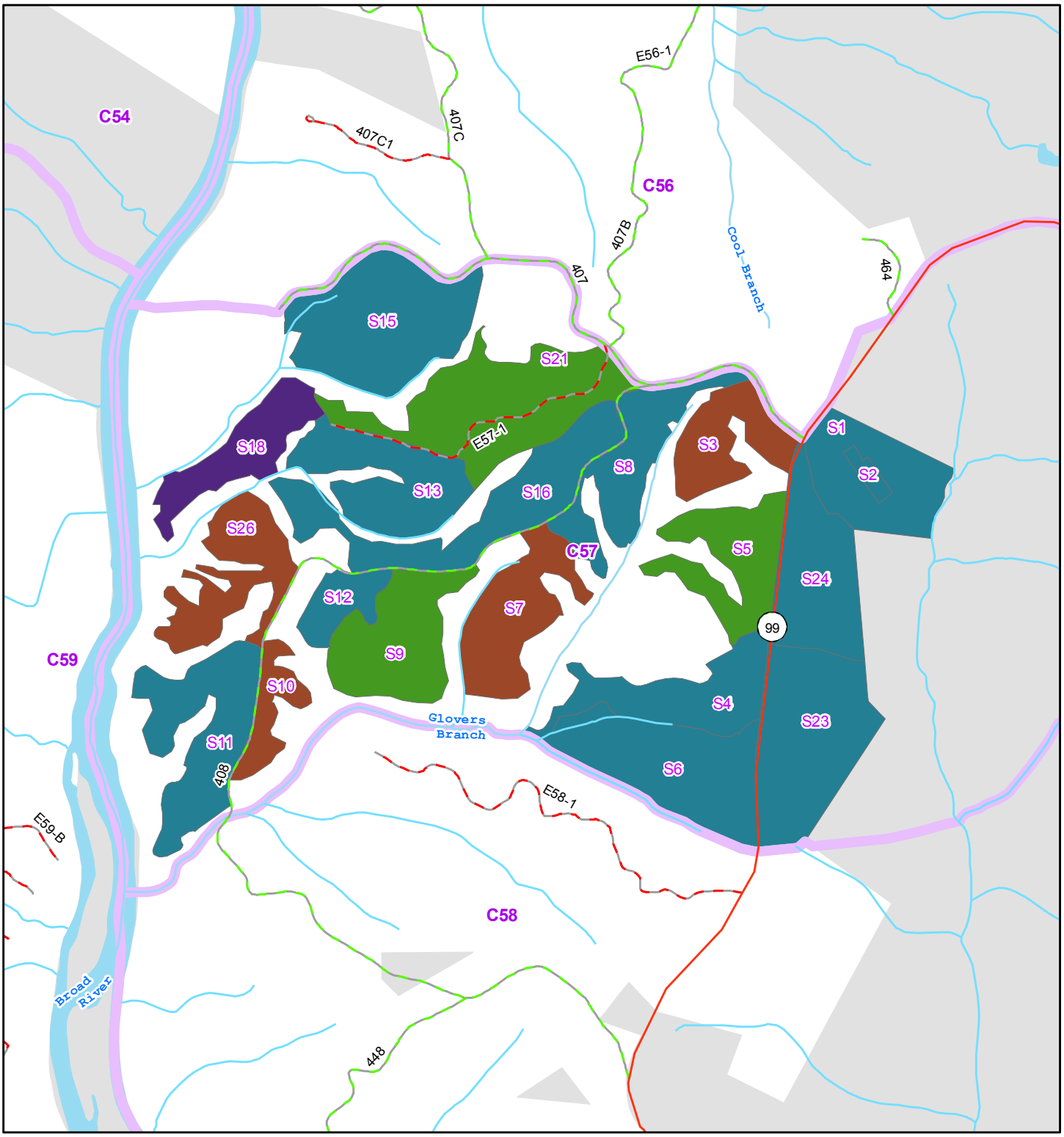

0 0.125 0.25 0.5 Miles

First Thin
Intermediate Thin
Seedtree with Reserves
Shelterwood
Private Land
Forest Service Land
Forest Boundary
Forest Compartment
Other Public Road
Open Forest Service Road
Closed Forest Service Road

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 3
Compartment: 0057
Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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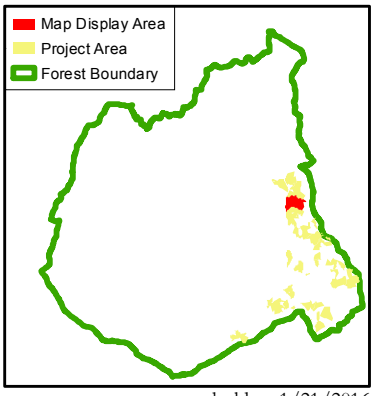

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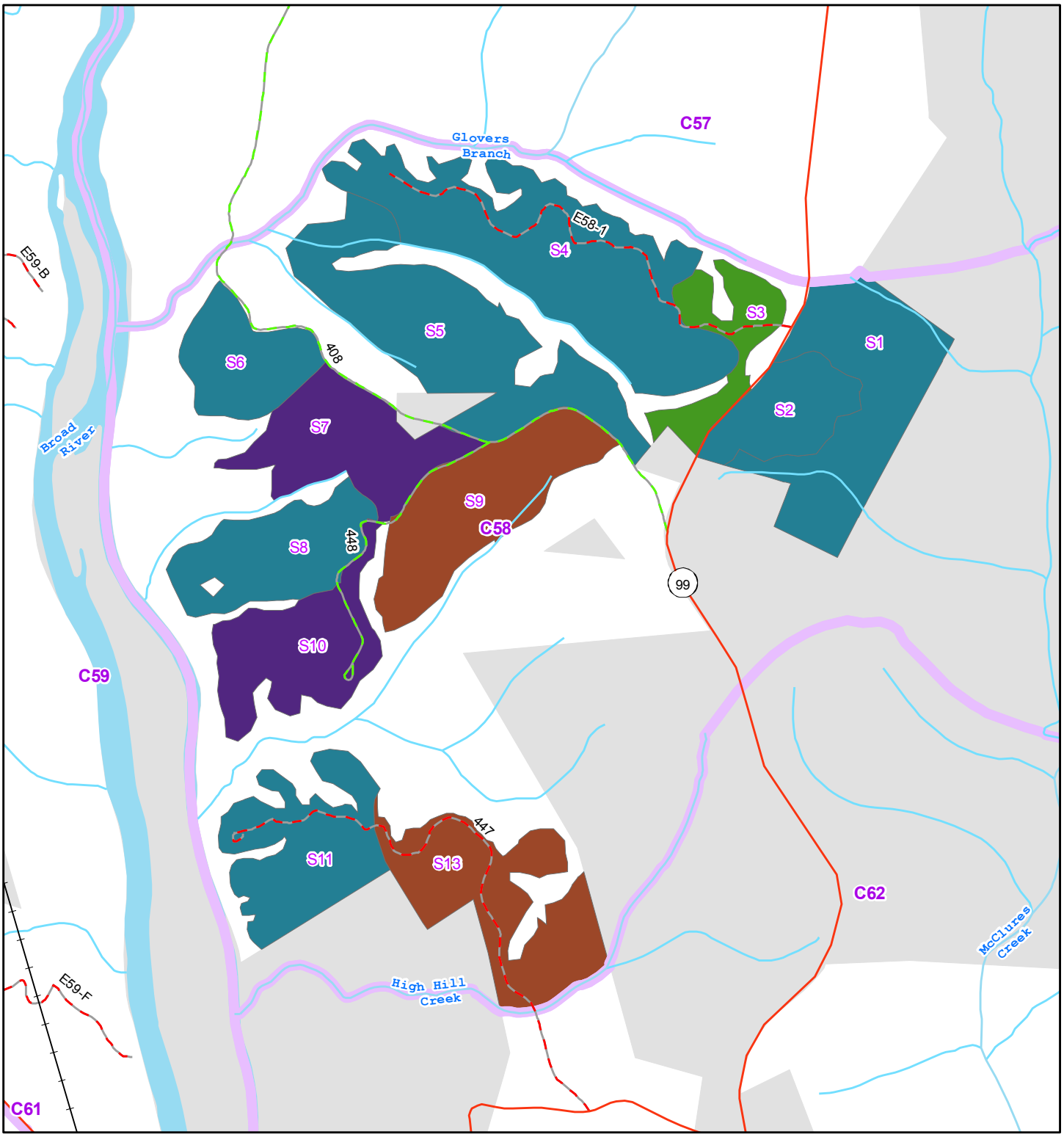
gholden, 1/21/2016



0 0.125 0.25 0.5 Miles

First Thin
Intermediate Thin
Seedtree with Reserves
Shelterwood
Private Land
Forest Service Land
Forest Boundary
Forest Compartment
Other Public Road
Open Forest Service Road
Closed Forest Service Road
Railroad

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 3
Compartment: 0058
Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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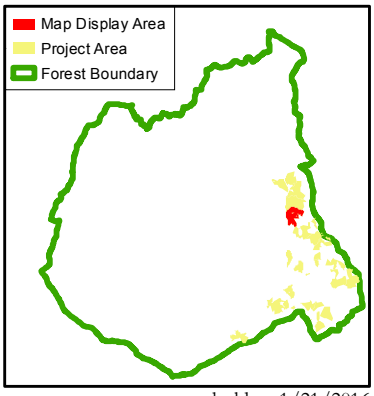

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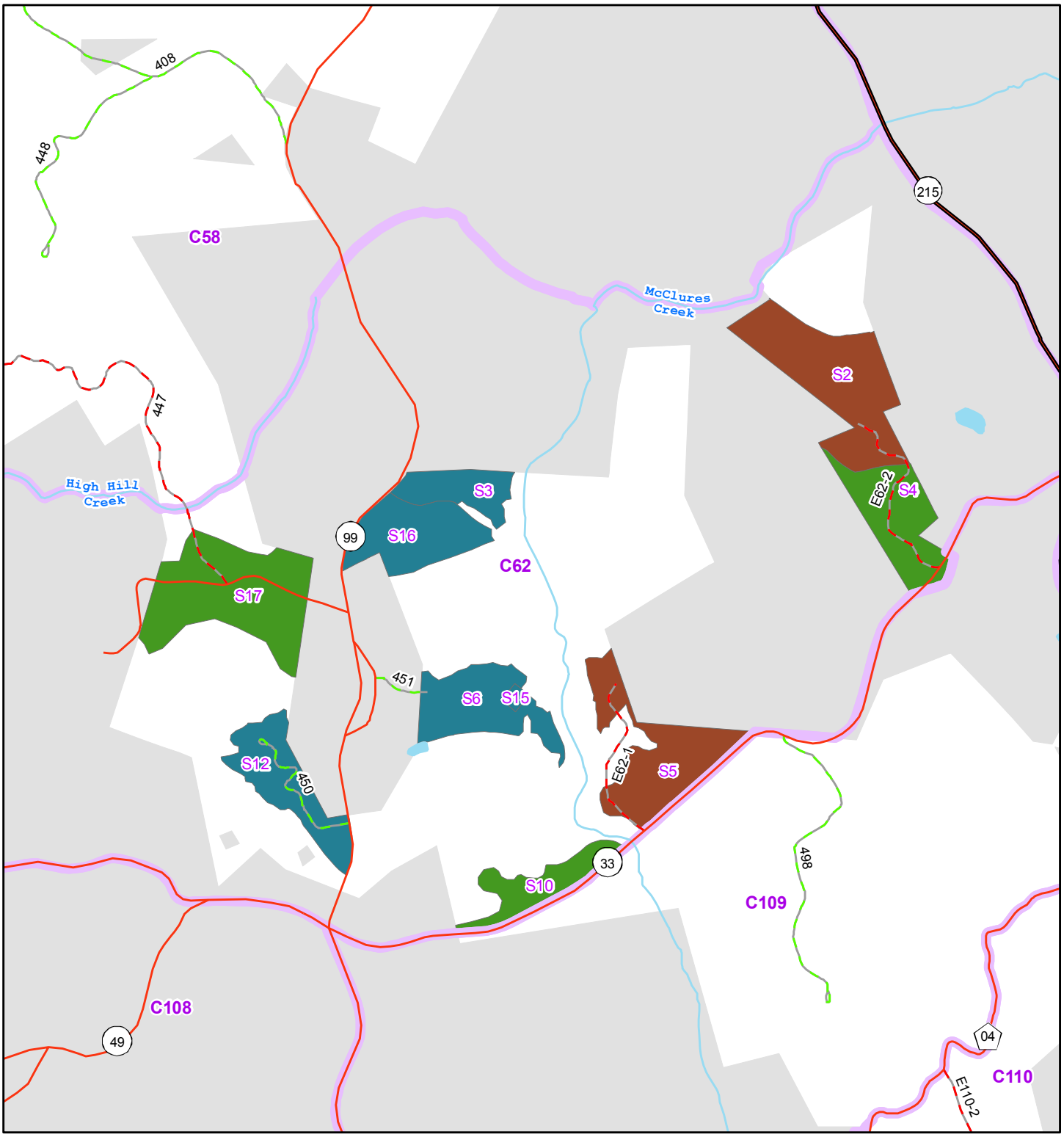
gholden, 1/21/2016



0 0.125 0.25 0.5 0.75 Miles

First Thin
Intermediate Thin
Seedtree with Reserves
Private Land
Forest Service Land
Forest Boundary
Forest Compartment
US/State Highway
Other Public Road
Open Forest Service Road
Closed Forest Service Road

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 3
Compartment: 0062
Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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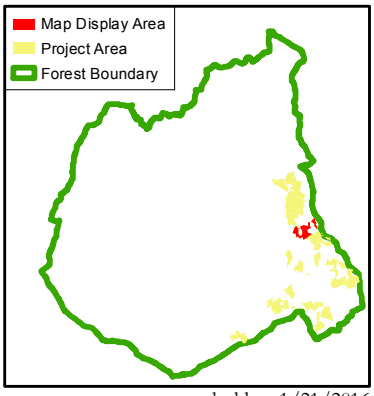

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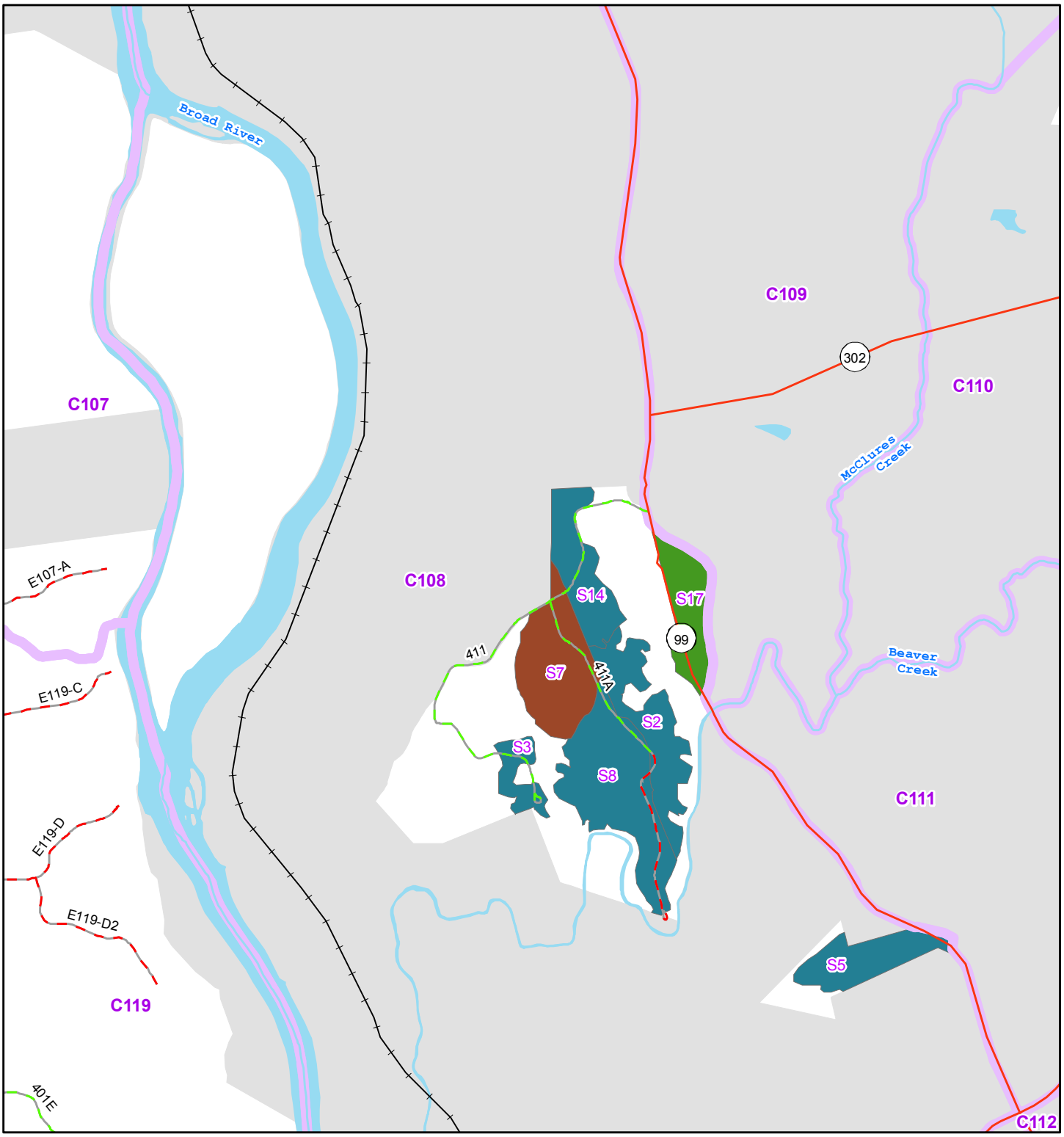
gholden, 1/21/2016



0 0.125 0.25 0.5 0.75 Miles

- First Thin
- Intermediate Thin
- Seedtree with Reserves
- Private Land
- Forest Service Land
- Forest Boundary
- Forest Compartment
- Other Public Road
- Open Forest Service Road
- Closed Forest Service Road
- Railroad

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 3
Compartment: 0108

Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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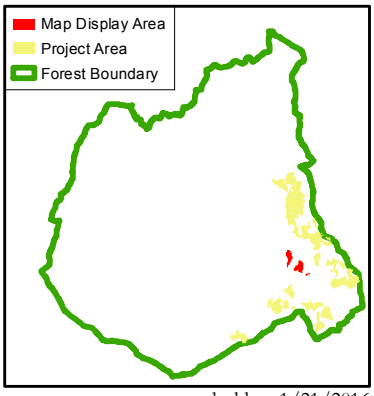

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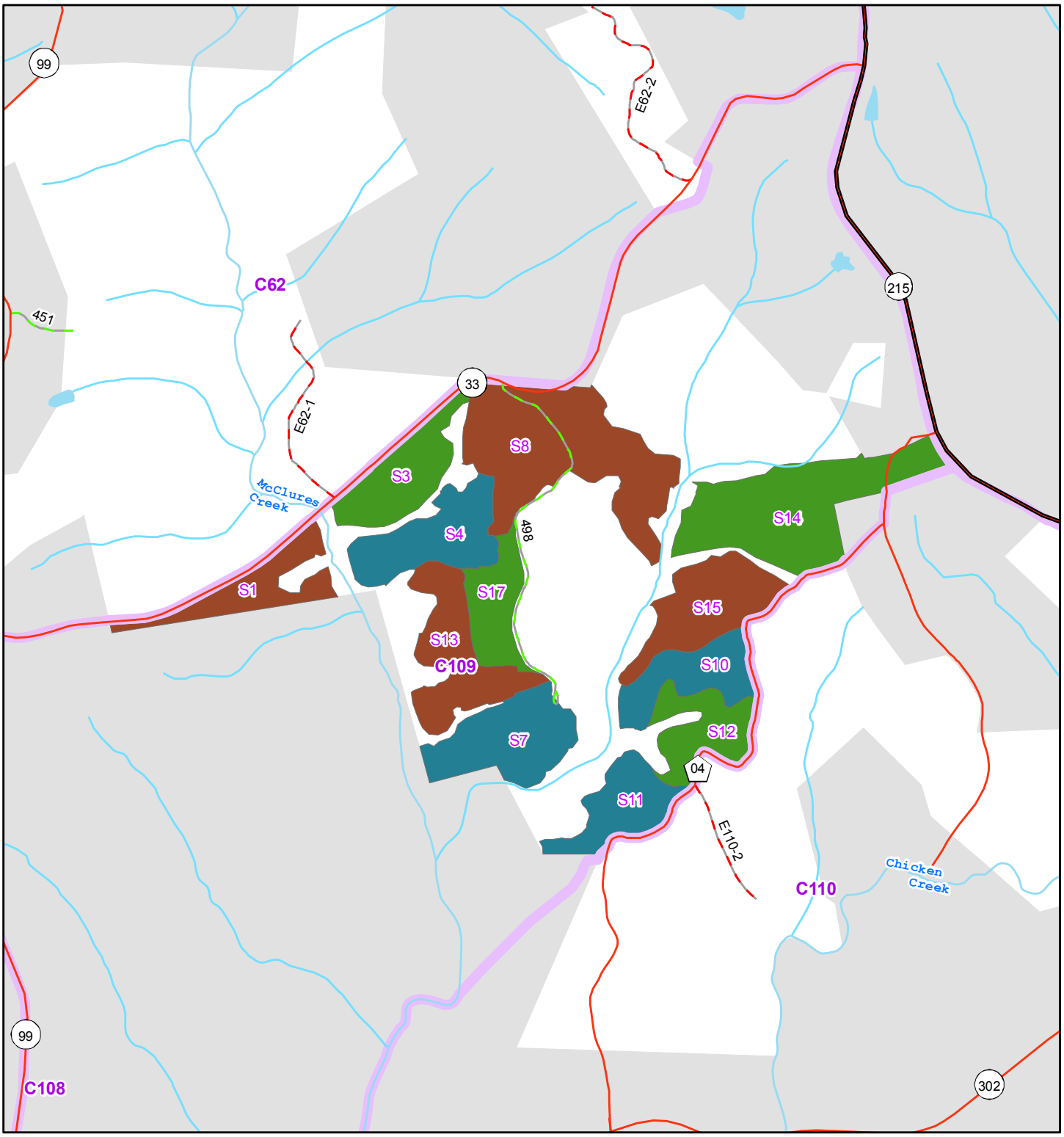
gholden, 1/21/2016



0 0.125 0.25 0.5 Miles

First Thin
Intermediate Thin
Seedtree with Reserves
Private Land
Forest Service Land
Forest Boundary
Forest Compartment
US/State Highway
Other Public Road
Open Forest Service Road
Closed Forest Service Road

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 3
Compartment: 0109
Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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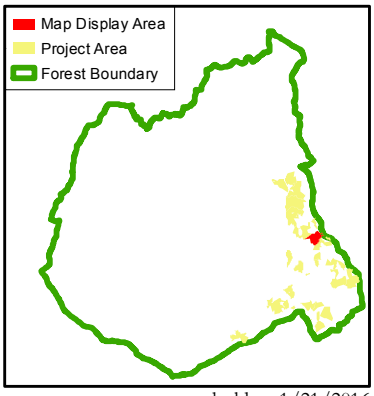

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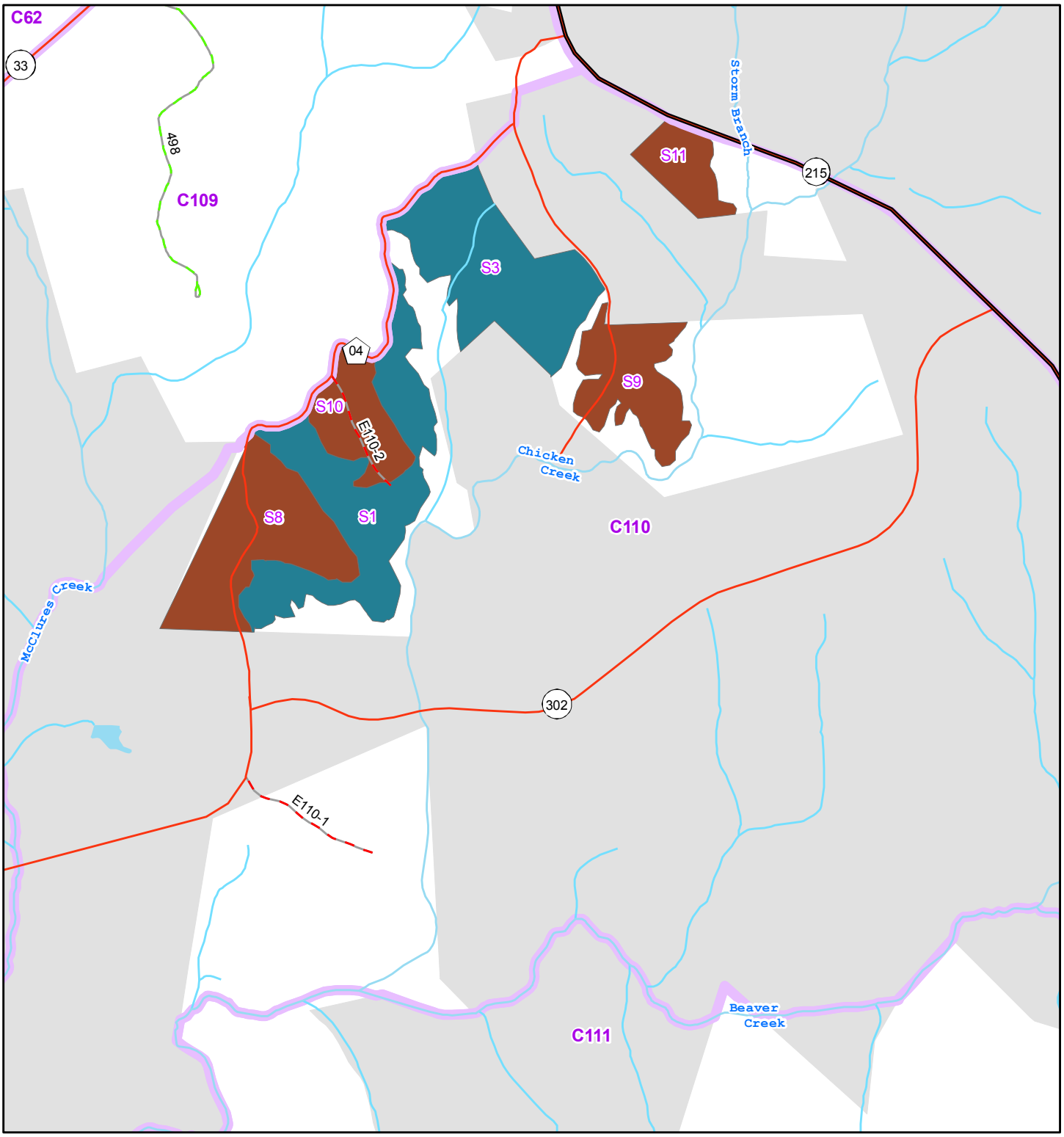
gholden, 1/21/2016



0 0.125 0.25 0.5 Miles

First Thin
Intermediate Thin
Private Land
Forest Service Land
Forest Boundary
Forest Compartment
US/State Highway
Other Public Road
Open Forest Service Road
Closed Forest Service Road

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 3
Compartment: 0110
Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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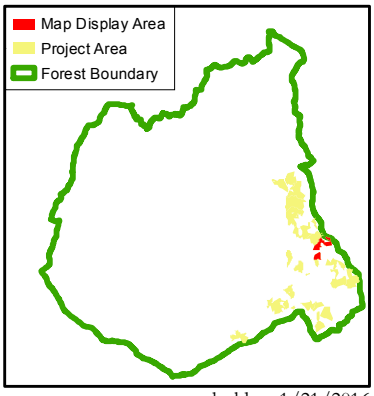

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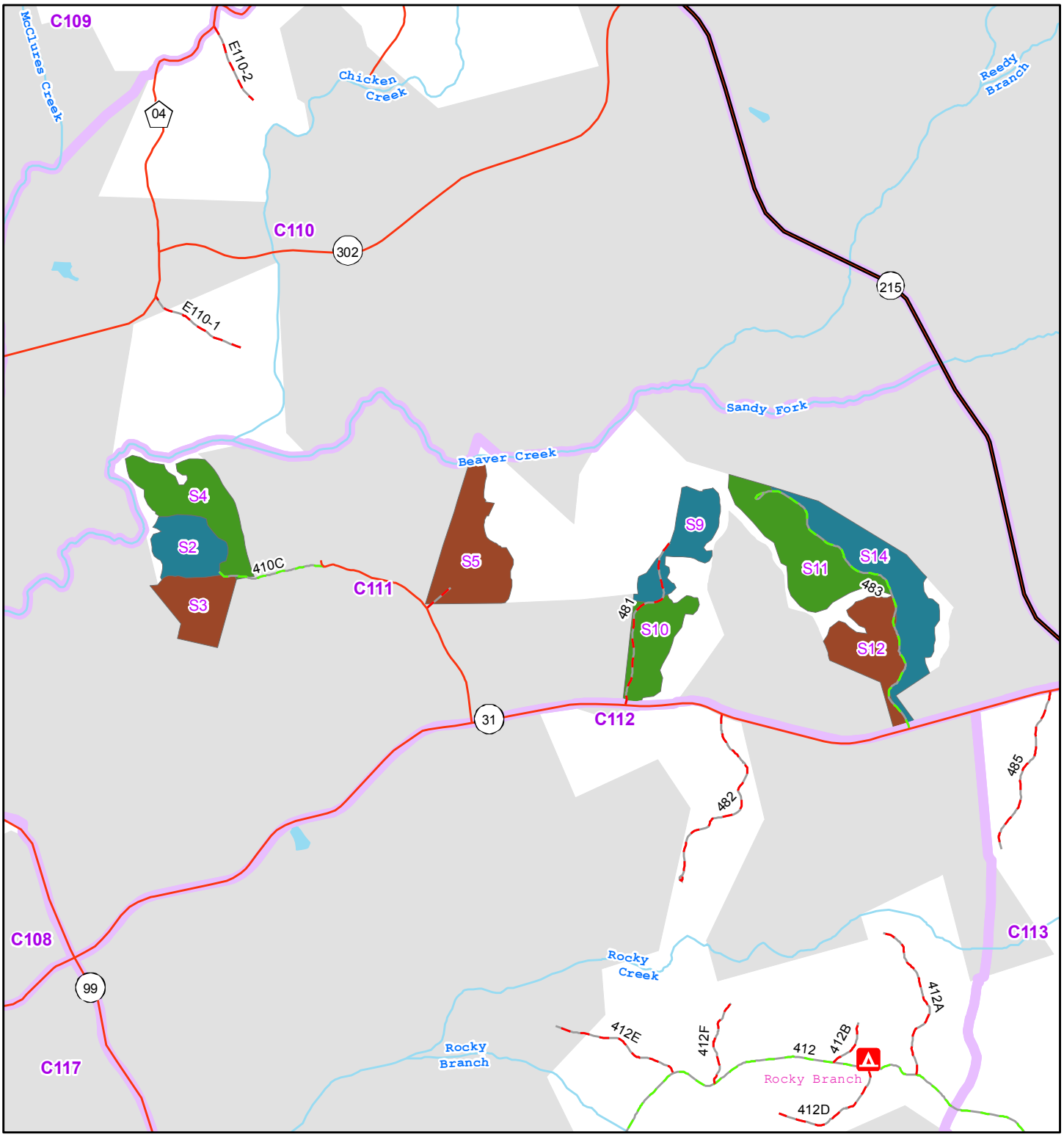
gholden, 1/21/2016



0 0.125 0.25 0.5 0.75 1 Miles

First Thin
Intermediate Thin
Seedtree with Reserves
Private Land
Forest Service Land
Forest Boundary
Forest Compartment
US/State Highway
Other Public Road
Open Forest Service Road
Closed Forest Service Road

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 3

Compartment: 0111

Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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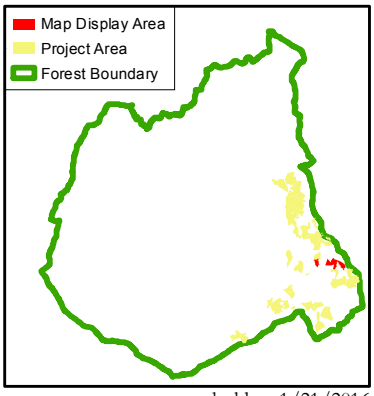

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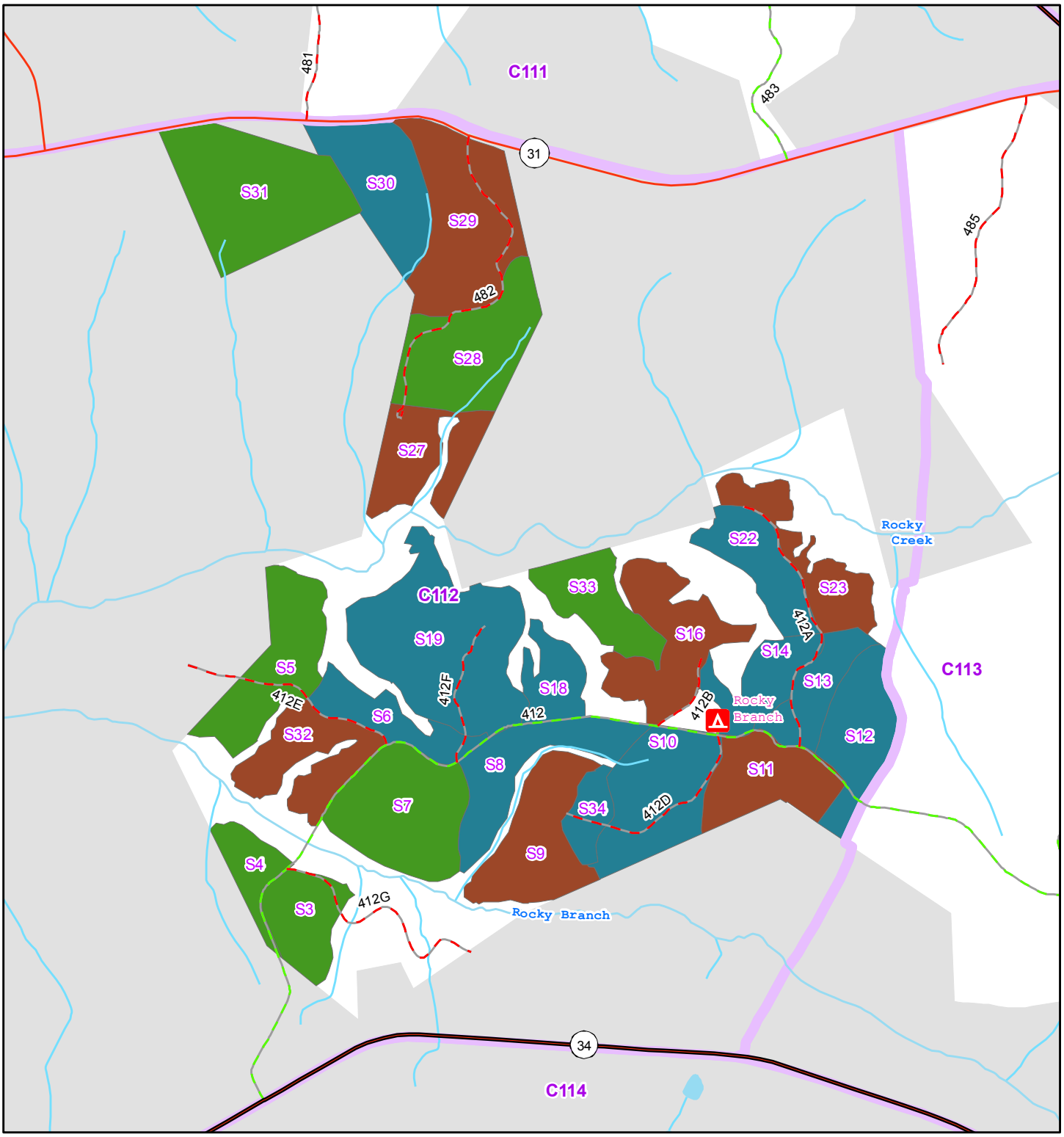
gholden, 1/21/2016



0 0.125 0.25 0.5 Miles

- First Thin
- Intermediate Thin
- Seedtree with Reserves
- Private Land
- Forest Service Land
- Forest Boundary
- Forest Compartment
- US/State Highway
- Other Public Road
- Open Forest Service Road
- Closed Forest Service Road

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 3

Compartment: 0112

Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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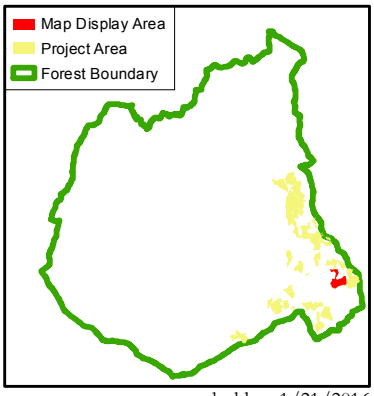

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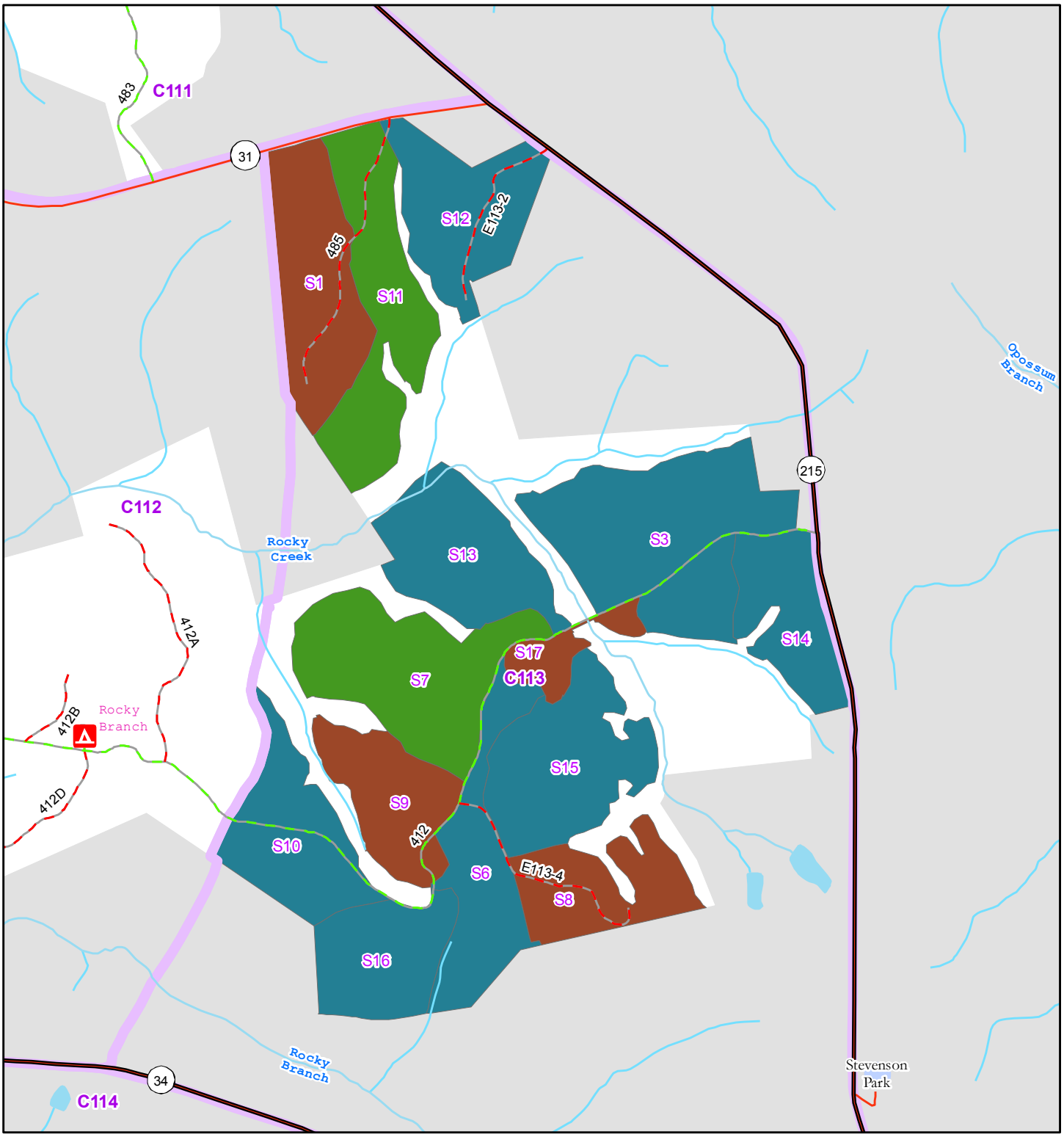
gholden, 1/21/2016



First Thin
Intermediate Thin
Seedtree with Reserves
Private Land
Forest Service Land
County/Municipal Land
Forest Boundary
Forest Compartment
US/State Highway
Other Public Road
Open Forest Service Road
Closed Forest Service Road

0 0.125 0.25 0.5 Miles

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 3
Compartment: 0113
Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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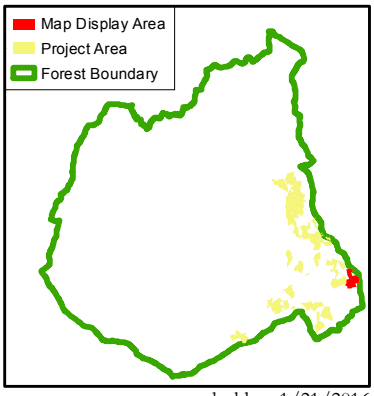

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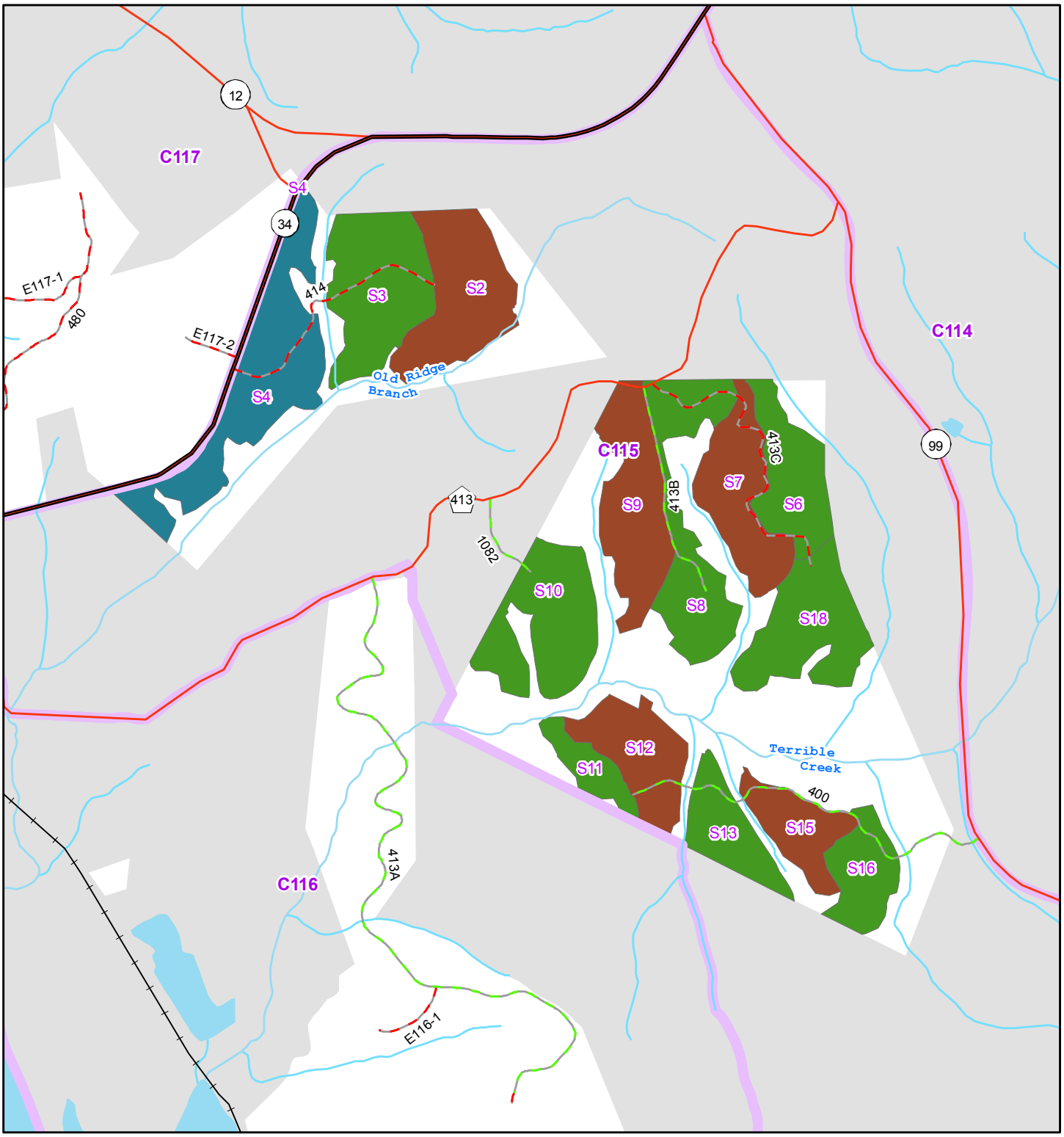
gholden, 1/21/2016



0 0.125 0.25 0.5 Miles

- First Thin
- Intermediate Thin
- Seedtree with Reserves
- Private Land
- Forest Service Land
- Forest Boundary
- Forest Compartment
- US/State Highway
- Other Public Road
- Open Forest Service Road
- Closed Forest Service Road
- Railroad

Lower Broad Analysis Area EA

Treatment Unit Map - Alternative 3

Compartment: 0115

Sumter National Forest

Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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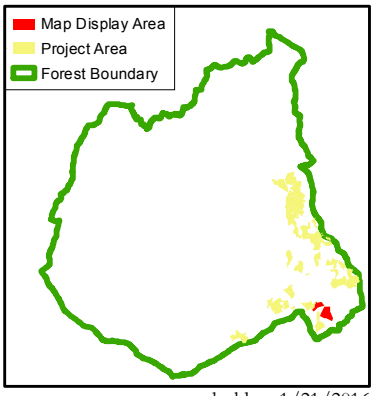

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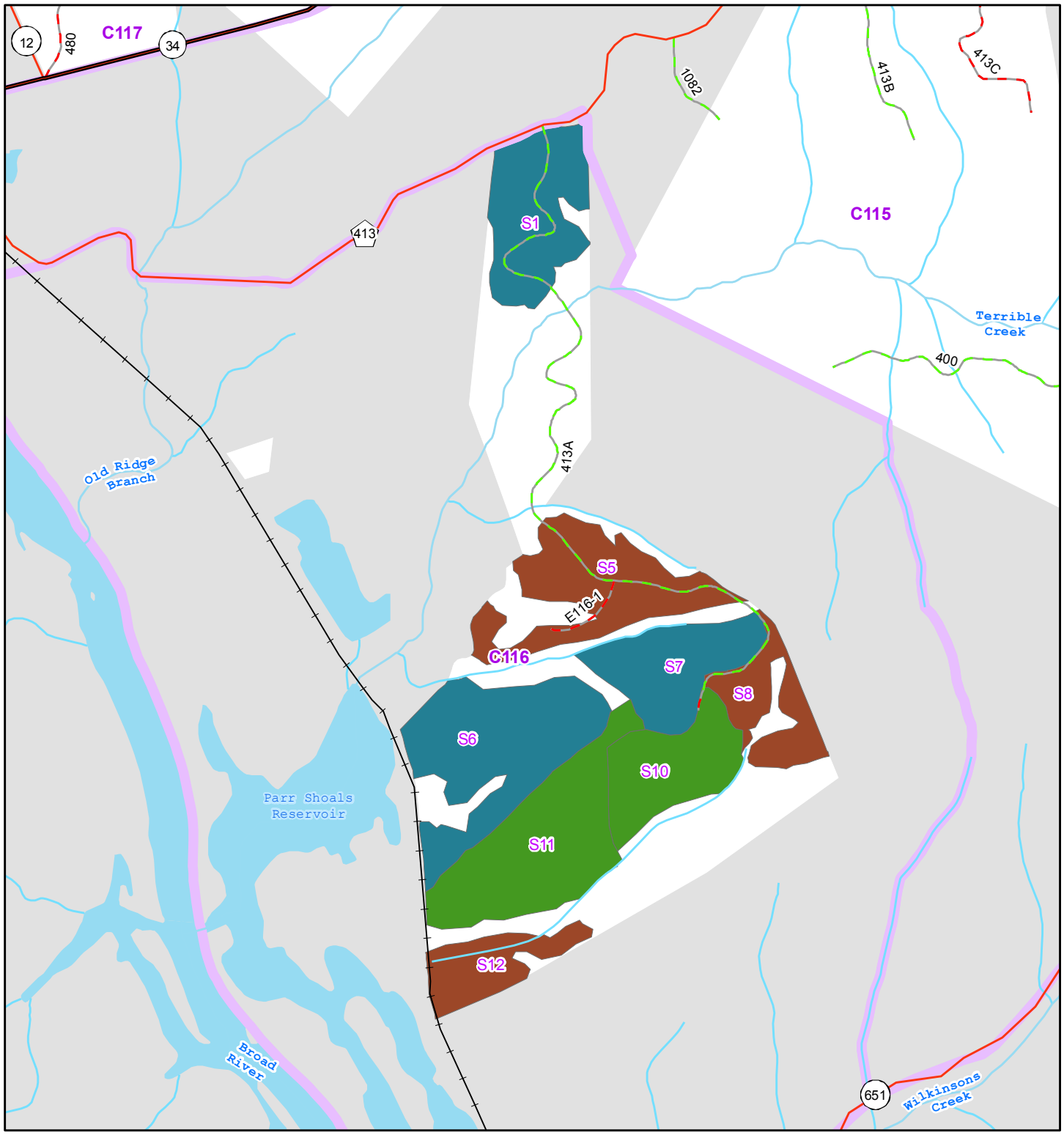
gholden, 1/21/2016



First Thin
Intermediate Thin
Seedtree with Reserves
Private Land
Forest Service Land
Forest Boundary
Forest Compartment
US/State Highway
Other Public Road
Open Forest Service Road
Closed Forest Service Road
Railroad

0 0.125 0.25 0.5 Miles

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 3
Compartment: 0116
Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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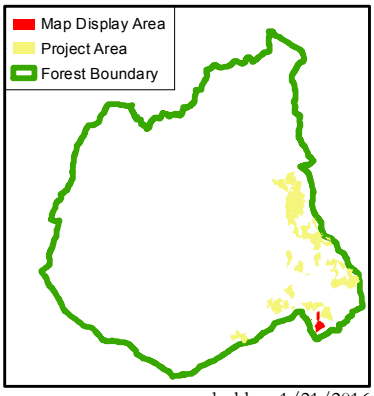

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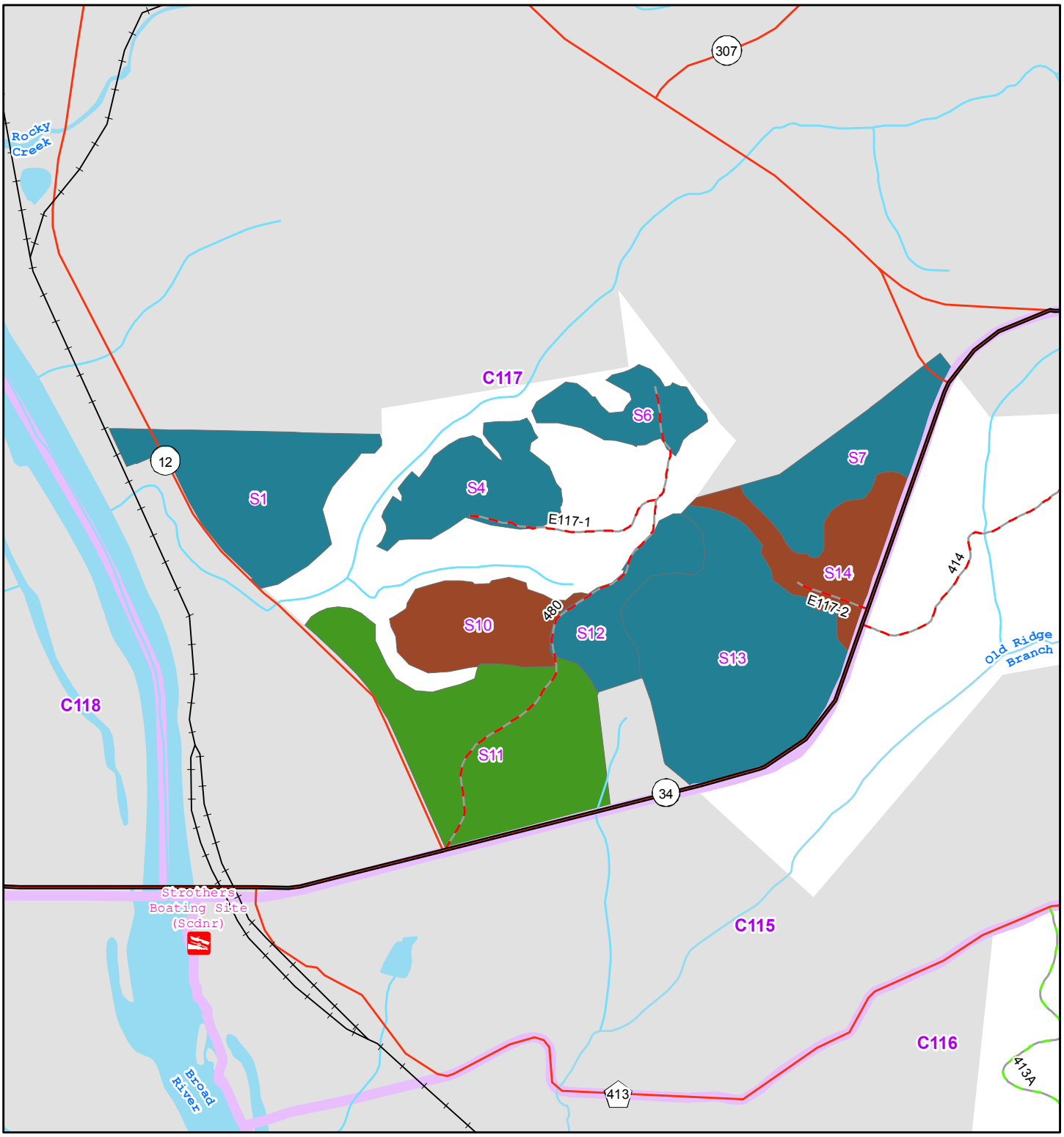
gholden, 1/21/2016



First Thin
Intermediate Thin
Seedtree with Reserves
Private Land
Forest Service Land
Forest Boundary
Forest Compartment
US/State Highway
Other Public Road
Open Forest Service Road
Closed Forest Service Road
Railroad

0 0.125 0.25 0.5 Miles

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 3
Compartment: 0117
Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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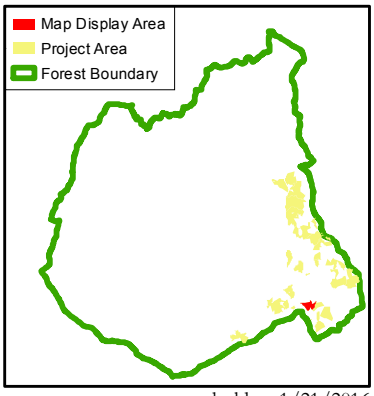

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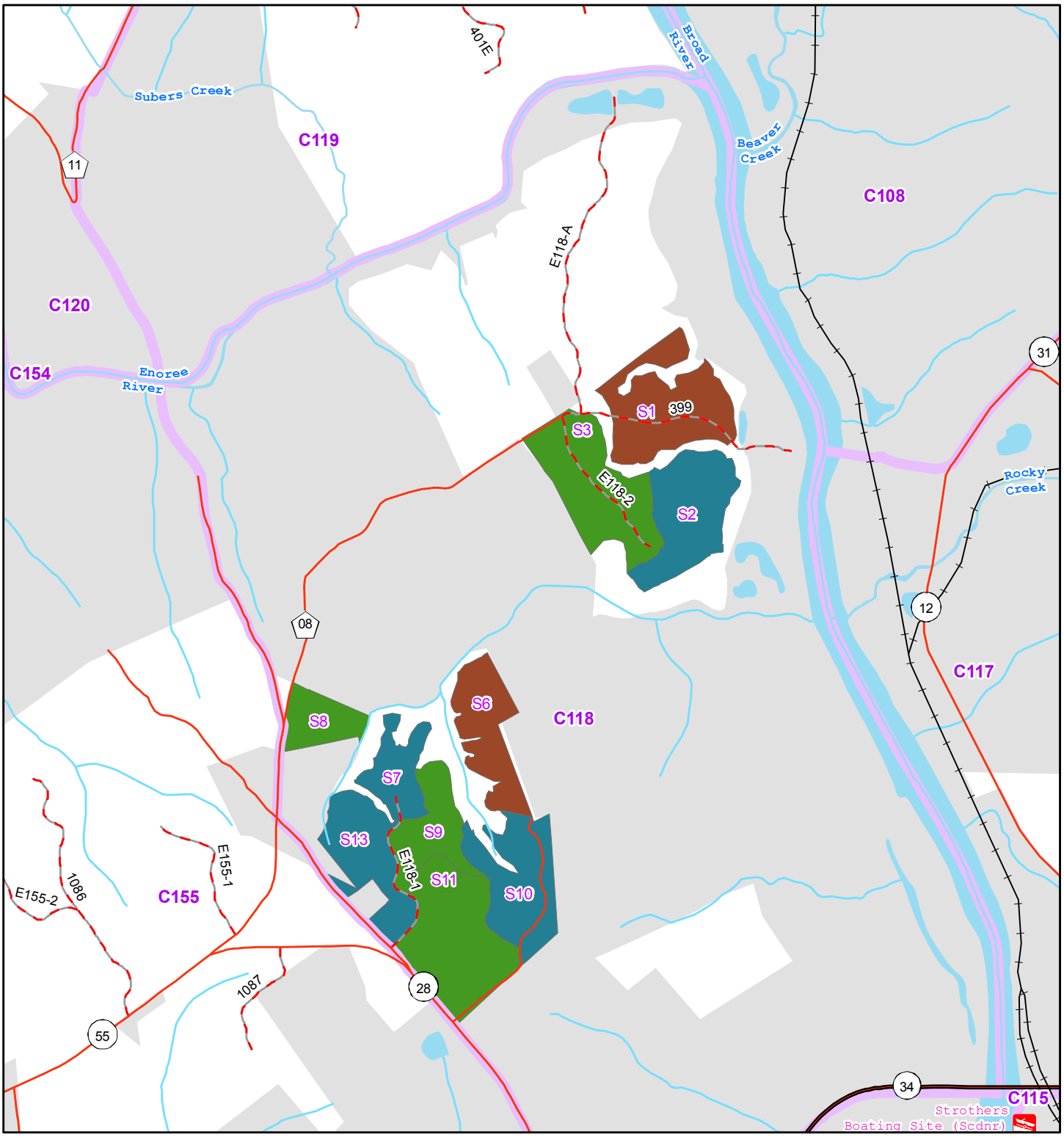
gholden, 1/21/2016



0 0.125 0.25 0.5 0.75 Miles

- First Thin
- Intermediate Thin
- Seedtree with Reserves
- Private Land
- Forest Service Land
- Forest Boundary
- Forest Compartment
- US/State Highway
- Other Public Road
- Closed Forest Service Road
- Railroad

Lower Broad Analysis Area EA

Treatment Unit Map - Alternative 3

Compartment: 0118

Sumter National Forest

Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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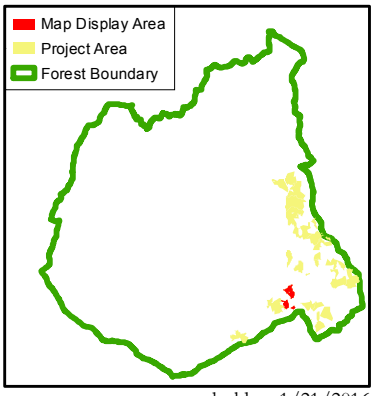

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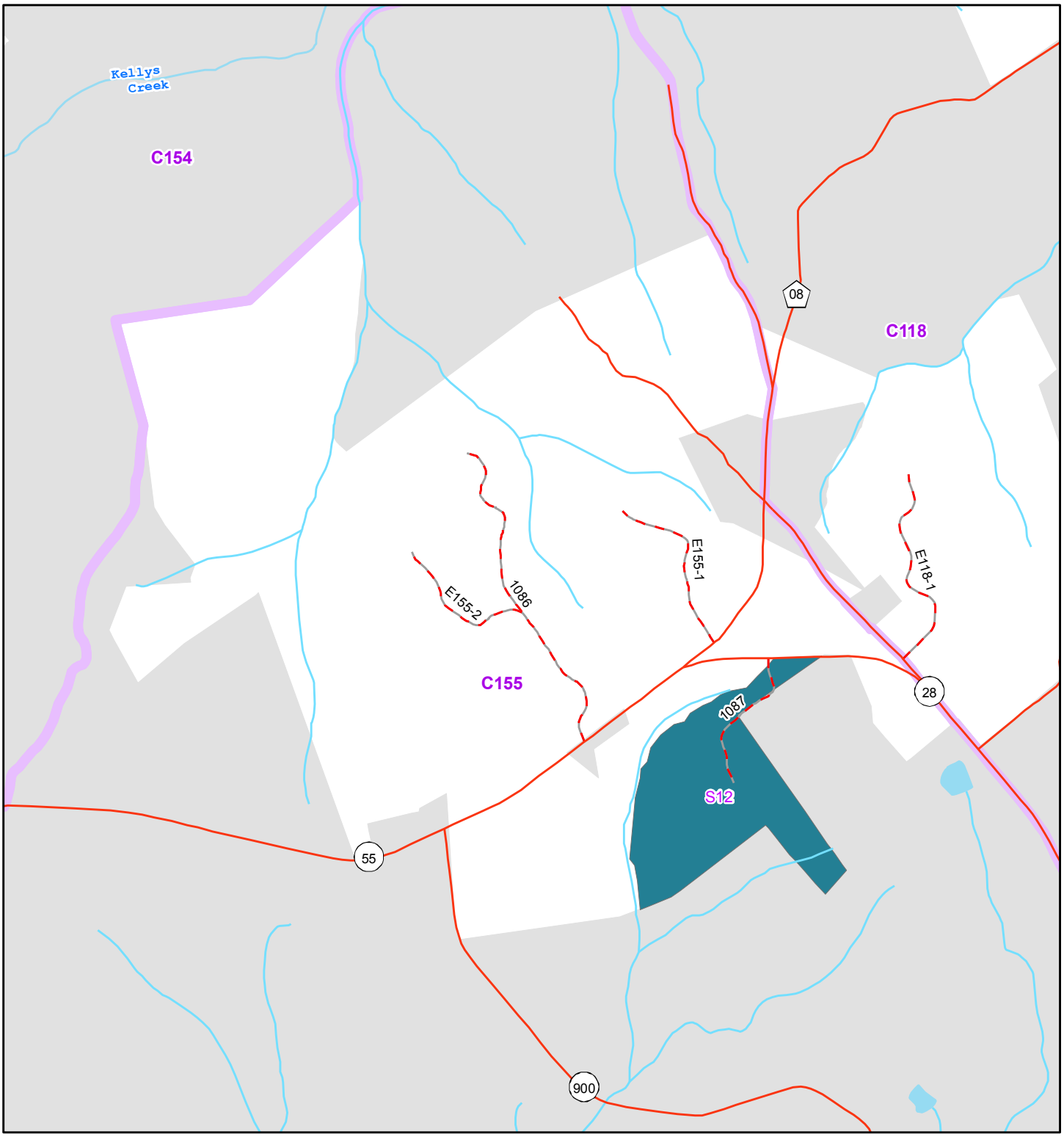
gholden, 1/21/2016



0 0.125 0.25 0.5 Miles

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 3

Compartment: 0155

Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

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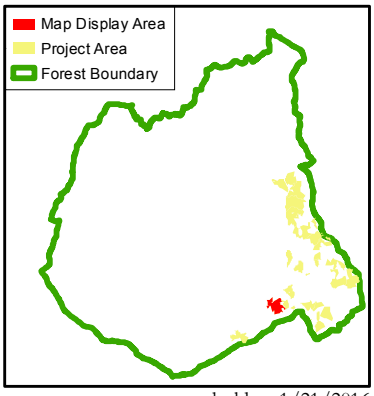
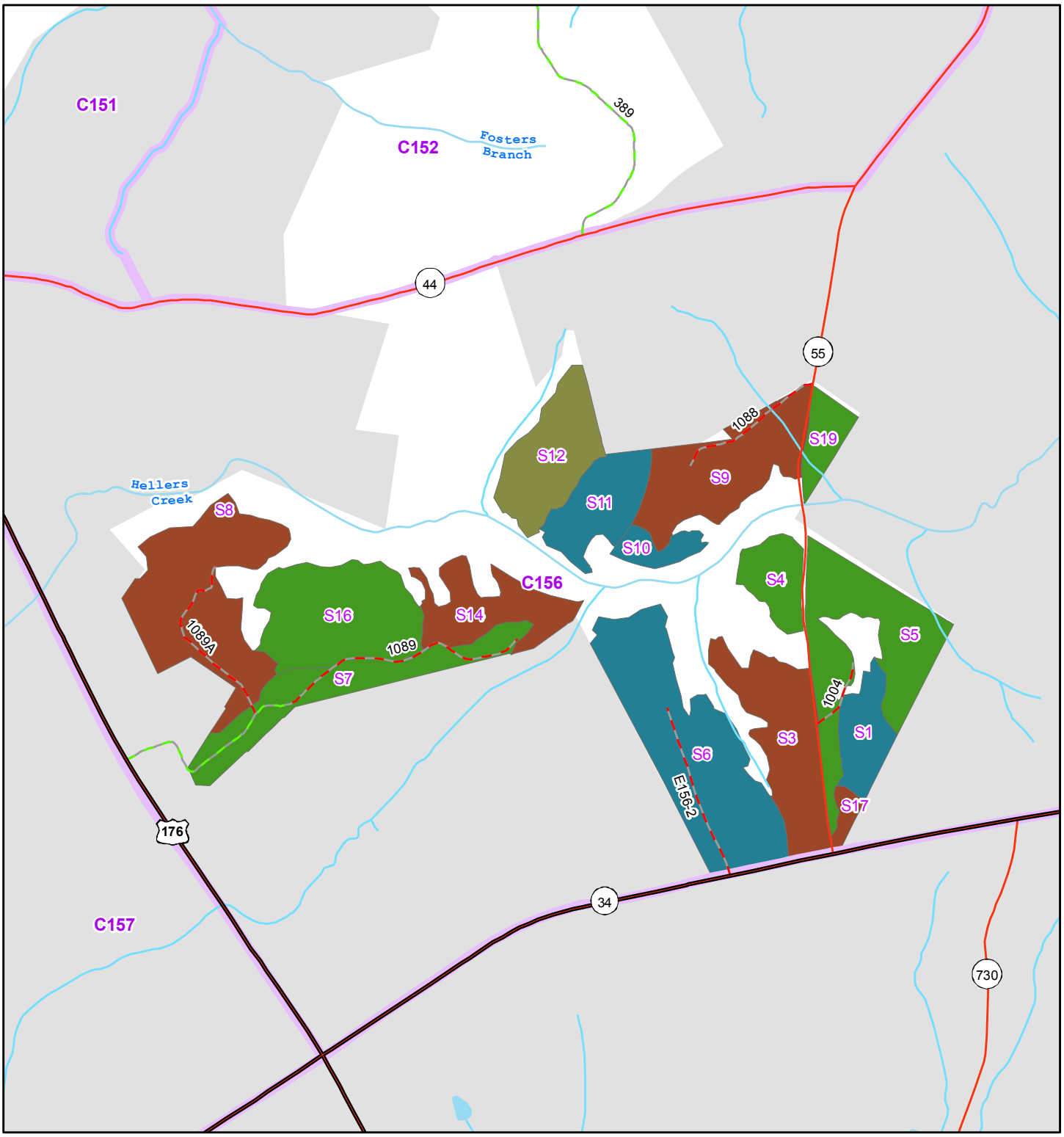
- Intermediate Thin
- Private Land
- Forest Service Land
- Forest Boundary
- Forest Compartment
- Other Public Road
- Closed Forest Service Road



N

gholden, 1/21/2016



First Thin
Intermediate Thin
Seedtree with Reserves
Shortleaf Pine Restoration
Private Land
Forest Service Land
Forest Boundary
Forest Compartment
US/State Highway
Other Public Road
Open Forest Service Road
Closed Forest Service Road

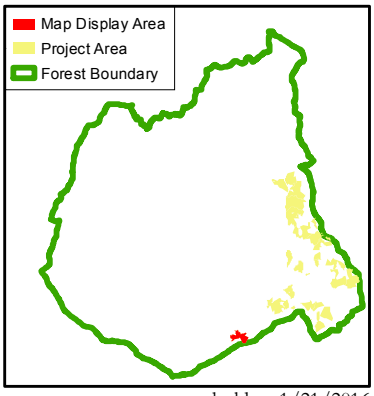
0 0.125 0.25 0.5 Miles

Lower Broad Analysis Area EA
Treatment Unit Map - Alternative 3
Compartment: 0156
Sumter National Forest
Enoree Ranger District

Coordinate System: NAD 1983 UTM Zone 17N

Data Source: USFS, USGS, SCDOT, SCDNR

Disclaimer: The USDA Forest Service makes no warranty, expressed or implied, regarding the data displayed on the map, and reserves the right to correct, update, modify, or replace this information without notification.



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gholden, 1/21/2016

Lower Broad Alternative 2 Compartment/Stand Treatments

Compartment	Stand	TREATMENT	Acres
0054	1	Intermediate Thin	27
0054	2	First Thin	33
0054	5	Intermediate Thin	26
0054	8	Intermediate Thin	11
0054	9	First Thin	32
0054	11	Intermediate Thin	35
0054	13	Shelterwood	14
0054	15	First Thin	49
0055	2	Shortleaf Pine Restore	13
0055	5	Intermediate Thin	29
0055	6	Intermediate Thin	24
0055	8	Shortleaf Pine Restore	20
0055	11	Intermediate Thin	16
0055	12	First Thin	49
0055	13	Clearcut with Reserves	17
0055	14	Intermediate Thin	30
0056	1	Shelterwood	57
0056	2	Intermediate Thin	53
0056	3	Clearcut with Reserves	73
0056	4	First Thin	33
0056	5	Intermediate Thin	37
0056	6	Intermediate Thin	33
0056	7	First Thin	16

0056	9	Intermediate Thin	77
0056	10	Clearcut with Reserves	64
0056	11	Intermediate Thin	63
0056	12	Clearcut with Reserves	26
0056	13	Intermediate Thin	51
0056	17	First Thin	11
0056	18	Clearcut with Reserves	16
0057	1	Intermediate Thin	42
0057	2	Intermediate Thin	4
0057	3	First Thin	30
0057	4	Intermediate Thin	40
0057	5	Clearcut with Reserves	39
0057	6	Intermediate Thin	63
0057	7	First Thin	41
0057	8	Intermediate Thin	40
0057	9	Clearcut with Reserves	45
0057	10	First Thin	15
0057	11	Intermediate Thin	52
0057	12	Intermediate Thin	15
0057	13	Intermediate Thin	45
0057	15	Intermediate Thin	72
0057	16	Intermediate Thin	56
0057	18	Shelterwood	31
0057	21	Clearcut with Reserves	73
0057	23	Intermediate Thin	66

0057	24	Intermediate Thin	47
0057	26	First Thin	38
0058	1	Intermediate Thin	78
0058	2	Intermediate Thin	33
0058	3	Clearcut with Reserves	28
0058	4	Intermediate Thin	122
0058	5	Intermediate Thin	97
0058	6	Intermediate Thin	36
0058	7	Shelterwood	54
0058	8	Intermediate Thin	49
0058	9	First Thin	65
0058	10	Shelterwood	52
0058	11	Intermediate Thin	59
0058	13	First Thin	70
0058	14	Intermediate Thin	95
0062	1	Intermediate Thin	47
0062	2	First Thin	70
0062	3	Intermediate Thin	22
0062	4	Clearcut with Reserves	41
0062	5	First Thin	55
0062	6	Intermediate Thin	40
0062	10	Clearcut with Reserves	27
0062	12	Intermediate Thin	38
0062	15	Intermediate Thin	2
0062	16	Intermediate Thin	40

0062	17	Clearcut with Reserves	75
0062	21	Clearcut with Reserves	32
0108	2	Intermediate Thin	38
0108	3	Intermediate Thin	12
0108	4	Intermediate Thin	8
0108	5	Intermediate Thin	27
0108	7	First Thin	45
0108	8	Intermediate Thin	62
0108	14	Intermediate Thin	30
0108	17	Clearcut with Reserves	30
0109	1	First Thin	26
0109	3	Clearcut with Reserves	30
0109	4	Intermediate Thin	32
0109	5	Intermediate Thin	31
0109	6	Intermediate Thin	28
0109	7	Intermediate Thin	35
0109	8	First Thin	76
0109	10	Intermediate Thin	25
0109	11	Intermediate Thin	25
0109	12	Clearcut with Reserves	25
0109	13	First Thin	35
0109	14	Clearcut with Reserves	65
0109	15	First Thin	34
0109	17	Clearcut with Reserves	21
0109	19	Intermediate Thin	68

0110	1	Intermediate Thin	91
0110	2	Clearcut with Reserves	78
0110	3	Intermediate Thin	83
0110	8	First Thin	68
0110	9	First Thin	42
0110	10	First Thin	32
0110	11	First Thin	21
0111	2	Intermediate Thin	33
0111	3	First Thin	34
0111	4	Clearcut with Reserves	53
0111	5	First Thin	60
0111	6	Intermediate Thin	197
0111	9	Intermediate Thin	35
0111	10	Clearcut with Reserves	39
0111	11	Clearcut with Reserves	68
0111	12	First Thin	45
0111	14	Intermediate Thin	69
0112	3	Clearcut with Reserves	20
0112	4	Clearcut with Reserves	12
0112	5	Clearcut with Reserves	33
0112	6	Intermediate Thin	17
0112	7	Clearcut with Reserves	42
0112	8	Intermediate Thin	28
0112	9	First Thin	33
0112	10	Intermediate Thin	37

0112	11	First Thin	27
0112	12	Intermediate Thin	28
0112	13	Intermediate Thin	17
0112	14	Intermediate Thin	18
0112	16	First Thin	34
0112	18	Intermediate Thin	14
0112	19	Intermediate Thin	66
0112	22	Intermediate Thin	21
0112	23	First Thin	22
0112	27	First Thin	25
0112	28	Clearcut with Reserves	40
0112	29	First Thin	49
0112	30	Intermediate Thin	32
0112	31	Clearcut with Reserves	54
0112	32	First Thin	27
0112	33	Clearcut with Reserves	21
0112	34	Intermediate Thin	9
0113	1	First Thin	64
0113	3	Intermediate Thin	100
0113	6	Intermediate Thin	51
0113	7	Clearcut with Reserves	77
0113	8	First Thin	43
0113	9	First Thin	43
0113	10	Intermediate Thin	54
0113	11	Clearcut with Reserves	67

0113	12	Intermediate Thin	55
0113	13	Intermediate Thin	56
0113	14	Intermediate Thin	42
0113	15	Intermediate Thin	64
0113	16	Intermediate Thin	43
0113	17	First Thin	15
0115	2	First Thin	50
0115	3	Clearcut with Reserves	54
0115	4	Intermediate Thin	75
0115	6	Clearcut with Reserves	34
0115	7	First Thin	41
0115	8	Clearcut with Reserves	47
0115	9	First Thin	48
0115	10	Clearcut with Reserves	50
0115	11	Clearcut with Reserves	14
0115	12	First Thin	34
0115	13	Clearcut with Reserves	25
0115	15	First Thin	24
0115	16	Clearcut with Reserves	25
0115	18	Clearcut with Reserves	45
0116	1	Intermediate Thin	46
0116	5	First Thin	53
0116	6	Intermediate Thin	68
0116	7	Intermediate Thin	37
0116	8	First Thin	25

0116	10	Clearcut with Reserves	36
0116	11	Clearcut with Reserves	64
0116	12	First Thin	23
0117	1	Intermediate Thin	47
0117	4	Intermediate Thin	29
0117	6	Intermediate Thin	17
0117	7	Intermediate Thin	32
0117	10	First Thin	28
0117	12	Intermediate Thin	22
0117	14	First Thin	28
0117	13	Intermediate Thin	84
0117	11	Clearcut with Reserves	73
0118	1	First Thin	47
0118	10	Intermediate Thin	40
0118	13	Intermediate Thin	34
0118	2	Intermediate Thin	40
0118	3	Clearcut with Reserves	49
0118	6	First Thin	30
0118	7	Intermediate Thin	19
0118	8	Clearcut with Reserves	17
0118	9	Clearcut with Reserves	24
0118	11	Clearcut with Reserves	55
0155	12	Intermediate Thin	77
0156	1	Intermediate Thin	14
0156	3	First Thin	36

0156	4	Clearcut with Reserves	13
0156	5	Clearcut with Reserves	45
0156	6	Intermediate Thin	65
0156	7	Clearcut with Reserves	32
0156	8	First Thin	55
0156	9	First Thin	39
0156	10	Intermediate Thin	7
0156	11	Intermediate Thin	21
0156	12	Shortleaf Pine Restore	29
0156	14	First Thin	24
0156	16	Clearcut with Reserves	43
0156	17	First Thin	3
0156	19	Clearcut with Reserves	9

Lower Broad Alternative 3 Compartment/Stand Treatments

Compartment	Stand	Treatment	Acres
0054	1	Intermediate Thin	27
0054	2	First Thin	33
0054	5	Intermediate Thin	26
0054	8	Intermediate Thin	11
0054	9	First Thin	32
0054	11	Intermediate Thin	35
0054	13	Shelterwood	14
0054	15	First Thin	49
0055	2	Shortleaf Pine Restore	13
0055	5	Intermediate Thin	29
0055	6	Intermediate Thin	24
0055	11	Intermediate Thin	16
0055	12	First Thin	49
0055	13	Seedtree with Reserves	17
0055	14	Intermediate Thin	30
0056	1	Shelterwood	57
0056	2	Intermediate Thin	53
0056	3	Seedtree with Reserves	73
0056	4	First Thin	33
0056	5	Intermediate Thin	37
0056	6	Intermediate Thin	33
0056	7	First Thin	16
0056	9	Intermediate Thin	77
0056	10	Seedtree with Reserves	64
0056	11	Intermediate Thin	63
0056	12	Seedtree with Reserves	26
0056	13	Intermediate Thin	51
0056	17	First Thin	11
0056	18	Seedtree with Reserves	16
0057	1	Intermediate Thin	42
0057	2	Intermediate Thin	4
0057	3	First Thin	30
0057	4	Intermediate Thin	40
0057	5	Seedtree with Reserves	39
0057	6	Intermediate Thin	63
0057	7	First Thin	41
0057	8	Intermediate Thin	40
0057	9	Seedtree with Reserves	45
0057	10	First Thin	15
0057	11	IntermediateThin	52

0057	12	Intermediate Thin	15
0057	13	Intermediate Thin	45
0057	15	Intermediate Thin	72
0057	16	Intermediate Thin	56
0057	18	Shelterwood	31
0057	21	Seedtree with Reserves	73
0057	23	Intermediate Thin	66
0057	24	Intermediate Thin	47
0057	26	First Thin	38
0058	1	Intermediate Thin	78
0058	2	Intermediate Thin	33
0058	3	Seedtree with Reserves	28
0058	4	Intermediate Thin	122
0058	5	Intermediate Thin	97
0058	6	Intermediate Thin	36
0058	7	Shelterwood	54
0058	8	Intermediate Thin	49
0058	9	First Thin	65
0058	10	Shelterwood	52
0058	11	Intermediate Thin	59
0058	13	First Thin	70
0062	2	First Thin	70
0062	3	Intermediate Thin	22
0062	4	Seedtree with Reserves	41
0062	5	First Thin	55
0062	6	Intermediate Thin	40
0062	10	Seedtree with Reserves	27
0062	12	Intermediate Thin	38
0062	15	Intermediate Thin	2
0062	16	Intermediate Thin	40
0062	17	Seedtree with Reserves	75
0108	2	Intermediate Thin	38
0108	3	Intermediate Thin	12
0108	5	Intermediate Thin	27
0108	7	First Thin	45
0108	8	Intermediate Thin	62
0108	14	Intermediate Thin	30
0108	17	Seedtree with Reserves	30
0109	1	First Thin	26
0109	3	Seedtree with Reserves	30
0109	4	Intermediate Thin	32
0109	7	Intermediate Thin	35
0109	8	First Thin	76

0109	10	Intermediate Thin	25
0109	11	Intermediate Thin	25
0109	12	Seedtree with Reserves	25
0109	13	First Thin	35
0109	14	Seedtree with Reserves	65
0109	15	First Thin	34
0109	17	Seedtree with Reserves	21
0110	1	Intermediate Thin	91
0110	3	Intermediate Thin	83
0110	8	First Thin	68
0110	9	First Thin	42
0110	10	First Thin	32
0110	11	First Thin	21
0111	2	Intermediate Thin	33
0111	3	First Thin	34
0111	4	Seedtree with Reserves	53
0111	5	First Thin	60
0111	9	Intermediate Thin	35
0111	10	Seedtree with Reserves	39
0111	11	Seedtree with Reserves	68
0111	12	First Thin	45
0111	14	Intermediate Thin	69
0112	3	Seedtree with Reserves	20
0112	4	Seedtree with Reserves	12
0112	5	Seedtree with Reserves	33
0112	6	Intermediate Thin	17
0112	7	Seedtree with Reserves	42
0112	8	Intermediate Thin	28
0112	9	First Thin	33
0112	10	Intermediate Thin	37
0112	11	First Thin	27
0112	12	Intermediate Thin	28
0112	13	Intermediate Thin	17
0112	14	Intermediate Thin	18
0112	16	First Thin	34
0112	18	Intermediate Thin	14
0112	19	Intermediate Thin	66
0112	22	Intermediate Thin	21
0112	23	First Thin	22
0112	27	First Thin	25
0112	28	Seedtree with Reserves	40
0112	29	First Thin	49
0112	30	Intermediate Thin	32

0112	31	Seedtree with Reserves	54
0112	32	First Thin	27
0112	33	Seedtree with Reserves	21
0112	34	Intermediate Thin	9
0113	1	First Thin	64
0113	3	Intermediate Thin	100
0113	6	Intermediate Thin	51
0113	7	Seedtree with Reserves	77
0113	8	First Thin	43
0113	9	First Thin	43
0113	10	Intermediate Thin	54
0113	11	Seedtree with Reserves	67
0113	12	Intermediate Thin	55
0113	13	Intermediate Thin	56
0113	14	Intermediate Thin	42
0113	15	Intermediate Thin	64
0113	16	Intermediate Thin	43
0113	17	First Thin	15
0115	2	First Thin	50
0115	3	Seedtree with Reserves	54
0115	4	Intermediate Thin	75
0115	6	Seedtree with Reserves	34
0115	7	First Thin	41
0115	8	Seedtree with Reserves	47
0115	9	First Thin	48
0115	10	Seedtree with Reserves	50
0115	11	Seedtree with Reserves	14
0115	12	First Thin	34
0115	13	Seedtree with Reserves	25
0115	15	First Thin	24
0115	16	Seedtree with Reserves	25
0115	18	Seedtree with Reserves	45
0116	1	Intermediate Thin	46
0116	5	First Thin	53
0116	6	Intermediate Thin	68
0116	7	Intermediate Thin	37
0116	8	First Thin	25
0116	10	Seedtree with Reserves	36
0116	11	Seedtree with Reserves	64
0116	12	First Thin	23
0117	1	Intermediate Thin	47
0117	4	Intermediate Thin	29
0117	6	Intermediate Thin	17

0117	7	Intermediate Thin	32
0117	10	First Thin	28
0117	12	Intermediate Thin	22
0117	14	First Thin	28
0117	13	Intermediate Thin	84
0117	11	Seedtree with Reserves	73
0118	1	First Thin	47
0118	10	Intermediate Thin	40
0118	13	Intermediate Thin	34
0118	2	Intermediate Thin	40
0118	3	Seedtree with Reserves	49
0118	6	First Thin	30
0118	7	Intermediate Thin	19
0118	8	Seedtree with Reserves	17
0118	9	Seedtree with Reserves	24
0118	11	Seedtree with Reserves	55
0155	12	Intermediate Thin	77
0156	1	Intermediate Thin	14
0156	3	First Thin	36
0156	4	Seedtree with Reserves	13
0156	5	Seedtree with Reserves	45
0156	6	Intermediate Thin	65
0156	7	Seedtree with Reserves	32
0156	8	First Thin	55
0156	9	First Thin	39
0156	10	Intermediate Thin	7
0156	11	Intermediate Thin	21
0156	12	Shortleaf Pine Restore	29
0156	14	First Thin	24
0156	16	Seedtree with Reserves	43
0156	17	First Thin	3
0156	19	Seedtree with Reserves	9

BIOLOGICAL ASSESSMENT / BIOLOGICAL EVALUATION

Lower Broad Analysis Area

US Forest Service
Enoree Ranger District
Sumter National Forest
Chester, Fairfield, Newberry, and Union Counties
South Carolina

September 2015

I. INTRODUCTION

The purpose of this Biological Assessment/Biological Evaluation (BA/BE) is to determine whether the proposed action is likely to affect any proposed, endangered, threatened, or sensitive (PETS) species or their habitats.

Proposed, endangered, and threatened species are designated by the US Fish and Wildlife Service (USFWS) and are managed under the authority of the Endangered Species Act (ESA) (Public Law 93-205, as amended) and the National Forest Management Act (Public Law 94-588). The ESA requires Federal agencies to ensure that no actions that they "authorize, fund, or carry out" are likely to jeopardize the continued existence of any proposed, endangered, or threatened species or their habitat.

Sensitive species are managed under the authority of the National Forest Management Act requiring that National Forests manage for "viable populations of all native and desirable non-native species" both across the range of the species and within the planning area. Sensitive species designation occurs on a periodic basis through the recommendation of Forest Biologists who consult with local State Heritage Programs, The Nature Conservancy, and local species experts. The Regional Forester administratively designates sensitive species.

The objectives of this BA/BE are:

- To ensure that Forest Service actions do not contribute to the loss of viability of any PETS species;
- To comply with the requirements of the ESA; and
- To provide a process and standard to ensure PETS species receive full consideration in the decision-making process.

II. PROPOSED ACTION

The proposed action was reduced by 48 acres from what was scoped. Units within the foreground viewshed of the Broad River were reduced in size to be consistent with Forest Plan management prescription 7.E.1 – Dispersed Recreation Areas (Piedmont Only).

The proposed action would involve thinning and regeneration harvests in the Lower Broad Analysis Area (LBAA). Proposed silviculture prescriptions are listed in Table 1.

Commercial Thinning

Commercial thinning is proposed on 6,355 acres of loblolly pine stands. First thinnings are proposed in younger poletimber stands (less than 30 years old). Intermediate thinnings are proposed in older stands (30+ years old). The desired basal area would average from 60 to 80 square feet of basal area per acre for both first and intermediate thinnings.

Regeneration Clearcut with Reserves

Regeneration clearcut with reserves is proposed on 2,083 acres of loblolly pine stands. Healthy shortleaf pine and desirable hard mast species (oaks, hickories, etc.) that are eight inches or greater in diameter would be retained. Regeneration clearcut with reserves is subject to Forest Plan design standards applicable to even-age or two-aged regeneration management (*e.g.*, limitation of available suitable acres, size of area cut, and age of stands).

An herbicide site preparation treatment would be used prior to planting of loblolly pine seedlings to control sprouting and to release desirable oaks, hickories and loblolly/shortleaf pine trees.

Planting of 600 – 650 trees per acre of loblolly pine seedlings would take place during the dormant season (December-March). Approximately 3-5 years after planting loblolly pine, an herbicide release treatment may be prescribed if there is competition from undesirable tree species.

Shortleaf Pine Restoration - Regeneration Clearcut with Reserves

Field evaluations of three stands using the Campbell and Copeland (1954) risk rating for little leaf disease, indicate that suitable soil conditions exist for the restoration of shortleaf pine. All or portions of stand 12 (29 acres) in compartment 156 and stands 2 and 8 (13 and 20 acres, respectively) in compartment 55 would be targeted for shortleaf restoration totaling 62 acres. Healthy shortleaf pine and desirable hard mast species (oaks, hickories, etc.) that are eight inches or greater in diameter would be retained. Regeneration clearcut with reserves is subject to Forest Plan design standards applicable to even-age or two-aged regeneration management (*e.g.*, limitation of available suitable acres, size of area cut, and age of stands).

A herbicide site preparation treatment would be used prior to planting of shortleaf pine seedlings to control sprouting and to release desirable oaks, hickories, and shortleaf pine trees.

Planting of 600 – 650 trees per acre of shortleaf pine seedlings would take place during the dormant season (December-March). Approximately 3-5 years after planting shortleaf pine, a herbicide release treatment may be prescribed if there is competition from undesirable tree species. If after 5 years, shortleaf pine cannot be restored for ecological or management reasons, the area would be considered for regeneration to loblolly pine as described above under regeneration clearcut with reserves.

Shelterwood with Reserves

Shelterwood with reserves is proposed on 208 acres of loblolly pine stands. Shelterwood harvests would leave approximately 30 square feet per acre of basal area of trees to provide a seed source for natural regeneration, shade to favor shortleaf pine and oak over loblolly pine, and woody fuel to carry a fire in these stand. Merchantable pine and certain hardwood species would be harvested to achieve the basal area objective. Desirable hard mast species (oaks, hickories) and shortleaf pine that are eight inches or greater DBH would be retained. Herbicide site preparation treatments would be used to control sprouting and to release desirable oaks, hickories, and shortleaf pine trees. The overstory loblolly pine trees would be removed when the stands are stocked.

An herbicide release treatment would be prescribed after final removal of the loblolly overstory approximately 3-5 years after initial harvest.

A manual pre-commercial thinning would be completed after the loblolly pine trees have been removed. Herbicide treatments and pre-commercial thinning are described below.

Table 1 - List of timber management activity acres in the Lower Broad Analysis Area – Proposed Action

Treatment	Acres
Clearcut with Reserves	2,083
First Thin	2,092
Intermediate Thin	4,264
Shelterwood	208
Shortleaf Pine Restoration	62
Total	**8,710**

Site Preparation

Site preparation is scheduled after the initial regeneration harvest and before tree planting. Site preparation would occur only in the stands identified for regeneration harvest (clearcut with reserves, shortleaf pine restoration and shelterwood with reserves) and the purpose of site preparation is to reduce competition from less desired species, such as generation, sweetgum, red maple, winged elm, and yellow-poplar. In the shelterwood stands only chemical site preparation would be used to encourage both natural loblolly and hard mast regeneration. In clearcut stands site preparation would utilize herbicides (chemical site preparation) during the growing season (June through September) to control less desired species. Site preparation in clearcut stands differ from shelterwood stands in the desire to eliminate natural loblolly pine regeneration. The control of loblolly pine regeneration would utilize chemical site preparation followed by burning (March-June). Natural loblolly pine regeneration is difficult to control, and utilizing chemical, burning, and mechanical methods may be needed. Once the loblolly pine seedlings have been controlled (through chemical, burning and or manual treatments), the clear-cut areas would be planted to either loblolly or shortleaf pine.

Chemical Site Preparation

Chemical site preparation consists of the use of herbicides containing the active ingredients: Imazapyr (such as Arsenal AC or equivalent) and Triclopyr (Garlon 3A or Garlon 4 or equivalents). The herbicides would be applied to control sprouting of tree species, such as sweetgum and maple. The objective of the herbicide treatment is to promote the growth of selected species by limiting competition from non-preferred species. Preferred species, including shortleaf pine, oak, and hickory, would be selectively released from competition from undesirable species such as sweetgum, natural loblolly pine, yellow-poplar, red maple, sourwood, winged elm, blackgum, and other undesirable species. Herbicide treatments would occur between July and October.

Herbicides would be applied using foliar spray and hack-n-squirt methods (see Table 2 for methods and herbicide concentrations).

Foliar spray herbicides would be applied using a backpack sprayer to spray the foliage of targeted plants. A mixture containing 0.5 ounce of Arsenal AC (active ingredient Imazapyr), 0.5 ounce of Milestone (active ingredient aminopyralid), 5 ounces Accord XRT II (active ingredient Glyphosate), 2 ounces of Bullseye spray pattern indicator (water soluble dye), and 1-2 ounces of Cidekick adjuvant (limonene) per gallon of water would be used. Herbicides would be applied to targeted vegetation by speckling the leaf surface during the period of July through October of the second or third growing season. The anticipated application rate is 10 gallons of mix, 5 ounces of Arsenal AC (0.16 pound of Imazapyr) and 5 ounces of aminopyralid per acre.

In hack-n-squirt applications, a hatchet is used to cut into the tree surface of larger (greater than 6 feet tall) targeted vegetation and Imazapyr (Arsenal AC or equivalent) and triclopyr (Garlon 3A) herbicide are sprayed/injected into the cut area. A cutting tool, such as a hatchet, machete, or sandvik, would make the cuts. A mixture of 50 percent Garlon 3A and 50 percent water, plus 6 ounces of Arsenal AC per gallon of water would be used. All treated areas would be monitored for further follow-up treatments after the initial treatment. All downed vegetation would be left on-site to decompose.

Commercial herbicides/ adjuvant/dyes referenced in this document (Garlon 3A, Arsenal AC, Cidekick, and Bullseye) represent those formulations that are commonly used for the proposed forestry treatments. However, other equivalent formulations may be used for implementation of the proposed treatments. Equivalent formulations would include any other brand name herbicides that have an equivalent proportion of the specified active ingredient.

Table 2 - Herbicide Application Summary

Method	Herbicide (Active Ingredient)				Additives (Non-Active)	
	Arsenal AC (Imazapyr)	Garlon 3A (Triclopyr)	Milestone (Aminopyralid)	Accord XRT II (Glyphosate)	Bullseye (Indicator)	Cidekick (Adjuvant)
	Estimated Application Rate (LBWs active ingredient/acre)				Proposed Maximum Application Rate (oz./acre)	
Foliar Spray	0.16		0.066	1.6	2	2
Hack-n-squirt	0.02	0.18				

Frequency: Herbicides may be applied once or twice depending on need. First time for chemical site preparation as listed in the attached table for the regeneration areas and the second time for chemical release during the 3rd, 4th, or 5th growing season after the initial clearcut in the regeneration areas.

Mechanical Site Preparation

Mechanical site preparation consists of a one-time pass for shearing and roller drum chopping and would be used to control unwanted natural loblolly pine regeneration in clearcut stands and shortleaf restorations sites. A bulldozer with a shearer attached to the blade and a roller drum chopper attached to the rear pass over the regeneration area and chop up un-merchantable materials left on site. Hand tool site preparation may be used in conjunction with the mechanical site preparation an includes chainsaw felling or use of brush saws.

Tree Planting (proposed only for Regeneration Clearcut with Reserves)

It is anticipated that not enough trees would be left to restock the stand, so planting loblolly pine seedlings would be needed except for compartment 156 stand 12 and Compartment 55 Stands 2 and 8 which would be planted to shortleaf pine. Planting would be implemented immediately after site preparation. Tree seedlings for both loblolly and shortleaf pine would be planted on 7ft x10ft spacing.

Chemical Release (Proposed only for regeneration sites)

Herbicide would be used to release crop trees from competing vegetation. Under management prescriptions, an average of 500 seedlings of pine, oaks, and hickories per acre is the desired stocking level. Stands would be treated for release approximately 3-5 years after initial regeneration harvest and when the survival and stocking checks indicate more than one hundred stems per acre of sweetgum, maple, and yellow-poplar. The herbicides and the applications used would be similar to the chemical site preparation treatments described above.

Pre-commercial Thinning (Proposed only for regeneration sites)

Pre-commercial thinning consists of felling and/or deadening pre-merchantable trees to reduce tree stocking in overstocked stands (overstocked is defined as 700 stems per acre or greater). The objective of pre-commercial thinning is to accelerate diameter increment on remaining steams, maintain stand density range, and to improve the vigor and quality of remaining trees. Pre-commercial thinning would take place in shelterwood stands after seed tree removal (3-5 years after initial harvest). In clearcut with reserves, pre-commercial thinning may be used to control unwanted natural loblolly pine regeneration when stocking is over 700 stems per acre. Pre-commercial thinning would be accomplished using hand tools such as chainsaws, brush saws, and others to reduce stocking levels to 500 stems per acre. Healthy shortleaf pine would be favored over loblolly pine. Oaks and hickories would also be favored over loblolly pine and be released.

Road Decommissioning and Road Relocation

Approximately four miles of Forest Service system roads would be decommissioned and includes roads 406B (compartment 55 map), 411A (compartment 108 map), 412F and 412G (compartment 112 map), E110-2 (compartment 110 map), E116-2(compartment 116 map), E156-2 (compartment 156 map), E-54-1 and E54-2 (compartment 54 map). Decommissioning work may include but is not limited to removing culverts, restoring normal drainage function, removing road ditching, blocking the road from further access, out-sloping to improve drainage and water-barring and reseeding with native and desired non-native vegetation.

Forest Service system roads E54-1 and E54-2 (totaling 0.63 miles) would be constructed to continue to provide access to a privately owned cemetery and to provide access for the maintenance of two wildlife openings, respectively. The intent is to reduce long term adverse resource impacts from the existing roads.

Connected Actions

The following connected actions are associated with project activities.

Road Work

New system road construction (approximately 1.8 miles) would be needed to provide access for present and future timber management. System road reconstruction/reconditioning and maintenance (estimated at about 43.4 miles) would also be needed to support timber removal and other management. Reconstruction/reconditioning work would consist of, but not be limited to, gravelling road surfaces, replacing culverts, ditch cleaning, removing brush and trees along road rights-of-way, installing or replacing gates and correcting road safety hazards. Maintenance would consist of spot gravel, road grading, cleaning culverts, light brushing and mowing. Specific information on roads is contained in the project file. Temporary roads would be needed for access to some of the harvest units (approximately five miles). Temporary roads would be closed after use and would be water-barred as needed and revegetated to reduce erosion.

Erosion Control

Log decks, skid trails and temporary roads at risk for erosion would be vegetated or covered with logging slash to act as a mulch to reduce soil erosion. As a general rule, this disturbed area averages three percent of the harvested area. If planting is utilized for erosion control, native and desired non-native vegetation would be used. Native vegetation may include a mix consisting of fall panicum, little bluestem, deer tongue grass, purple top, side oats grama, bird's foot trefoil, black-eyed Susan, partridge pea, showy tickseed, false sunflower and Illinois bundleflower (spring mix). Native vegetation for fall planting may include a mix of Virginia wild rye, gray goldenrod and hairy mountain mint. Desirable non-native vegetation may include a mix consisting of bahia grass, brown top millet, kobe lespedeza, and common Bermuda (spring mix) or a mix consisting of perennial rye grass, clover, wheat, and kobe lespedeza (fall mix).

Rights-of-Way Acquisition

Four rights-of-way (approximately 1.3 miles) would be acquired to improve/establish access to national forest system lands for resource management. These rights-of-way are located in compartment 62 stand 1, compartment 108 stand 4, compartment 109 stand 19 and compartment 110 stand 2. The roads would be reconstructed to provide sustainable access.

Skidding, Decking and Hauling of Logs

Logs would be skidded with heavy equipment to landings where they would be stacked for later removal by logging trucks. Existing and new skid trails would be used during skidding operations.

III. CONSULTATION HISTORY

This BA/BE tiers to the Biological Assessment for the *Revised Land and Resource Management Plan, Sumter National Forest* (Forest Plan, 2004b). The USFWS was consulted informally on the Forest Plan BA and concurred with a determination of "not likely to adversely affect."

IV. SPECIES CONSIDERED AND EVALUATED

The complete list of PETS species for the Sumter National Forest is attached in Appendix A. All species on this list were considered for this BA/BE. Using a step-down process and best available science, species and potential habitat in the project area were identified by:

1) Evaluating the location and nature of the proposed project;
2) Considering the species' range, life history, and available habitat information;
3) Reviewing District records and the South Carolina Heritage Trust Geographic Database of Rare, Threatened, and Endangered Species for known PETS species occurrences; and
4) Reviewing USFWS's *South Carolina List of At-Risk, Candidate, Endangered, and Threatened Species* for Chester, Fairfield, Newberry, and Union Counties.

USFWS's *South Carolina List of At-Risk, Candidate, Endangered, and Threatened Species* identifies red-cockaded woodpecker (*Picoides borealis*) as potentially occurring in Chester and Newberry Counties; Carolina heelsplitter (*Lasmigona decorata*) as potentially occurring in Chester and Fairfield Counties; and northern long-eared bat (*Myotis septentrionalis*) as potentially occurring in Union County. Red-cockaded woodpecker and northern long-eared bat are eliminated from consideration because the project area is outside of the species' known ranges. Carolina heelsplitter is eliminated from consideration because it is not known to occur within the project area and project activities would not affect aquatic habitats.

Bald eagle (*Haliaeetus leucocephalus*) is known to nest within the project area. Potential habitat exists for Bachman's sparrow (*Peucaea aestivalis*) and migrant loggerhead shrike (*Lanius ludovicia migrans*). These species will be address in this BA/BE. All other species on the Sumter National Forest PETS list are eliminated from this analysis because they lack habitat within the project area.

V. EVALUATED SPECIES SURVEY INFORMATION

The procedure used to decide when to inventory for PETS species is consistent with Forest Service Manual (FSM) 2672.43. Surveys during February and April 2015 determined that the bald eagle nest in compartment 116 was active. Forest Service personnel and a Forest Service contractor surveyed botanical PETS species during the fall of 2011 and 2012 and during the spring of 2012 and 2013. No botanical PETS species were present within proposed treatment stands of the Lower Broad Analysis Area.

VI. ENVIRONMENTAL BASELINE FOR THE SPECIES EVALUATED

See the Forest Plan Final BA and BE and the *2013 Monitoring and Evaluation Annual Report* (US Forest Service 2014) for information on the status and environmental baseline for PETS species on the Sumter National Forest.

Bachman's sparrows inhabit open pinewoods with grassy understories maintained by frequent fire. In the piedmont, Bachman's sparrows may also use overgrown fields with scattered saplings. This species forages strictly on the ground in dense grass, palmettos, or shrubs. From 1992 to 2004, bird surveys on the Francis Marion and Sumter National Forests indicate a 6.3% annual decline in this species (La Sorte et al. 2007). Bachman's sparrows have not been detected in the Lower Broad Analysis Area or on the Enoree District; however, potential habitat does exist.

Bald eagles nest in tall, usually living trees near an open body of water. They usually forage near estuaries, lakes, ponds, rivers, open marshes, and shorelines. Bald eagles soar over a body of water and swoop to the surface for fish. They also scavenge for dead fish and other carrion along shores and occasionally consume small birds and mammals. Although nationwide recovery efforts led to the removal of bald eagles from the Threatened and Endangered Species List on August 9, 2007 (Federal Register 2007), this bird is still protected under the Bald and Golden Eagle Protection Act (16 USC 668-668c) and the Migratory Bird Treaty Act (16 USC 703-712).

There are four known bald eagle nests on the Enoree Ranger District. Two of the nests (located in compartments 6 and 18) are greater than 15 miles away from the project area. One nest

(compartment 108) is appoximately a half a mile from the project area and another (compartment 116) is located within the project area. The compartment 116 nest is located in stand 11, immediately adjacent to stand 6. Additionally, the Broad River is used as foraging habitat and much of the project area along the Broad River may provide potential nesting or roosting habitat.

Migrant loggerhead shrikes are predatory songbird that feed opportunistically on a variety of small prey items including insects, small mammals, birds, reptiles, and amphibians. This species will impale its prey on thorny bushes or barbed-wire fences. Shrikes use open habitats characterized by low-growing grasses and forbs interspersed with bare ground and scattered shrubs and trees. They most commonly occur in pastures, old fields, and native prairies but also utilize agricultural fields, utility rights-of-way, and open woodlands. Because of loss of habitat, this species has experienced a 70% population decline across their range over the last 30 years. Bird surveys on the Enoree Ranger District rarely occur in open, early successional habitats, so shrikes are not detected; however, potential habitat does exist within the project area.

VII. EFFECTS OF PROPOSED MANAGEMENT ACTION ON EACH SPECIES EVALUATED

This effects evaluation has taken into account not only the knowledge of species distribution from previous field surveys, but also the adequacy of those surveys. The best available science (including species' habitat requirements, reasons for species' decline, limiting factors, project area habitat conditions, and the biological effects of the intensity of the proposed action) is also considered in the effects analysis. The effects of a proposed action on a species can be direct, indirect, or cumulative.

Direct Effects

Direct effects are effects to the species known to occur in the proposed project area. They occur at the same time and place as the project activity.

Bald eagle. Proposed activities (commercial thinning, regeneration clearcut with reserves, shortleaf pine restoration, shelterwood with reserves, site preparation, tree planting, chemical release, pre-commercial thinnings, and road decommissioning/road relocation) and connected actions (road work, erosion control, rights-of-way acquisition, and skidding/decking/hauling of logs) could directly affect bald eagles if they were using any of the project stands for roosting or nesting. Bald eagles using the known nest in compartment 116, stand 11, would be particularly susceptible to direct effects from project activities. To avoid adverse direct effects, Forest Plan Standard FW-28 (stated as design criterion #14) would be followed. If other nests are found before or during project implementation, then Forest Plan Standard FW-28 would also apply.

Bachman's sparrow, migrant loggerhead shrike. Direct effects are not expected to occur to Bachman's sparrows or migrant loggerhead shrikes. These highly mobile avian species would relocate to undisturbed areas if they were displaced by proposed activities. However, it is possible that if project activities were to occur during the breeding season, nests and nestlings could be lost due to the activities. These effects are not expected to significantly reduce reproductive success since only a portion of the area would be managed at any one time and avian species will re-nest multiple times throughout the nesting season. In addition, these activities would have to occur at the exact time when species are most vulnerable and also occur

over successive years to have substantial impacts. This is unlikely given past management practices.

Herbicide application as proposed in this alternative is not expected to have a direct effect on bald eagles, Bachman's sparrows, or migrant loggerhead shrikes. While the use of some herbicides can have direct effects on wildlife by causing injury or mortality from direct spray, drift, or ingestion of contaminated food or water, those herbicides proposed in this alternative, namely imazapyr, triclopyr, aminopyralid, and glyphosate, are practically non-toxic to birds and other wildlife species.

Imazapyr is practically non-toxic to terrestrial animals and birds. The acute oral LD_{50}[1] of imazapyr for mallard ducks (*Anas platyrhynchos*) and northern bobwhites (*Colinus virginianus*) are both greater than 2,150 mg/kg (US Forest Service 2004a). Acute toxicity studies in northern bobwhites and mallard ducks found no adverse effects at dietary concentrations up to 5,000 ppm (Fletcher et al. 1984a,b). Imazapyr is rapidly eliminated in the urine and feces of animals and is not known to accumulate in animal tissues (Miller et al. 1991).

The acute oral LD_{50} of triclopyr for mallard ducks and northern bobwhites are 1,698 mg/kg and 2,935 mg/kg, respectively (US Forest Service 2011a). A one-generation reproduction study showed no reproductive effects, symptoms of toxicity, or abnormal behavior when mallards were given up to 500 ppm of triclopyr in their diet for a 20-week period, including ten weeks prior to egg laying and ten weeks during egg laying. Newton et al. (1990) predicted that triclopyr would not be present in animal forage in doses large enough to cause either acute or chronic effects to wildlife, and concluded that the tendency for triclopyr to dissipate quickly in the environment would preclude any problems with bioaccumulation in the food chain.

Aminopryalid is practically non-toxic to birds based on acute exposure to northern bobwhite that resulted in an LD_{50} value of greater than 2,250 mg/kg (EPA 2005). In 5-day dietary studies with northern bobwhites and mallard ducks, LC_{50}[2] concentrations were greater than 5,000 (EPA 2005). The mammalian toxicity of aminopryalid is relatively well-characterized in experimental mammals in a series of toxicity studies that are required for pesticide registration (US Forest Service 2007). In rats, mice, rabbits, and dogs, aminopryalid has low acute and chronic oral toxicity. For example, Brooks (2001) found that in rats the acute oral LD_{50} is greater than 5,000 mg/kg for aminopyralid. It seems reasonable to assume the most sensitive effects in wildlife mammalian species will be the same as those in experimental mammals. Results of acute exposure studies in birds indicate that avian species appear no more sensitive than mammals to aminopyralid in terms of acute lethality (US Forest Service 2007).

Glyphosate is of relatively low toxicity to birds. The acute oral LD_{50} of glyphosate for northern

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[1] Acute toxicity is commonly measured by the lethal dose (LD) that causes death in 50 percent of treated laboratory animals. LD_{50} indicates the dose of a chemical per unit body weight of an animal and is expressed as milligrams per kilogram (mg/kg). Chemicals are highly toxic when the LD_{50} value is small and practically nontoxic when the value is large.

[2] Acute toxicity is sometimes measured by the lethal concentration that causes death in 50 percent of treated laboratory animals (LC_{50}). LC values usually refer to the concentration of a chemical in air, but it can also mean the concentration of a chemical in water. LC_{50} indicates the dose of a chemical per unit body weight of an animal and is expressed as milligrams per liter (mg/l). Chemicals are highly toxic when the LC_{50} value is small and practically nontoxic when the value is large.

bobwhite is greater than 2,000 mg/kg (US Forest Service 2011b). Avian reproduction studies yielded no reproductive effects at dietary exposure levels of up to 1,000 ppm (US Forest Service 1989). The effects of glyphosate on wild mammals have been examined in numerous field studies (Sullivan and Sullivan 2000; Santillo et al. 1989). These studies indicate that glyphosate will not cause unreasonable adverse effects to wildlife species.

Indirect Effects

Indirect effects are effects to the species habitat in or near the project area.

Bald eagle. Activities that involve tree removal (namely, commercial thinning, regeneration clearcut with reserves, shortleaf pine restoration, and shelterwood with reserves) could affect the availability of potential roost and nest trees, particularly in those treatment stands near the Broad River. However, considering the amount of available habitat within the surrounding areas, any loss of potential nest or roost sites is insignificant and would not have an adverse indirect effect on bald eagles. The existing bald eagle nest in compartment 116 would not be affected by project activities. Forest Plan Standard FW-28 would protect the nest and surrounding canopy from disturbance or modification.

Bachman's sparrow, migrant loggerhead shrike. Habitat for Bachman's sparrow and migrant loggerhead shrike would improve with the implementation of this project. Commercial thinning, regeneration cuts, shortleaf pine restoration, and shelterwood harvests would result in short-term early successional conditions, which would provide suitable habitat for these species.

Cumulative Effects

Cumulative Effects are those resulting from incremental impacts of the proposed action added to other past, present, and future actions. Cumulative effects can result from individually minor but collectiviely significant actions that take place over a period of time.

Other management activities that have taken place on the Enoree Ranger District include prescribed burning, timber sales, precommercial thinning and release of timber, southern pine beetle control, drum chopping for site preparation and tree planting, recreation trail reconstruction and maintenance, seeding of roads, skid trails, firelines and log decks, additional road maintenance (grading, brushing, and mowing), and road decommissioning. Most of these activities are expected to continue in the near future at approximately the same levels.

The Forest Service is proposing the Chester County Stream and Riparian Restoration/Enhancement Project to restore and enhance the hydrologic and aquatic functions on approximately 18 miles of streams within four watersheds. The project would take place in Chester County north of the Lower Broad Analysis Area. The Chester County Stream and Riparian Restoration/Enhancement Project is not likely to contribute to cumulative effects on PETS species or their habitats.

The Forest Service is also proposing to restore hydrological features and forest composition within approximately 974 acres along the Broad River in Union, Chester, and Fairfield Counties. The wetland restoration project is not likely to contribute to cumulative effects on PETS species or their habitats.

Private lands within or adjacent to the proposed project areas are made up of timberland, home sites, pastures, and farmland. Intensive timber management activities on private lands, including thinning, regeneration cuts, and road building, have occurred heavily over the past 10 years within some of these areas.

The cumulative effects of the proposed project in combination with other past, present, and future actions are not anticipated to result in any measurable loss of the evaluated species or their habitats.

VIII. DETERMINATION OF EFFECT AND RATIONALE

Since all threatened and endangered species were eliminated from consideration due to lack of habitat in the project area, ESA Section 7 consultation with the USFWS in not necessary.

Sensitive Species

Bald eagle – NO IMPACTS

> Rationale: There would be no direct effects to bald eagles with the implementation of Forest Plan Standard FW-28. Tree removal could affect the availability of potential roost and nest sites, but considering the amount of available habitat within the surrounding areas, indirect effects would be minor.

Bachman's sparrow, migrant loggerhead shrike – NO IMPACTS

> Rationale: There would be no direct effects on Bachman's sparrows or migrant loggerhead shrikes. Project activities are expected to result in short-term habitat improvements for these species.

IX. DESIGN CRITERIA

Forest-wide standards found in the Forest Plan would be followed during implementation of this project. In addition, *South Carolina Best Management Practices for Forestry* (2003) and *National Best Management Practices for Water Quality Management on National Forest System Lands* (2012), collectively referred to as BMPs, and *Soil and Water Conservation Practices Guide for R8* (2002) would also be followed.

The following design criteria apply to the proposed action:

1. Identified heritage sites would be avoided during site disturbing activities associated with logging and follow-up treatments.

2. Skid trails would be located in a manner as to minimize concentration of water flow.

3. Gully crossings would be avoided and water from roads would not be directed into gullies.

4. Log decks would be ripped, disked, seeded, limed, fertilized and mulched at the time each harvest area is closed. Seed mixtures would include native grasses and legumes or other desired non-native species.

5. Trees would not be harvested within gullies or on steep slopes adjacent to gullies unless needed to promote stabilization or recovery efforts.

6. Streams would be identified on sale area maps and protective measures would be specified in the timber sale contract.

7. Desirable oaks and hickories would be retained within treatment stands.

8. Hardwood inclusions, to be protected within and adjacent to harvest units, would be identified on-the-ground and on the sale area map of the timber sale contract.

9. Skid trails that cross ephemeral streams would be recontoured to the natural terrain as much as possible to avoid discharging sediment directly into stream channels. These areas would be seeded, limed, fertilized and mulched after the area is recontoured to the natural terrain.

10. Erosion control devices such as diversions and temporary rock sediment dams would be installed prior to road construction, reconstruction and maintenance activities where needed to deter soil runoff into streams. Erosion control devices would be maintained in working order throughout project activities until plant growth is established and stable enough to control runoff and erosion. Road ditch lines would not be routed toward stream crossings, but instead into vegetative buffers.

11. No logging operations would occur in or around the perimeter of Rocky Branch Seasonal Camp, during fall and April hunting seasons. Coordinate with other project work to reduce the direct impacts to recreational users. There would be no hauling of timber through the seasonal campground.

12. Flowering and other visually attractive trees and understory shrubs would be favored when leaving vegetation during timber marking.

13. If temporary roads, skid trails and landings are necessary, they would be located outside the immediate foreground viewshed of roads, trails, Broad River corridor or other recreation facilities, when possible. If these features must be located in the immediate foreground view shed of roads, trails or other recreation facilities, disturbed soil would be re-vegetated with native species or covered with woody material as soon as possible following the completion of logging activities.

14. Protection zones shall be delineated and maintained around all bald eagle nests and communal roost sites, until they are determined to be no longer suitable through coordination with the US Fish and Wildlife Service. The protection zone shall extend a minimum of 1,500 feet from the nest or roost. Activities that modify the forest canopy within this zone are prohibited. All management activities not associated with bald eagle management and monitoring are prohibited within this zone during the periods of use

(nesting season is October 1 to June 15; roost use periods are determined through site-specific monitoring). Where controlled by the Forest Service, public access routes into or through this zone would be closed during the seasons of use, unless they are major arterial roads. (Forest Plan Standard FW-28)

15. Drainage dips and lead-outs would be incorporated into construction of temporary roads.

16. Temporary roads would be closed, ripped, disked, rolling-dips installed if needed, limed, fertilized, mulched and seeded with native and desirable non-native vegetation.

X. SIGNATURES

This Biological Assessment/Biological Evaluation was prepared by:

/s/ Carrie M. Miller *6/4/2015*

Carrie M. Miller
Biological Science Technician
Sumter National Forest

Date

This Biological Assessment/Biological Evaluation was reviewed and accepted by:

Jeffrey M. Magniez 9/30/2015

Jeffrey M. Magniez
Zone Wildlife Biologist
Sumter National Forest

Date

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APPENDIX A

Proposed, Endangered, Threatened, and Sensitive (PETS) Species of the Sumter National Forest (2015). Obs = Observed during field surveys or known to occur based on previous records; Hab = Suitable habitat exists within the project area; "+" = meets criterion, "--" = does not meet criterion. P = piedmont (Enoree and Long Cane Ranger Districts), M = mountains (Andrew Pickens Ranger District).

Species	Status	Habitat Description / Reason for Including In or Excluding From Analysis	Obs	Hab	Range
CAROLINA HEELSPLITTER *Lasmigona decorata*	Federally Endangered	Known historically from Catawba, Pee Dee, and Saluda drainages in South Carolina; occurs in Mountain, Beaverdam, Cuffytown, Sleepy, and Turkey Creeks **Not known to occur within project area**	--	--	P
NORTHERN LONG-EARED BAT *Myotis septentrionalis*	Federally Threatened	Winters in caves and cave-like structures (e.g., mines, railroad tunnels); summer roosts include cavities, underneath bark, crevices, or hollows of both live and dead trees **Outside of known range**	--	--	M
PERSISTENT TRILLIUM *Trillium persistens*	Federally Endangered	Known from one site in South Carolina; occurs in mixed mesic forest in the Tugaloo River Composite watershed **Outside of known range**	--	--	M
RELICT TRILLIUM *Trillium reliquum*	Federally Endangered	Basic mesic forests in Savannah and Chattahoochee drainages; known from the lower piedmont/fall line sandhills region **Outside of known range**	--	--	P
SMOOTH CONEFLOWER *Echinacea laevigata*	Federally Endangered	Occurs along the Brevard Geologic Belt in association with grassy understories and open canopies **Outside of known range**	--	--	M
WOOD STORK *Mycteria americana*	Federally Threatened	Known to forage in freshwater wetlands on both Enoree and Long Cane Ranger Districts **Not known to occur within project area**	--	--	P
FLORIDA GOOSEBERRY *Ribes echinellum*	Federally Threatened	Known from the Stevens Creek drainage, on north facing hardwood slopes in association with basic soils **Outside of known range**	--	--	P
SMALL WHORLED POGONIA *Isotria medeoloides*	Federally Threatened	Occurs in mixed mesic forests at moderate elevations (>1,000 feet) **Outside of known range**	--	--	M
ASHLEAF GOLDENBANNER *Thermopsis mollis* var. *fraxinifolia*	Sensitive	Pine-oak heaths and roadsides **Outside of known range**	--	--	M
BACHMAN'S SPARROW *Peucaea aestivalis*	Sensitive	Occurs in forest stands with open canopies and grassy understories **Potential habitat occurs within project area**	--	+	P
BALD EAGLE *Haliaeetus leucocephalus*	Sensitive	Perennial rivers and lakes, nesting in dominant or co-dominant pines 3 km or less from open water **Known to occur adjacent to and within project area**	+	+	P, M

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Species	Status	Habitat Description / Reason for Including In or Excluding From Analysis	Obs	Hab	Range
BILTMORE SEDGE *Carex biltmoreana*	Sensitive	Thin soils on rock outcrops and adjacent woodlands; known from the Chattooga River Corridor **Outside of known range**	--	--	M
BROOK FLOATER *Alasmidonta varicosa*	Sensitive	Small streams with gravel bottoms; known from Chattooga, Turkey and Upper Stevens Creek watersheds on the Long Cane Ranger District **Outside of known range**	--	--	P, M
BUTTERNUT *Juglans cinerea*	Sensitive	Basic mesic forests along the Brevard Geologic Belt; usually at old homesites **Outside of known range**	--	--	M
CAROLINA DARTER *Etheostoma collis*	Sensitive	Localized populations occur in lower and middle piedmont streams with slow to moderate current. Known from Saluda and Broad River watersheds **Not known to occur within project area**	--	--	P
CAROLINA PLAGIOMNIUM *Plagiomnium carolinianum*	Sensitive	Damp, shaded, vertical rock faces along streams in mountain gorges; known from Long Creek and Opossum Creek **Outside of known range**	--	--	M
CHAUGA CRAYFISH *Cambarus chaugaensis*	Sensitive	Fast-moving, rocky 3rd and 4th order streams in tributaries of the upper Savannah River; known most recently from the Chauga River; noted historically in Ramsey Creek, West Village Creek, Crane Creek, Cedar Creek, and a stream between Long Creek and the Chattooga River (1972 data) **Outside of known range**	--	--	M
DIANA FRITILLARY *Speyeria diana*	Sensitive	Violets are larval host plant; open areas for nectar sources in summer **Outside of known range**	--	--	M
EASTERN SMALL-FOOTED MYOTIS *Myotis leibii*	Sensitive	At southern terminus of range on Andrew Pickens Ranger District; known from Moody Creek near Lake Cherokee; may commonly roost in hemlock trees near streams in summer **Outside of known range**	--	--	M
EDMUND'S SNAKETAIL *Ophiogomphus edmundo*	Sensitive	Clear moderately flowing mountain streams and rivers with sand or gravel riffles; known to occur in the Chattooga River **Outside of known range**	--	--	M
FORT MOUNTAIN SEDGE *Carex communis* var. *amplisquama*	Sensitive	Found in rich coves, at Tamassee Knob, East Fork of the Chattooga, and White Rock Cove on the Andrew Pickens Ranger District **Outside of known range**	--	--	M

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FRASER'S LOOSESTRIFE *Lysimachia fraseri*	Sensitive	Open stands or rights-of-way with grassy understories **Outside of known range**	--	--	M
GEORGIA ASTER *Symphyotrichum georgianus*	Sensitive; Federal Candidate	Open stands or rights-of-way with grassy understories; piedmont and lower elevations in mountains **Not known to occur within project area**	--	--	P, M
HARTWIG'S LOCUST *Robinia viscose* var. *hartwegii*	Sensitive	Pine-oak heaths and roadsides in the mountains; one location known near Village Creek on the Andrew Pickens Ranger District **Outside of known range**	--	--	M
INDIGO BUSH *Amorpha schwerini*	Sensitive	Pine-oak heaths and oak-hickory communities **Not known to occur within project area**	--	--	P
JEWELED TRILLIUM *Trillium simile*	Sensitive	Basic mesic forests of the mountains **Outside of known range**	--	--	M
LANCELEAF TRILLIUM *Trillium lancifolium*	Sensitive	Basic mesic forests of the piedmont **Not known to occur within project area**	--	--	P
LIVERWORT SP. *Cheilolejeunea evansii*	Sensitive	Bark of trees in moist escarpment gorges or gorge-like habitats **Outside of known range**	--	--	M
LIVERWORT SP. *Plagiochila caduciloba*	Sensitive	Found on damp, shaded, vertical rock faces along streams in mountain gorges; southern appalachian endemic **Outside of known range**	--	--	M
LIVERWORT SP. *Plagiochila sharpii*	Sensitive	Found on damp, shaded, vertical rock faces along streams in mountain gorges **Outside of known range**	--	--	M
LIVERWORT SP. *Radula sullivantii*	Sensitive	Wet shaded rocks and crevices **Outside of known range**	--	--	M
MIGRANT LOGGERHEAD SHRIKE *Lanius ludovicia migrans*	Sensitive	Breeds in open areas dominated by grasses interspersed with shrubs, trees, or bare ground; uses agricultural landscapes (pastures) **Potential habitat occurs within project area**	--	+	P
MOUNTAIN WITCH ALDER *Fothergilla major*	Sensitive	Occurs in oak-hickory forests; may occur on monadnocks or north-facing slopes in piedmont **Outside of known range**	--	--	M
NODDING TRILLIUM *Trillium rugelii*	Sensitive	Rich wooded slopes over mafic or calcareous rocks **Not known to occur within project area**	--	--	P, M
OGLETHORPE OAK *Quercus oglethorpensis*	Sensitive	Upland wetland depressions and streamside forests in the Carolina Slate belt **Not known to occur within project area**	--	--	P

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PIEDMONT ASTER *Eurybia mirabilis*	Sensitive	Nutrient-rich bottomlands and moist slopes, ednemic to the NC and SC piedmont **Not known to occur within project area**	--	--	P
PIEDMONT STRAWBERRY *Waldsteinia lobata*	Sensitive	Occurs in mixed mesic hardwood forests in the lower elevations of the mountains **Outside of known range**	--	--	M
RADFORD'S SEDGE *Carex radfordii*	Sensitive	Occurs in basic mesic and mixed mesic hardwood forests **Outside of known range**	--	--	M
RAFINESQUE'S BIG-EARED BAT *Corynorhinus rafinesquii*	Sensitive	Restricted to the mountains, sandhills, and coastal plain Physiographic regions; may be found in hollow trees or behind loose bark near streams, caves, mines, or human-made structures **Outside of known range**	--	--	M
RAYED PINK FATMUCKET *Lampsilis splendida*	Sensitive	Primarily a coastal plain species; one occurrence in Middle Saluda River Composite watershed **Not known to occur within project area**	--	--	P
ROBUST REDHORSE *Moxostoma robustrum*	Sensitive	Occurs in the Lower Savannah River composite watershed and introduced to the Broad River **Not known to occur within project area**	--	--	P
SHOAL'S SPIDER LILY *Hymenocallis coronaria*	Sensitive	Rocky river shoals; sandhills and piedmont **Not known to occur within project area**	--	--	P
SOUTHERN APPALACHIAN SALAMANDER *Plethodon teyahalee*	Sensitive	Mature mesic hardwood forests **Outside of known range**	--	--	M
SOUTHERN OCONEE BELLS *Shortia galacifolia* var. *galacifolia*	Sensitive	Large colonies in mixed mesic forests near Lake Jocassee **Outside of known range**	--	--	M
SPREADING POGONIA *Cleistes bifaria*	Sensitive	Dry ridgetops under pines **Outside of known range**	--	--	M
SUN-FACING CONEFLOWER *Rudbeckia heliopsidis*	Sensitive	Open forests with herbaceous understories; known from roadsides in the vicinity of Lake Cherokee **Outside of known range**	--	--	M
SWEET PINESAP *Monotropsis odorata*	Sensitive	Shortleaf pine-oak heaths in the southern Appalachians and piedmont **Not known to occur within project area**	--	--	P, M

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WEBSTER'S SALAMANDER *Plethodon websteri*	Sensitive	Mesic hardwood slopes with rocky outcrops; Greenwood, Edgefield, and McCormick Counties **Not known to occur within project area**	--	--	P
WHORLED HORSEBALM *Collinsonia verticillata*	Sensitive	Found in basic mesic forests along the Brevard Geologic Belt in South Carolina **Outside of known range**	--	--	M