

**Appendix G. Supplementary Modeling Results – No Grouping or Scheduling is Included**

Appendix G includes supplementary maximum A-weighted sound levels and percent time audible contour maps for scenarios that were developed during the initial modeling. These models were analyzed during the initial implementation of OSVs in the INM. The modeling scenarios are described below and the operations are detailed in Table 117. At this stage in the modeling, grouping of snowmobiles was not included, so there are more operations for snowmobiles and these represent single vehicles. Additionally, peak and off-peak hours were not modeled, therefore the models were run for the entire 8 hour day rather than individual hours.

Each modeling scenario was evaluated for an 8-hour day with temperature, relative humidity, and snow cover representative of an average day during the winter season in the parks. Modeling scenarios are labeled A to J and each was designed to model a particular management scenario:

- Modeling scenario A represents the parks' current winter use plan, i.e. the current maximum allowed use. This scenario requires the use of BAT snowmobiles and guides but allows nearly historic usage otherwise.
- Modeling scenario B represents the option of prohibiting snowmobiles in the parks. In this case, all transport of visitors in Yellowstone would be conducted by snow coaches.
- Modeling scenario C represents the situation where the majority of the roads would not be groomed. Visitors could travel using OSVs on the stretch of road from Flagg Ranch in Grand Teton to Old Faithful in Yellowstone.
- Modeling scenario D was modeled in order to determine the impact of no longer grooming the path through Gibbon Canyon. These paths are a concern because, when groomed, are an unnatural trail connecting two populations of bison.
- Modeling scenario E is designed to evaluate what sound levels would be obtained if usage was increased beyond all historical levels.
- Modeling scenario F represents the current actual usage (not current allowed usage – See scenario A) determined by the NPS. Modeling scenario F represents about one-quarter of the usage of modeling scenario E.
- Modeling scenario G is for the assumption that vehicles will be more or less evenly distributed throughout the day. Because the INM treats each operation independently (i.e., they do not overlap in time or platoon), this modeling scenario only provides a measure of the effect of a different number of operations and does not measure the effect of grouping of multiple OSVs.
- Modeling scenario H represent the maximum usage for a single day under the condition that a specified seasonal limit is not exceeded. In order to comply with the seasonal limit some days would have fewer operations than specified in the scenario. This scenario was developed to allow businesses more flexibility as to how the OSVs are used throughout the season. For example, there may be some days where no OSV usage occurs.
- Modeling scenario I limits OSV usage geographically by plowing (not grooming) west side roads. West side roads would allow wheeled vehicles, which are not modeled.

Modeling scenario J was designed to evaluate observed historical levels, i.e. the levels in years past when no restrictions were put on OSV use. There are no BAT requirements for scenario J.

Table 117: Modeling scenarios (Entries are for number of operations per 8-hour day)

	A - Continue Temp. Winter	B - Prohibit Snow-mobiles	C - Stop most grooming	D - Stop Grooming Gibbon Canyon	E - Enhance Rec. Use	F - Current Conditions	G - Unguided Access	H - Seasonal Allocation	I - Plow West Side Roads	J - Historical Unreg. Conditions
	BAT	X	BAT	BAT	BAT	BAT	BAT	BAT	BAT	ANY
Snowmobiles, Yellowstone										
Canyon Village to Fishing Bridge	322.80	0.00	0.00	164.40	500.50	146.80	251.75	342.70	307.00	337.88
Madison to Old Faithful	737.40	0.00	0.00	842.60	1054.75	312.85	553.30	835.10	0.00	894.70
Fishing Bridge to East Entrance	84.20	0.00	0.00	0.00	186.00	40.90	78.35	70.90	0.00	76.48
Fishing Bridge to West Thumb	166.80	0.00	0.00	196.60	228.50	79.10	120.20	182.40	295.00	155.82
Madison to Norris	323.60	0.00	0.00	0.00	464.00	142.40	259.70	360.40	0.00	384.20
West Entrance to Madison	744.00	0.00	0.00	751.60	1113.75	300.25	543.00	852.50	0.00	987.60
Norris to Canyon Village	232.80	0.00	0.00	68.60	345.50	101.80	182.75	258.70	60.00	282.48
Mammoth to Norris	93.60	0.00	0.00	86.60	107.50	46.00	102.35	96.50	0.00	73.48
West Thumb to Flagg Ranch	412.00	0.00	500.00	427.10	481.25	186.75	275.50	466.50	460.60	340.70
Old Faithful to West Thumb	437.00	0.00	500.00	526.50	558.25	197.95	302.80	491.70	549.40	413.16
Snow coaches, Yellowstone										
	ANY	BAT	BAT	BAT	BAT	BAT	BAT	BAT	BAT	ANY
Canyon Village to Fishing Bridge	25.24	36.33	0.00	37.80	36.33	13.57	26.42	28.76	40.10	13.57
Madison to Old Faithful	80.81	108.09	0.00	76.86	108.09	41.54	85.72	92.64	0.00	41.54
Fishing Bridge to East Entrance	4.68	8.47	0.00	0.00	8.47	2.45	4.74	4.92	0.00	2.45
Fishing Bridge to West Thumb	9.36	13.56	0.00	32.90	13.56	5.64	9.60	10.84	36.70	5.64
Madison to Norris	38.86	52.11	0.00	0.00	52.11	18.88	41.97	45.16	0.00	18.88
West Entrance to Madison	75.61	101.50	0.00	71.16	101.50	40.56	78.67	84.80	0.00	40.56
Norris to Canyon Village	25.04	33.83	0.00	20.90	33.83	12.57	26.72	28.76	9.40	12.57
Mammoth to Norris	25.70	33.90	0.00	28.70	33.90	10.31	29.35	31.36	0.00	10.31
West Thumb to Flagg Ranch	40.21	53.55	40.00	22.21	53.55	21.86	42.72	47.60	37.60	21.86
Old Faithful to West Thumb	46.37	61.13	40.00	53.79	61.13	24.40	49.34	54.20	57.70	24.40
Snowmobiles, Grand Teton										
	BAT	X	BAT	BAT	BAT	BAT	BAT	BAT	BAT	ANY
Moran Junction to Flagg Ranch	100.00	0.00	100.00	0.00	150.00	0.00	150.00	0.00	0.00	50.00
Flagg Ranch west to boundary	95.00	0.00	0.00	95.00	190.00	38.00	142.50	142.50	95.00	47.50
Jackson Lake fishing access	80.00	0.00	0.00	80.00	200.00	20.00	80.00	80.00	80.00	70.00

**G.1. Maximum A-Weighted Sound Levels,  $L_{Amax}$ , Yellowstone**

Maximum A-weighted sound level contours are shown for Yellowstone in Figure 107 to Figure 116.

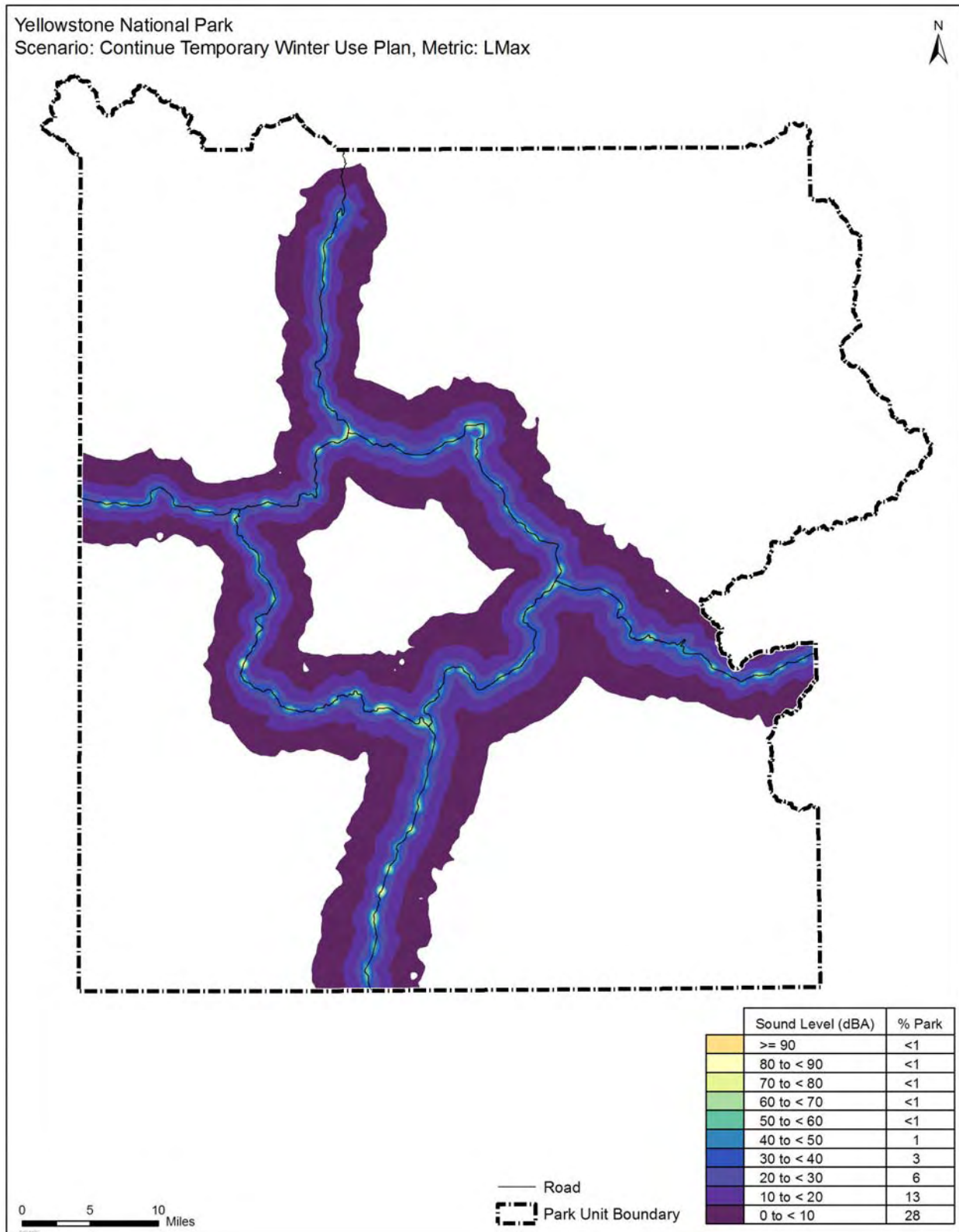


Figure 107: Yellowstone L<sub>Amax</sub> for modeling scenario A

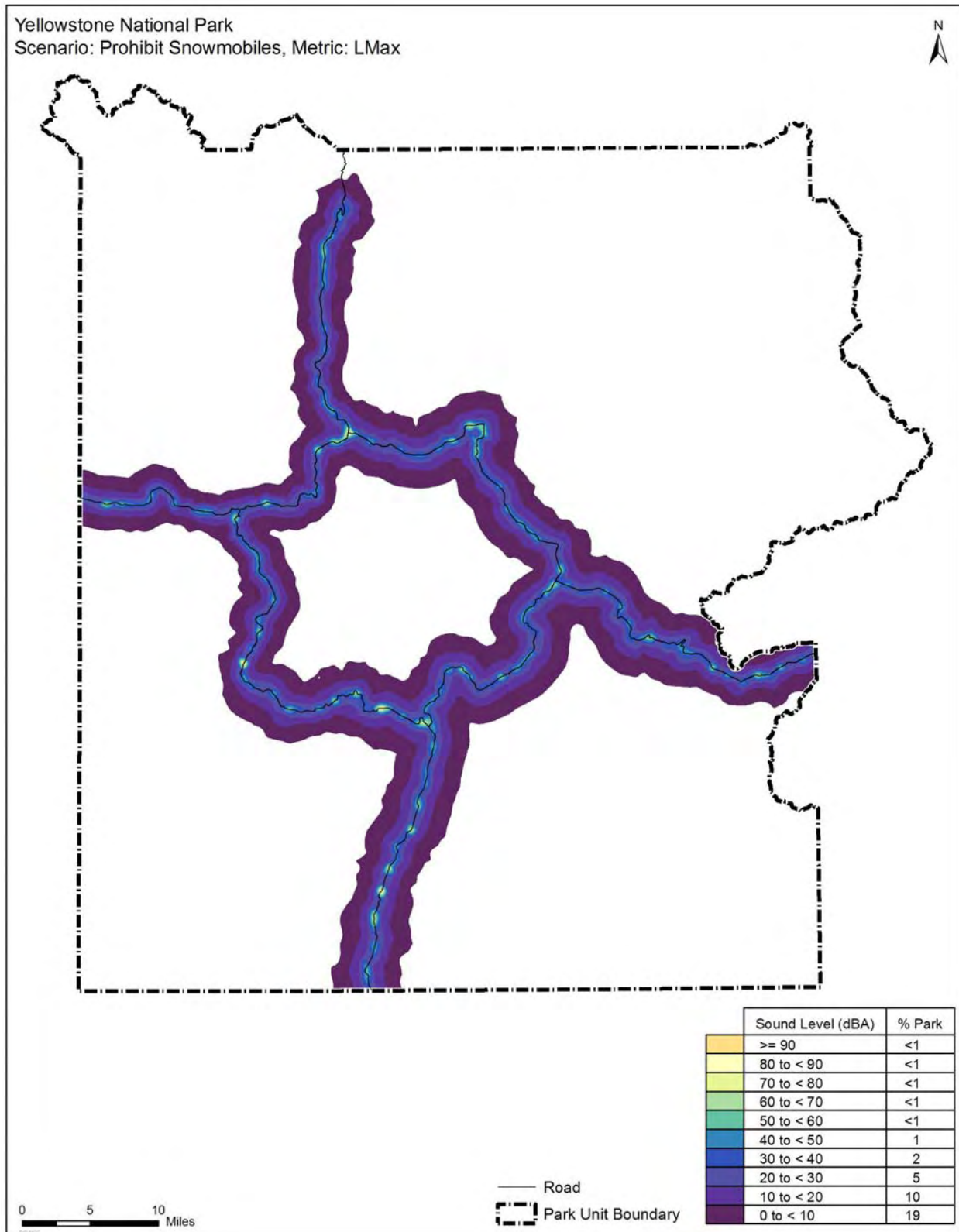


Figure 108: Yellowstone L<sub>Amax</sub> for modeling scenario B

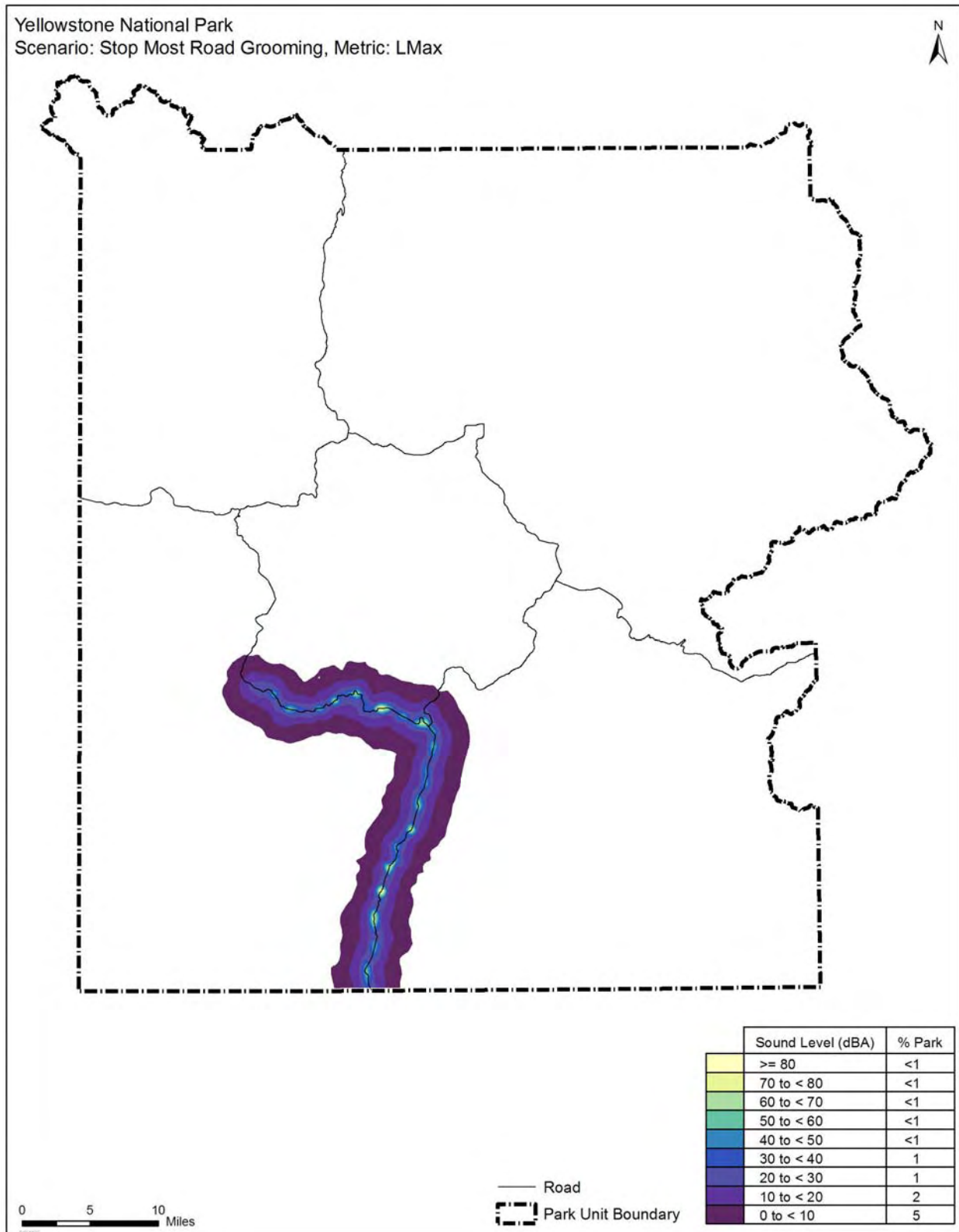


Figure 109: Yellowstone L<sub>Amax</sub> for modeling scenario C

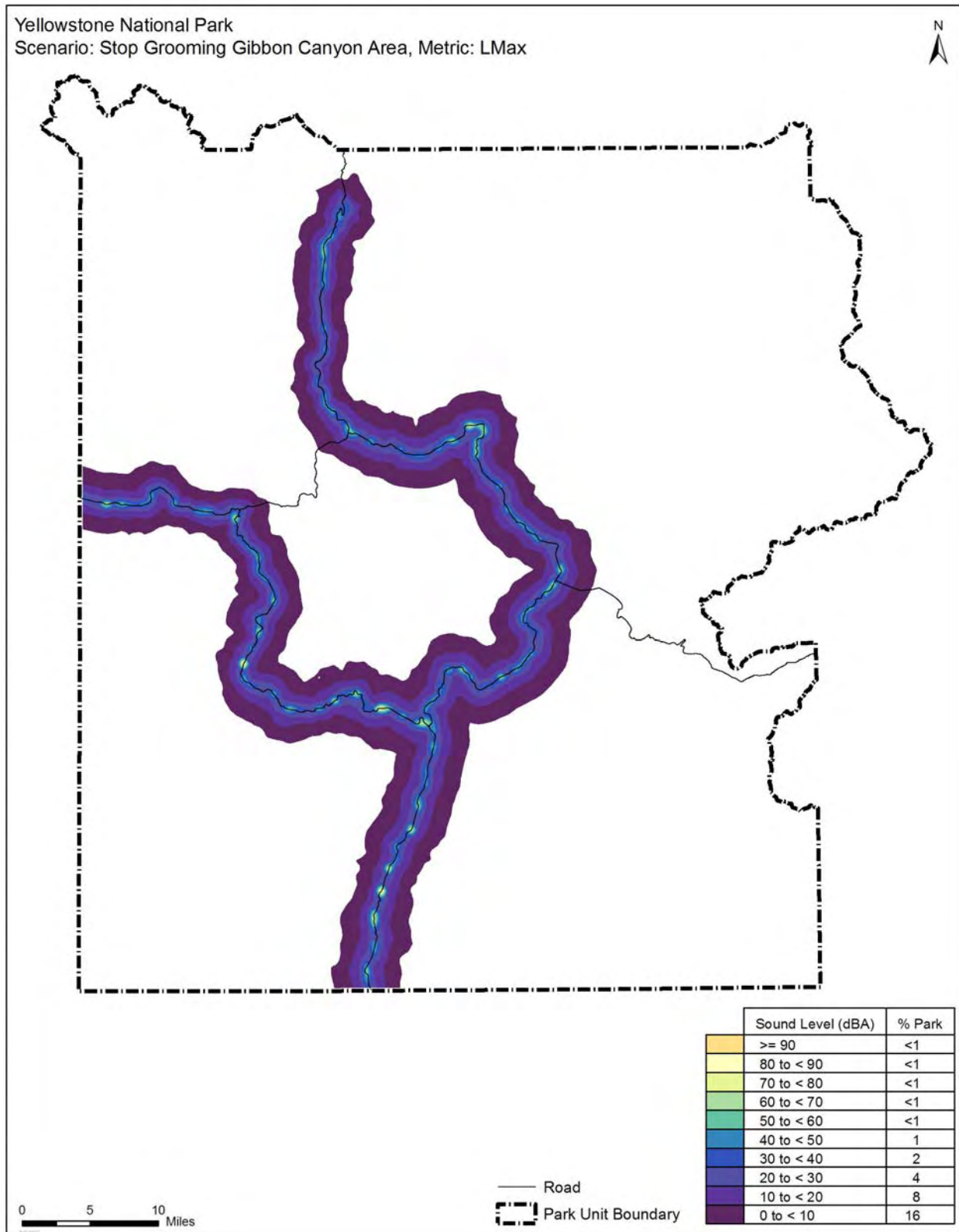


Figure 110: Yellowstone L<sub>Amax</sub> for modeling scenario D



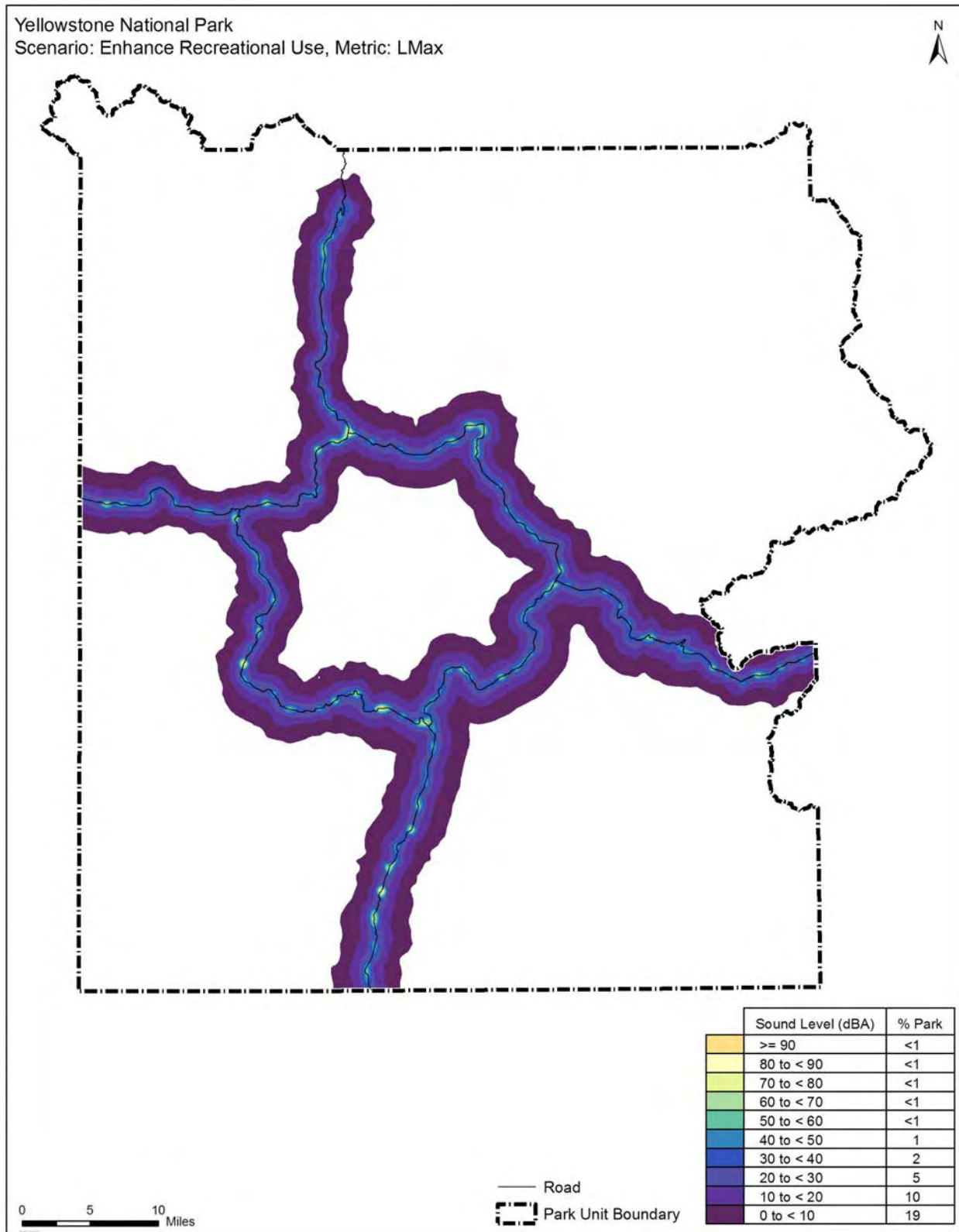


Figure 111: Yellowstone L<sub>Amax</sub> for modeling scenario E



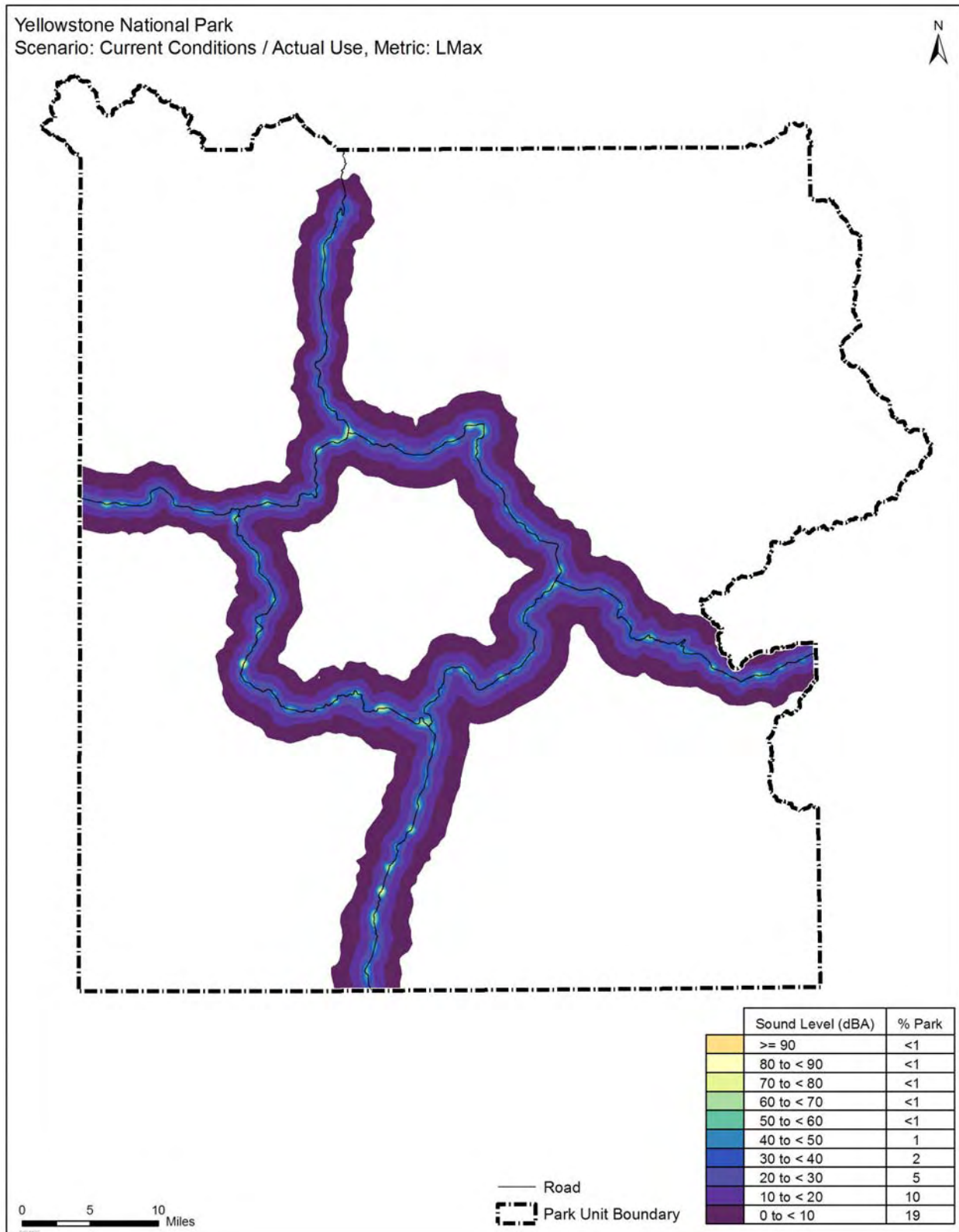


Figure 112: Yellowstone L<sub>Amax</sub> for modeling scenario F

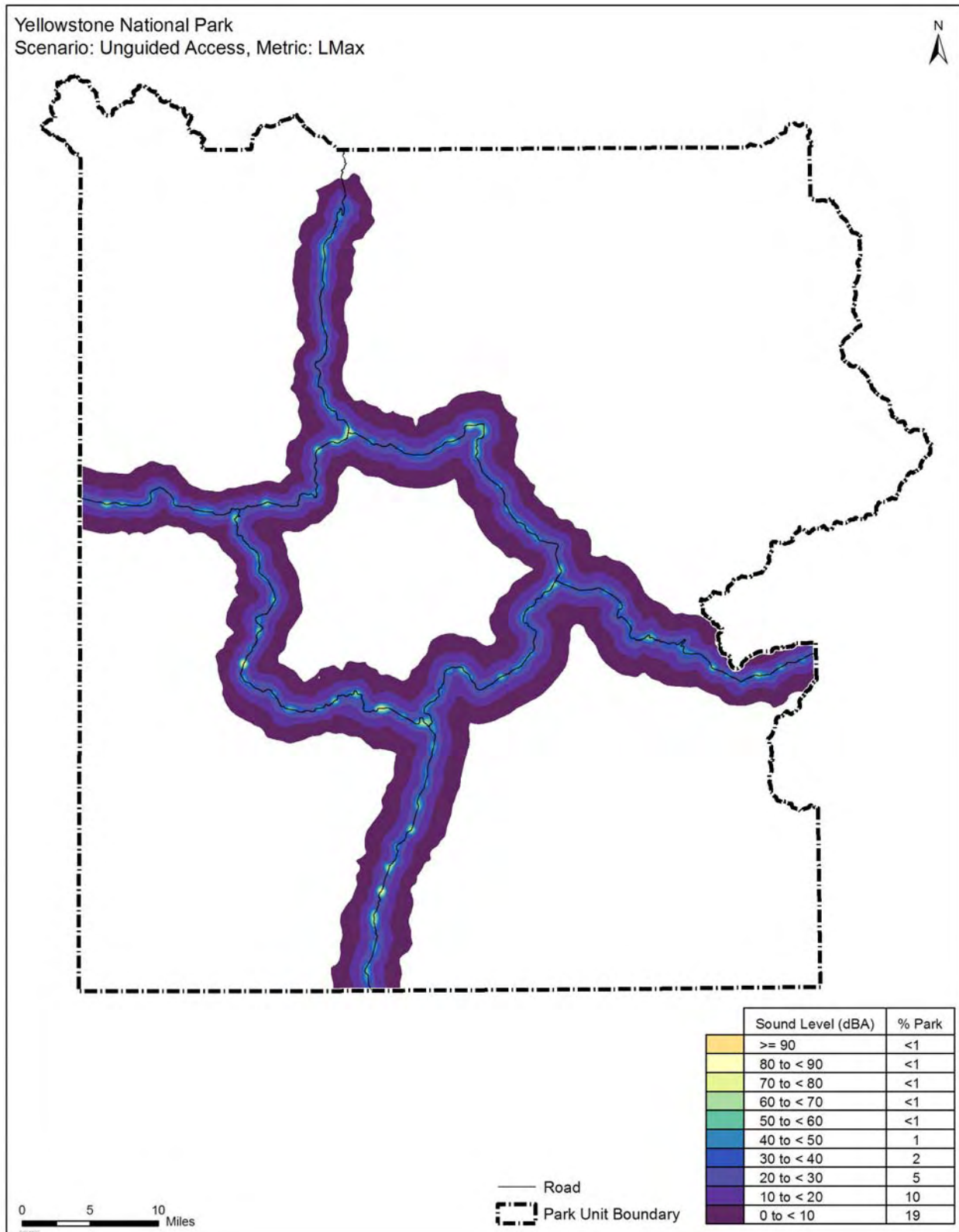


Figure 113: Yellowstone L<sub>Amax</sub> for modeling scenario G

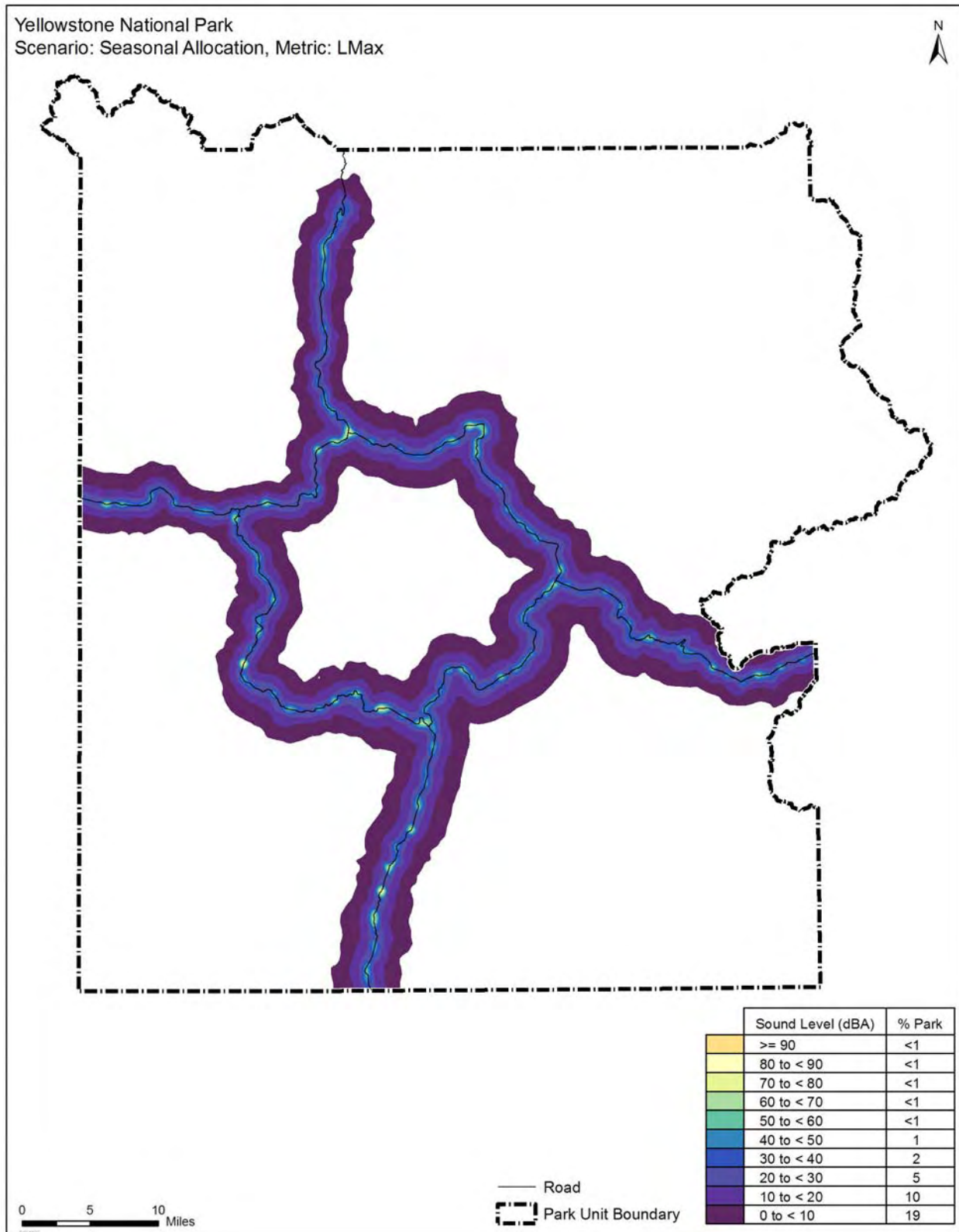


Figure 114: Yellowstone L<sub>Amax</sub> for modeling scenario H

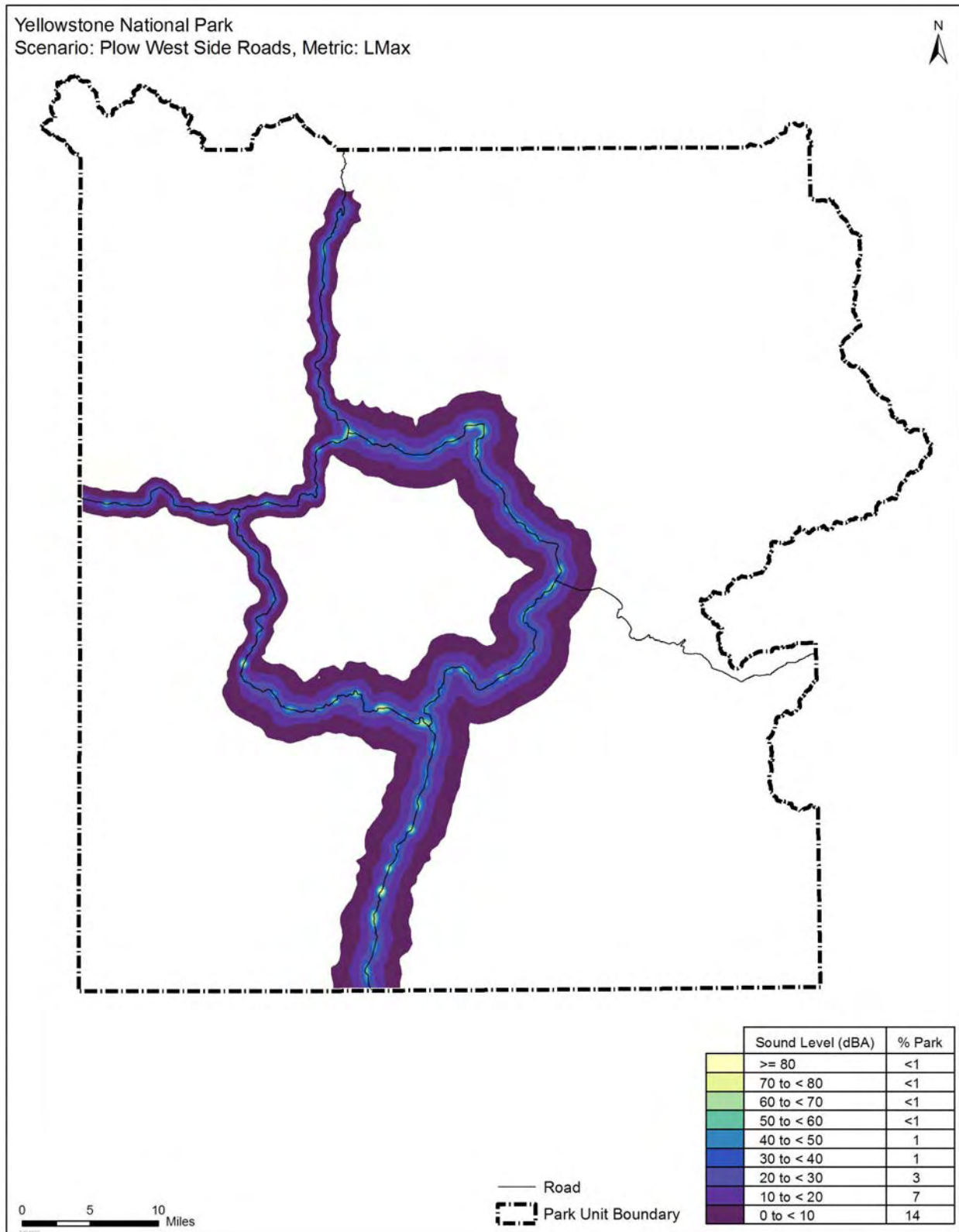


Figure 115: Yellowstone L<sub>Amax</sub> for modeling scenario I



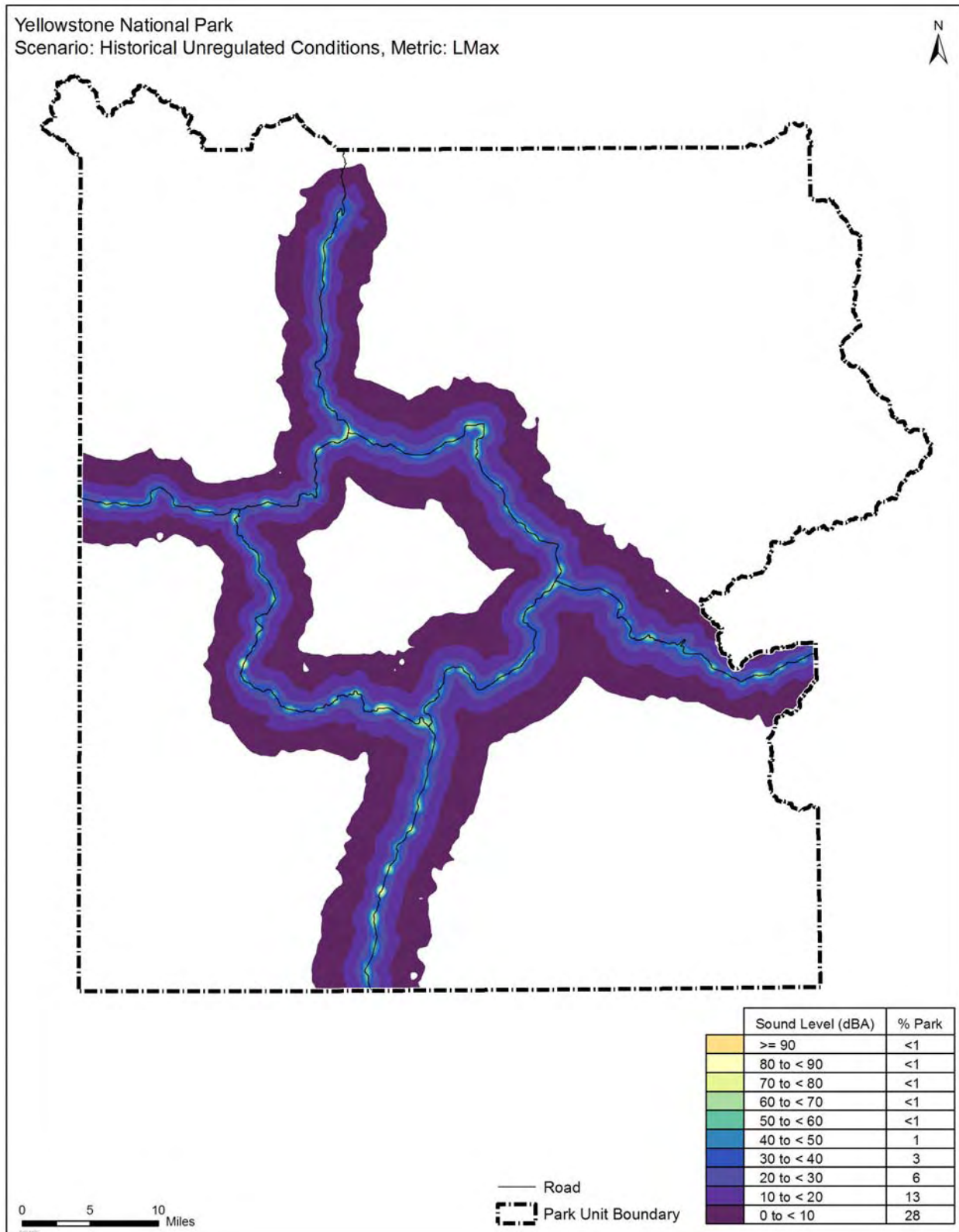


Figure 116: Yellowstone L<sub>Amax</sub> for modeling scenario J

**G.2. Maximum A-Weighted Sound Levels,  $L_{Amax}$ , Grand Teton (Jackson Lake 25 Mile Per Hour Operation)**

For Grand Teton, speed was an additional modeling variable (refer to Table 118). Graphical representations of the results for  $L_{Amax}$  in Grand Teton are shown in Figure 117 to Figure 126. Scenario B shows no contours because Grand Teton has no operations for this scenario. The modeling results are identical for scenarios D and I since these two scenarios have the same operations in Grand Teton.

The speeds at which the OSVs were modeled are shown in Table 118. Speed one in the table represents the current speed limits for each path segment. It was also desired to model Jackson Lake with the limit raised to 45 mph. Thus, speed two is the same for all path segments except for on Jackson Lake.

**Table 118: Over-snow vehicle speed limits for preliminary study**

<i>Grand Teton road segment</i>	<i>Average speed, mph (not differentiated by vehicle type)</i>	
	<b>Speed One</b>	<b>Speed Two</b>
Moran Junction to Flagg Ranch	25	25
Flagg Ranch west to boundary	25	25
Jackson Lake fishing access	25	45

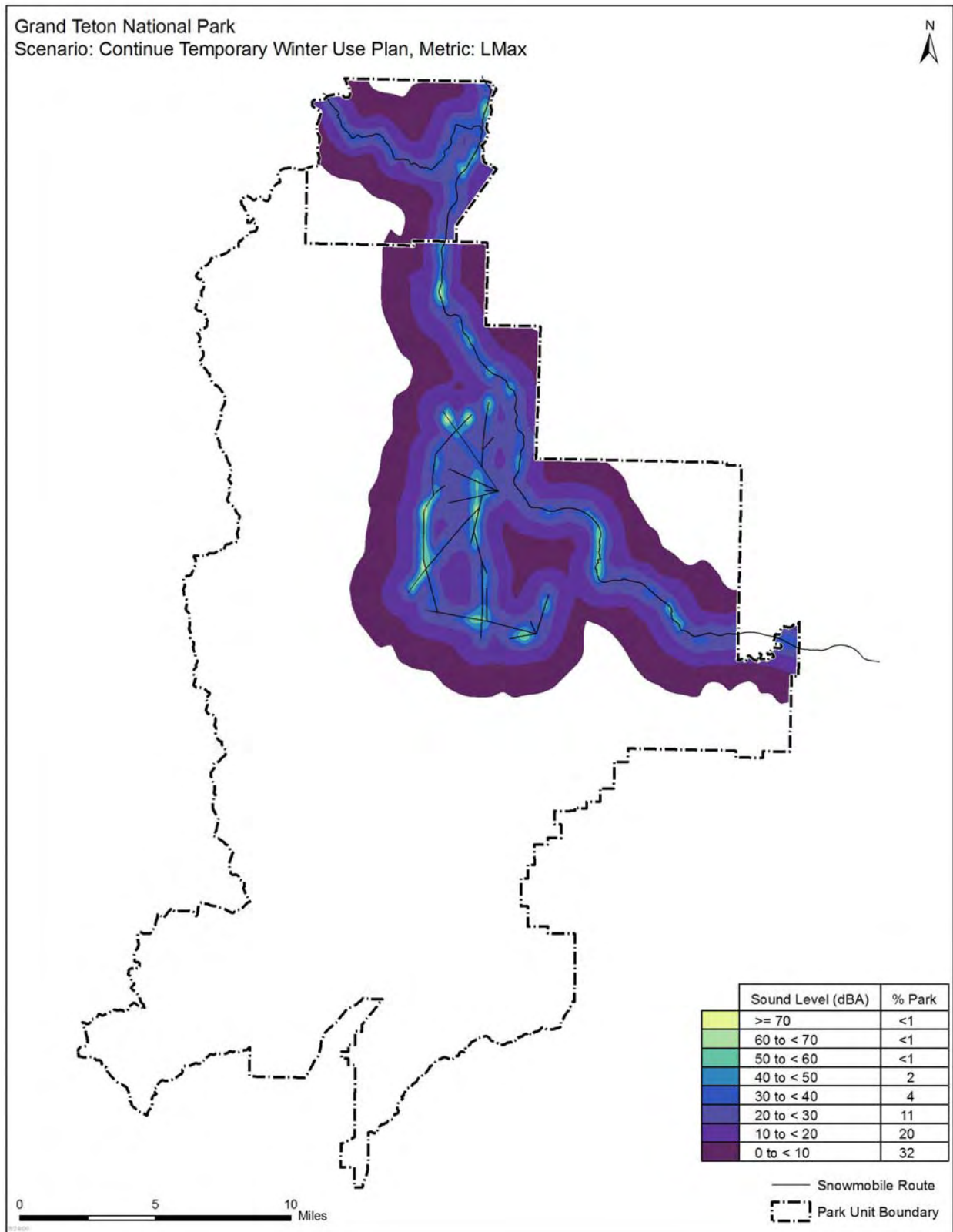


Figure 117: Grand Teton  $L_{Amax}$  for modeling scenario A, speed 25 mph



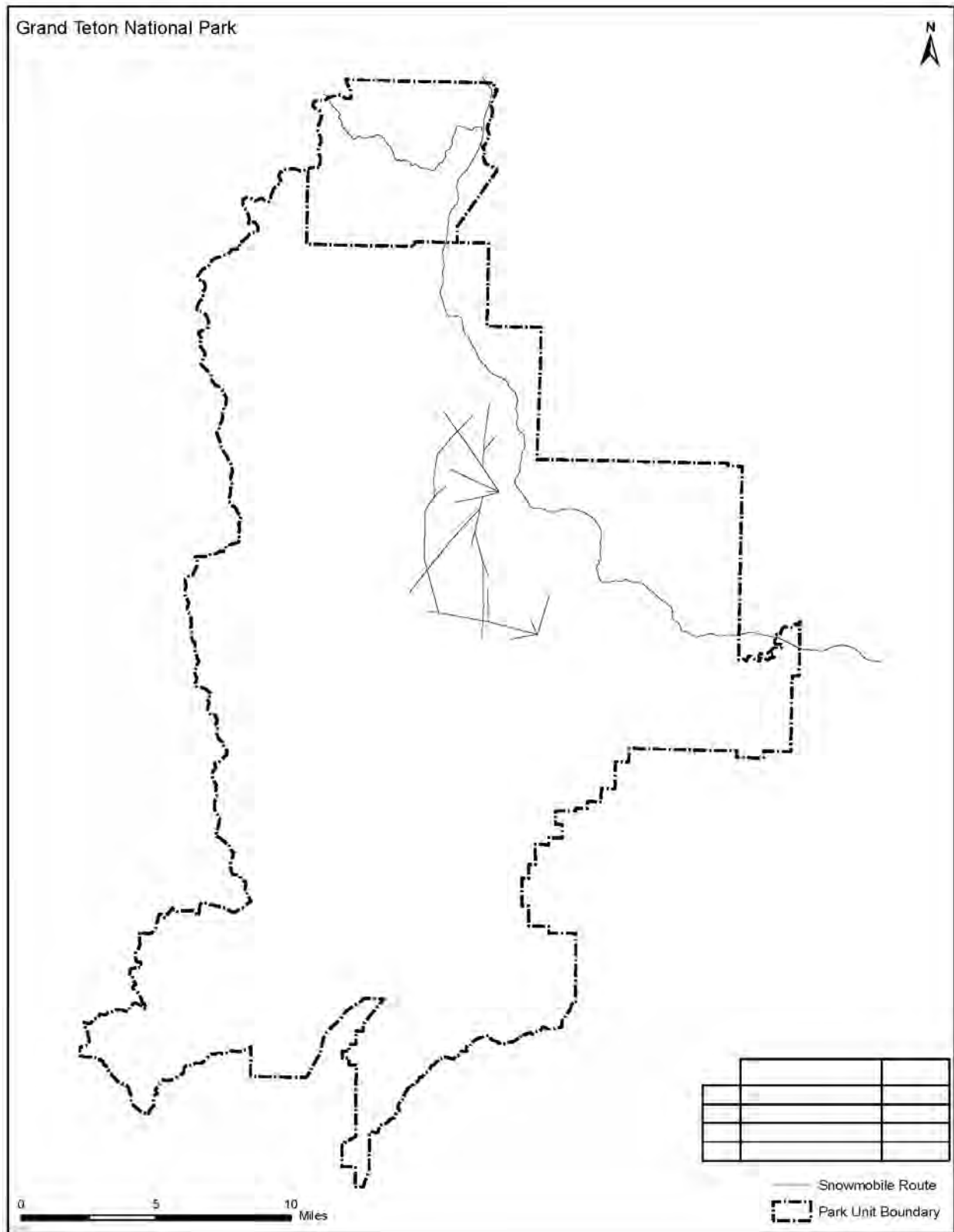


Figure 118: Grand Teton  $L_{Amax}$  for modeling scenario B, speed 25 mph

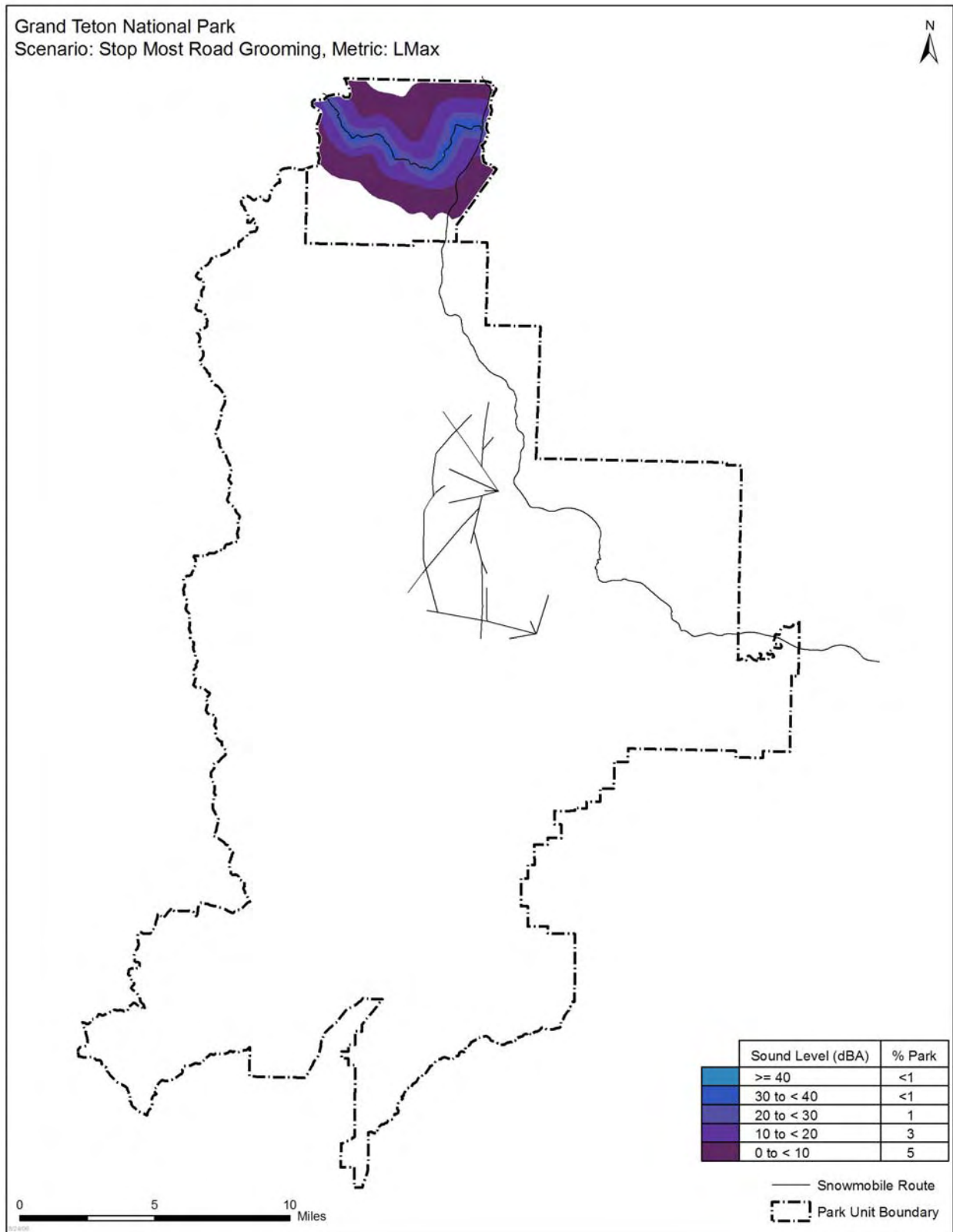


Figure 119: Grand Teton L<sub>Amax</sub> for modeling scenario C, speed 25 mph

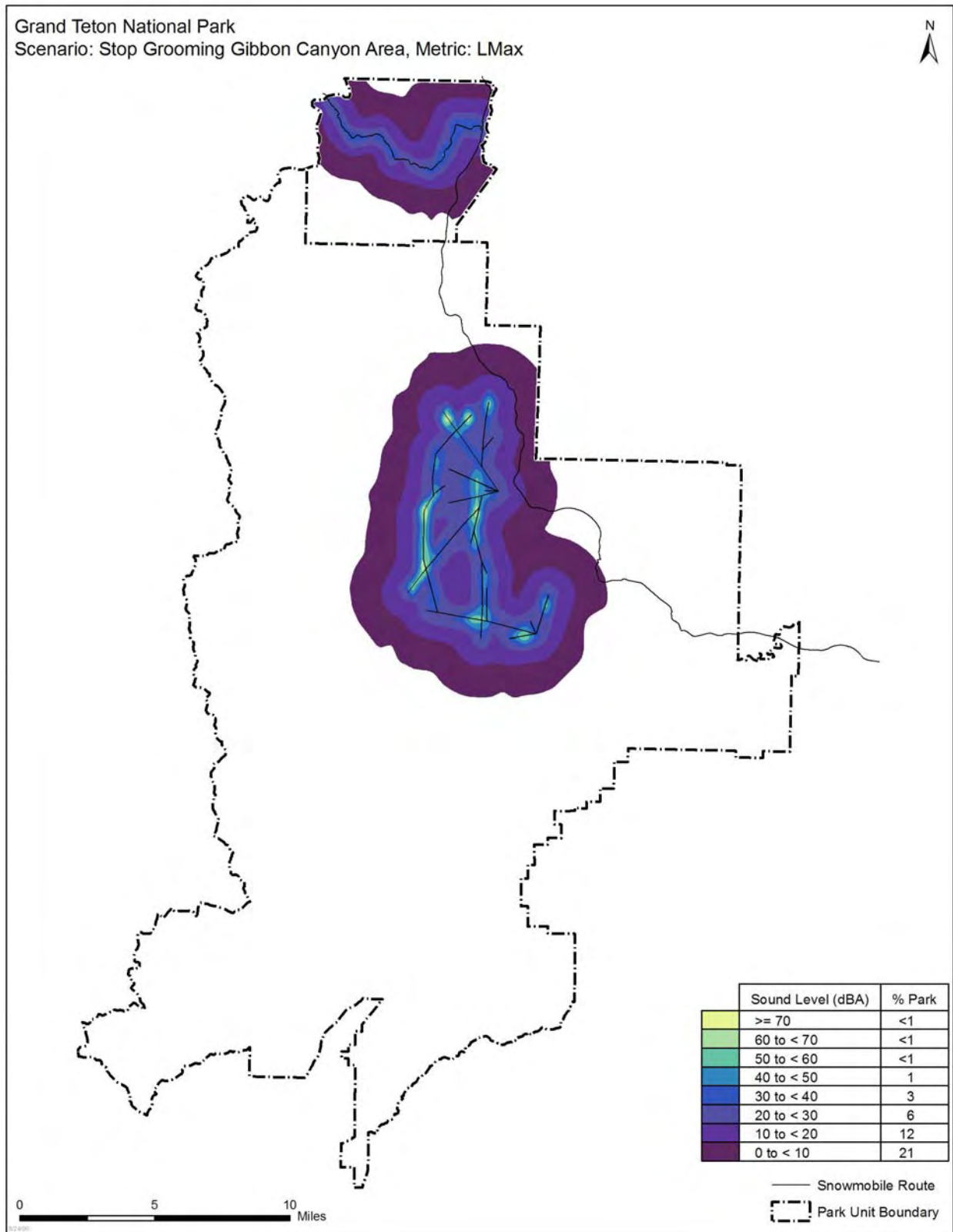


Figure 120: Grand Teton  $L_{Amax}$  for modeling scenario D, speed 25 mph

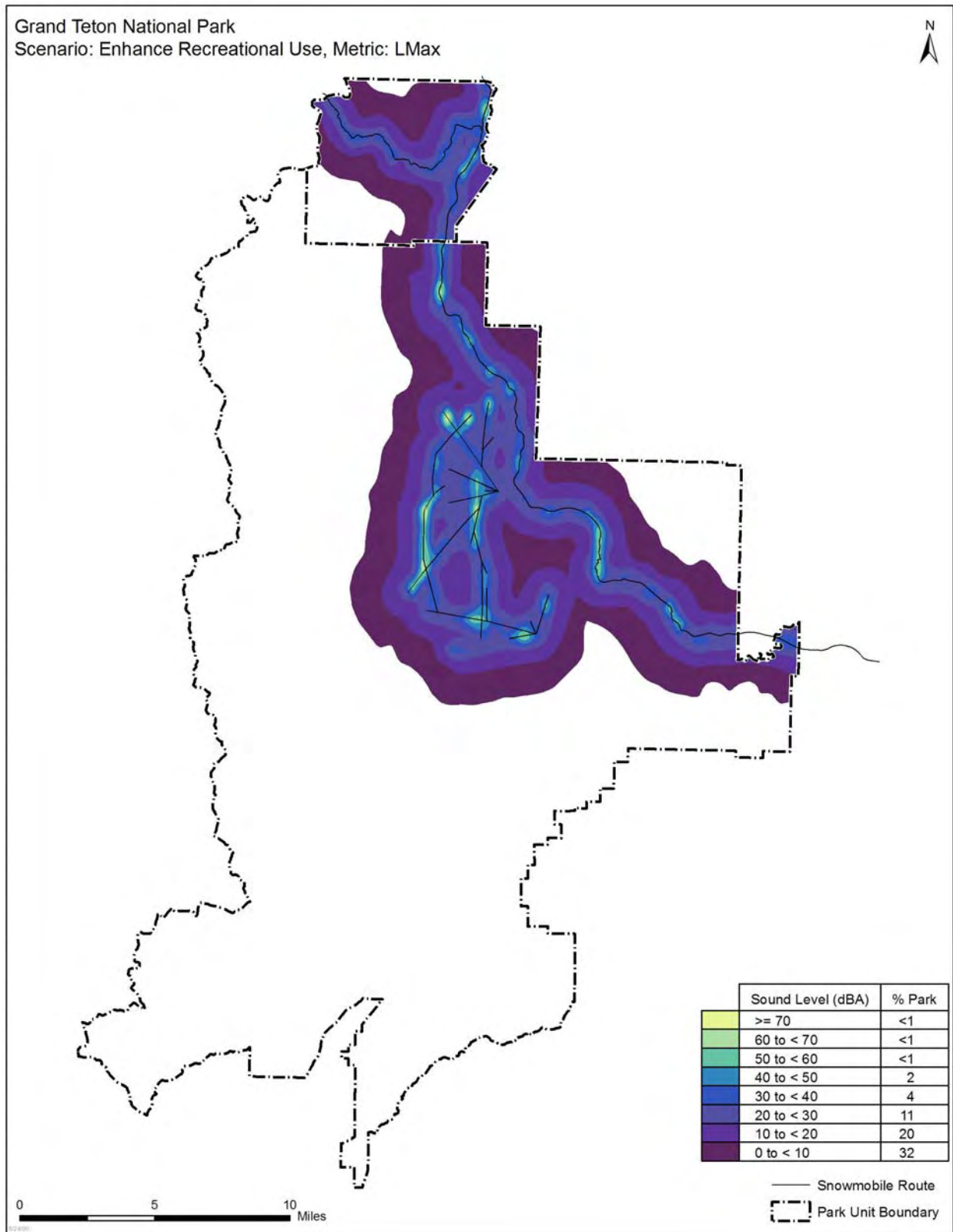


Figure 121: Grand Teton  $L_{Amax}$  for modeling scenario E, speed 25 mph

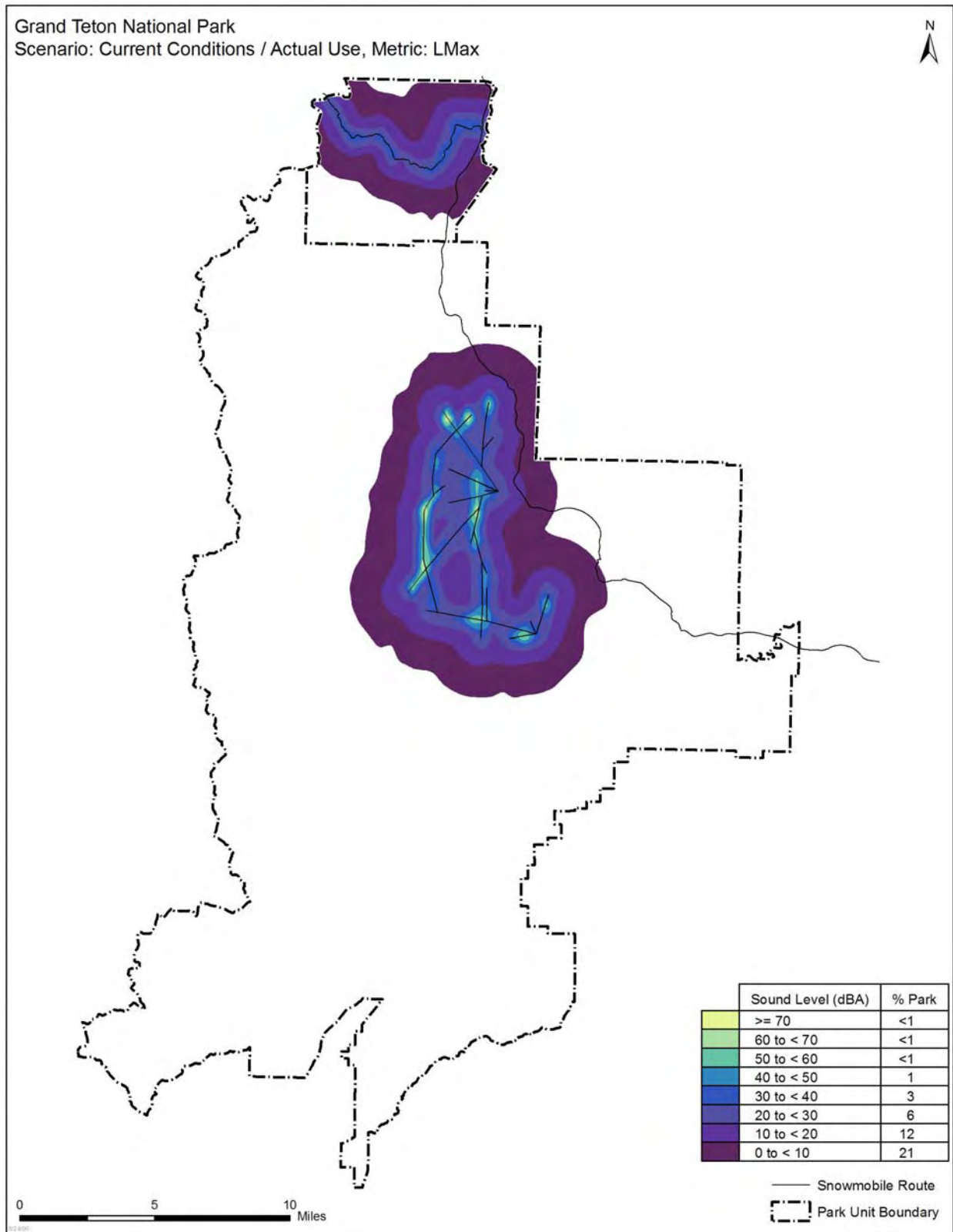


Figure 122: Grand Teton  $L_{Amax}$  for modeling scenario F, speed 25 mph

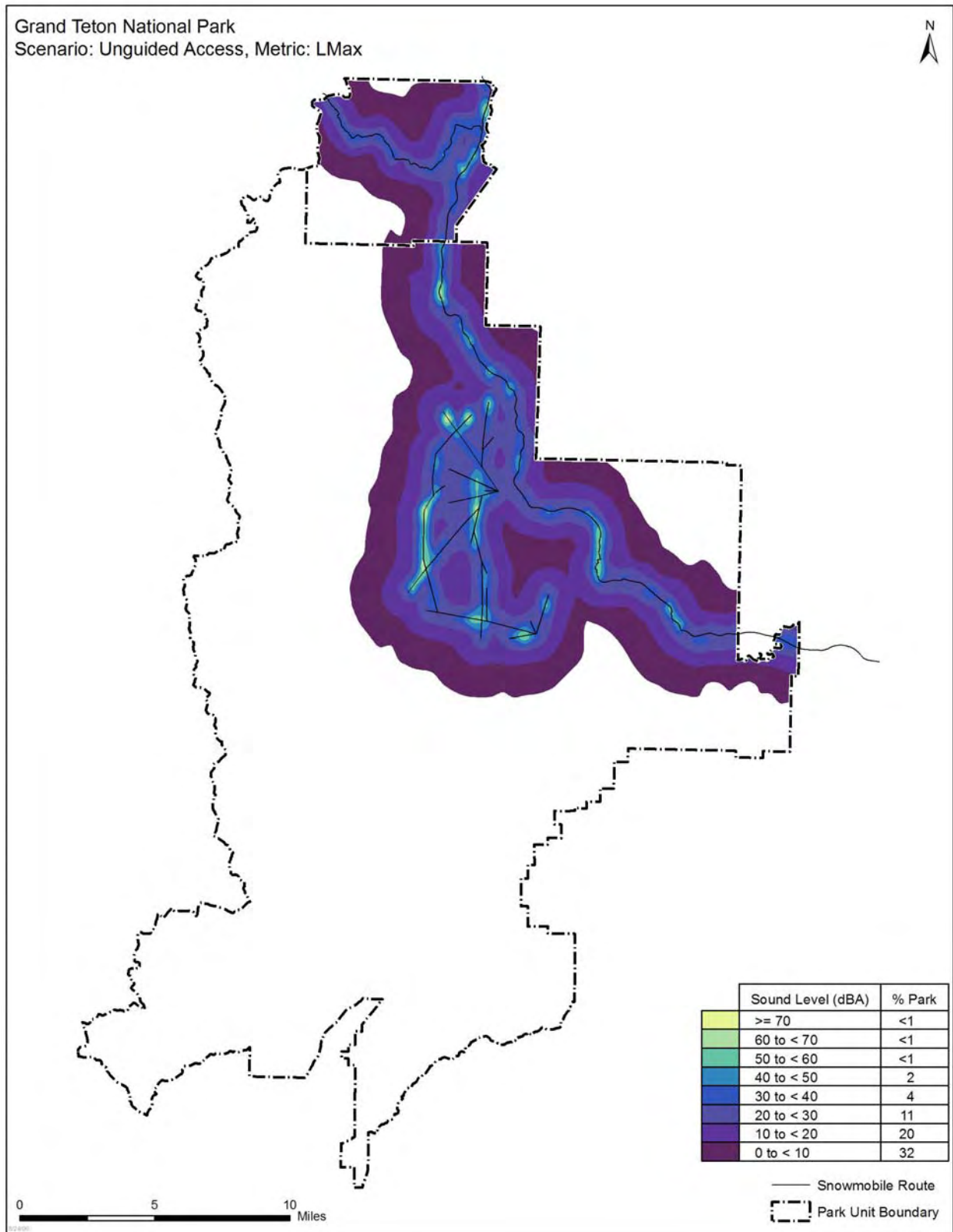


Figure 123: Grand Teton  $L_{Amax}$  for modeling scenario G, speed 25 mph



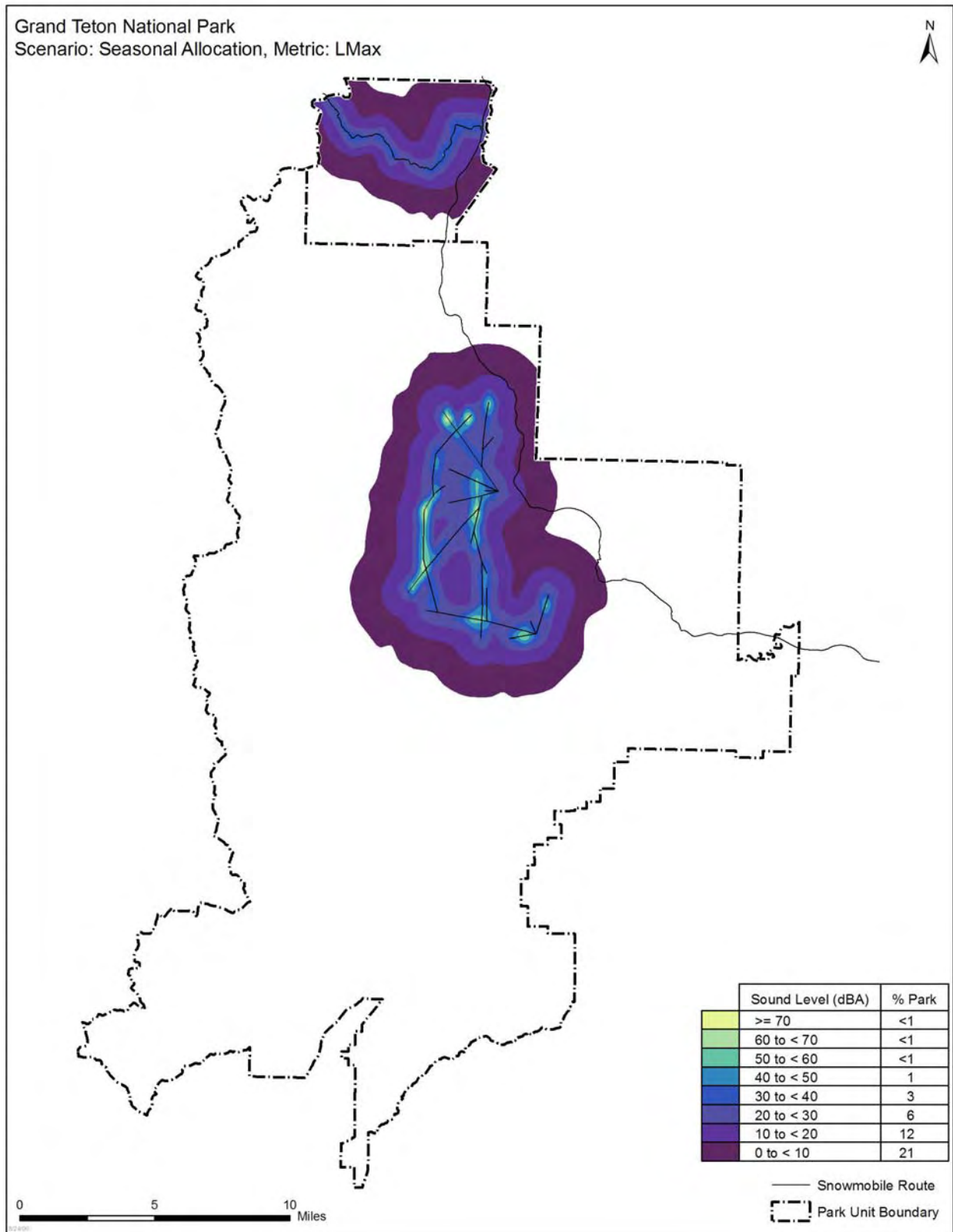


Figure 124: Grand Teton  $L_{Amax}$  for modeling scenario H, speed 25 mph



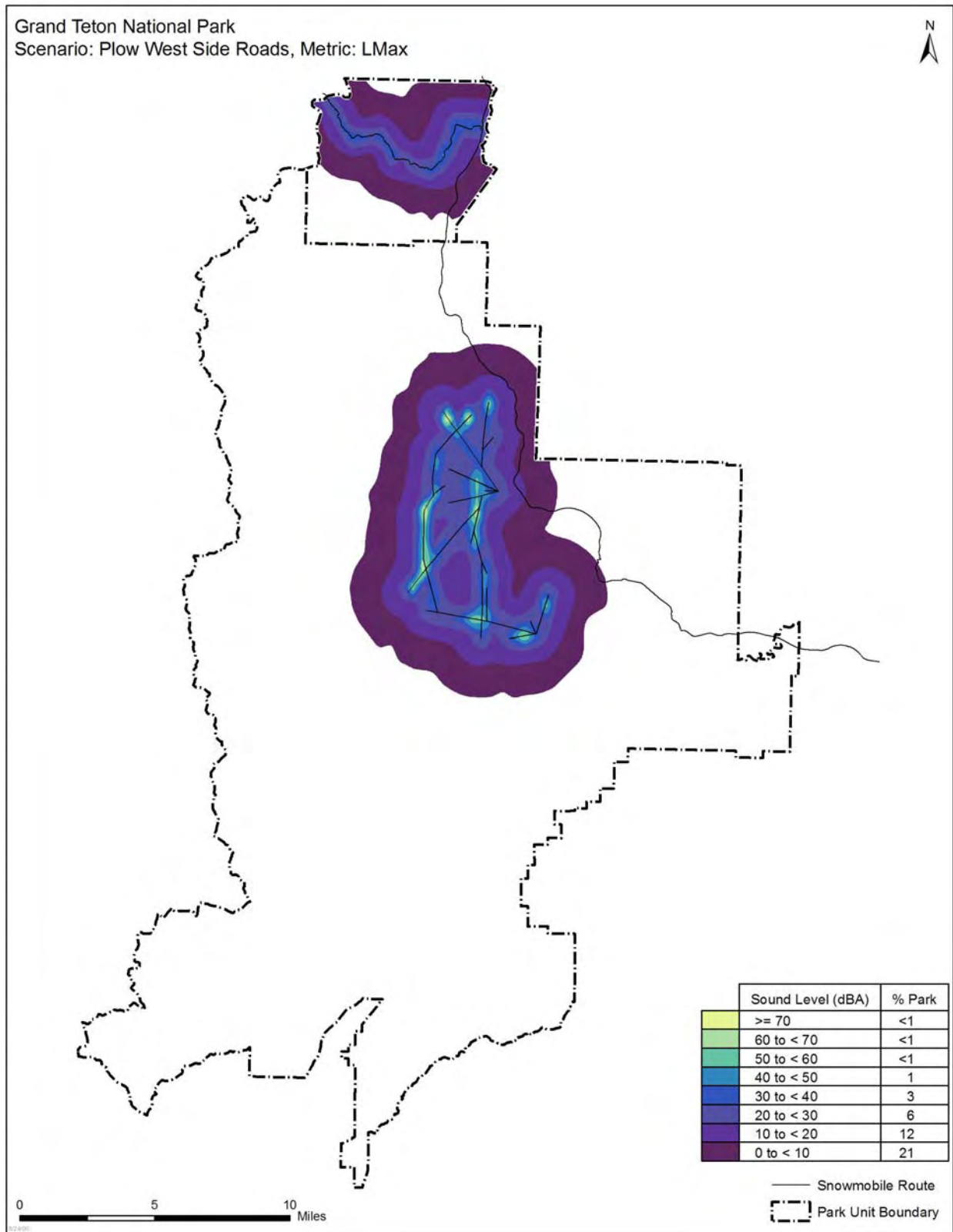


Figure 125: Grand Teton L<sub>Amax</sub> for modeling scenario I, speed 25 mph

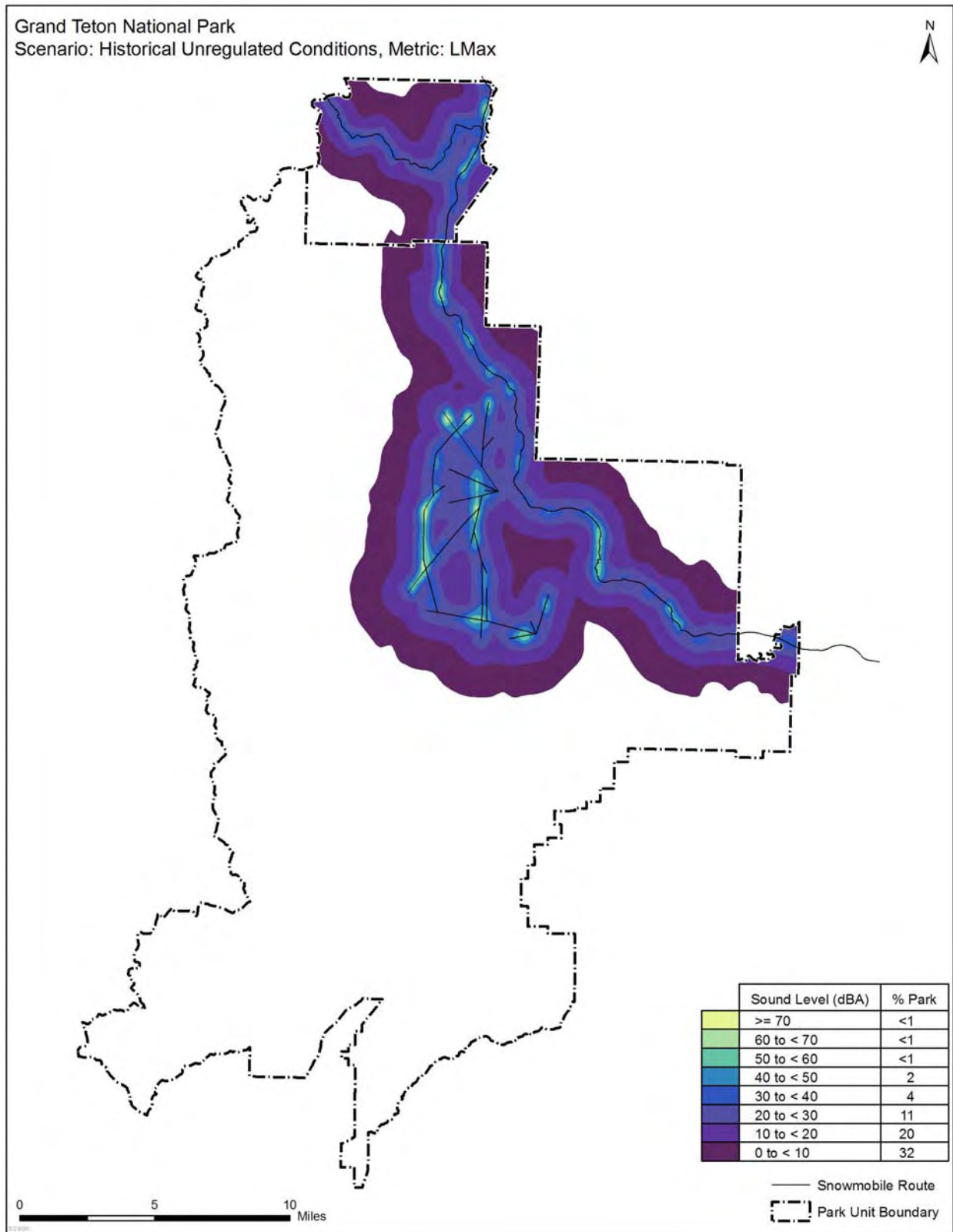


Figure 126: Grand Teton  $L_{Amax}$  for modeling scenario J, speed 25 mph

**G.3. Maximum A-Weighted Sound Levels,  $L_{Amax}$ , Grand Teton (Jackson Lake 45 Mile Per Hour Operation)**

Similar results are shown in Figure 127 to Figure 136 for Grand Teton with speeds on Jackson Lake set to 45 miles per hour. Again, scenario B shows no contours because Grand Teton has no operations for this scenario.

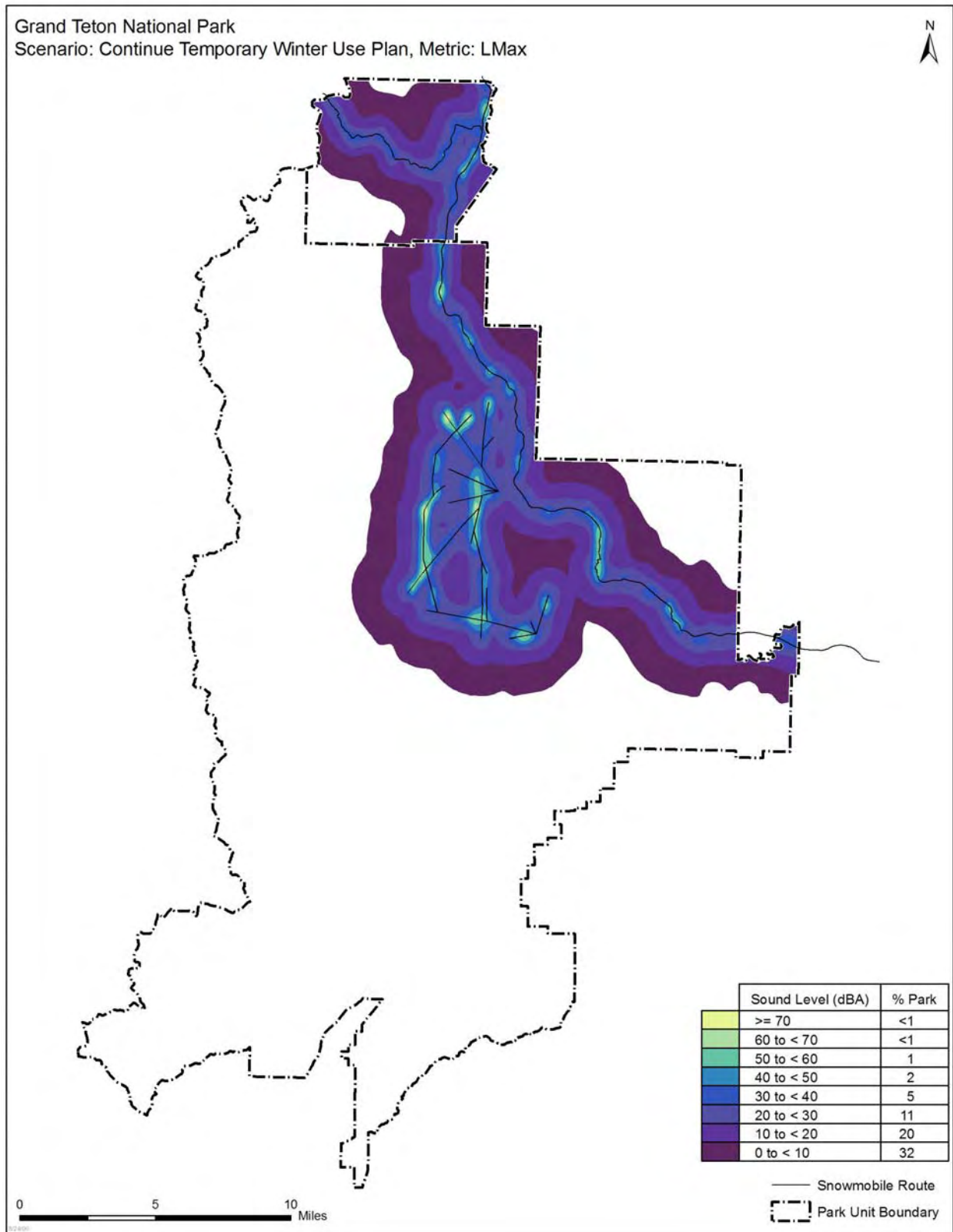


Figure 127: Grand Teton  $L_{Amax}$  for modeling scenario A, speed 45 mph

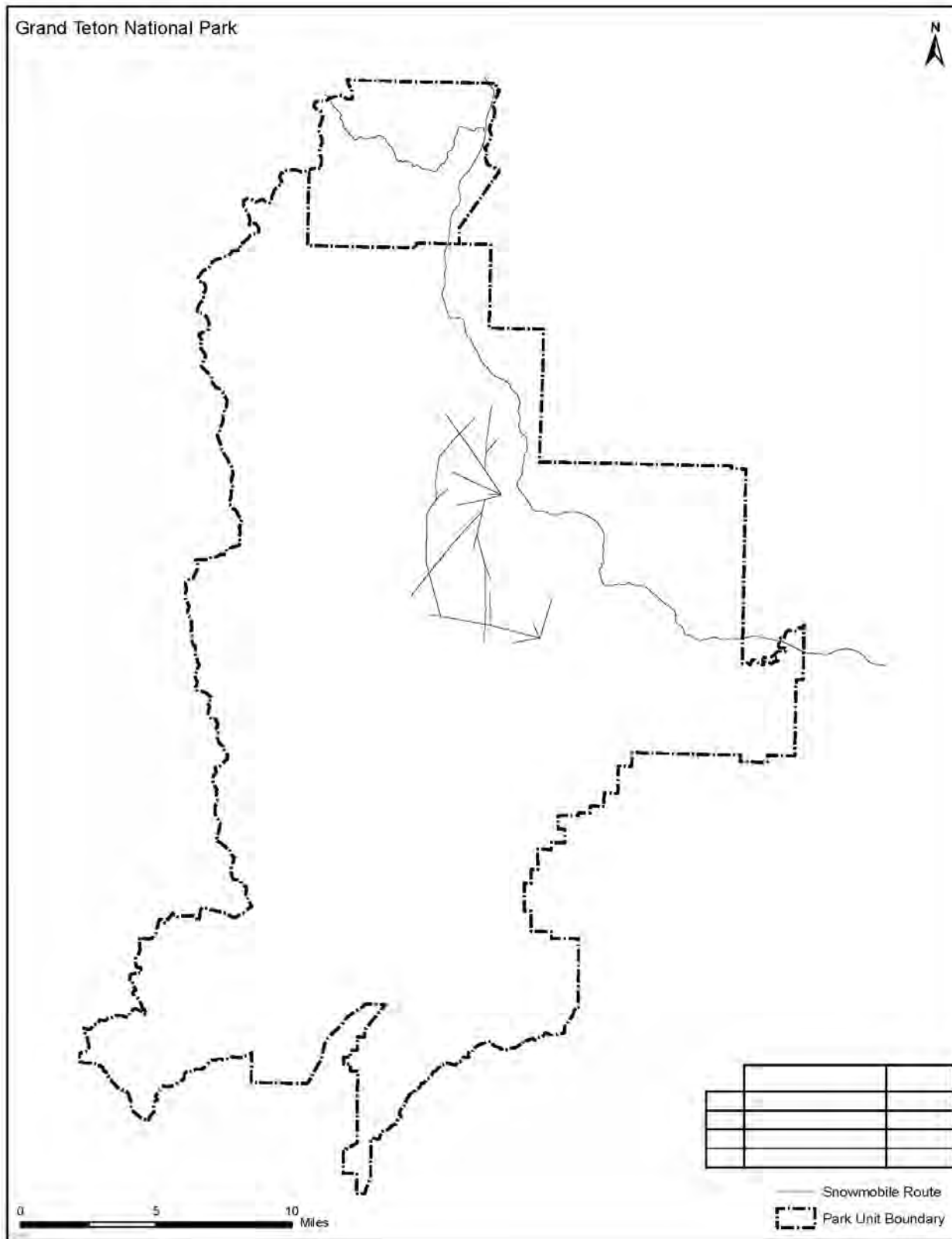


Figure 128: Grand Teton  $L_{Amax}$  for modeling scenario B, speed 45 mph

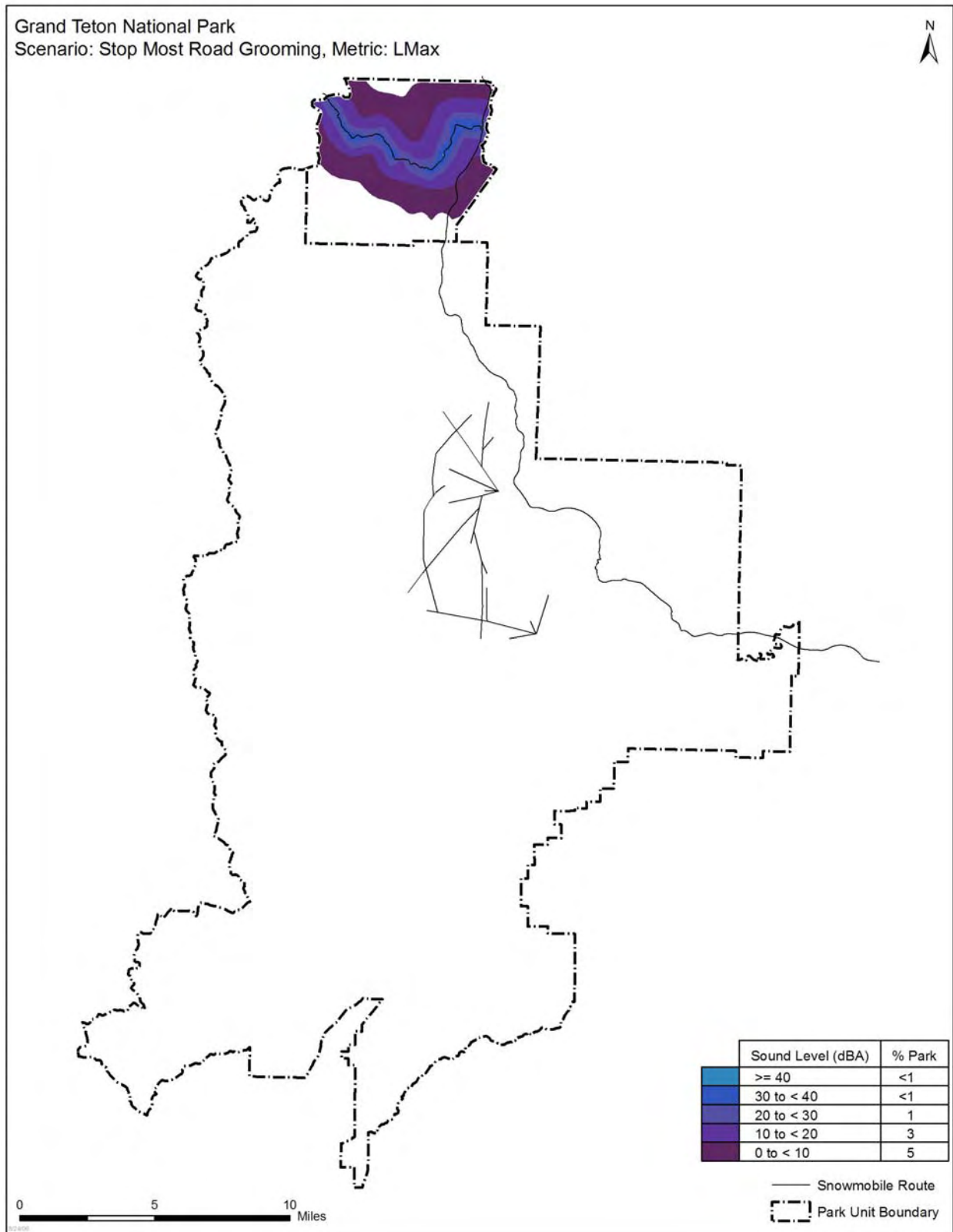


Figure 129: Grand Teton L<sub>Amax</sub> for modeling scenario C, speed 45 mph

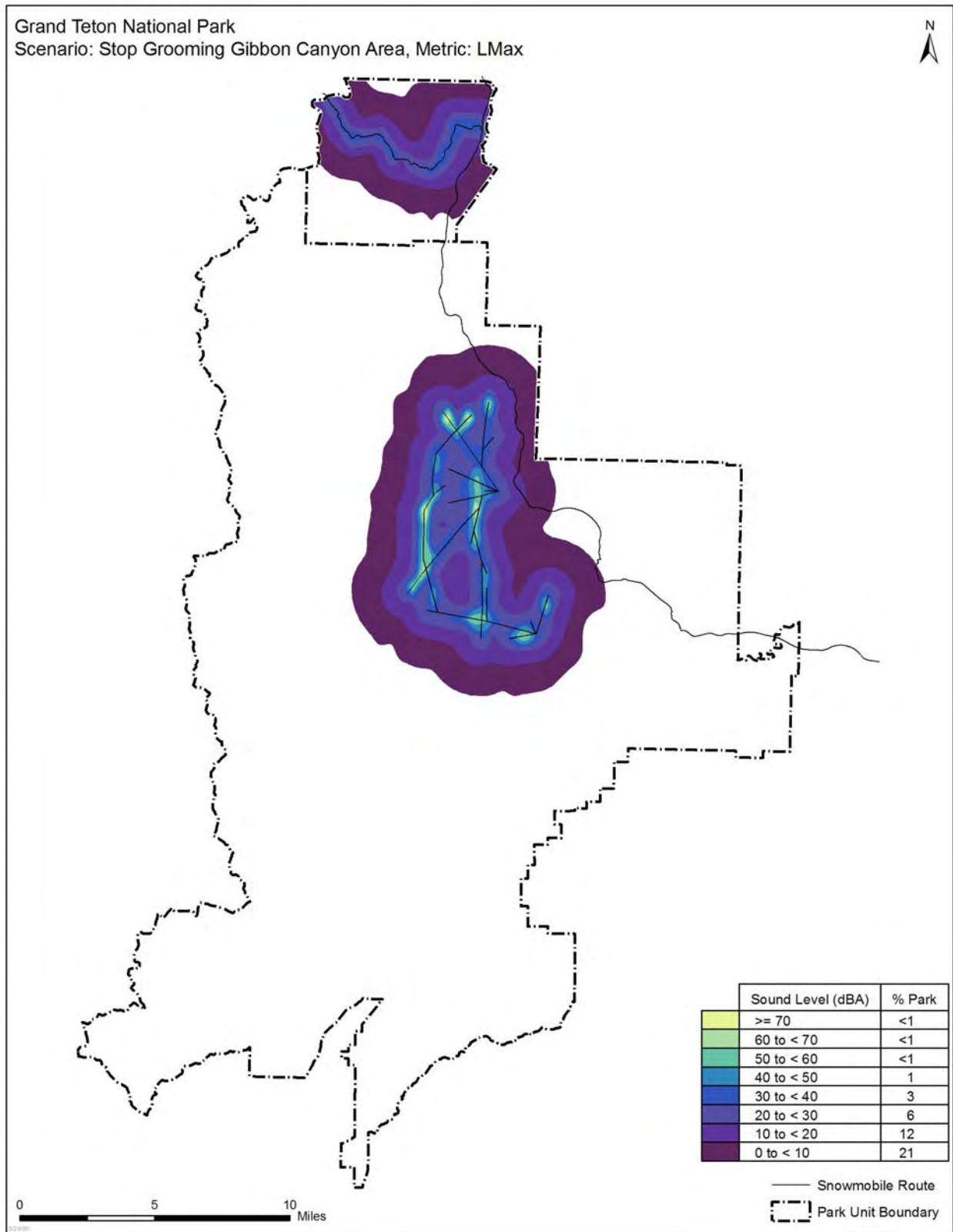


Figure 130: Grand Teton  $L_{Amax}$  for modeling scenario D, speed 45 mph



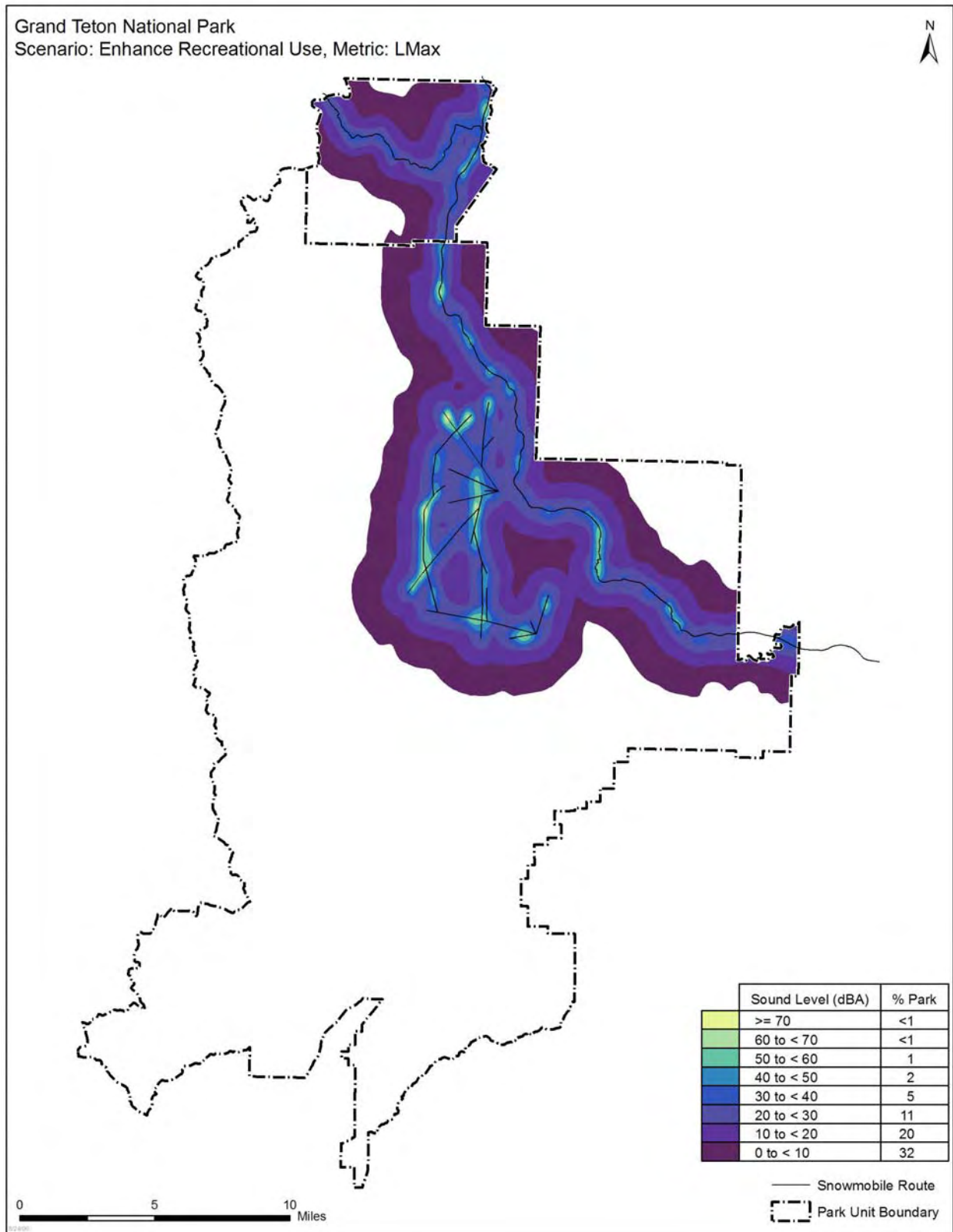


Figure 131: Grand Teton  $L_{Amax}$  for modeling scenario E, speed 45 mph

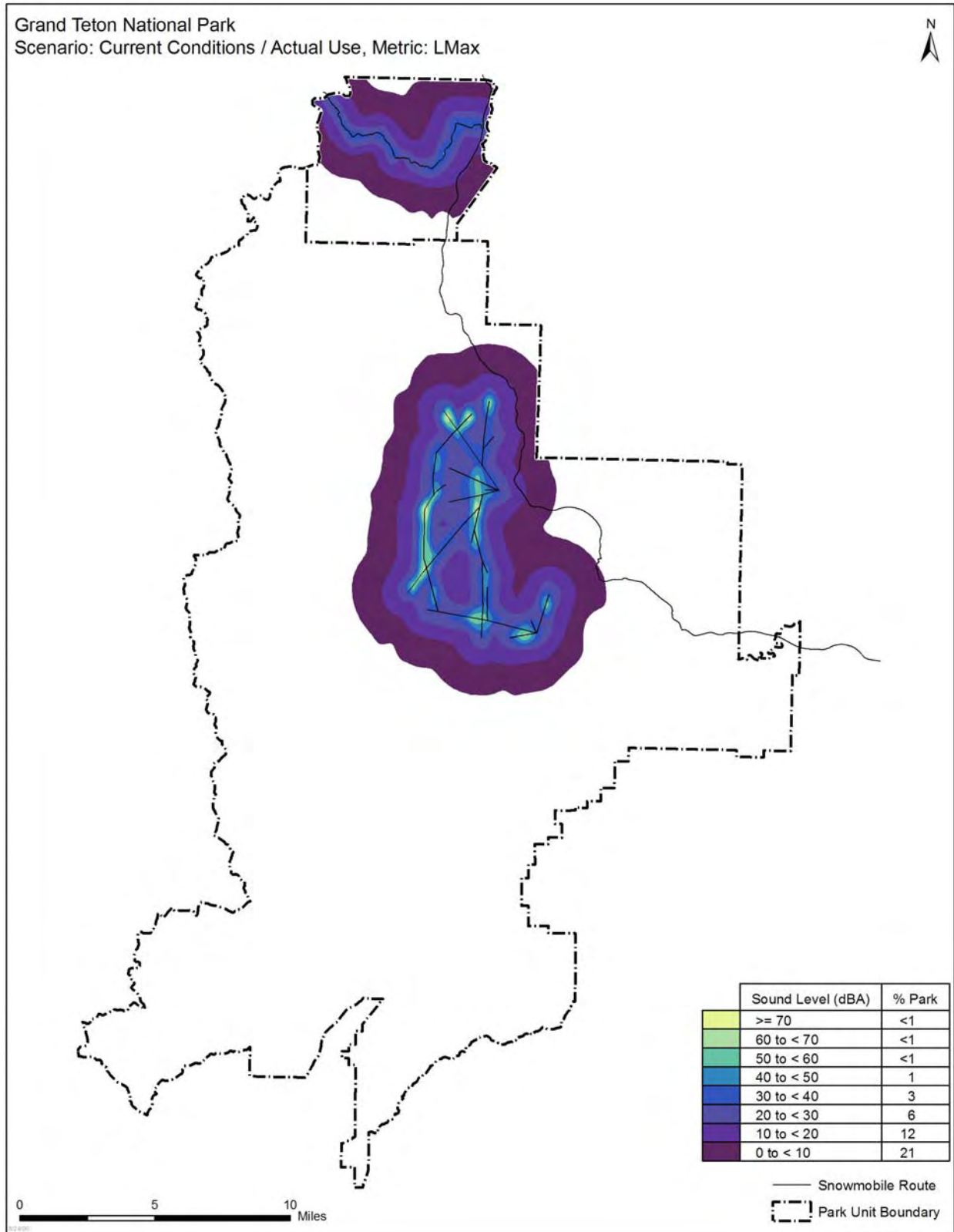


Figure 132: Grand Teton  $L_{Amax}$  for modeling scenario F, speed 45 mph

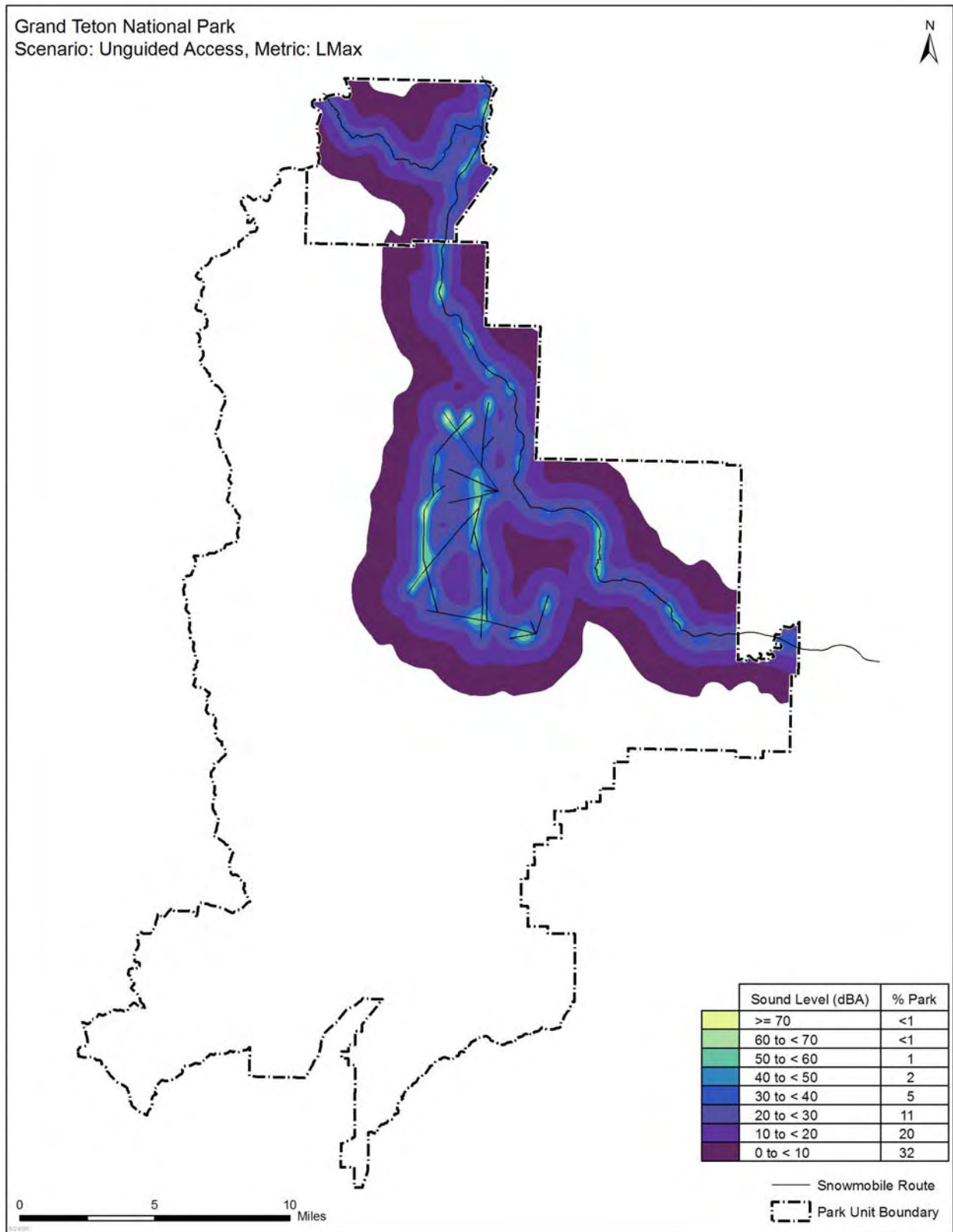


Figure 133: Grand Teton  $L_{Amax}$  for modeling scenario G, speed 45 mph

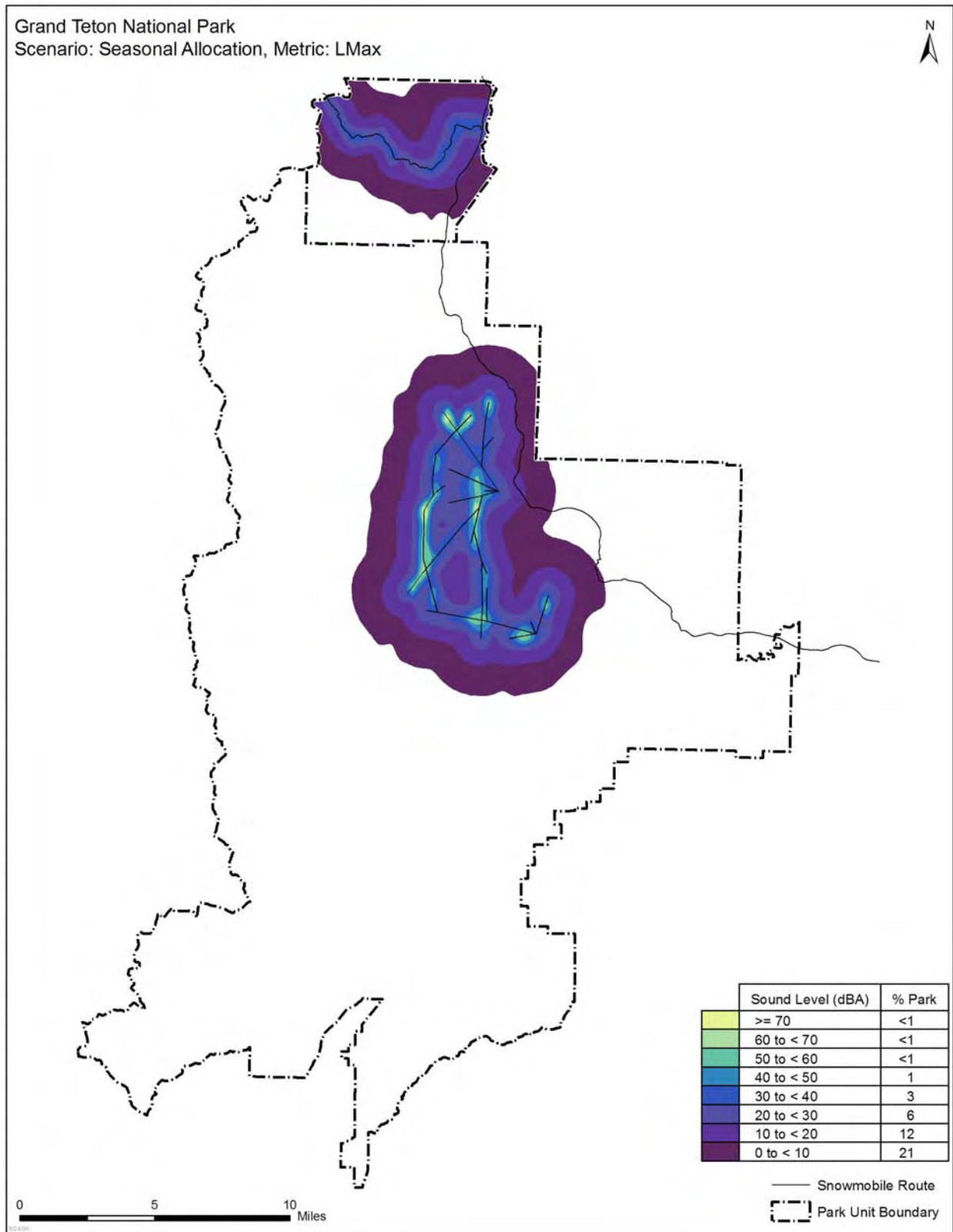


Figure 134: Grand Teton  $L_{Amax}$  for modeling scenario H, speed 45 mph

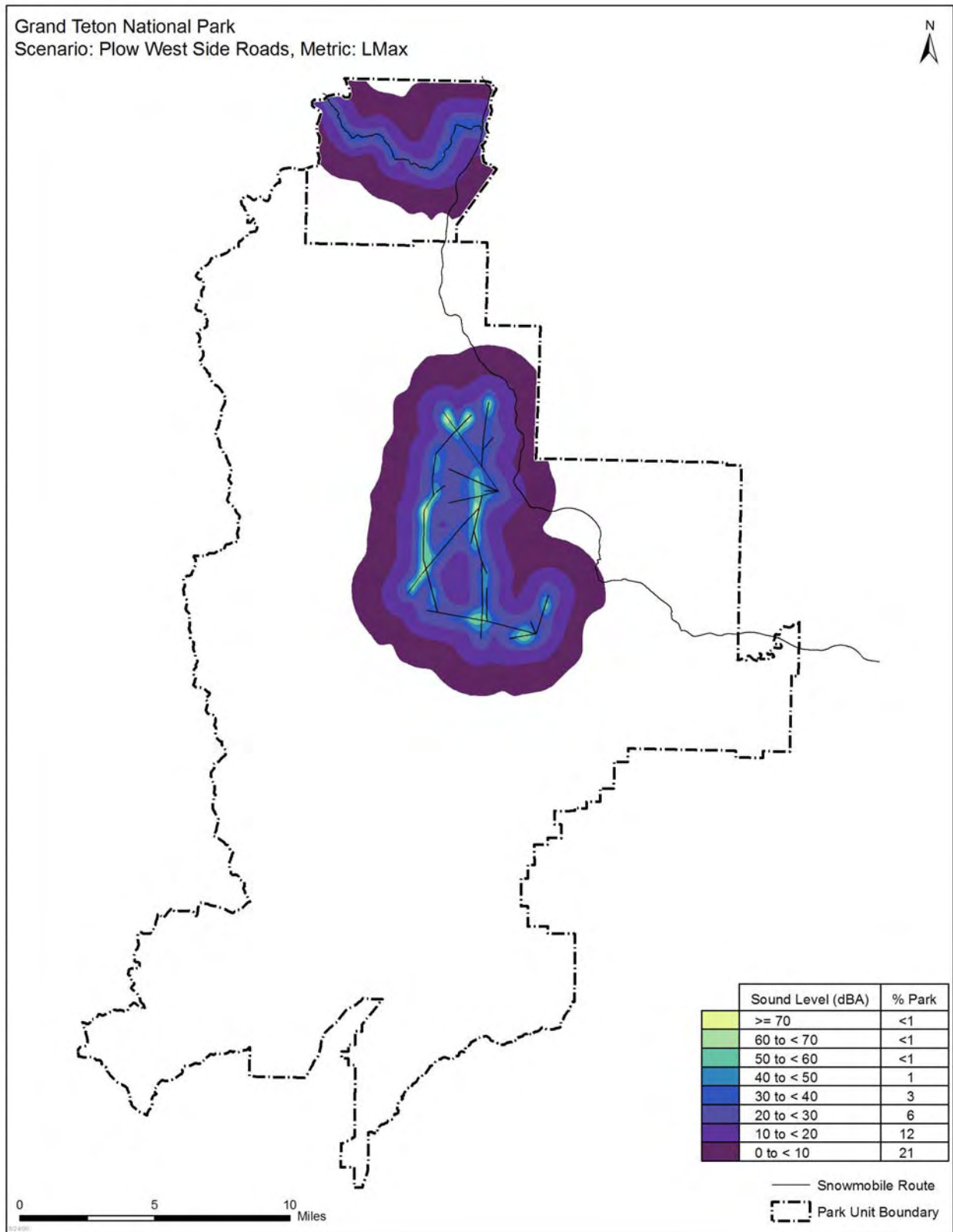


Figure 135: Grand Teton  $L_{Amax}$  for modeling scenario I, speed 45 mph



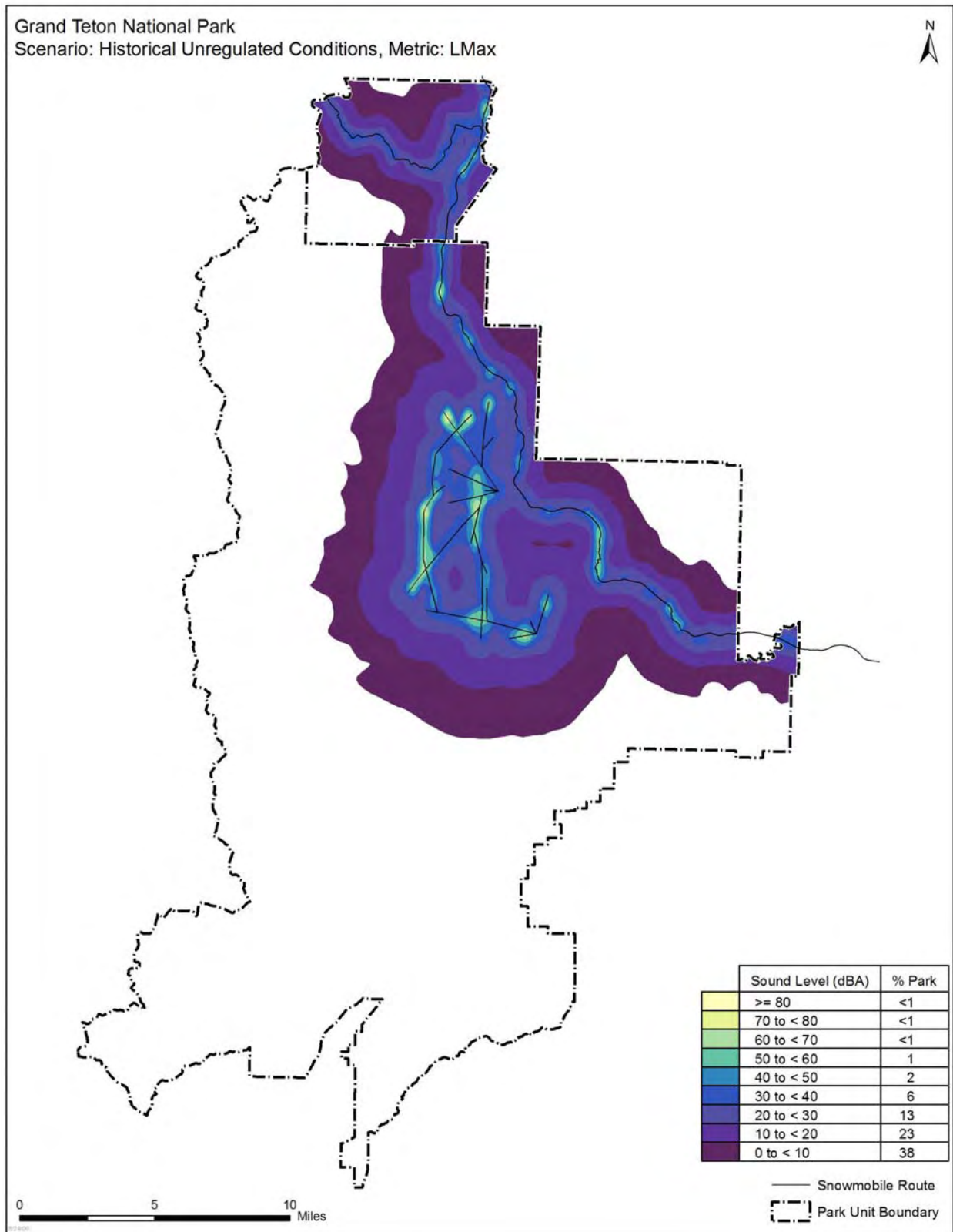


Figure 136: Grand Teton  $L_{Amax}$  for modeling scenario J, speed 45 mph

**G.4. Percent Time Audible, Yellowstone**

Graphical representations of the results for percent time audible (%TAUD) in Yellowstone are shown in Figure 137 to Figure 146.



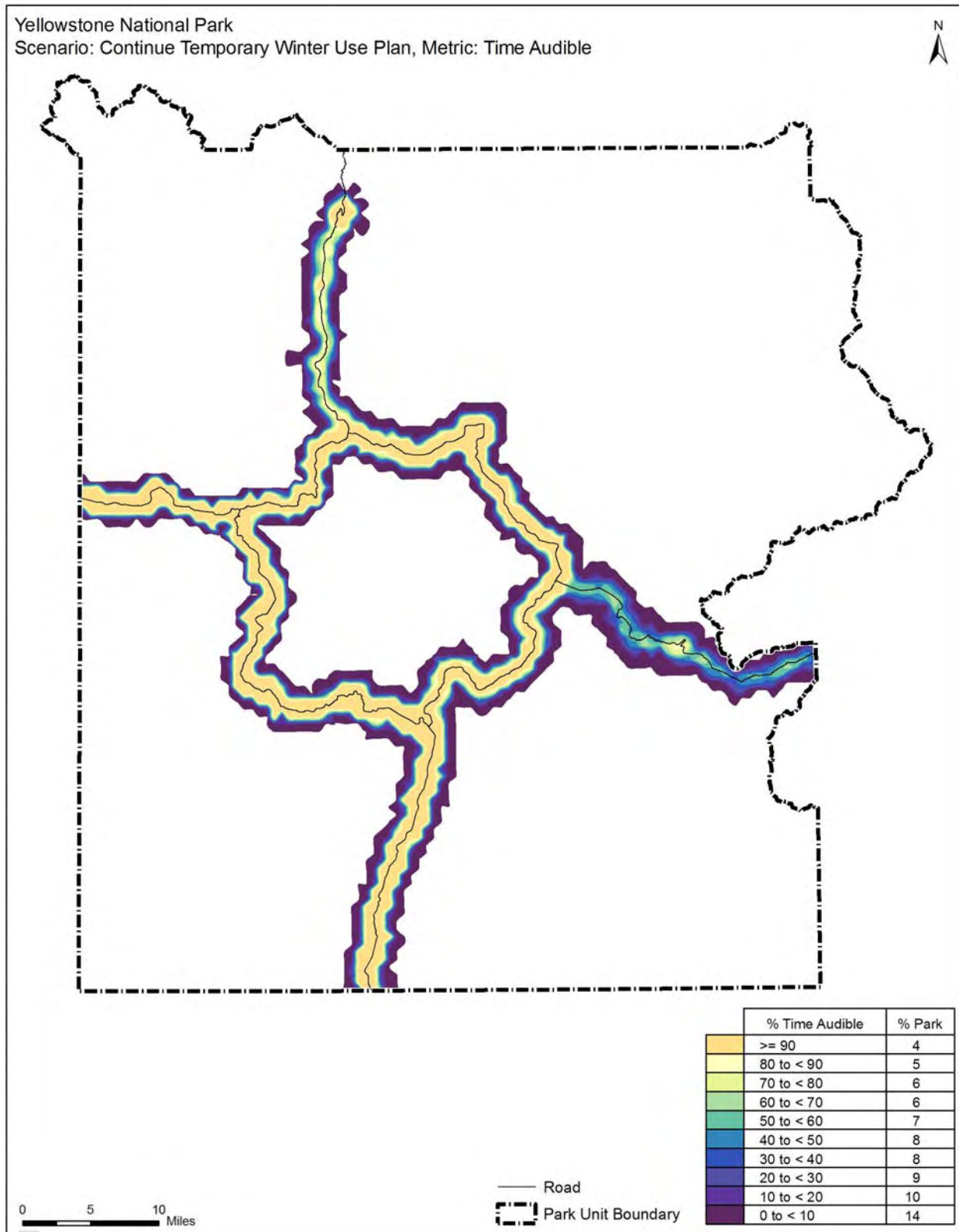


Figure 137: Yellowstone %TAUD for modeling scenario A

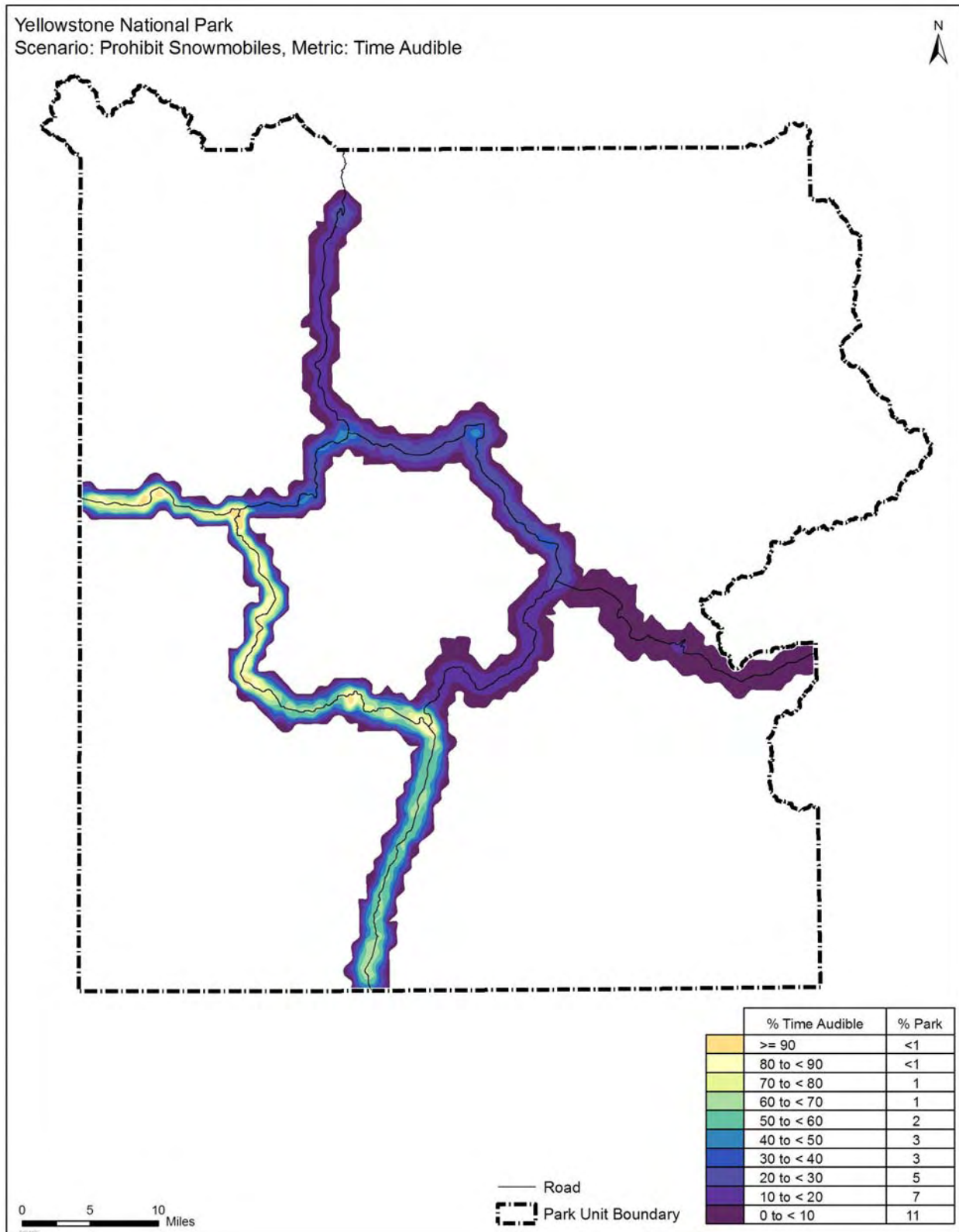


Figure 138: Yellowstone %TAUD for modeling scenario B

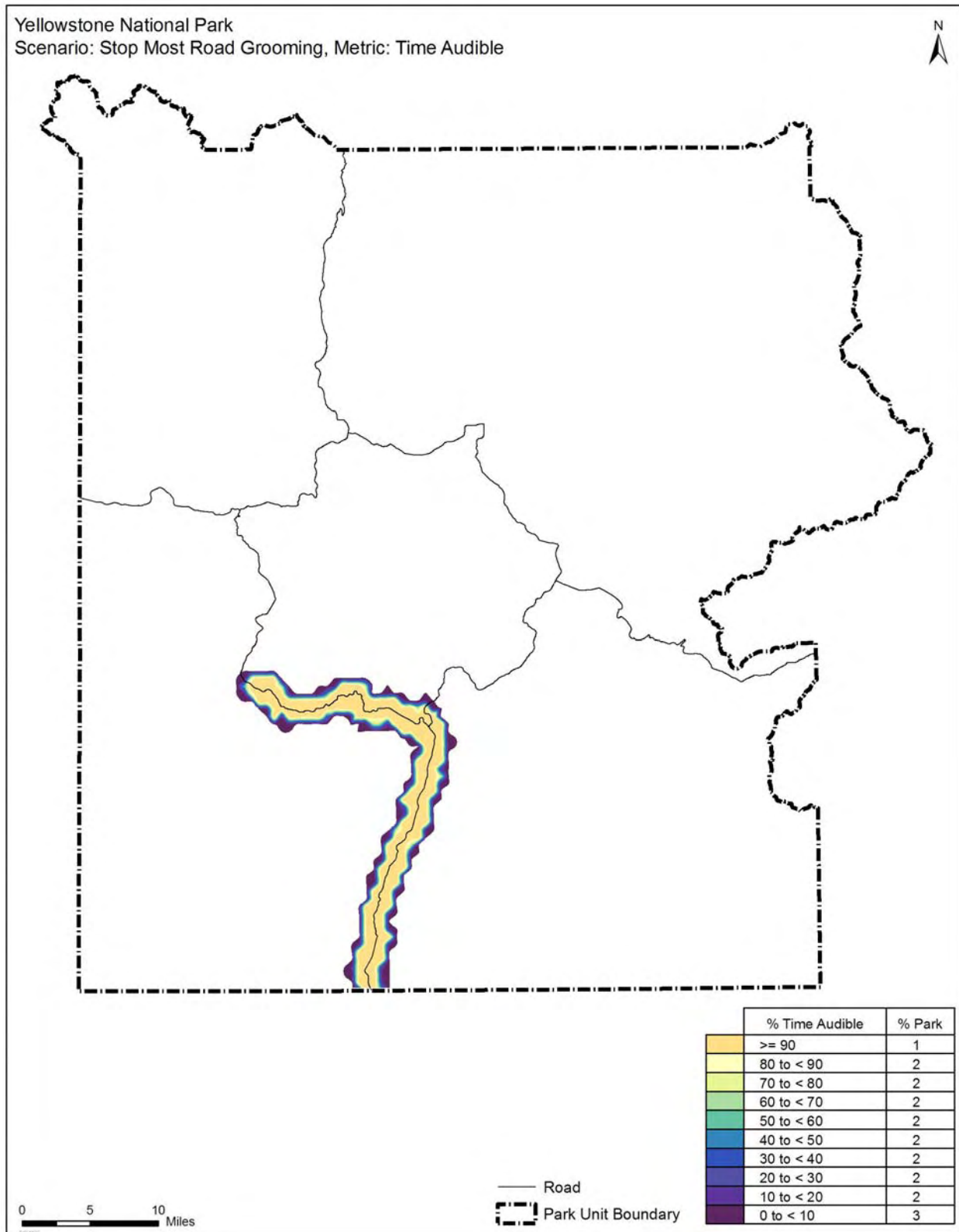


Figure 139: Yellowstone %TAUD for modeling scenario C

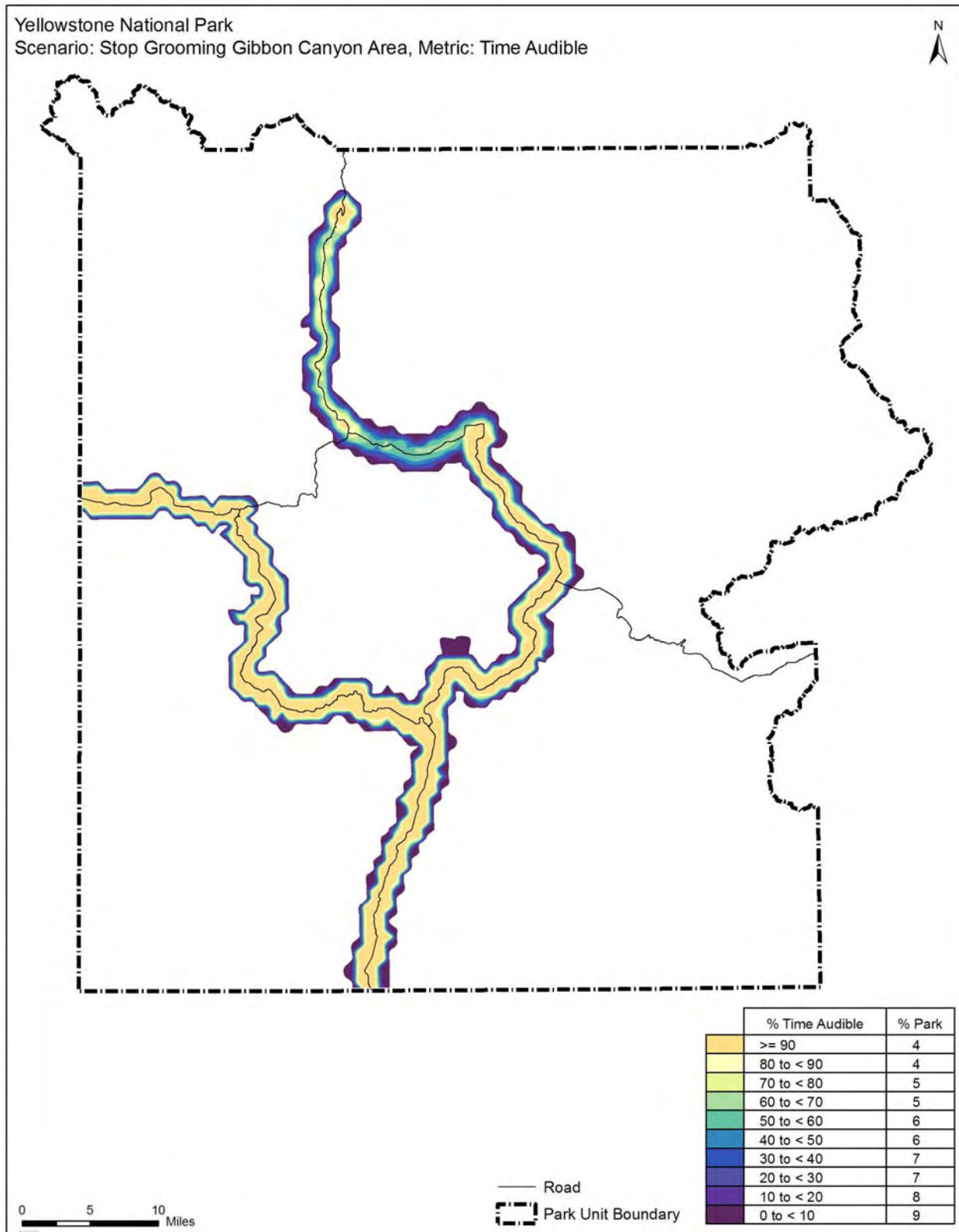


Figure 140: Yellowstone %TAUD for modeling scenario D

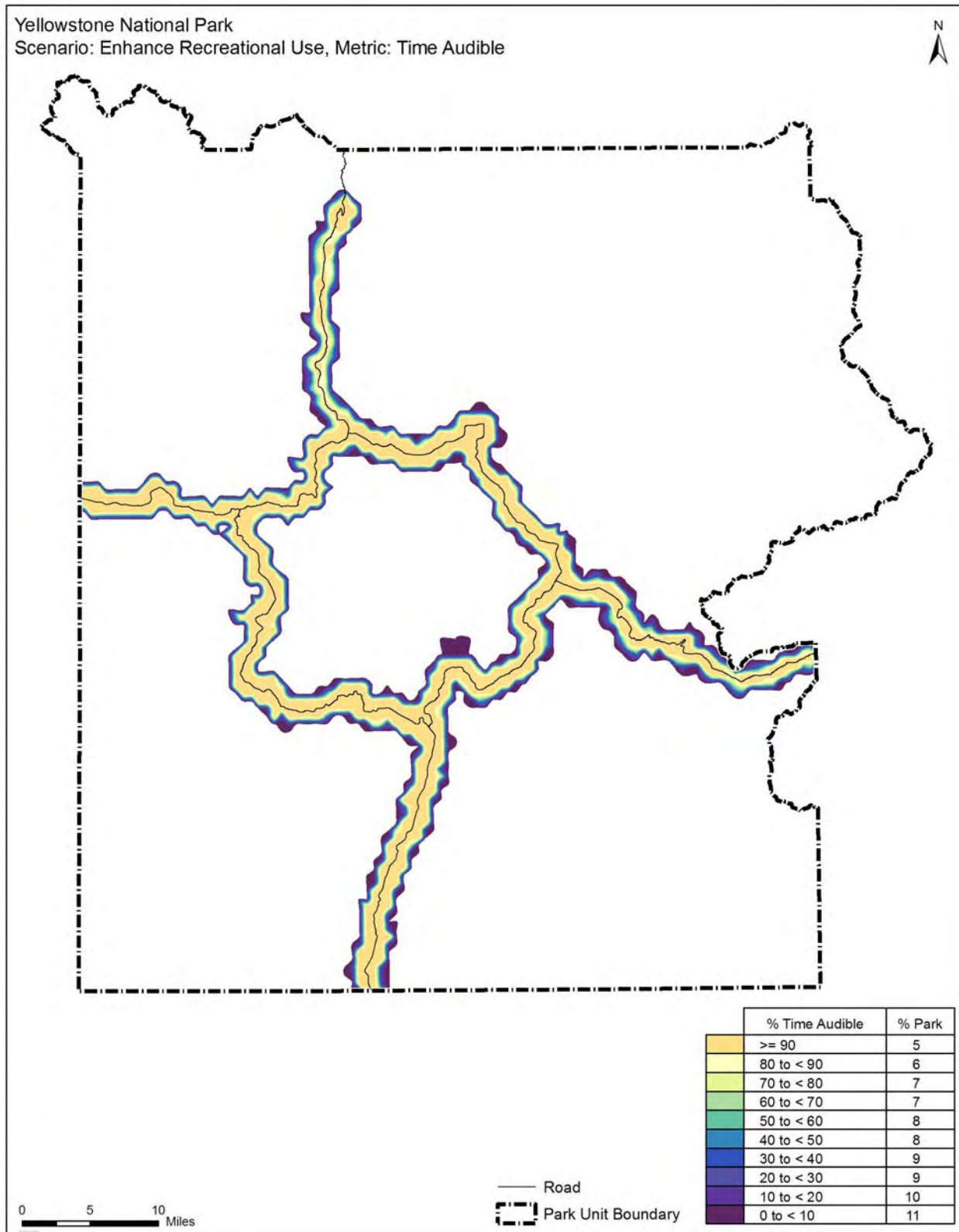


Figure 141: Yellowstone %TAUD for modeling scenario E



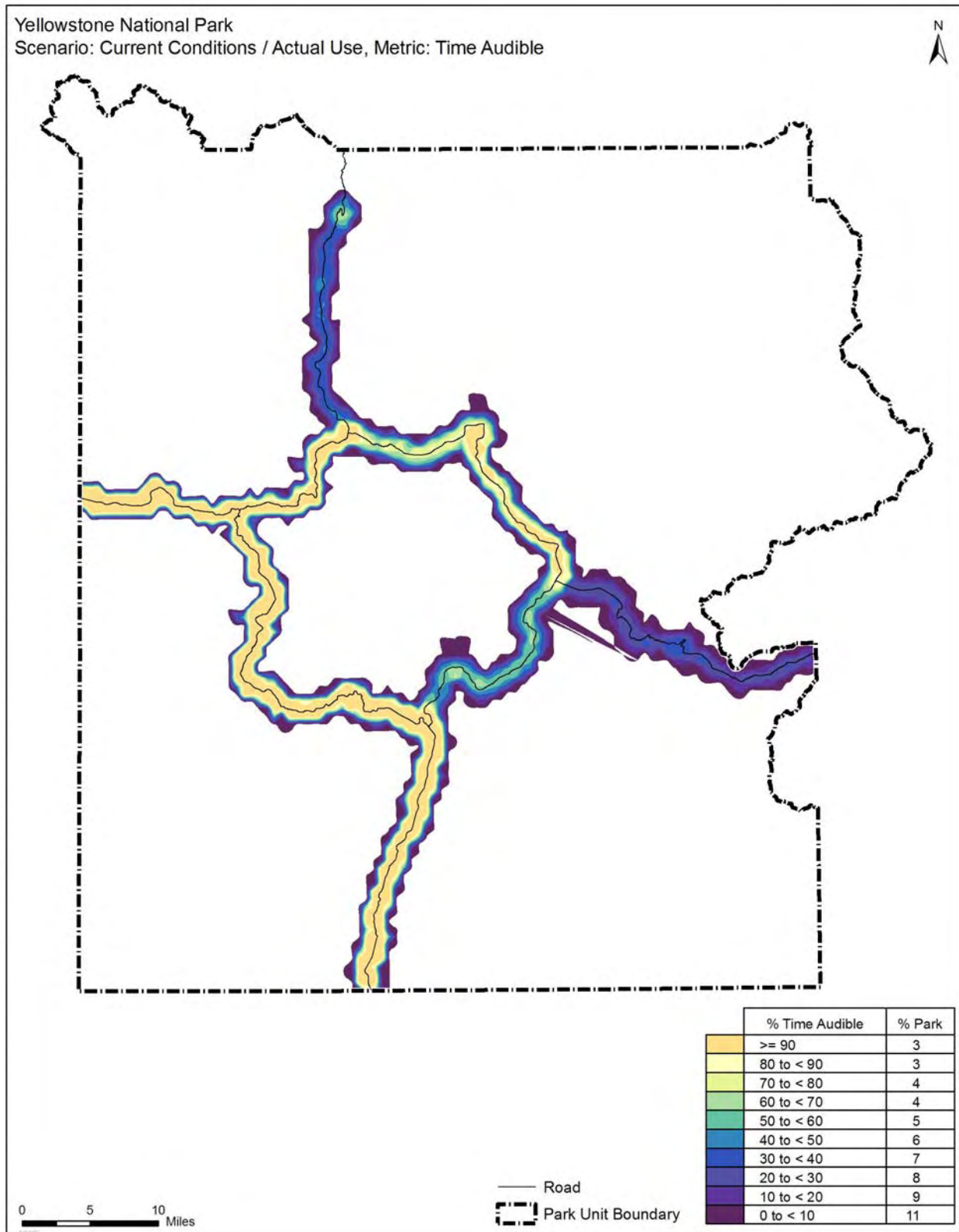


Figure 142: Yellowstone %TAUD for modeling scenario F



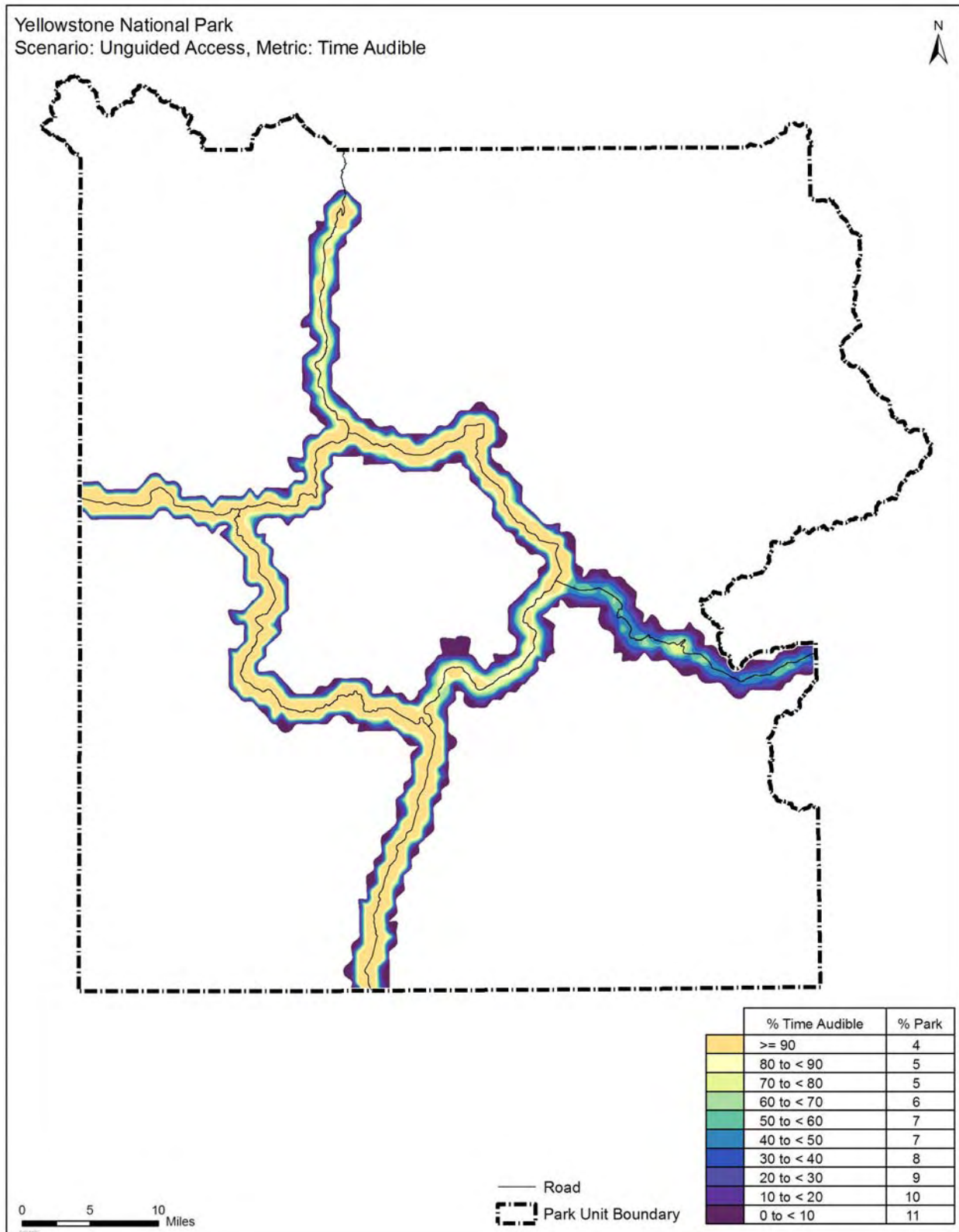


Figure 143: Yellowstone %TAUD for modeling scenario G

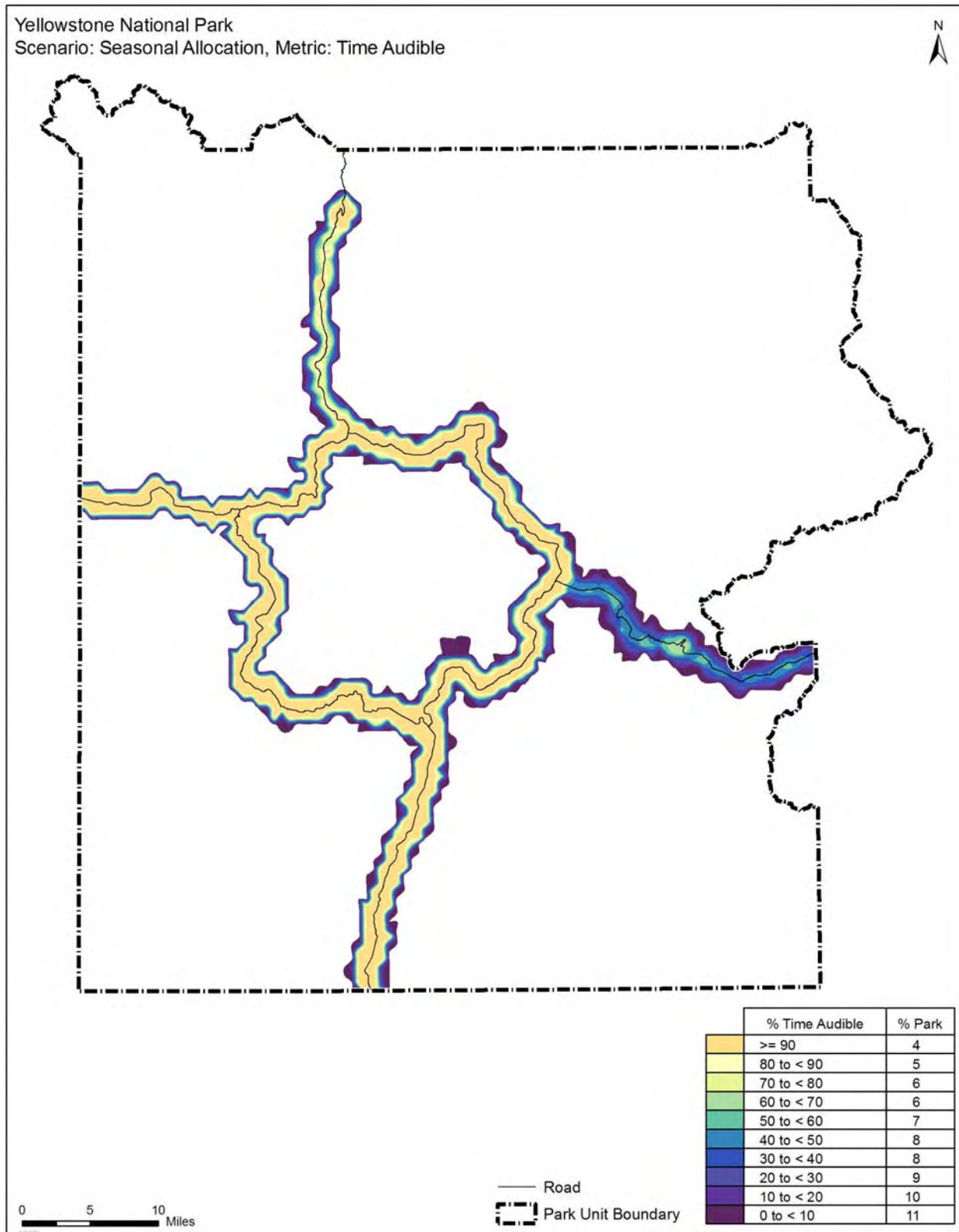


Figure 144: Yellowstone %TAUD for modeling scenario H

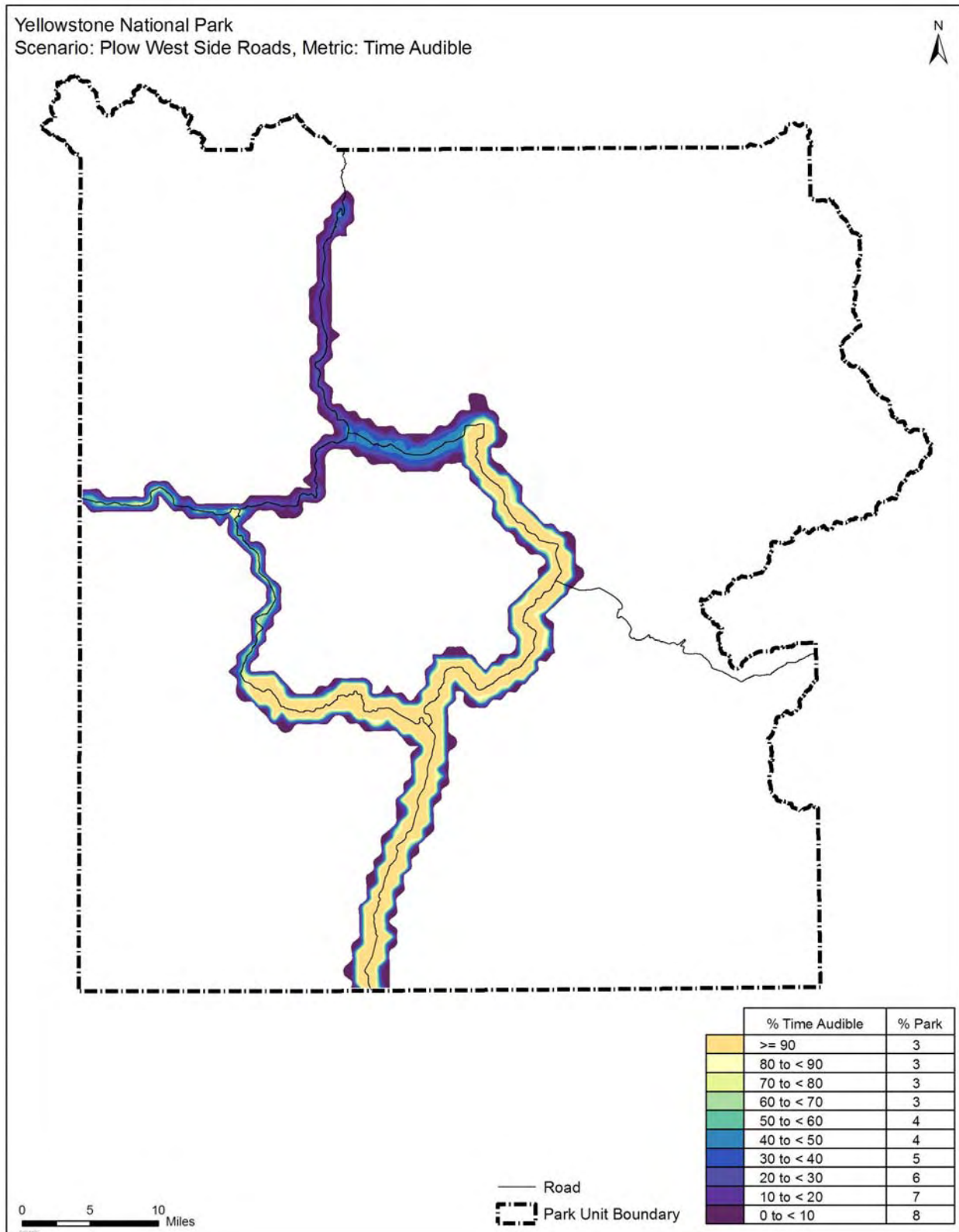


Figure 145: Yellowstone %TAUD for modeling scenario I

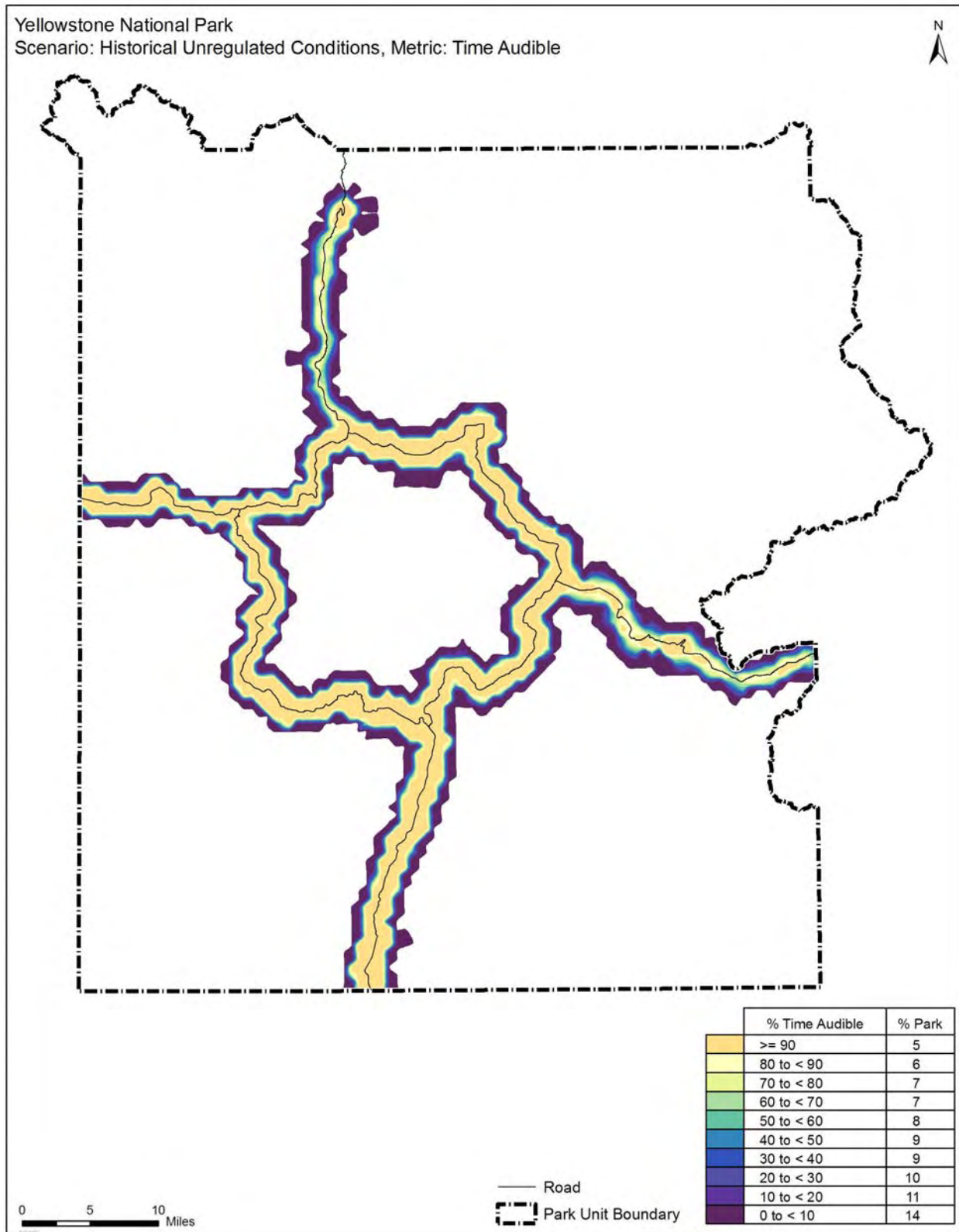


Figure 146: Yellowstone %TAUD for modeling scenario J

**G.5. Percent Time Audible, Grand Teton (Jackson Lake 25 Mile Per Hour Operation)**

Percent time audible (%TAUD) results for Grand Teton for a speed limit of 25 miles per hour on Jackson lake are shown in Figure 147 to Figure 156. Scenario B shows no contours because Grand Teton has no operations for this scenario.

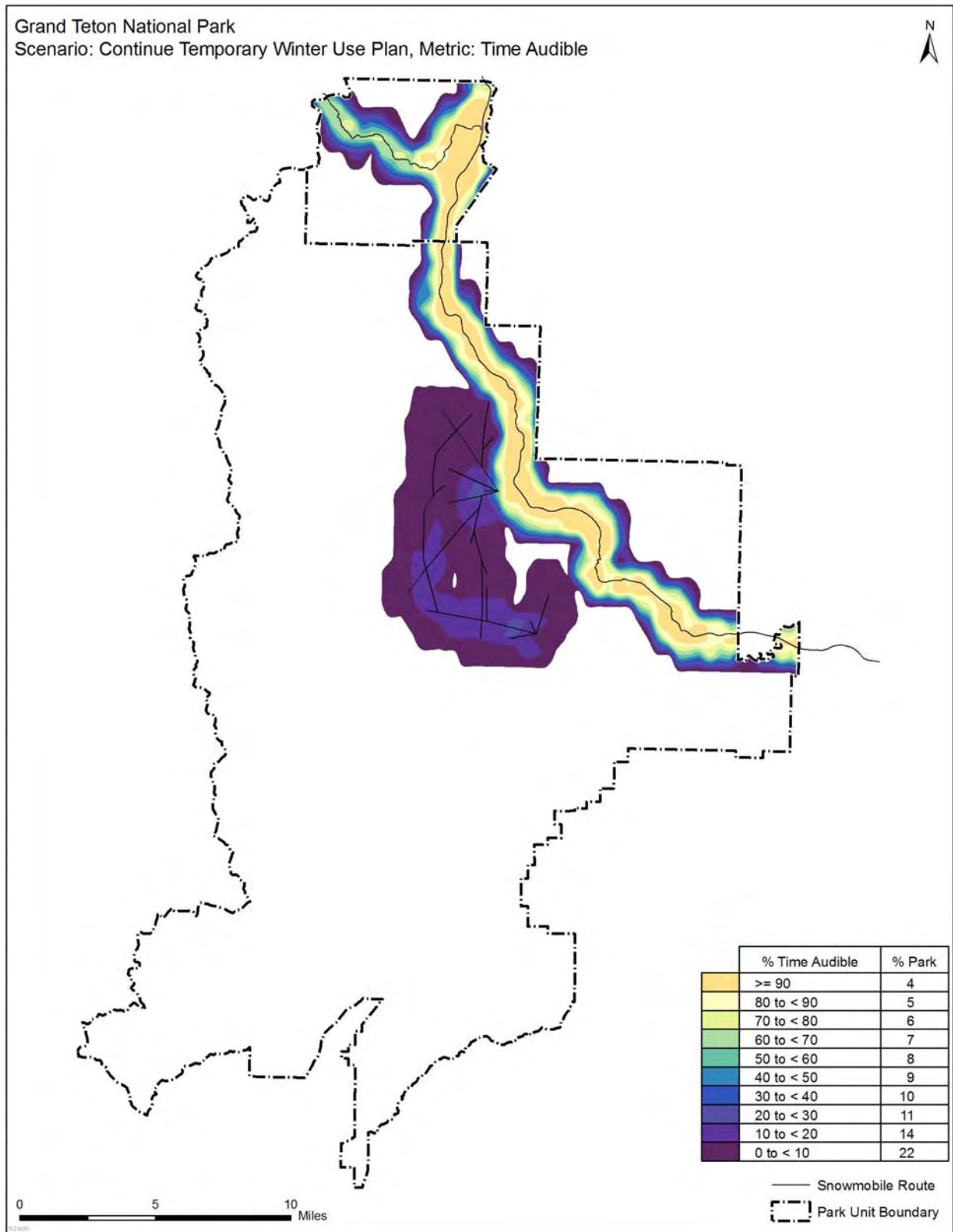


Figure 147: Grand Teton %TAUD for modeling scenario A, speed 25 mph



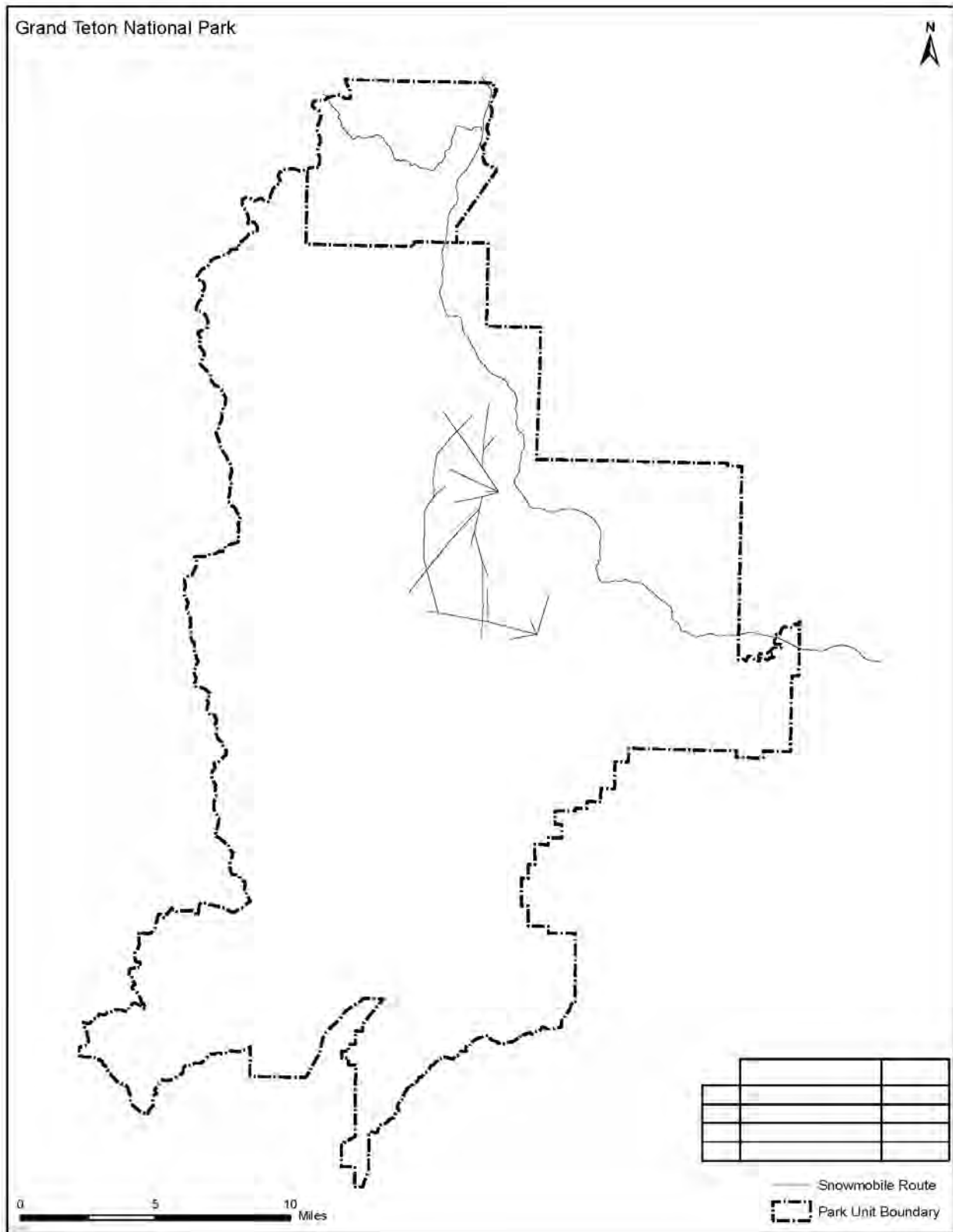


Figure 148: Grand Teton %TAUD for modeling scenario B, speed 25 mph

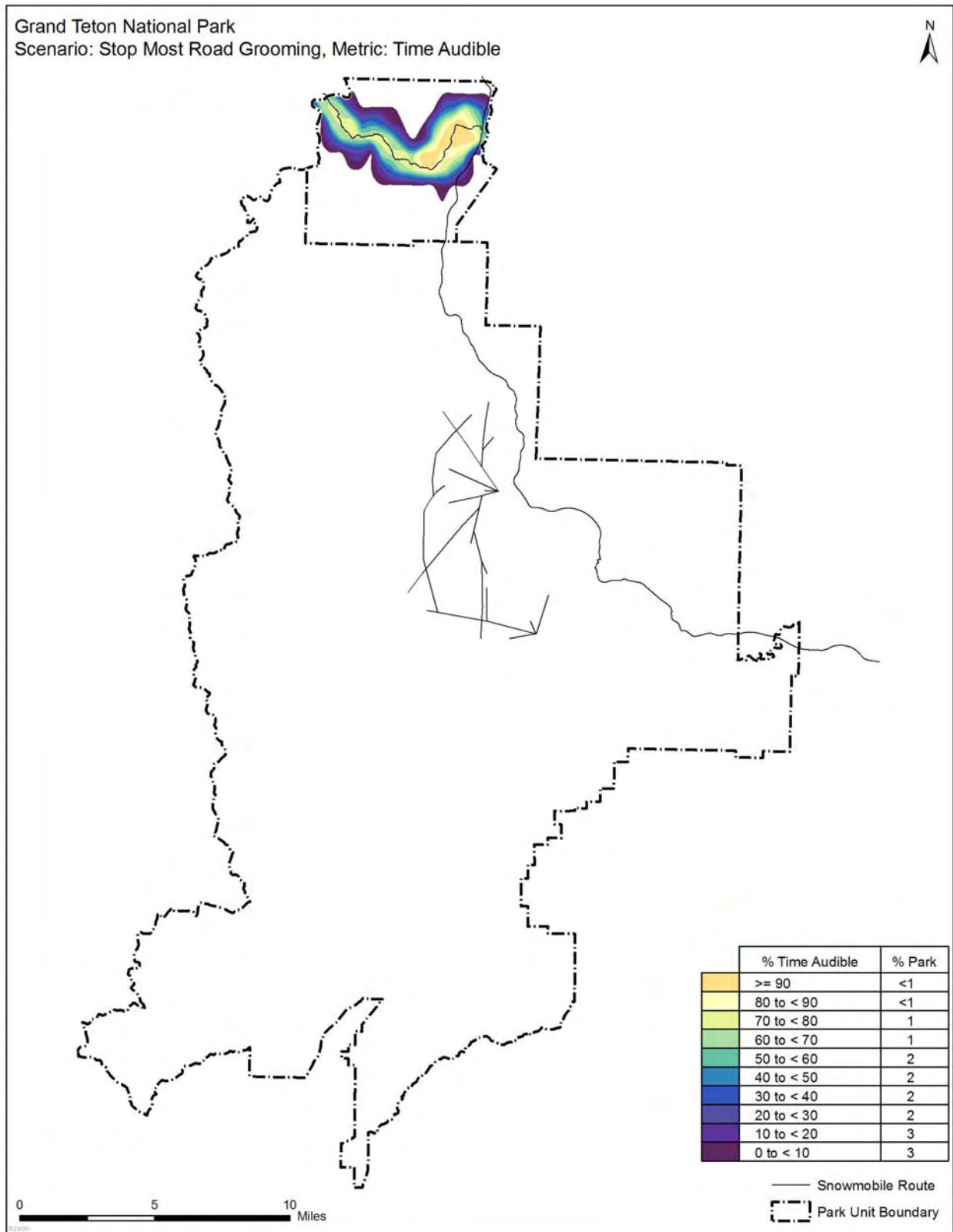


Figure 149: Grand Teton %TAUD for modeling scenario C, speed 25 mph

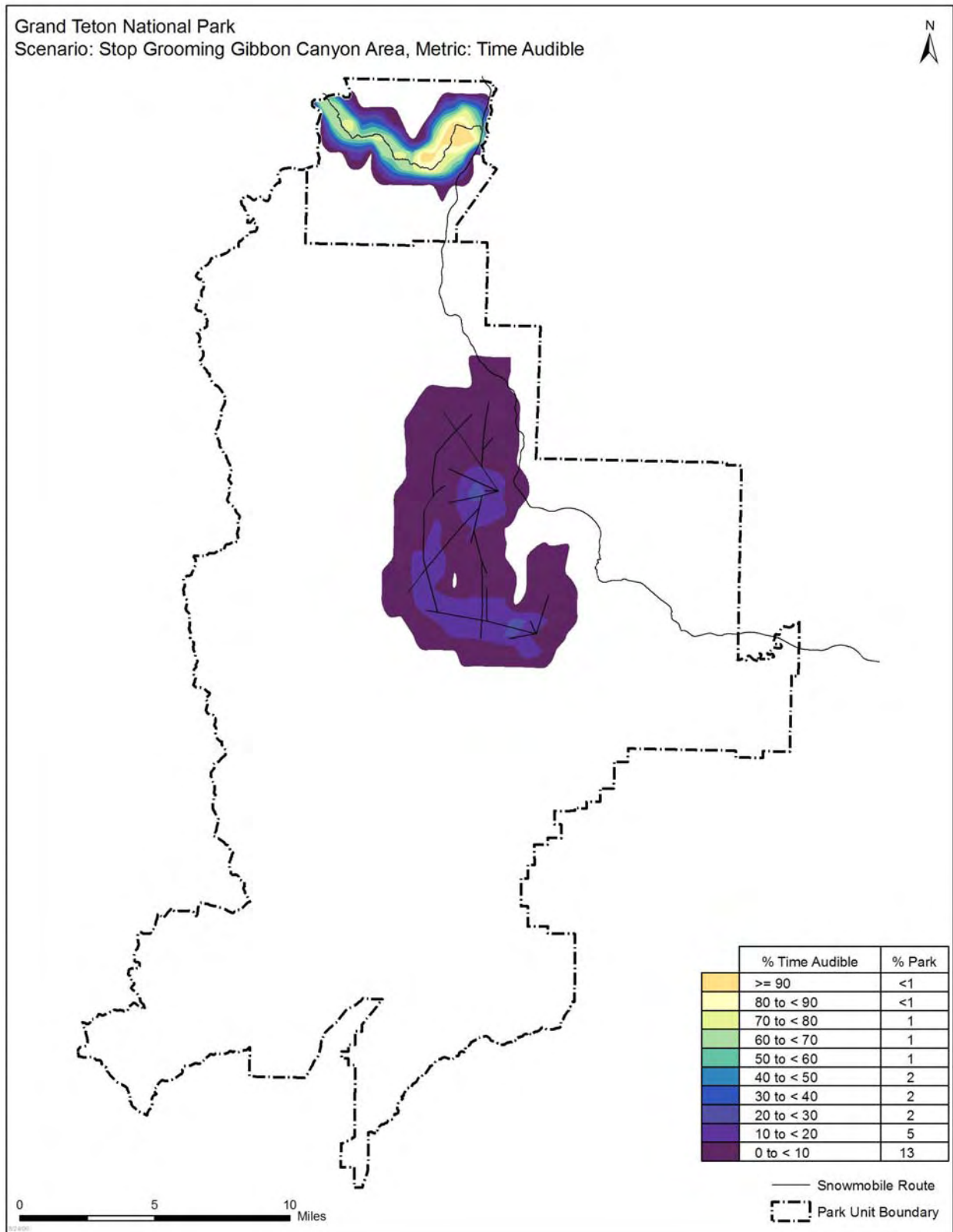


Figure 150: Grand Teton %TAUD for modeling scenario D, speed 25 mph

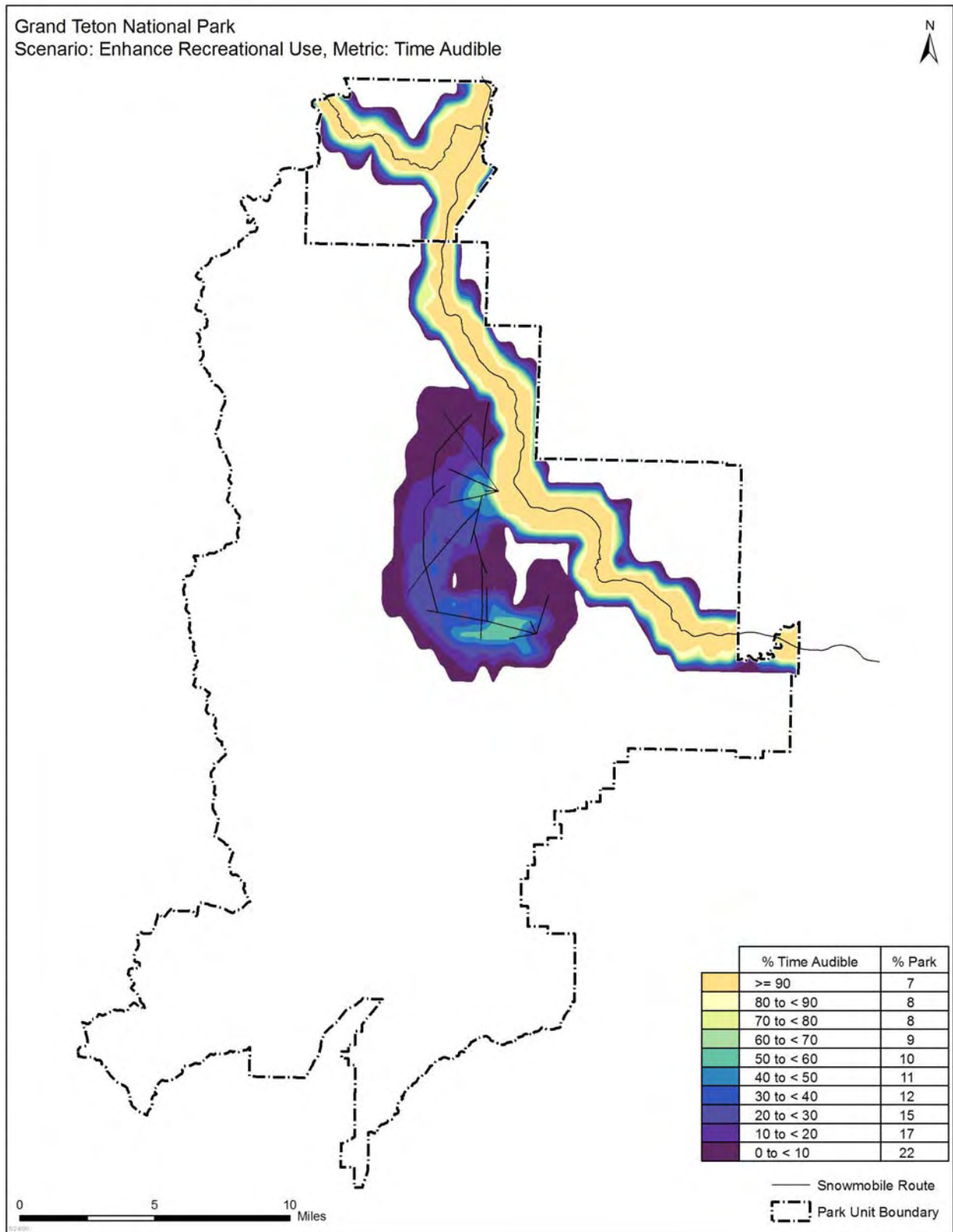


Figure 151: Grand Teton %TAUD for modeling scenario E, speed 25 mph

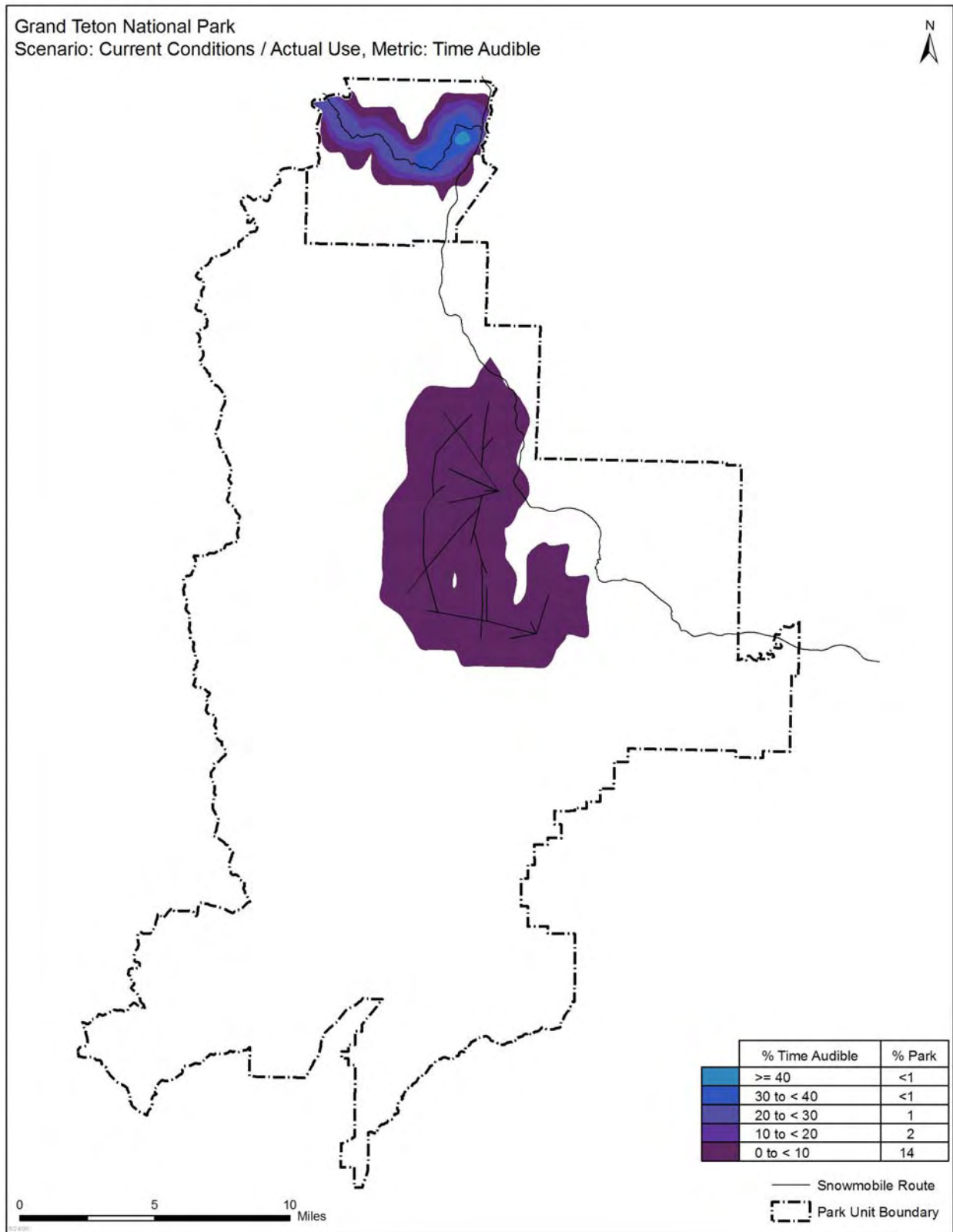


Figure 152: Grand Teton %TAUD for modeling scenario F, speed 25 mph

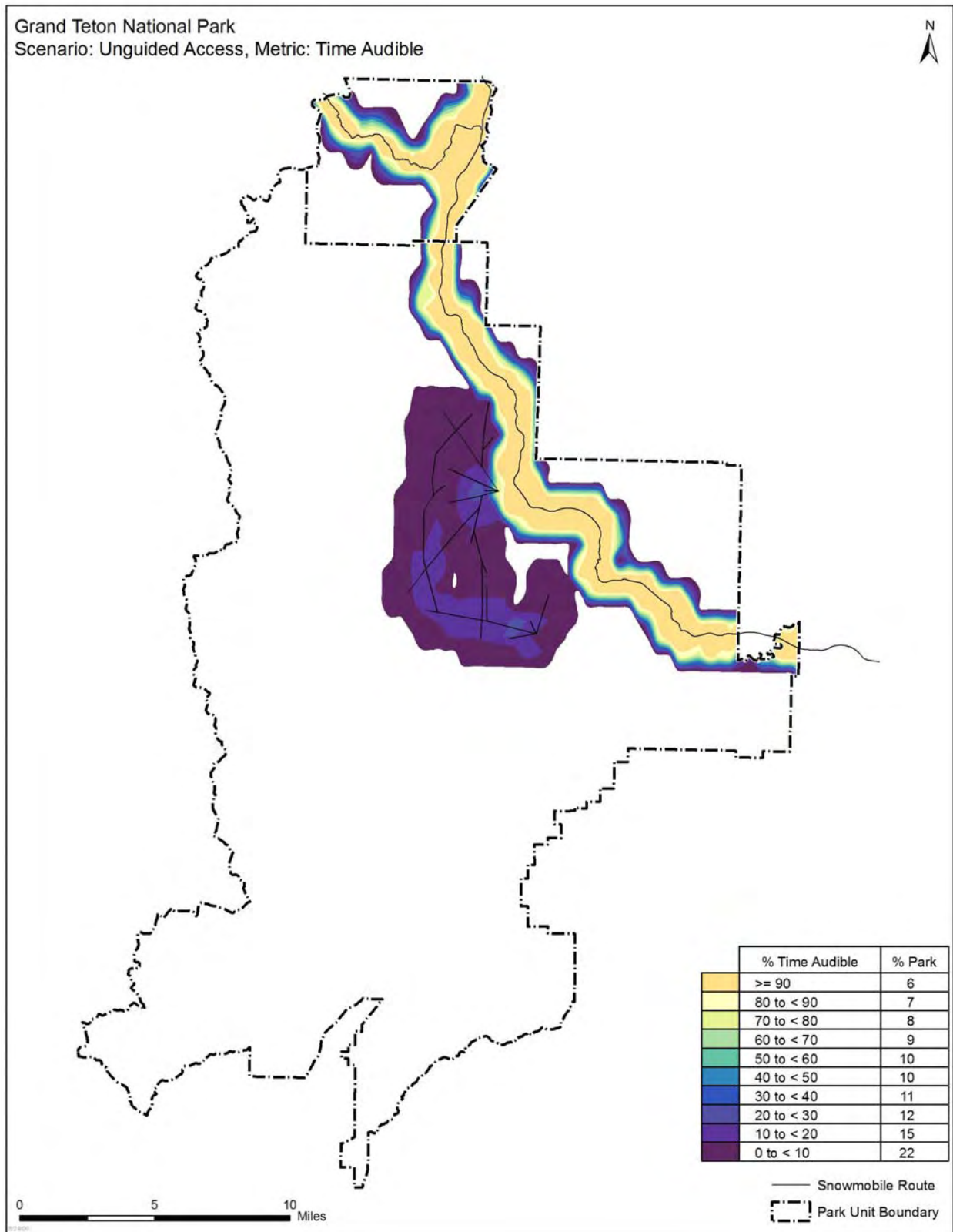


Figure 153: Grand Teton %TAUD for modeling scenario G, speed 25 mph



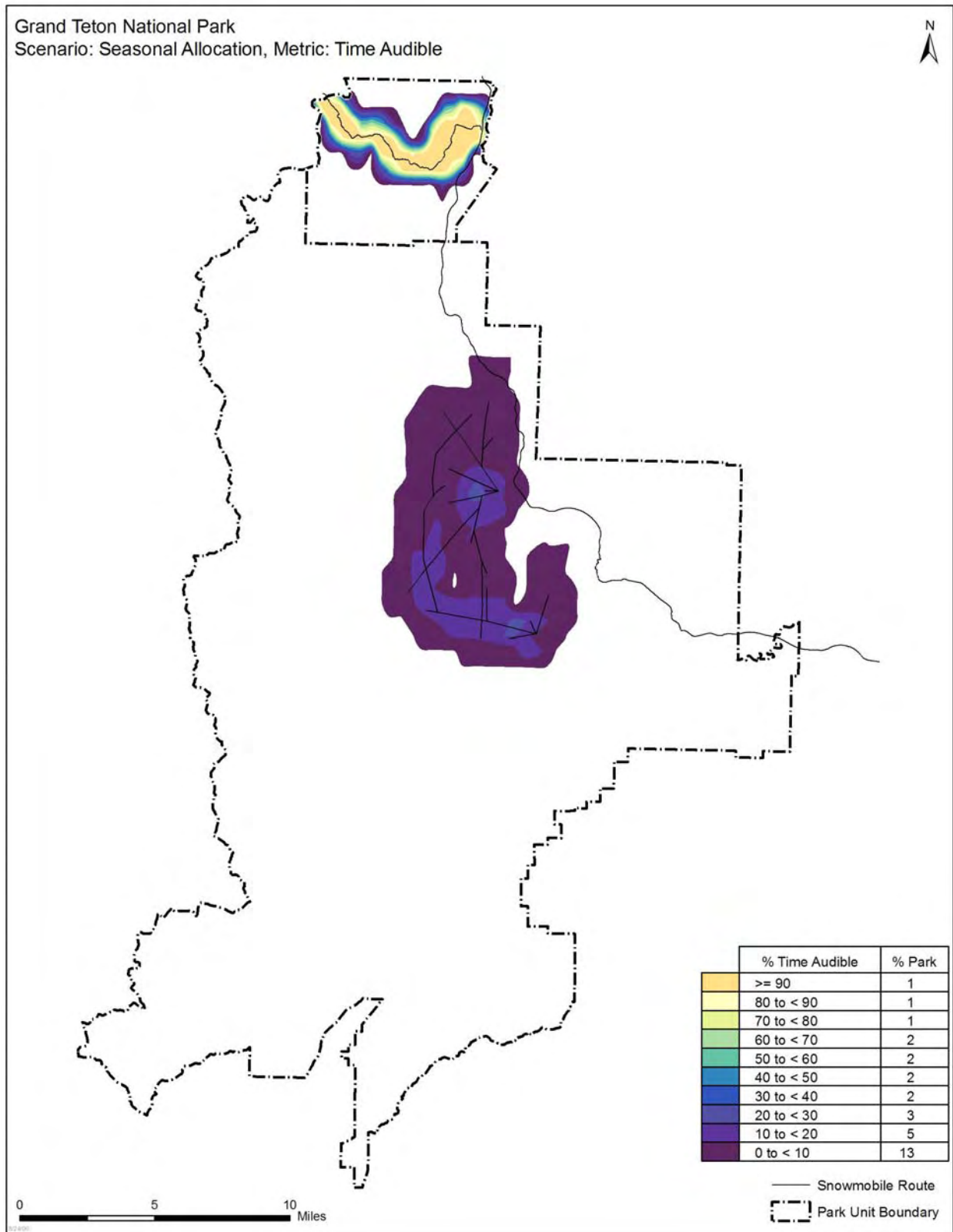


Figure 154: Grand Teton %TAUD for modeling scenario H, speed 25 mph

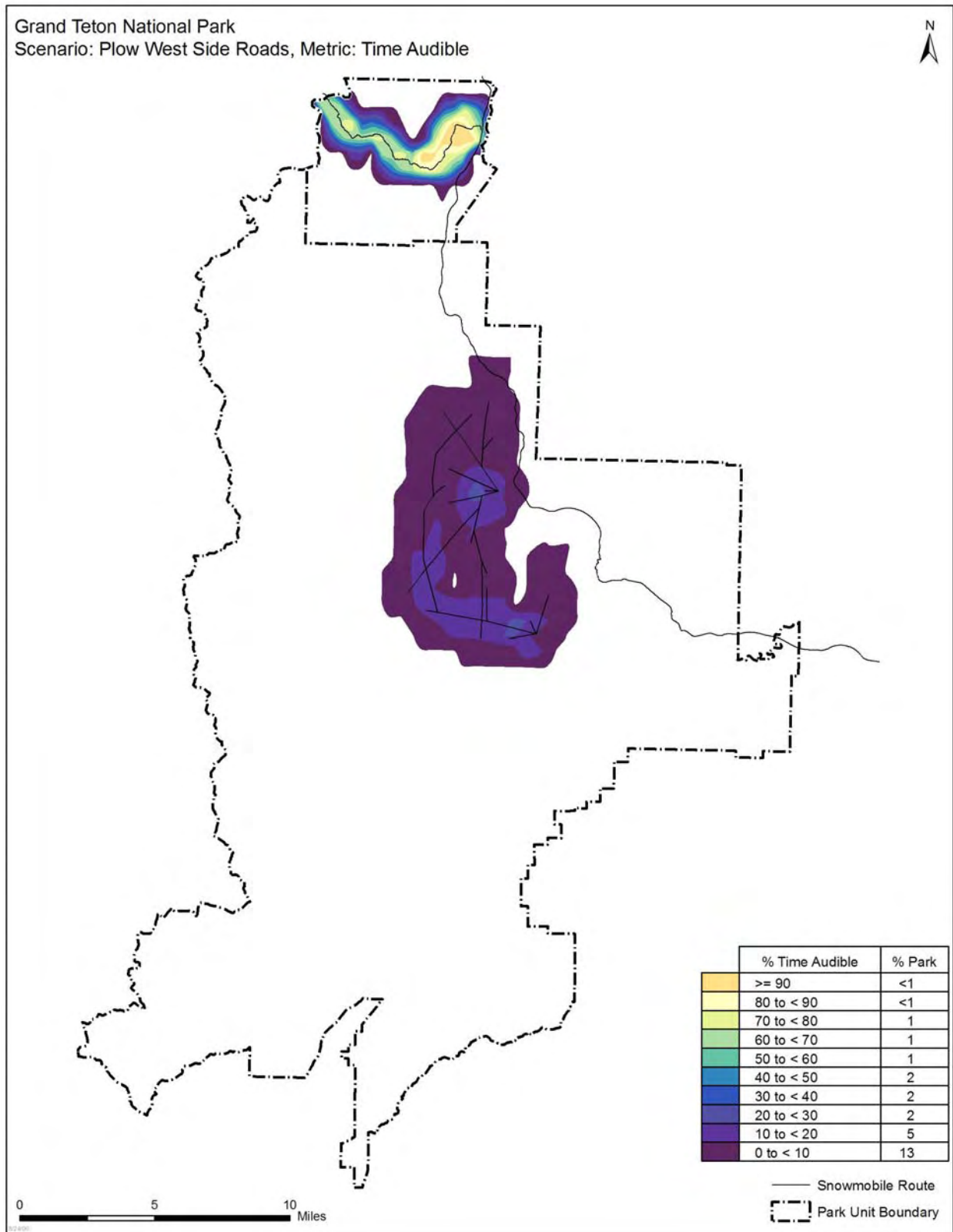


Figure 155: Grand Teton %TAUD for modeling scenario I, speed 25 mph

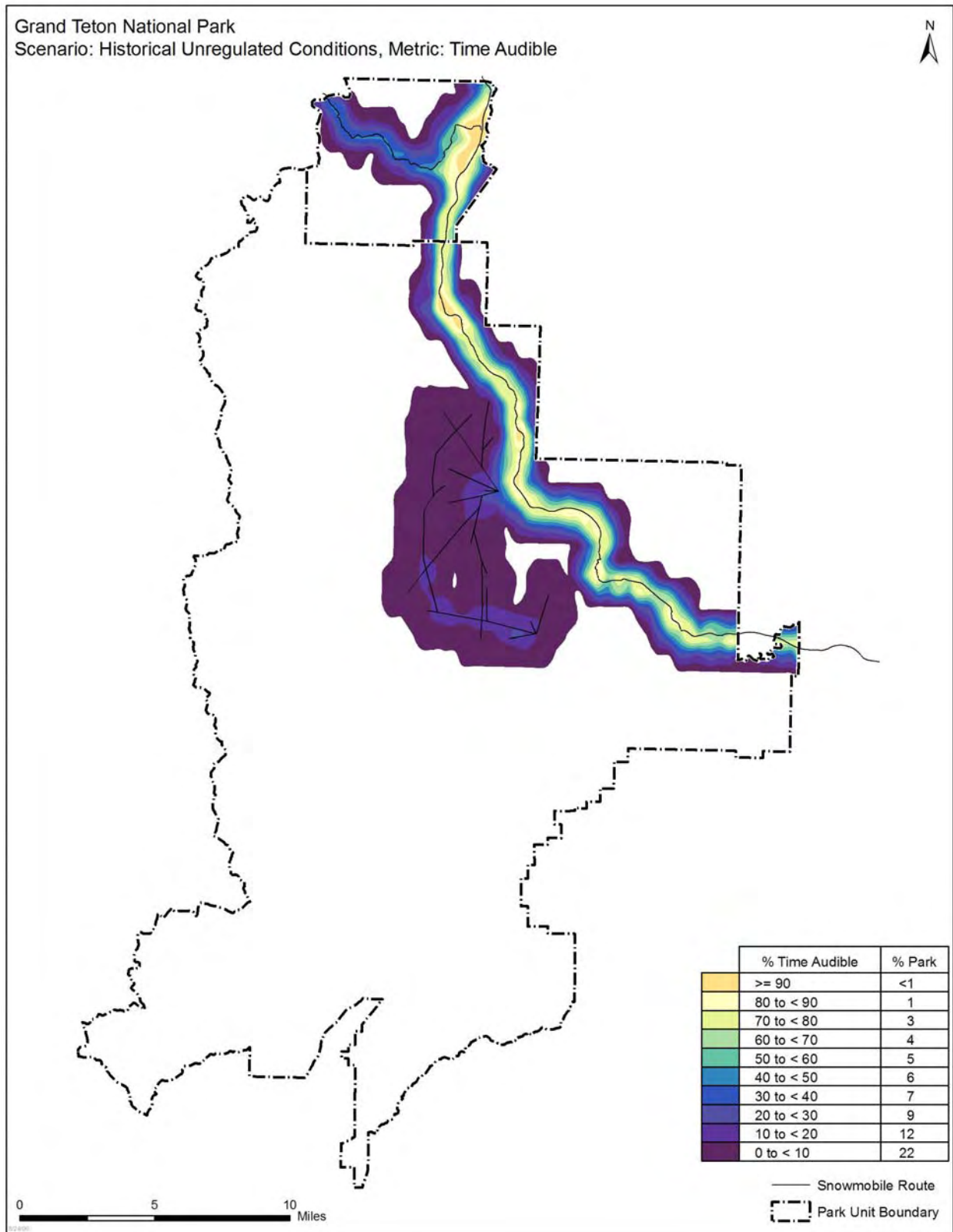


Figure 156: Grand Teton %TAUD for modeling scenario J, speed 25 mph

**G.6. Percent Time Audible, Grand Teton (Jackson Lake 45 Mile Per Hour Operation)**

Percent time audible (%TAUD) results for Grand Teton for a speed limit of 45 miles per hour on Jackson lake are shown in Figure 157 to Figure 166. Again, scenario B shows no contours because Grand Teton has no operations for this scenario.

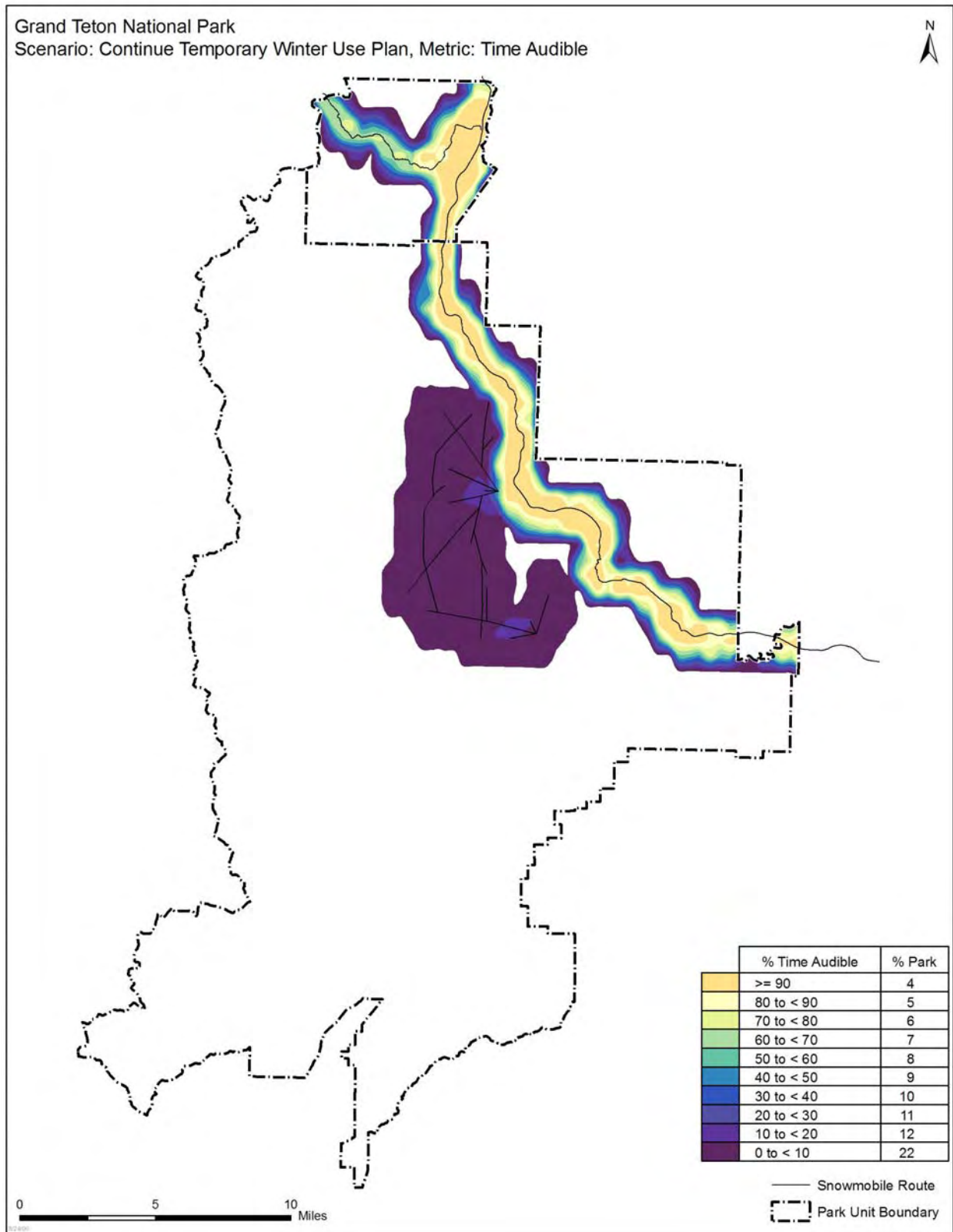


Figure 157: Grand Teton %TAUD for modeling scenario A, speed 45 mph

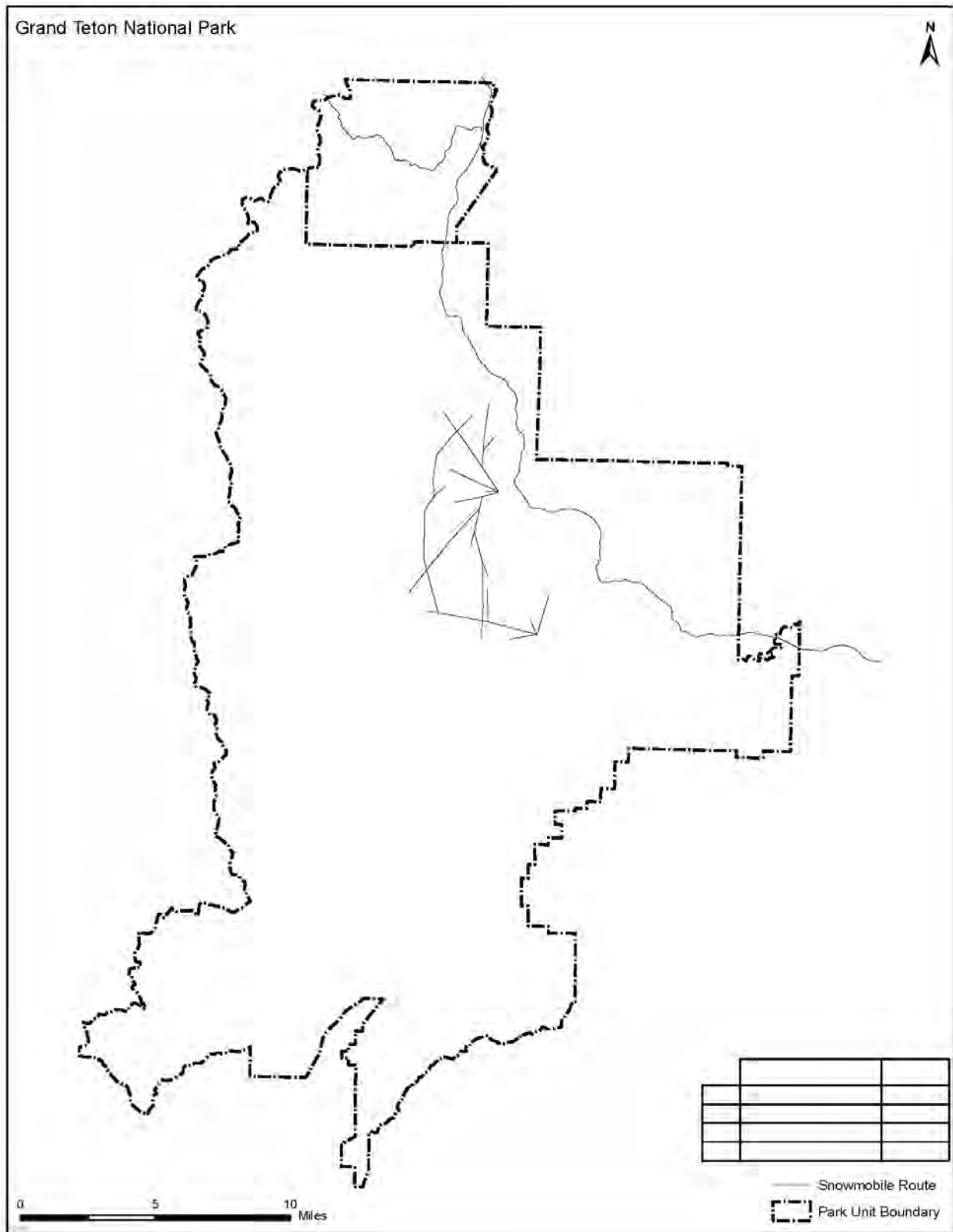


Figure 158: Grand Teton %TAUD for modeling scenario B, speed 45 mph



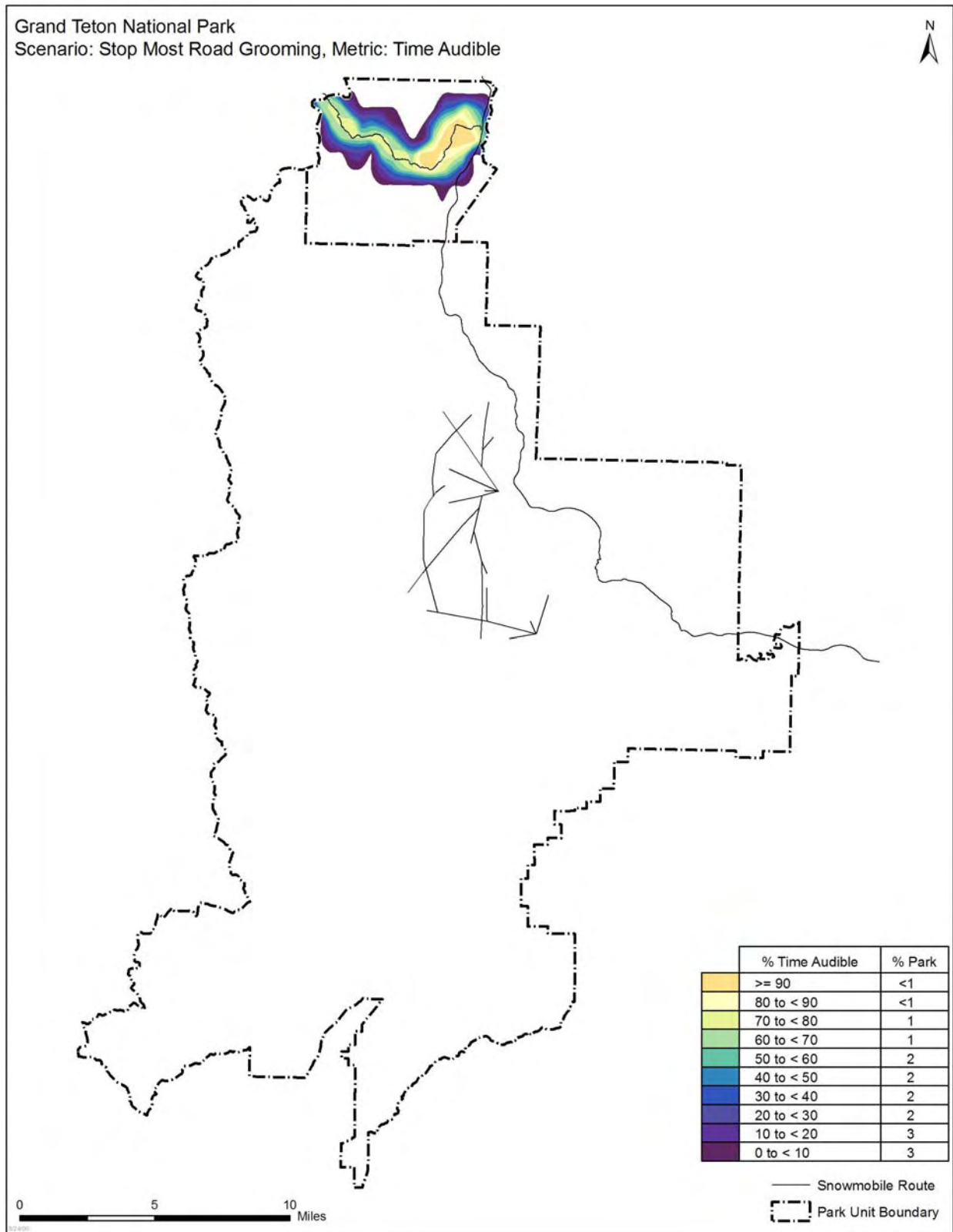


Figure 159: Grand Teton %TAUD for modeling scenario C, speed 45 mph

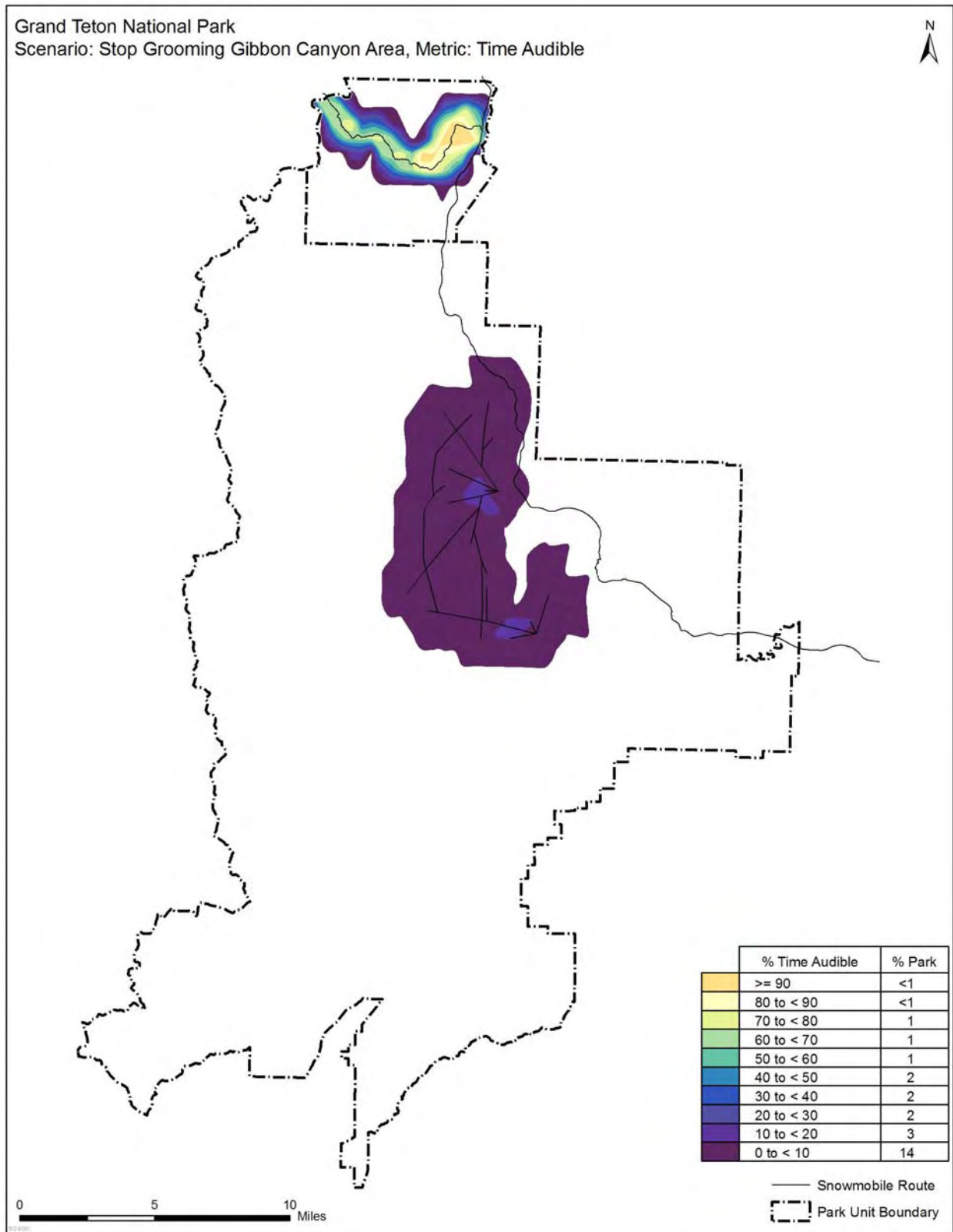


Figure 160: Grand Teton %TAUD for modeling scenario D, speed 45 mph

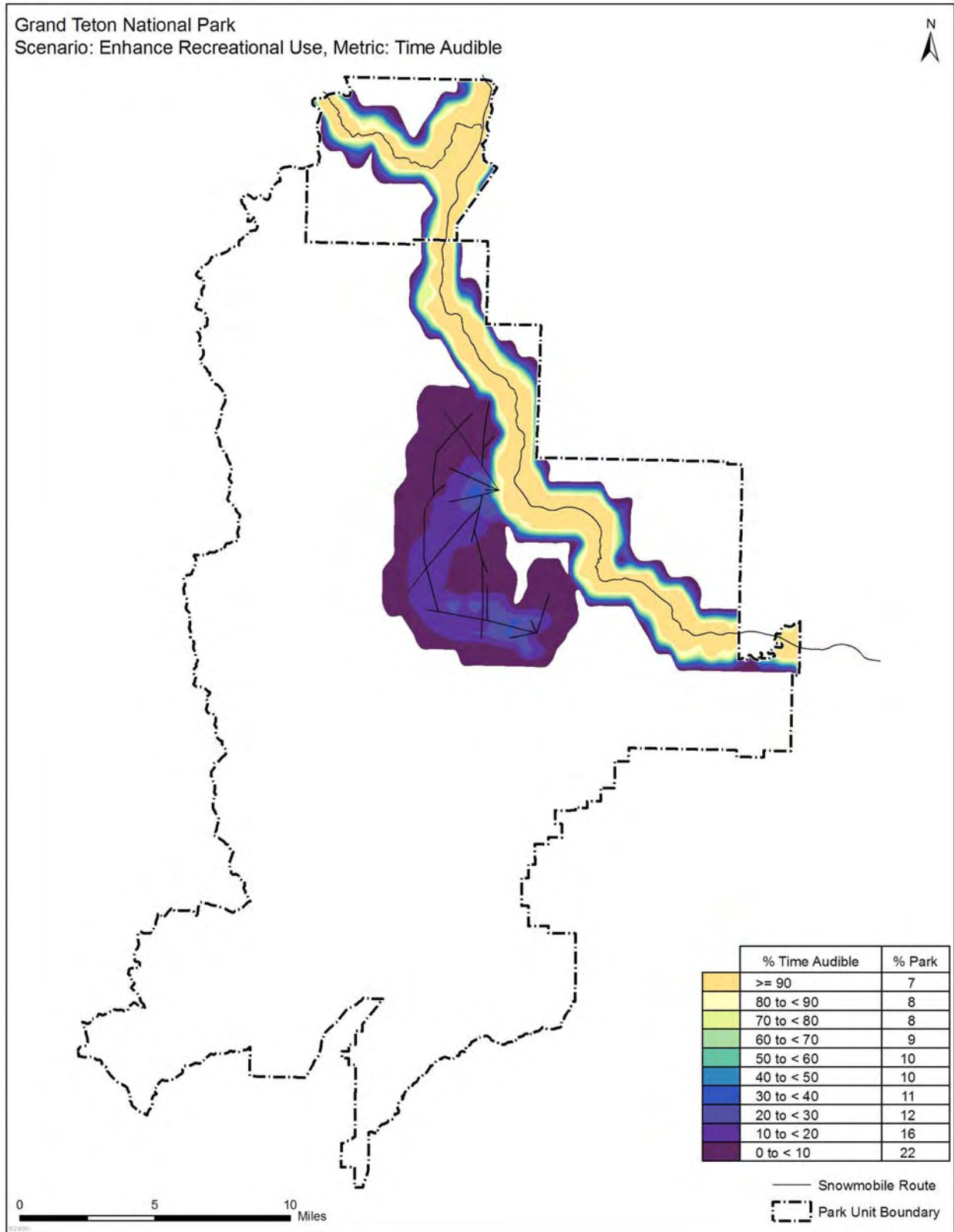


Figure 161: Grand Teton %TAUD for modeling scenario E, speed 45 mph

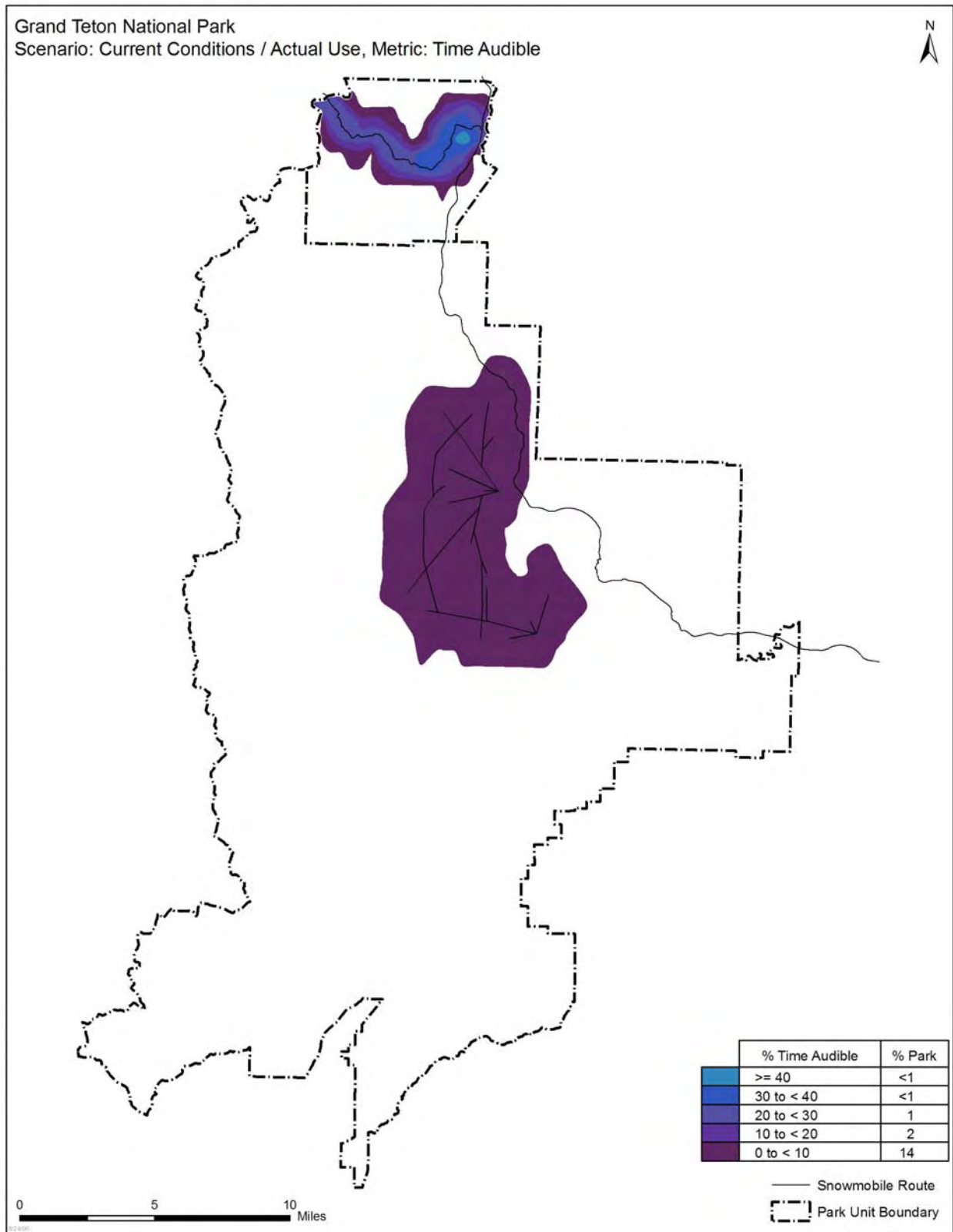


Figure 162: Grand Teton %TAUD for modeling scenario F, speed 45 mph

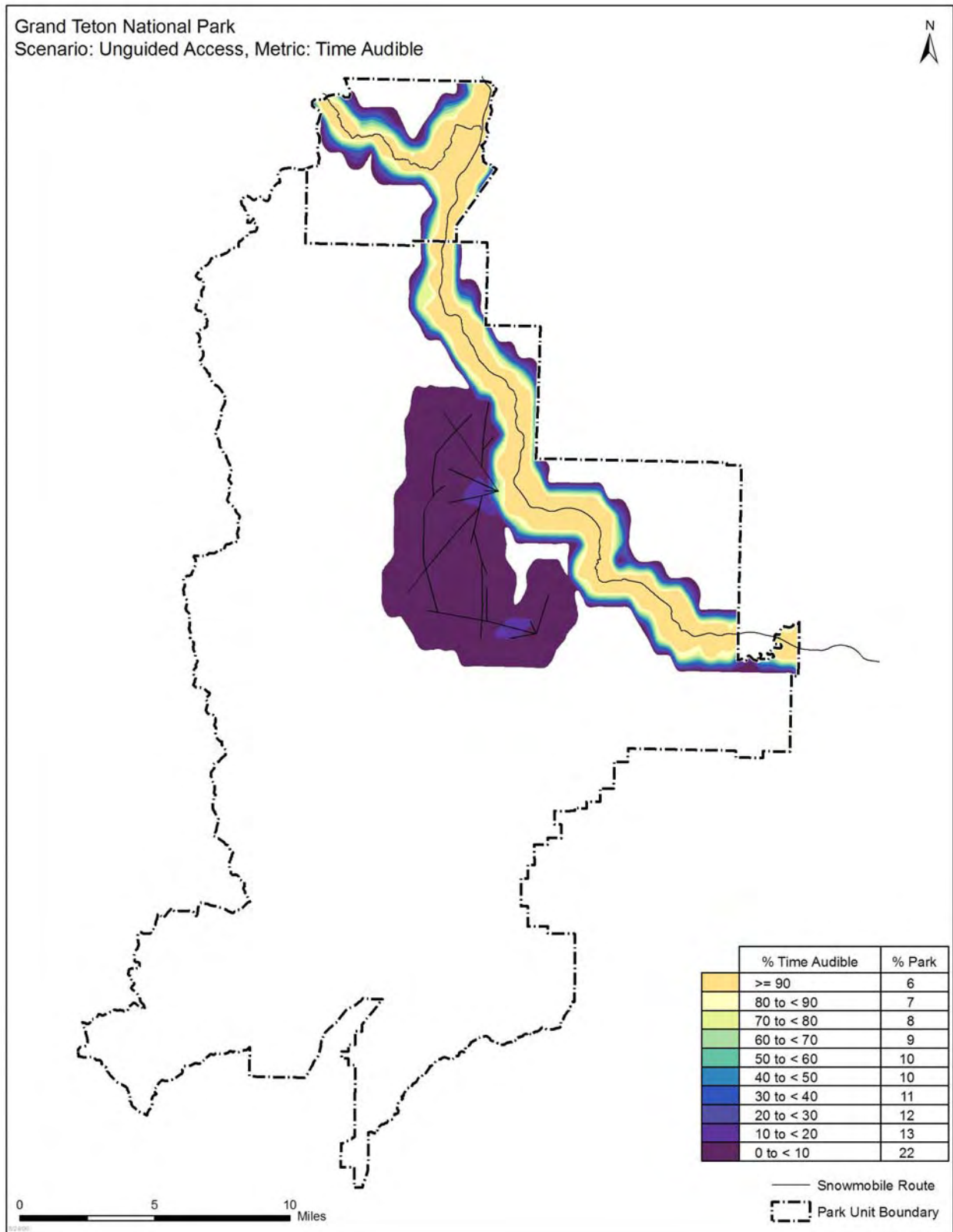


Figure 163: Grand Teton %TAUD for modeling scenario G, speed 45 mph

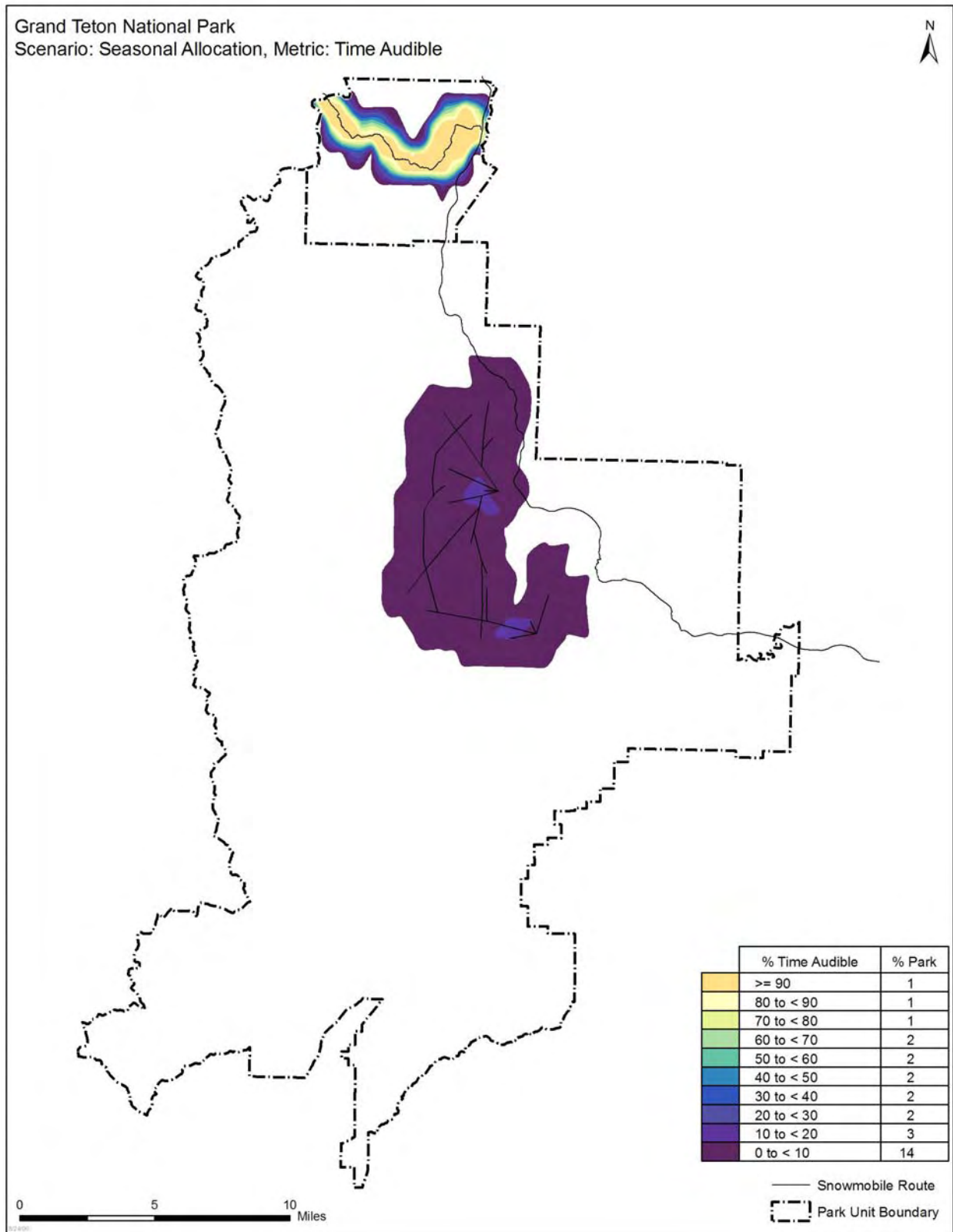


Figure 164: Grand Teton %TAUD for modeling scenario H, speed 45 mph



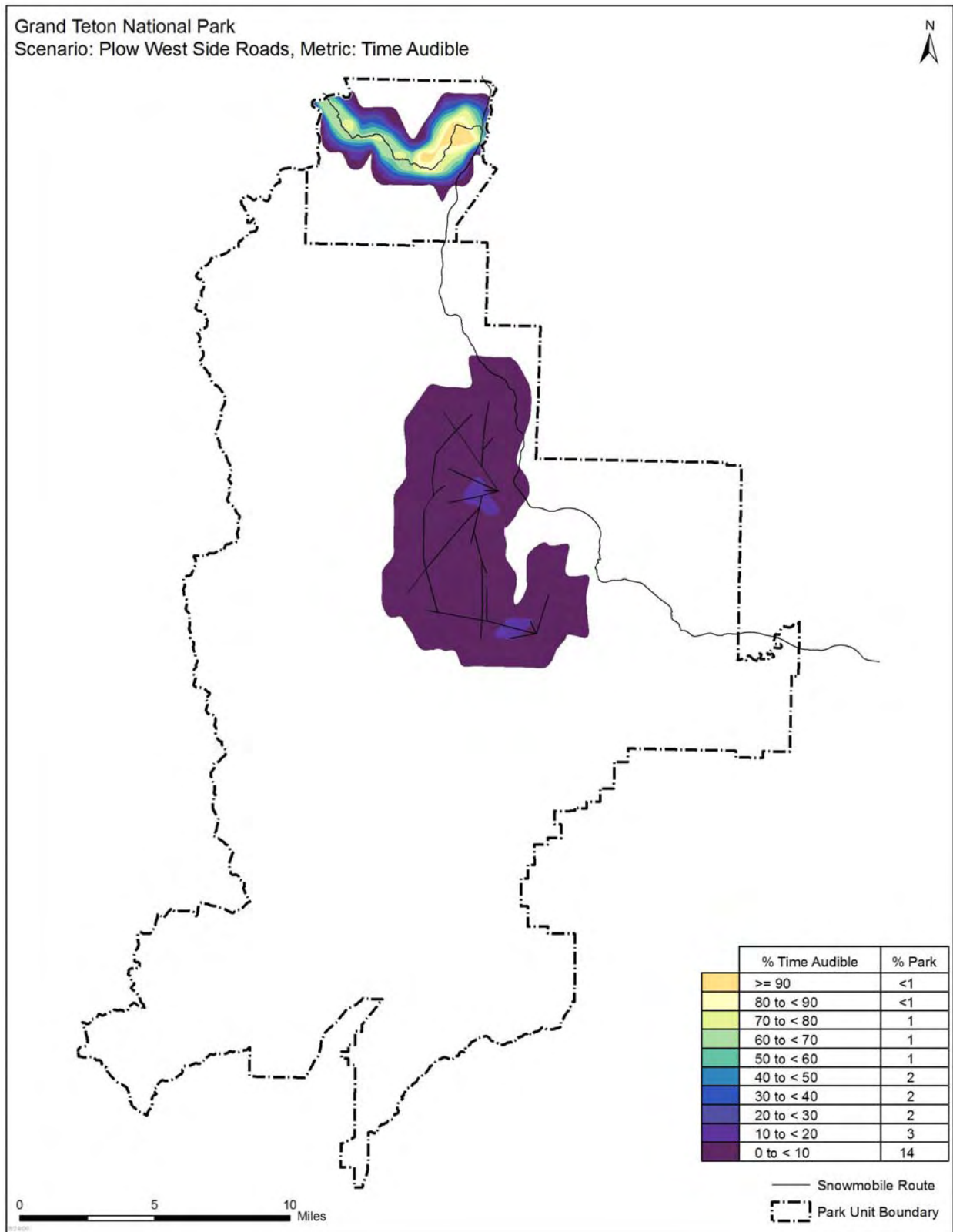


Figure 165: Grand Teton %TAUD for modeling scenario I, speed 45 mph

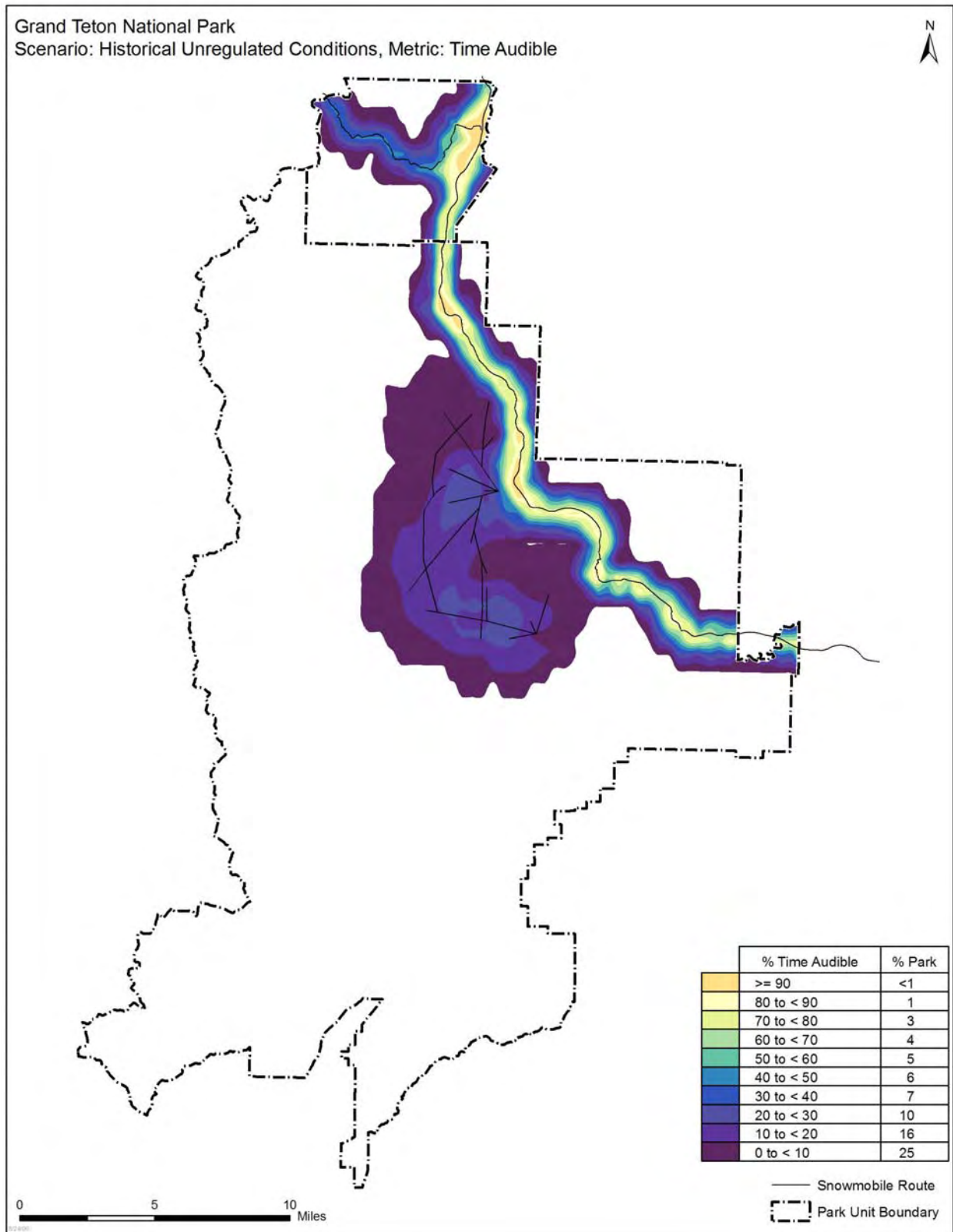


Figure 166: Grand Teton %TAUD for modeling scenario J, speed 45 mph

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