Progress report for Waabizheshi (American marten) research on the Chequamegon-Nicolet National Forest in Wisconsin 2016-2017

by

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Administrative Report 17-03
May 2017

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Background Information

Waabizheshi (American martens; *Martes americana*) were extirpated from the mainland of Wisconsin by the 1930s following unregulated fur harvest, timber harvest, and forest fires (reviewed by Williams et al. 2007). Martens were reintroduced to the Chequamegon-Nicolet National Forest (CNNF) Eagle River-Florence Ranger District (hereafter, Eagle River District; Figure 1) between 1975 and 1983 (N = 172 martens). Additional martens were reintroduced to the CNNF Great Divide Ranger District (hereafter, Great Divide District) between 1987 and 1990 (N = 139 martens). Marten numbers on the Eagle River District have been stable or have increased (Woodford et al. 2005), but marten numbers have likely declined on the Great Divide District (J. Gilbert, Great Lakes Indian Fish and Wildlife Commission, unpublished data). Additional martens were released on the Great Divide District in 2008-10 to augment marten numbers there (N = 90 martens; Woodford et al. 2013). A recent genetic mark-recapture study concluded that marten population growth was small (2%, SE = 25%) for the 4 years following augmentation (Manlick et al. 2016).

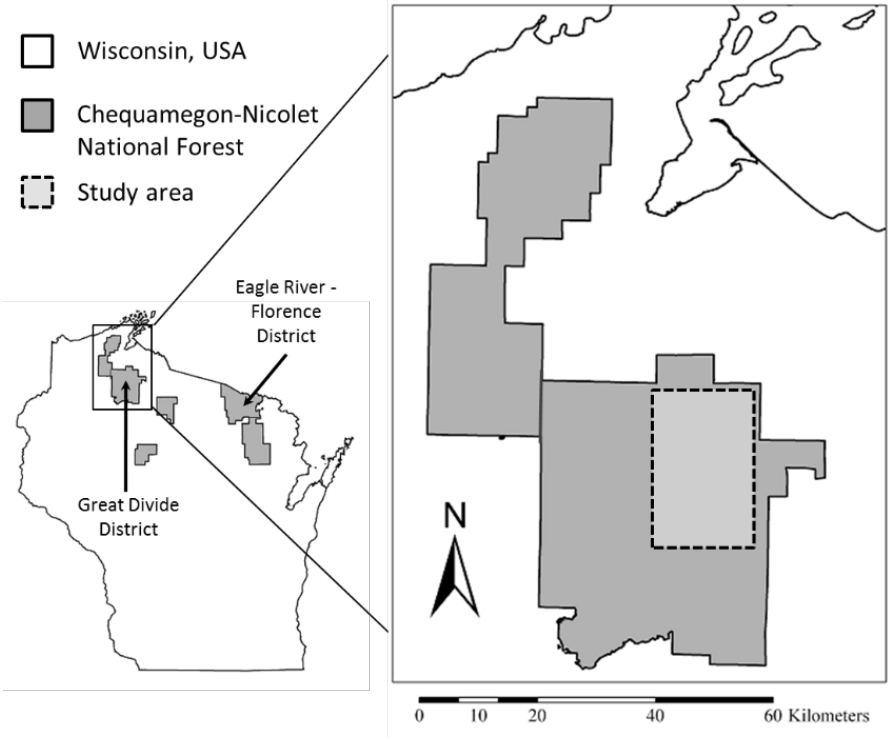

Figure 1. Chequamegon-Nicolet National Forest Ranger Districts where martens were released in Wisconsin, and location of current study area.

Research has improved our understanding of marten survival, diet, and habitat selection on the Great Divide District – critical information for understanding why martens numbers have not increased. Survival of adult martens monitored using VHF collars was not low (McCann et al. 2010, Woodford et al. 2013). Low rates of juvenile captures and genetic analyses suggested low and moderate rates of juvenile recruitment (McCann et al. 2010, Manlick et al. 2016). Prevalence of shrews in marten scats may suggest prey limitation (Carlson et al. 2014).

Marten habitat selection studies have had different results. Dumyahn et al. (2007) found that martens selected mature upland hardwood forests. McCann et al. (2014) found that martens selected hemlock-cedar. Different habitat selection results are probably due to the spatial scale of data used during analysis. McCann et al. (2014) measured forest types at a fine spatial scale (i.e., spatial grain) while snow-tracking marten paths. Dumyahn et al. (2007) plotted VHF telemetry locations on maps delineating forest types measured at coarse spatial scales that omit forest type heterogeneity, including areas with hemlock and cedar that martens select (McCann et al. 2014).

Data that classify forest types precisely and accurately at fine scales have not been available at the broad spatial extents necessary for mapping suitable habitat for martens on the Great Divide District. Fine scale forest type data collected on marten snow-tracks have been useful for quantifying selection (McCann et al. 2014). Such data, however, are limited to areas near marten paths and are thus not useful for mapping forest types at broad spatial extents.

Newly-available LiDAR data for the Great Divide District should enable development of maps that can be used to assess marten habitat selection at fine scales. New GPS technology has led to GPS collars that are small and light enough for martens, which enables collection of fine-scale location data that elucidate patterns of space-use that cannot be detected using broad-scale location data (Moriarty et al. 2015). Pairing fine-scale GPS data with fine-scale LiDAR data should enable mapping of suitable marten habitat across broad spatial extents, which may elucidate whether habitat availability limits martens.

The goals of this research are to investigate year-round marten movement patterns (rates, timing, and tortuosity) and habitat selection using GPS collars and LiDAR. Objectives for the 2016-17 field season were to (1) retrieve GPS collars (Advanced Telemetry Systems G10 UltraLITE; Figure 2) that we deployed during winter 2016, and (2) deploy collars on martens that were new to the project.

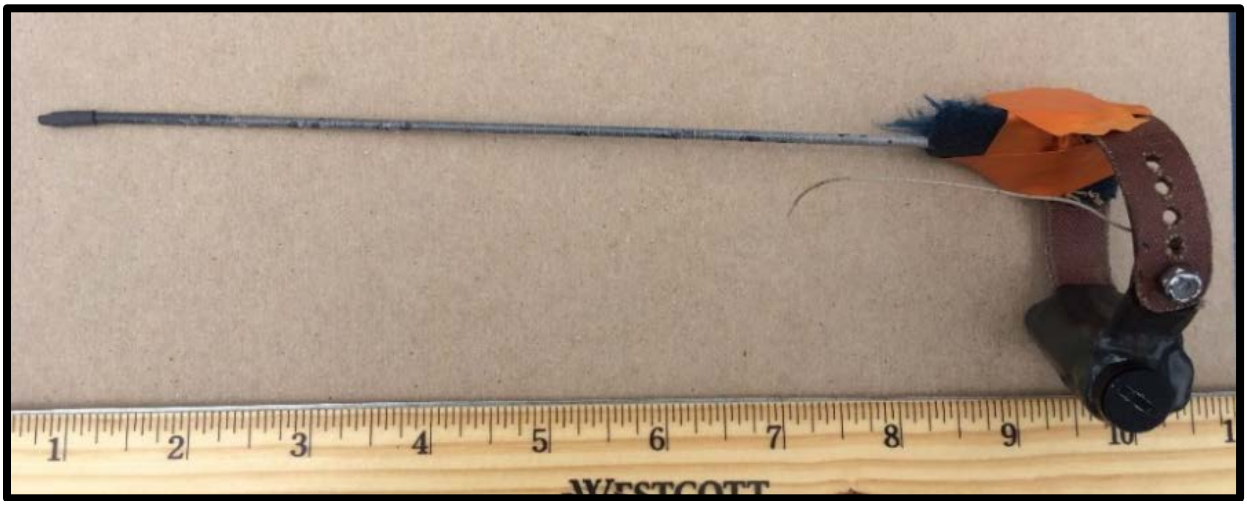

Figure 2. ATS G10 UltraLITE collar used to study martens in northern Wisconsin. Total collar mass (including VHF and GPS components) was 27 g.

Key accomplishments for fall 2016 and winter 2017

Deployment of collars

Technicians Adam Oja, Jose Estrada, Ron Parisian, and I conducted live-trapping efforts in areas where martens were captured in fall 2015 and winter 2016 (Figure 3). Live-trapping efforts mostly focused on retrieving GPS collars from martens collared at the end of the winter 2016 (McCann 2016) and swapping these collars with collars containing fully charged batteries. Retrieving collars is necessary for downloading location data and recharging GPS batteries.

Figure 3. Technicians Jose Estrada (left) and Adam Oja release a marten after GPS-collaring it on the Great Divide District of the Chequamegon-Nicolet National Forest in northern Wisconsin.

We live-trapped martens for 10 weeks during fall 2016 (October, November, and mid-December). During this time we maintained up to 25 traps at a time, with traps set in clusters (of 4 or 5 traps) in about 15 areas of about 1 km^2, and we captured and GPS-collared 4 martens (1 F, 3 M; Table 1). During winter 2017 (mid-January, February, and the first week of March), we live-trapped martens for about 8 weeks, maintaining up to 20 traps clustered in about 10 areas. This resulted in capture and GPS-collaring 2 additional martens (1 F, 1 M; Table 1). Of the 6 martens we captured during fall 2016 and winter 2017, 3 (1 F, 2 M) were new to the project. We periodically recaptured martens to swap collars, resulting in 11 total captures using chemical immobilization.

Retrieval of collars from the previous winter

We had limited success retrieving GPS collars deployed during the previous winter. Of the 9 collars that were still in the field at the end of winter 2016 trapping, we retrieved 3 by live-trapping male martens in fall 2016 and 2 were retrieved after being slipped by female martens. (Slipped collars were found intact, without evidence of a dead marten.) One of these 2 collars was slipped shortly after deployment in winter 2016 and did not collect useful data, and we were unable to retrieve data from the other slipped collar as it was damaged.

We did not retrieve the remaining 4 collars deployed during the previous winter. Wisconsin Department of Natural Resources conducted 2 aerial searches for these 4 missing collars, but did not find them. This indicates that the VHF transmitters ceased operating, the VHF antennas were missing (chewed off, as observed with some of the males we recaptured), or the martens emigrated.

Location acquisition

We retrieved GPS collars from 6 martens after 29- to 301-day deployments (Table 1). Each collar was scheduled to collect locations at 5-minute intervals. One collar did not record data during deployment. The other 5 collar deployments yielded a total of 6,894 locations (mean = 1,379, SD = 935). As was the case with deployments from fall 2015 and winter 2016 season (McCann 2016), some collars collected locations as programmed, while others did not.

Future research

We plan to re-trap GPS-collared martens in fall 2017 and winter 2018 to download GPS data, and recharge and redeploy GPS collars on the same martens and martens new to the project, with a focus on capturing females, which are poorly represented in our data. Because of persistent collar failures in this study and in others, ATS has discontinued G10 UltraLITE GPS collars. Consequently, we will need to identify GPS collars with appropriate mass (< 5% of marten mass; ≤ 30 g for most females and ≤ 45 g for most males) and size for martens from a different manufacturer to supplement use of collars we retrieve in fall 2017.

Table 1. GPS collar deployment information. GPS collars were deployed on American martens live-trapped on the Great Divide Ranger District of the Chequamegon-Nicolet National Forest in northern Wisconsin.

Animal ID	Sex	Age[†]	Mass (g)*	GPS ID	Deployed	Retrieved	Days deployed	Days with locations	# of locations
M252	M	A	1300	1394	3/3/16	11/12/16	254	71	2,626
M252	M	A	1260	1340	11/12/16	-	-	-	-
M253	M	A	1030	1368	10/6/16	11/4/16	29	0	0
M253	M	A	910	1368	11/08/16	12/23/16	48	15	304
M253	M	A	940	1364	12/23/16	-	-	-	-
M254	M	A	1380	1427	2/2/16	11/29/16	301	53	1,072
M254	M	A	1260	1438	11/29/16	-	-	-	-
M261	M	J	920	1428	10/25/16	1/26/17	93	90	2,031
M261	M	J	960	1368	1/26/17	3/1/17	34	34	861
M261	M	J	-	1428	3/1/17	-	-	-	-
M262	M	A	1010	1316	11/1/16	-	-	-	-
F263	F	J	640	1394	2/23/17	-	-	-	-

[†]Adults had teeth with noticeable ware, and had larger sagittal crests and masses than juveniles.

*Marten mass on collar deployment date.

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