Conserving Purple Martins in OSU's McDonald-Dunn Research Forest: Final Project Report

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INTRODUCTION

The purple martin (*Progne subis*) is the largest swallow in North America and among the largest in the world[1]. The western subspecies (*P. s. arboricola*) was reported to be common in the southern Willamette Valley during the 1940s[2], but populations appeared to be in steep decline through most of the state during the 1940s – 1980s[3]. It was during this period that forestry practices were causing a reduction in the number of snags and thus decreasing the availability of cavity nesting sites for purple martins. Numbers of European starlings (*Sturnus vulgaris*), a major, non-native competitor for nest sites, also dramatically increased in Oregon during this period and certainly contributed to lower productivity of martin populations[4]. There is some evidence that purple martin populations may be undergoing recovery in local areas (e.g., Oregon Coast, Fern Ridge Reservoir), largely because of the effectiveness of artificial nest box programs[5]. The western purple martin is presently listed as state sensitive-critical by the State of Oregon and is listed as a species of concern by the U. S. Fish and Wildlife Service (USFWS).

Local birders have been observing two purple martin colonies in Oregon State University's McDonald-Dunn Research Forest (the "Forest") since 2009. Purple martins have been using cavities excavated by woodpeckers in snags that have been retained on clearcut harvest units. Informal but regular observations suggest that European starlings are becomingly increasingly numerous near one of the Forest colonies and competitive behavior between martins and starlings has been observed at snags (personal observation). What makes the Forest colonies particularly special is that martins continue to nest in natural tree cavities. Of the many thousands of purple martin breeding pairs monitored in North America every year, less than 50 are known to still use tree cavities. All other martins use nest boxes and artificial gourds deliberately placed for martins, or they opportunistically find nesting sites in wood piers, bridges, and other manmade structures.

In 2011, the Oregon Wildlife Institute (OWI) began a program of monitoring and nest site supplementation activities in an effort to secure the long-term persistence of purple martin colonies in the Forest. Progress reports that were submitted to project partners in 2011 and 2012 summarized the annual activities for those years. This is the final report to the Oregon Wildlife Heritage Foundation, an important sponsor of the project

[1] Brown, C. 1997. Purple martin (*Progne subis*). In, A. Poole and F. Gill (Eds.) Birds of North America. Number 287. The Academy of Natural Sciences (Philadelphia) and the American Ornithologist's Union (Washington D.C.).
[2] Gullion, G. W. 1951. Birds of the southern Willamette Valley. Condor 53:129-149.
[3] Sharp, B. 1986. Guidelines for the management of the purple martin, Pacific Coast population. Sialia 8:9-13.
[4] Korpi., R. T. 2003. European starling (Sturnus vulgaris). Pp. 496-498. In, D. B. Marshall, M. G. Hunter, and A. L. Contreras [Eds.]. Birds of Oregon: a general reference. Oregon State University Press. Corvallis, OR.
[5] Horvath, E. G. 1999. Distribution, abundance, and nest site characteristics of purple martins in Oregon. Oregon Dept. of Fish and Wildlife Technical Report 99-1-01.

Goal & Objectives

The overarching goal of this project is to ensure that the Forest purple martin colonies will continue to persist at the site in the face of competition for tree cavities by European starlings. The immediate objective is to provide starling-resistant nest sites for martins. Two secondary objectives are 1) to assess whether use of snags by martins is more widespread in the Forest than incidental observations by local birders indicate, and 2) determine the degree of fidelity martins show to types of nest sites: snags, nest boxes, and artificial gourds.

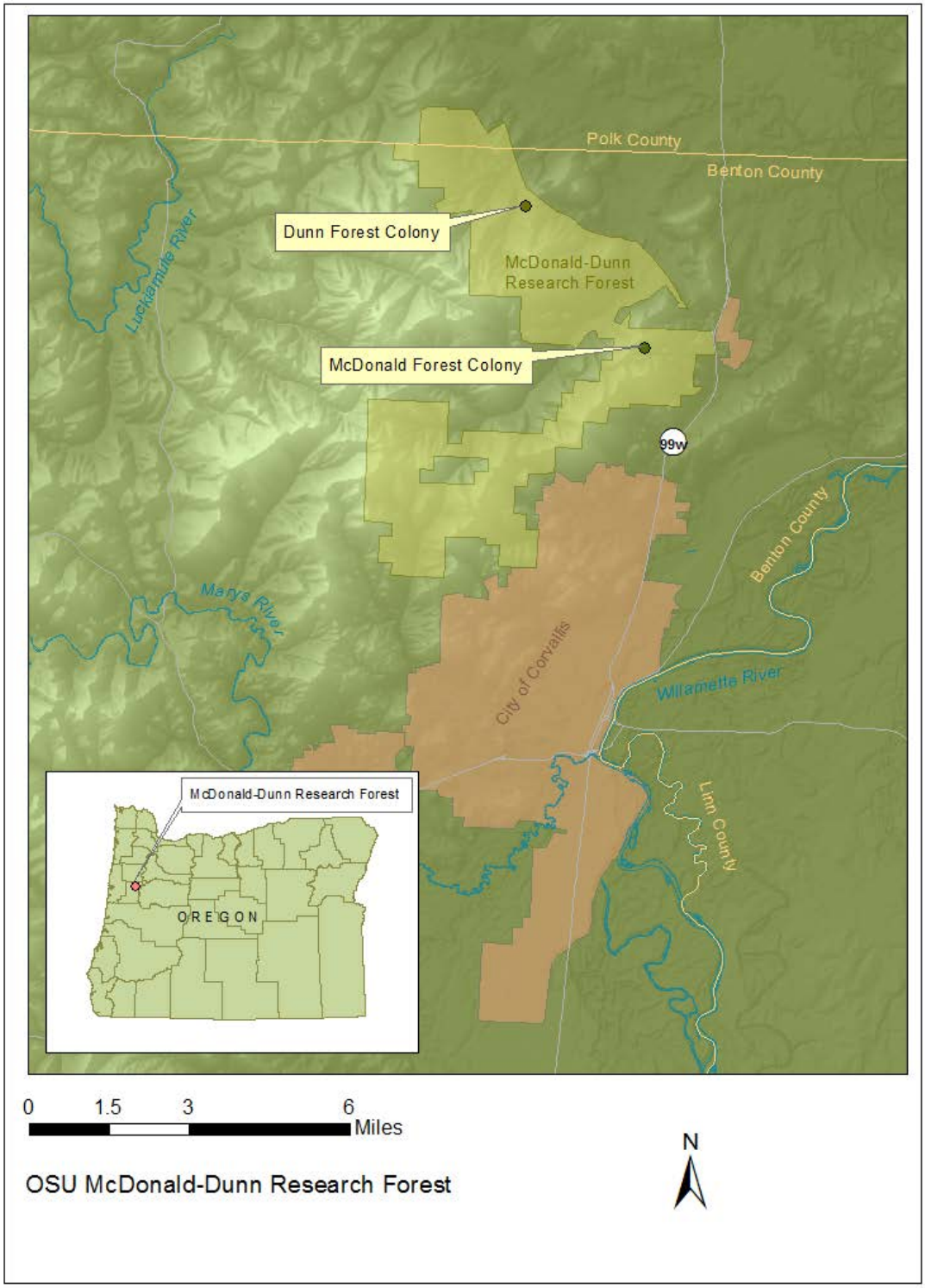
Project Area Description

The McDonald-Dunn Research Forest is located in northern Benton County, Oregon (Figure 1). The Forest is owned by the State of Oregon and administered by Oregon State University, College of Forestry, College Forests. The Forest consists of approximately 11,250 acres that lie along a system of ridges in a transition zone between the Oregon Coast Range and the Willamette Valley.

Purple martin nesting has been observed at two sites in the Forest. The primary site which has been the focus of our nest site supplementation and monitoring activities is in Township 10S, Range 5W, Sections 9, 15, and 16. In 2011, a second colony was discovered in T10S, R5W, Section 25, approximately 3.5 miles southeast of the primary site. We refer to the primary site as the "Dunn Forest colony" and the latter site as the "McDonald Forest colony", in reference to the original names for the forests in which the colonies are located.

The local landscape in which the colonies are inhabiting is a mosaic of forest, rural residential neighborhoods, and agricultural lands. Most of the forest stands are dominated by Douglas-fir (*Pseudotsuga menziesii*) with grand fir (*Abies grandis*), big-leaf maple (*Acer macrophyllum*), red alder (*Alnus rubra*), and Oregon white oak (*Quercus garryanna*) also common in the area. The nesting and foraging activities of both colonies are centered on young forest stands with canopy heights averaging less than 15 ft, but with scattered large snags and live trees that were retained after the last forest harvest.

Figure 1. Oregon State University's McDonald-Dunn Research Forest



Project Activities

Artificial Nest Sites

Two artificial gourd racks mounted on 14 ft. poles were erected prior to the 2011 breeding season and are identified as Tampico Rack (TAMR) and Road 110 Rack (110R; Figure 2). The racks are placed near snags that have been recently observed to be used by purple martins (TAMS; Figure 2). Each rack is capable of supporting 12 plastic "gourds" with starling-resistant entrances, although only 6 gourds were mounted on each rack during the first three seasons of the project. Two important design features of the gourd racks are 1) the ability to lower the aluminum arms supporting the gourds to ground level, and 2) a large access opening in the side of each gourd that is normally sealed with a threaded cap. These features permit easy inspection inside of the gourds and removal of nestlings for banding, thereby avoiding the need for a ladder or tree climbing.

Rack TAMR is located in young stand of Douglas-fir averaging approximately 12 ft. in height (2012) and growing quickly. In 2012, the pole was extended to 18 ft. so that the trees would not grow over the rack and make it unsuitable as a nest site.

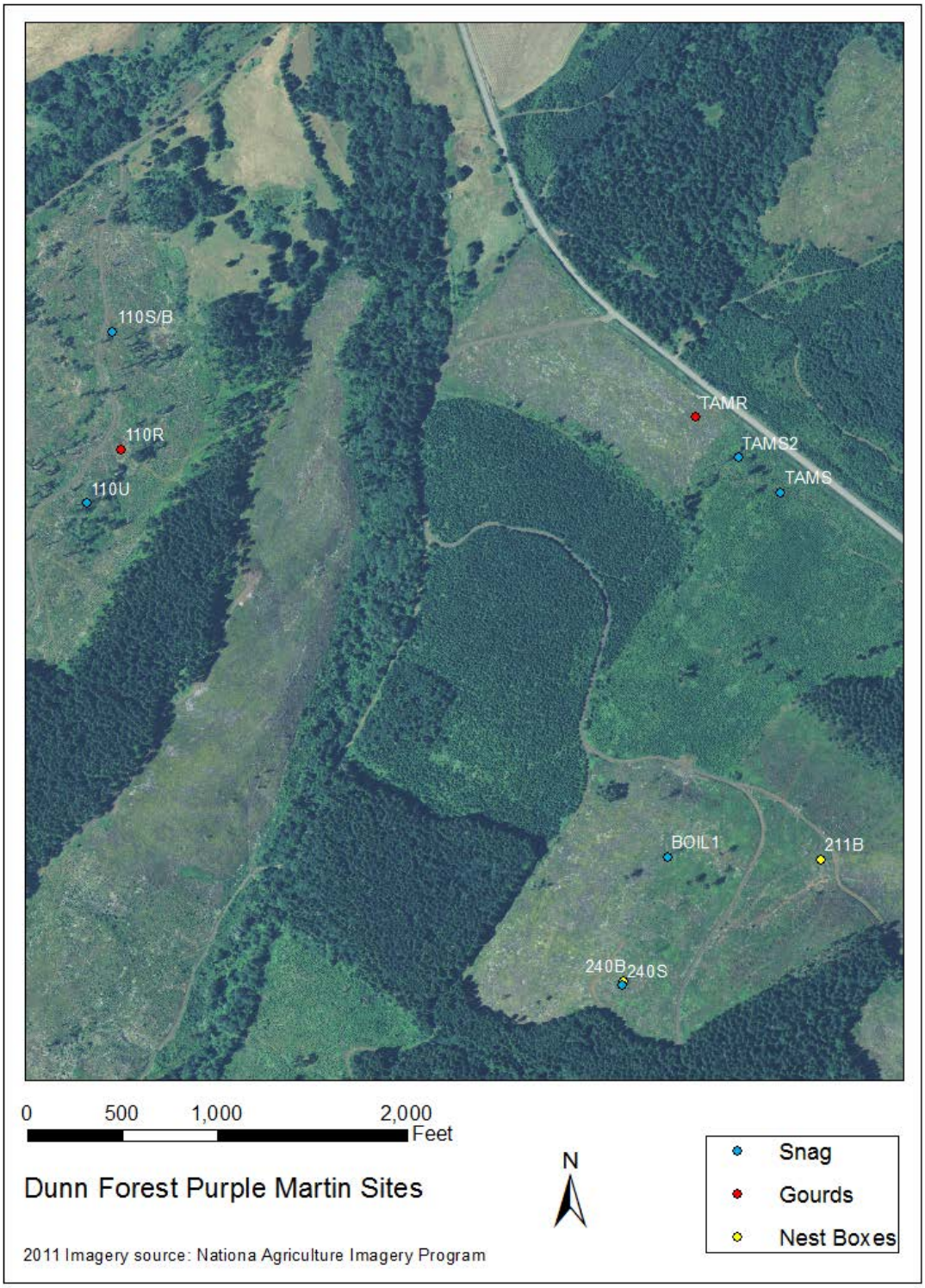
Eleven wood nest boxes designed specifically for purple martins were installed on snags in clearcuts at three locations (identified as sites 240B, 211B, and 110S/B in Dunn Forest during winter 2011. These nest boxes are of an identical design used on USFWS refuges in the Willamette Valley and at the U. S. Army Corp of Engineers Fern Ridge Reservoir colony in Lane County.

Colony Monitoring

Seasonal Activity

Observers made visits to the colony sites beginning in early April and ending in August, 2011-2013. Monitoring was largely a volunteer effort and visits to the colony were irregular, although there was always at least one visit each week during the breeding season and usually two visits per week after eggs hatched. The dates of arrival for purple martins at Dunn Forest ranged from April 28 (2011) to May 1 (2012). Nest-building activity by martins began in late May all three years. Egg laying in the gourd racks began between June 19-June 23. The last martins to leave Dunn Forest at the end of the breeding season were hatch year (HY) juveniles that departed during mid-August.

Figure 2. Dunn Forest purple martin colony. Locations of snags, artificial gourd racks, and nest boxes. 2011-2013.



Artificial Nest Sites and Productivity

During the first year of the project (2011), a single gourd was used for nesting by purple martins at Site 110R. Gourd use at both racks increased during the following two seasons (Table 1). The level of survival for eggs and nestlings has been remarkable. The ratio of fledglings per nest during 2011-2013 ranged from 4.5 to 5.0. Every egg laid in a gourd during the first three years of the project has resulted in nestling that has fledged successfully. For comparison, the Silver Lake colony in Washington had a mean of 4.1 fledglings/nest in 2013[6] and the Fern Ridge colony had 2.6 fledglings/nest in 2011[7].

Table 1. Artificial gourd use and productivity, 2011-2013.

	2011	2012	2013
Gourds used for nesting	1	4	6
Total eggs	5	18	30
Total hatched	5	18	30
Total fledged	5	18	30
Mean fledglings/nest	5.0	4.5	5.0

Gourd nests were a simple cup constructed of fresh Oregon white oak (*Quercus garryanna*) leaves and twigs (unknown tree species) set on cedar shavings I placed in gourds at the beginning of the season. Following each breeding season, nesting material was removed and the gourds were washed before they were rehung on the racks for the next season. Nevertheless, all occupied gourds were severely infested with nest mites (assumed to be *Dermanyssus prognephilus*) in 2012 and 2013. The infestations were so heavy in 2013 that we moved each clutch of nestlings into clean replacement gourds with fresh shavings during mid-nesting season. The nest replacements went without any apparent problem and we observed a much reduced level of mite infestation two weeks later at banding.

No martins have used the nest boxes during the first three years of the project. A martin was observed trying to enter Box 211B early in the 2011 season, but the box had already been occupied by a pair of western bluebirds and the martin was driven off. Besides western bluebirds, the nest boxes have been used by violet-green swallows (*Tachycineta thalassina*), tree swallows (*Tachycineta bicolor*), and house wrens (*Troglodytes aedon*).

[6] Ken Bruker (2013). Report to the Western Purple Martin Working Group

[7] Roberta Swift (2011). USACE report to the Western Purple Martin Working Group

Observed Snag Use

We discovered cavities used by purple martins in nine snags during the 2011-2013 nesting seasons in Dunn and McDonald Forests (Table 2). Most of these snags were found during our observations of the colonies. Two snags were found by local birders who reported the locations to me. One of the snags was a big-leaf maple (*Acer macrophyllum*), two were Oregon white oak, and the remainder were Douglas-fir (*Pseudotsuga menziesii).*

Given the difficulty of inspecting cavity nest sites, we were unable to count eggs or determine the status of nestlings in snags. However, we did make sufficient visits to the Dunn Forest snags to observe that adult pairs were tending nests for the entire season.

A wildlife biologist taking a walk discovered the McDonald Forest purple martin colony during the summer of 2011 and reported the location to me. As far as I am aware, this colony was previously unknown to local birders or OSU College Forest staff. The snags used by martins are in the Lakeland management unit which is characterized by sapling and pole-size Douglas-fir trees, scattered hardwoods, and a number of large conifer snags (Figure 3). Because of the distance from the Dunn Forest colony, the MacDonald Forest site was visited only once each year during 2011 and 2012. The few observations I made cause me to suspect the McDonald Forest colony is considerably larger than the Dunn Forest colony. Further observations of marked individuals will be necessary to determine if martins are moving between the two sites within a breeding season, or returning to a different site upon arrival from spring migration.

Table 2. Notes on nine snags used by purple martins.

Identification	Tree Species	Cavities Used	Years Used	Notes
110S	QUGA	1	2011, 2012	Branch containing cavity fell during storm, winter 2012
110U	ACMA	1	2012-2013	
240S	PSME	1	2013	
TAMS	PSME	2	2011, 2012	
TAMS2	QUGA	1	2012	
BOIL1	PSME	1	2013	
MAC1	PSME	1	2011, 2012	Not visited in 2013
MAC2	PSME	2	2011, 2012	Not visited in 2013
MAC3	PSME	?	2012	Not visited in 2013, 1 or 2 cavities

Tree Species: *Acer macrophyllum* (ACMA), *Quercus garryanna* (QUGA), *Pseudotsuga menziesii* (PSME)

Banding

Identification banding was performed by Joan Hagar, U.S. Geological Survey, Forest and Rangeland Ecosystem Science Center, Corvallis OR. All of the purple martin nestlings had federal, numeric identification bands (consecutive numbers from 253194220 to 253194273) attached to their left leg and a red plastic color band attached to the right leg. The Western Purple Martin Working Group has established a color band identification scheme for all of the West Coast states in which all purple martins banded in the Willamette Valley are identified with red leg bands.

All of the purple martins observed at snag and gourd rack sites were checked for leg bands during each visit to the colonies. To date, only one banded adult has been observed. She was a female banded at Fern Ridge Reservoir in 2011 and then nested at the TAMR site in 2013.

Future Plans

In 2014, I will move the TAMR rack to a forest unit approximately ½ mile away that was clearcut in 2013. The move will place the rack in a position where it will not be overtopped by trees for 8-10 years. The gourd racks and nest boxes have a combined capacity to provide 35 nest sites. There are no plans to increase the number of gourds or boxes in Dunn Forest, although we may consider installing a gourd rack near the McDonald Forest colony. The primary goal of the project is to ensure the persistence of these colonies long enough for them to expand into the surrounding forest where many more nest cavities are available in snags and dead branches in live trees.

A secondary goal of this project was to determine if purple martins that have fledged from gourds or nest boxes would return to the Forest and nest in snag cavities. This finding will be important to understand whether gourds and nest boxes pose a risk of permanently shifting the nest -site selection behavior of purple martins from natural cavities toward man-made structures. Martin populations outside of the Pacific Northwest have become almost completely oriented to gourds, nest boxes, and multi-unit martin houses even where snags are available in the area. Therefore, nest site supplementation efforts should be reconsidered if providing artificial nesting structures are contributing to a permanent alteration of purple martin breeding behavior. Our hope is that purple martins populations will become more widespread in early-successional forests and clearcut harvest units where Oregon forest practice rules require snag and wildlife tree retention.

Figure 3. McDonald Forest purple martin colony. Locations of snags. 2011-2013.

Unfortunately, our observations to date are inconclusive as to whether individual martins raised in artificial structures will use cavities for nesting as adults. We have only detected a single banded martin in the Forest. She fledged from a nest box in Lane County and used an artificial gourd for nesting at the Dunn Forest site in 2013. We never recruited a sufficient number of volunteers to make the necessarily frequent observations in the surrounding forestlands where there are numerous snags available to cavity-nesting birds. This question will require a more intensive study than our project has been able to so far afford. The issue remains crucial for the recovery of purple martin populations in Oregon and the Oregon Wildlife Institute will seek further support to expand upon the accomplishments made during the first three years of the project.

Acknowledgements

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