Does Logging During The Nesting Season Negatively Affect Neotropical Migratory Bird Populations?

A Literature Review

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Any human-related activity that affects the natural environment has the potential to cause mortality to individual plants or animals. While some activities have the cumulative effect of significantly reducing populations and making species vulnerable to extinction, many activities have a negligible population-level effect. One activity some have suggested negatively affects Neotropical migratory bird populations is timber harvesting done during the nesting season. Some claim harvesting trees that may contain eggs or nestlings results in cumulative losses that directly contribute to the population declines many Neotropical migrants have experienced in recent decades. However, no mention is made of this issue in recent reviews that broadly examine the relationship between bird populations and forest management practices (e.g., Thompson et al. 1993, Lorimer 1994, McDermott 2007). It is unclear whether this omission is an oversight of a neglected threat to birds or reflects the issue's negligible effect on their populations.

The purpose of this report was to evaluate the published evidence supporting the contention that nesting season logging activities have a population-level effect on Neotropical migratory birds. To determine how extensively this issue has been studied, a literature survey was conducted using ten (10) peer-reviewed journals that regularly publish articles relating to avian ecology. To examine the magnitude of nest losses due to logging and how this cause of nest failure relates to other factors affecting nest success, a thorough review was made of thirty-five (35) scholarly articles relating to avian nest success and survival.

METHODS

How extensive is the body of evidence in the literature?

To determine the extent of research documenting logging effects during the nesting season, a literature survey was done using the JSTOR, ProQuest, and Blackwell Synergy research article search engines. The archives of 10 scholarly journals were surveyed by searching for relevant keywords (e.g., "logging", "nest", "breeding season") among the abstracts of each publication's peer-reviewed articles. Survey period for each journal ranged from 2 years (*The Journal of Field Ornithology*) to 124 years (*The Auk*). Search results, or "hits", were individually reviewed to determine if identified articles were actually related to the issue of logging-induced nest failure.

How large is the impact and how does the magnitude of logging-related nest losses compare to other causes of nest failure?

To estimate the magnitude of nest losses from nesting season logging activities and compare these with other causes of nest loss, thirty-five (35) peer-reviewed journal articles relating to nest loss were reviewed. Major scholarly journals related to avian ecology were searched using the keyword-phrases "nest success", "nest survival", and "nest failure" and the thirty-five (35) most recent articles were selected for complete review. Since results were typically reported as 'nest success' or 'nest survival', percent nest loss was calculated for this report as the inverse (1 - nest success value) of reported values of apparent nest success (i.e. the proportion of total nests fledging $\geq$1 individual) or Mayfield nest survival estimates (Mayfield 1961, Mayfield 1975, Johnson 1979). If reported, specific causes or contributors to nest loss (e.g., predation, weather, logging activities) were noted.

RESULTS AND DISCUSSION

The literature survey – spanning over a century of scholarly articles published in 10 journals related to avian ecology – resulted in no articles that had examined the effect of nesting season logging on nest success (Table 1). Furthermore, none of the 35 reviewed studies that examined Neotropical migratory bird nest loss mentioned losses due to logging activities (Table 2). Notably, most of these reviewed studies ($\geq$69%) were conducted on actively managed forests where one would expect concerns for logging-related effects on nest success to be at their greatest; however, even on these sites the issue went unmentioned (Table 2). The omission of logging-related nest loss in scholarly journals could suggest one of two possible conclusions; either researchers have overlooked what may be an important factor relating to avian population decline, or researchers assume such incidental losses have no meaningful or measurable population-level effects. Researchers have expressed much concern for Neotropical migratory bird species in recent decades, resulting in many publications that have examined population trends and possible causes for widespread declines (Robbins et al. 1989, Finch and Stangel 1993, Rappole and McDonald 1994, Herkert 1995, Robinson 1996, Murphy 2003). Given the recent scrutiny and attention paid to this important issue, it seems unlikely that researchers would simply overlook the direct effect of logging activities if they had meaningful impacts on bird populations, especially when most studies are conducted on managed forests.

CONCLUSIONS AND MANAGEMENT IMPLICATIONS

Following an extensive survey of scholarly articles related to avian ecology, no evidence was found to substantiate the claim that nesting season logging activities have a negative population-level impact on Neotropical migratory birds. Consequently, no quantitative estimates of nest loss due to nesting season logging could be found from the published studies reviewed. In contrast, many scholarly publications report forest

management activities improved habitat conditions (e.g., Brawn et al. 2001, Keller et al. 2003), resulting in increased avifaunal abundance (e.g., Baker and Laki 1997, Keller et al. 2003, Campbell et al. 2007, Augenfeld et al. 2008), nest success (e.g., Weakland et al. 2002), and species diversity (e.g., Costello et al. 2000, Keller et al. 2003, Campbell et al. 2007, Augenfeld et al. 2008) across managed forest landscapes. Given the absence of published studies addressing the topic, there appears to be no evidence to support restrictions on harvesting activities during the nesting season.

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Table 1. Keyword-abstract search results from 10 peer-reviewed journals relating to avian ecology. Search engines scanned abstracts published during survey period for the occurrence of keywords ("bold") in specified combinations. 'Hits' are articles meeting search criteria, 'Related Articles' are those that addressed logging-related avian mortality during the breeding season.

	Keywords Used in Search:	**"logging"** or "**harvest"** and **"nest"**		**"logging"** or "**harvest"** and "**breeding season"**		**"logging"** or "**harvest**" and "**mortality"**	
Publication	**Survey Period**	**Hits**	**Related Articles**	**Hits**	**Related Articles**	**Hits**	**Related Articles**
The Auk	1884-present	6	0	1	0	0	0
The Condor	1900-present	4	0	1	0	1	0
The Wilson Journal of Ornithology	1992-present	2	0	1	0	0	0
The Journal of Field Ornithology	2006-present	0	0	0	0	0	0
Conservation Biology	1987-present	7	0	0	0	4	0
Ecology	1920-present	6	0	0	0	16	0
Ecological Applications	1991-present	1	0	1	0	7	0
Journal of Avian Biology	1994-present	0	0	0	0	1	0
American Midland Naturalist	1904-present	1	0	2	0	10	0
Journal of Wildlife Management	1937-present	26	0	24	0	0[a]	0[a]
	Totals:	53	0	30	0	39	0

[a] used searched terms "'logging' and 'bird' and 'mortality'" because the keyword 'harvest' is often used in a hunting context in this publication which resulted in too many unrelated hits to effectively review

Table 2. Peer-reviewed articles documenting avian nest success and causes of nest loss on managed and unmanaged study areas. Nest loss estimates based on studies using natural, rather than artificial, nests. No reviewed studies mentioned nest losses due to logging activities.

				Nest Losses By Cause of Failure				
Study	Location	Managed Study Area?	% Total Nest Loss[a]	Predation	Weather	Abandon-ment	Breeding Season Logging	Other
Artman and Downhower 2003	OH	yes	73.0%	90%			not mentioned	
Barber et al. 2001	AR	yes	65.7%	80%			not mentioned	
Burke and Nol 2000	Ontario	unclear	57.7%				not mentioned	
Chapa-Vargas and Robinson 2007	so. IL	unclear	65.3%				not mentioned	
Dellinger et al. 2007	WV	yes	69.5%	87%		13%	not mentioned	
Duguay et al. 2001	WV	yes	50.6%	90%			not mentioned	
Farnsworth and Simons 1999	NC and TN	no	54.0%	96%		2%	not mentioned	
Fauth 2000	no. IN	unclear	60.7%	58%			not mentioned	
Flaspohler et al. 2001	no. WI	yes	44.3%	52%	13%	22%	not mentioned	
Ford et al. 2001	so. IN	yes	69.0%				not mentioned	
Gram et al. 2003	MO	yes	71.0%	typical cause		"rare"	not mentioned	
Hanski et al. 1996	WI	yes	57.0%	89%			not mentioned	
Hoover et al. 1995	PA	unclear	33.0%	95%			not mentioned	
Hoover et al. 2006	so. IL	unclear	44.0%	99%			not mentioned	
King et al. 1996	NH	yes	53.0%	89%			not mentioned	
Manolis et al. 2002	MN	yes	64.0%	94%	1%	3%	not mentioned	
Miller 2002	FL	yes	62.5%	83%		11%	not mentioned	
Moorman et al. 2002	SC	yes	56.0%	83%	7%	10%	not mentioned	
Oliarnyk and Robertson 1996	Ontario	unclear	33.0%				not mentioned	
Porneluzi and Faaborg 1999	MO	yes	66.5%				not mentioned	
Powell et al. 2000	GA	yes	NA				not mentioned	
Robinson and Robinson 2001	so. IL	yes	NA				not mentioned	
Rodewald and Yahner 2001	PA	yes	NA				not mentioned	
Rogers 2006	MI	yes	52.5%				not mentioned	
Sargent et al. 2003	SC	unclear	64.7%	100%			not mentioned	
Siepielski et al. 2001	PA	yes	51.5%				not mentioned	
Simons et al. 2000	NC and TN	no	65.0%	typical cause			not mentioned	
Smith et al. 2007	Ontario	yes	61.0%	63%			not mentioned	
Stuart-Smith and Hayes 2003	BC	yes	59.0%	"few"	"few"		not mentioned	
Tarvin and Garvin 2002	FL	unclear	69.2%				not mentioned	
Tewsbury et al. 1998	MT	yes	70.0%				not mentioned	
Twedt et al. 2001	MS	yes	82.7%	typical cause			not mentioned	
Weakland et al. 2002	WV	yes	63.5%	75%	2%	5%	not mentioned	deer trampling: 2.4%
Williams and Bohall Wood 2002	WV	yes	46.0%	88%		12%	not mentioned	
Zanette and Jenkins 2000	New Zea.	unclear	81.0%	typical cause			not mentioned	

[a] Inverse of reported apparent nest success or estimated nest success calculated using Mayfield-method