Conservation Assessment
for
Three-toed Woodpecker (Picoides tridactylus)

USDA Forest Service, Eastern Region
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Prepared by:

Christopher L. Burdett
Natural Resources Research Institute
University of Minnesota

Gerald J. Niemi
Natural Resources Research Institute
University of Minnesota

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

This is a draft conservation assessment designed to provide a synopsis of the life history, ecology, and management and conservation concerns of the Three-toed Woodpecker (*Picoides tridactlyus*). The primary focus of this conservation assessment is on information specifically relevant to Region 9 of the United States Department of Agriculture Forest Service.

The Three-toed Woodpecker (*Picoides tridactlyus*) is a medium-sized black-and-white woodpecker of boreal forests. It is the only woodpecker to be found in both the Old and New Worlds. In North America, it is broadly distributed across boreal forests from Alaska and Canada south of tree line down through the Rocky Mountains to central New Mexico, the northernmost portions of the Great Lakes states, and northern New England. It is generally sparsely distributed and relatively uncommon throughout its range although it can become common in old-growth coniferous forest and recently disturbed areas, particularly burns. The habitat association with these areas results from their narrow dietary preference for bark beetles, insects whose populations proliferate on dead and dying timber common in decadent forests and disturbed areas. The relationship between insect outbreaks and Three-toed Woodpecker populations may be responsible for the occasional irruptive movements that occur outside of their traditional range. Although these population irruptions are generally rare, the species regularly moves immediately south of its breeding range during winter.

The close association between Three-toed Woodpeckers and rare habitats such as old-growth conifers and ephemeral habitats such as recent burns creates significant management and conservation concerns. The Three-toed Woodpecker is thought to be one of the species most likely to be negatively affected by timber harvest in boreal forests. Harvesting old-growth coniferous forest, fire suppression, and salvage logging may negatively affect Three-toed Woodpecker populations. However, it may be possible to modify these practices in ways that help maintain woodpecker populations. Research investigating the affects of forestry and management practices on both Three-toed Woodpeckers and the closely related Black-backed Woodpecker are of great need in North America. Beyond these applied research questions, additional basic scientific research is needed on the natural history and ecology of the species, particularly in Region 9. Although its primary range is outside of Region 9, the overall lack of knowledge of Three-toed Woodpecker ecology and distribution in the region, coupled with its regular winter visits and occasional breeding, would make additional monitoring and research on the species in the eastern United States beneficial.

ACKNOWLEDGEMENTS

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NOMENCLATURE

Class: Aves
Order: Piciformes
Family: Picidae
Genus: Picoides
Binomial Name: *Picoides tridactylus*
Subspecies: 8 recognized - 3 in Nearctic, 5 in Palearctic

- North American region
  1. *P. t. dorsalis*
  2. *P. t. fasciatus*
  3. *P. t. bacatus* *

  * Region 9 subspecies
- Eurasian region
  1. *P. t. tridactylus*
  2. *P. t. crissoleucus*
  3. *P. t. albidior*
  4. *P. t. alpinus*
  5. *P. t. funebris*

Common Name: Three-toed Woodpecker
Synonyms:

- Formerly known as the Northern Three-toed Woodpecker and the American Three-toed Woodpecker

American Ornithologist's Union Code: TTWO

DESCRIPTION OF SPECIES

The Three-toed Woodpecker is a medium-sized black-and-white bird. Adults weigh between 46-66 g, are approximately 20 cm in length, and have a wing length of 10.8-12.9 cm. The upperparts of adults are black with variable amounts of white present on the central portion of the back and the outer retricies. The primaries are also barred with white. Conversely, the underparts of the Three-toed Woodpecker are white with a considerable amount of black barring on both sides and flanks. The head is primarily black with a relatively large yellow crown patch, white chin and throat, and white stripes extending from the base of the bill to the ear and from the posterior of the eye to the neck. The yellow crown patch is streaked with white in the female but is merely bordered with white in the male. Juveniles are similar to adults but with a duller overall appearance, smaller yellow crown patches, and a buff or brownish hue to the underparts and flanks. The chisel-tipped bill is long and heavily built. As inferred from its common name, a distinguishing feature of this bird is its feet, possessing 3 toes (2 forward and 1 backward) rather than the 4 toes common in most woodpecker species (Leonard 2001).

The Three-toed Woodpecker can be confused with the closely related Black-backed Woodpecker. The Black-backed Woodpecker is slightly larger with a weight of 61-88 g, a length of 23 cm, and a wing length of 12-3-13.4 (Dixon and Saab 2000). In addition, the Black-backed Woodpecker has a noticeably larger bill than the Three-toed

Woodpecker. In the field, the most prominent contrasting feature between the two species is the presence of white barring on the back of the Three-toed Woodpecker, a characteristic which is lacking in the Black-backed Woodpecker. However, the Three-toed Woodpecker subspecies found in eastern North America, *P. t. bacatus*, typically has less white barring on it's back than the other North American subspecies (Leonard 2001). The Three-toed Woodpecker also has a much more prominent white stripe running from behind the eye to the neck. Other differences between the species include white streaks associated with the yellow crown and black bars on the white outer retrices of the Three-toed Woodpecker, features usually absent in the Black-backed Woodpecker (Leonard 2001).

The Three-toed Woodpecker is a circumboreal bird and the only woodpecker present in both North America and Eurasia. In general, the Palearctic subspecies are larger than the Nearctic subspecies with the exception of *P. t. dorsalis*, the western North American subspecies from the Rocky Mountains, which approaches the size of the Eurasian birds (Bangs 1900). Also, the 2nd and 3rd outer retrices on the Palearctic subspecies are completely black at their bases and barred with black and white while in the Nearctic subspecies these feathers are pure white and are only barred with black basally (Bangs 1900). However, recent genetic analyses have suggested that the Palearctic and Nearctic subspecies should actually be reclassified as separate species (Zink et al. 2002).

The Three-toed Woodpecker is considered a somewhat "tame" bird because it is easily approached by humans (Leonard 2001). However, the species is rarely casually detected due to its extremely quiet nature (Short 1974). Despite its secretive nature, the vocalizations of the Three-toed Woodpecker are fairly well studied. The vocal repertoire of the Three-toed Woodpecker, from Short (1974), Winkler and Short (1978), and Leonard (2001) and references therein, consists of the following:

- Call Note: a common call consisting of a single note or series of notes rendered as *pik*; similar to the Pit Call of the Downy Woodpecker, but of a higher pitch than the call note of the Black-Backed Woodpecker and less sharp and loud than the call note of the Hairy Woodpecker
- Scolding Call: the call note emitted as a quick series during copulation or nest disturbances
- Rattle Call: a series of call notes emitted during interspecific encounters, threat displays, and territorial displays; common to most *Picoides* species and very diverse across the genus
- Short Rattle Call: a series of very short notes emitted by juveniles
- Kweek Call: a series of notes rendered as *kweeks* given during intra- and interspecific interactions; generally occurs only from April to May; often accompanied by head-swinging display; similar to the Kweek Call of the Hairy Woodpecker
- Twitter Call: a rhythmic chattering used to express sexual excitement, distress at the presence of a predator, or intra- and interspecific rivalry
- Wicka Call: a series of notes given during interspecific encounters and often accompanied by head-swinging display
- Wad Call: a low-pitched call typically given when a pair meets

- Chirp Call: a very common series of short notes given by older nestlings
- Loud Chirp Call: common during feeding, this call is similar to the Chirp Call but louder and with a less regular tempo
- Squeak Call: a loud squeak given by fledglings during aggressive encounters with adults
- Distress Cry: a series of notes emitted by adults during periods of extreme duress
- Screech Call: a series of notes similar to the Distress Cry given by juveniles during periods of extreme duress

The Three-toed Woodpecker utilizes drumming as a means of communication more than most woodpecker species (Short 1974). Drumming can occur throughout the year but is more common during breeding activities and can begin as early as March. Although drumming is common in both sexes, males frequently drum to attract females. Drumming episodes in the species average 15.8 beats with an average duration of 1.2 seconds (Short 1974). Two tempos have been discerned in the drumming episodes of *P. tridactylus*: fast and slow. The most common drumming episode is fast with an increase in tempo toward the end of the drum. It is believed that the fast drums are used to communicate to conspecifics or interspecifically, with slow drumming being used for intraspecific communication between a pair (Short 1974). Drumming activity seems to begin shortly after sunrise, peak 1-2 hours after sunrise, and continue until the late-morning hours (Goggans et al. 1988). Dead trees are preferred to live trees as drumming substrates, presumably due to the acoustic dynamics of snags permitting sound to travel over longer distances (Imbeau and Desrochers 2001).

LIFE HISTORY

MIGRATION

The Three-toed Woodpecker is a primarily a resident species throughout its breeding range. However, during winter it frequently moves to slightly more southern locations in Manitoba, Saskatchewan, Alberta, Minnesota, Wisconsin, Michigan, New York, Vermont, New Hampshire, and Maine (Leonard 2001). Green and Niemi (1980) state that the bird can arrive by late-September in the Superior National Forest, Minnesota. Generally, its winter range is restricted to the northernmost portions of these U.S. states. The overall low abundance of the species would make the detection of migratory movements and patterns difficult (Leonard 2001).

Despite the lack of regular migration, both the Three-toed Woodpecker and the closely related Black-backed Woodpecker are irruptive species that occasionally appear outside of their resident range. Three-toed Woodpecker irruptions are irregular and occur primarily in northern Eurasia and eastern North America (Leonard 2001). In a review of Black-backed and Three-toed Woodpecker irruptions in eastern North America from 1950 to 1982, Yunick (1985) found that the Three-toed Woodpecker is less irruptive than the Black-backed Woodpecker and the two species do not always irrupt in synchrony. In the fall and winter of 1956-1957 a major influx of both Black-backed and Three-toed

Woodpeckers occurred in southeastern Canada and the northeastern U.S (West and Speirs 1959). West and Speirs (1959) detailed 59 records of the species and then grouped them into activity areas within each state or province where records were clustered. Ten of these Three-toed Woodpecker activity areas were in southern Ontario with 9 of these occurring in southeastern section of the province. Also in eastern Canada, 3 activity areas were recorded in Quebec and 1 in New Brunswick. In the U.S. there were 3 areas recorded in northern New York, another 3 in central and southern Maine, 2 in Massachusetts, and 1 in the eastern half of the Upper Peninsula of Michigan (West and Speirs 1959). The fall and winter of 1974-75 was a highly irruptive season for both Three-toed (189 records) and Black-backed Woodpeckers (462 records) in the eastern U.S. (Yunick 1985). Between 61-63% of the sightings compiled by Yunick (1985) were of a single day and many were located in urban areas that stood in stark contrast to typical Three-toed Woodpecker habitat. A possible mechanism for these movements may be the prevalence of Dutch elm disease during some of these irruption years although the relationship is weak and perhaps more relevant to the Black-backed Woodpecker (Yunick 1985). Another possible irruption mechanism may be abundant fire years increasing fecundity in the Three-toed Woodpecker to the extent that overabundance in northern forest populations induces dramatically increased dispersal south of the traditional range (Axtell 1957). Lastly, it may be that the primary locations of most Three-toed Woodpecker irruptions, Eurasia and eastern North America, are representative of a detection bias due to the generally greater human population densities in these regions. It is possible that irruptions may also occur on a more regular basis in central and western North America but fewer observers are present to document the movements.

SEXUAL BEHAVIOR AND COURTSHIP

Little information is available on the sexual behavior and courtship of the Three-toed Woodpecker. It is seemingly monogamous with pair bonds occasionally lasting for multiple seasons. Typical courtship behavior consists of drumming by males to attract females followed by head-swinging and twitter calling in the male. Drumming usually begins in March or April. Copulation is accompanied by repeated calling by both sexes and is similar to most passerines in frequency and duration. Typically, eggs are laid from late-May through mid-June, with the young being raised from early-June through late-July (Leonard 2001).

NEST CHARACTERISTICS

P. tridactylus typically builds a cavity nest in the trunks of coniferous snags and trees, although deciduous snags and trees are also utilized (Steeger and Dulisse 1997, Leonard 2001). Although information is limited, spruce and balsam fir are trees in Region 9 that are known to be used for nesting. There is some evidence that trees with heartrot are preferred (Goggans et al. 1988). In British Columbia, 13 active nests were located in 5 different species of tree. Nests were placed in mature trees with a mean dbh of 26.1 cm, a mean height of 21.0 m, and a mean cavity height of 5.2 m. Most of the nest trees were still living although the onset of disease and decay was noticeable (Steeger and Dulisse 1997). In Oregon, nest trees had a mean dbh of 27.9 cm, a mean height of 23.1 m, and a

mean cavity height of 7.7 m (Goggans et al. 1988). One nest found in a black spruce bog in Minnesota was located approximately 3.9 m from the ground in a tree of about 4.8 m height and 20.3 cm dbh (Eckert 1981). A more recent Minnesota record describes a nest located about 2 m from the ground in a balsam fir or spruce (Eckert 2000). Although both parents provide food to the nestlings (Gibbon 1966, Eckert 2000), Gibbon (1966) determined that the male fed the nestlings almost 2.5 times more than the female. The nestlings almost constantly emit a rattle call similar to that heard in other young woodpeckers (Gibbon 1966, Short 1974). This frequent noise associated with Three-toed Woodpecker nestlings can often be used to locate active nests.

POPULATION BIOLOGY AND VIABILITY

The eastern North American subspecies of Three-toed Woodpecker, *P. t. bacatus*, typically lays 4 eggs (Bent 1939). For the species as a whole, Koenig (1987) provides a similar mean clutch size of 3.87 +/- 0.64 (SD). In Europe, the incubation period lasts about 10.5 days with the male doing the bulk of the incubating (Sollien et al. 1982). The eastern North American subspecies has a 14 day incubation period (Bent 1939).

In British Columbia, nesting success, defined as the fledging of at least one nestling, was 42.9% (Steeger and Dulisse 1997). The authors attribute this low nest success rate primarily to starvation although nest predation was also noted. The starvation of nestlings likely resulted from either a weather-related reduction in parental foraging efficiency or the loss of insect infested trees to timber harvest (Steeger and Dulisse 1997).

DIET

P. tridactylus is considered to be somewhat of a dietary specialist, foraging primarily on scolytid bark beetles (Koplin 1969, Murphy and Lehnhausen 1998). Within the Scolytidae are several species considered to be among the most damaging forest pests (Coulson and Witter 1984). Scolytids are elongated cylindrical beetles that range in size from 1.0 to 9.0 mm with most species being 1.0-3.0 mm in length. They infest damaged or severely weakened mature or senescent trees, with adults excavating tunnels just beneath the bark in the phloem. In most species, eggs are laid along the lateral walls of these tunnels. Upon hatching, the larvae move perpendicular to the tunnel with the various instar stages of most species remaining in the phloem throughout their lives (Coulson and Witter 1984). The Three-toed Woodpecker also consumes cerambycid beetles, a species whose larvae bore deeper into the phloem than scolytids. Foraging by cerambycid larvae often reaches the xylem (Coulson and Witter 1984). Aside from differences in depth of penetration into host trees, scolytid beetles are considerably smaller than cerambycids. Some early 20th century studies documented considerable use of cerambycids by Three-toed Woodpeckers although the bulk of recent evidence points toward greater consumption of scolytids (Murphy and Lehnhausen 1998, Leonard 2001). The closely related Black-backed Woodpecker is considered to prey on cerambycids to a greater extent than the Three-toed Woodpecker (Murphy and Lehnhausen 1998). The Three-toed Woodpecker was a more effective forager on larval scolytids than Downy

(*Dendrocopos pubescens*) and Hairy (*D. villosus*) Woodpeckers, a situation potentially attributable to foraging adaptations (Koplin 1972).

In northeastern Oregon, Three-toed Woodpeckers foraged exclusively by scaling, or the removal of bark layers to obtain insects present in the superficial bark layers (Bull et al. 1986). Similarly, in Quebec over 97% of foraging observations were of bark scaling and associated surface pecking for bark beetles and first instars of wood boring larvae (Imbeau and Desrochers 2002). Scaling was also the most common (92% of observations) technique used by Three-toed Woodpeckers in Manitoba (Villard 1994). However, in recently burned mixed boreal forests in Alaska, Murphy and Lehnhausen (1998) noted that 55.7% of 853 foraging observations were pecks, 27.6% were excavations, and 16.7% were flakes. The authors noted that all excavations were superficial, only entering the cambium layer. Inconsistent terminology and definitions of the various foraging techniques across studies somewhat complicates formulating generalizations of Three-toed Woodpecker foraging patterns. However, by combining the flaking and pecking techniques similar to Bull et al. (1986), this combined foraging technique occurred in 72.4% of observations in the Alaskan study (Murphy and Lehnhausen 1998). Therefore, the most consistent pattern seems to be that the species removes the outermost layers of bark and consumes bark beetles by pecking them from the substrate. The tendency of the Three-toed Woodpecker to forage in this manner is consistent with the ecology of scolytid beetles, its main prey species, whose larval and adult forms live on or in the superficial cambium layer directly under the outermost bark. Also *P.tridactylus* may do some sap licking but this foraging technique seems to be little utilized by the Nearctic subspecies (Villard 1994).

The high dietary reliance on bark beetles means that the Three-toed Woodpecker makes extensive use of disturbed forests. Even within predominantly living forests this woodpecker focuses its foraging on dead and dying timber (Yeager 1955). Frequently, the species selects burned coniferous trees as a foraging substrate (Bull et al. 1986, Murphy and Lehnhausen 1998). Murphy and Lehnhausen (1998) found that the Three-toed Woodpecker primarily foraged on undamaged portions of lightly to moderately burned spruces while the closely related Black-backed Woodpecker made greater use of the burned portions of moderate to heavily burnt trees. This differential use of foraging substrates in the two closely related species is consistent with the Three-toed Woodpeckers dietary specialization on scolytids and the Black-backed Woodpeckers specialization on cerambycids. The high dietary specialization of both of these *Picoides* species makes an improved understanding of bark beetle ecology a research priority.

HABITAT

P. tridactylus is a species of boreal and montane coniferous forests. It usually inhabits mature or old-growth coniferous stands with abundant insect-infested dead and dying trees (Yeager 1955, Leonard 2001). This dependence on insect-infested dead and dying timber frequently results in Three-toed Woodpecker populations showing an association with such forest disturbances as fire (Blackford 1955, Koplin 1969, Hutto 1995, Murphy and Lehnhausen 1998, Kreisel and Stein 1999), windthrow (Virkkala et al. 1991), floods

(Short 1974), insect outbreaks (Bull et al. 1986), and disease (Yunick 1985). In particular, Three-toed Woodpecker populations often show an increased abundance in early post-fire successional seres. This extensive use of recently burned stands means that the species relies to a considerable extent on an ephemeral resource. For example, Hoyt (2000) found in Alberta that the occupancy of recently burned stands decreased between 3 and 8 years post-fire. Other authors have also noted that *P. tridactylus* use of recently burned or dying stands decreases through time (Yeager 1955, Murphy and Lehnhausen 1998).

Despite a high reliance on recently burned stands, it has been suggested that the closely related Black-Backed Woodpecker is more dependent on early post-fire conditions than the Three-toed Woodpecker (Hutto 1995, Murphy and Lehnhausen 1998). Although *P. tridactylus* populations were higher in dying and dead forests than forests with abundant live trees, circumstantial evidence from Colorado suggests that, while the larger dead forest populations eventually left these survey plots entirely, populations in partially living forests never declined to zero (Yeager 1955). Short (1974) described the Three-toed Woodpecker making greater use of live trees in spruce-tamarack bogs in New York than the Black-backed Woodpecker. In Minnesota, studies investigating the bird communities of recent burns did not detect Three-toed Woodpeckers although Black-backed Woodpeckers were frequently found (Niemi 1978, Apfelbaum and Haney 1981, Schulte and Niemi 1998). However, these studies were based on surveys conducted in the spring breeding season in areas at the extreme periphery of the Three-toed Woodpeckers summer range. Surveys performed during winter near the geographical boundary of *P. tridactylus* would provide a more thorough understanding of its use of disturbed forests and interspecific relationships with the Black-backed Woodpecker in Region 9. More information is also needed on *P. tridactylus* use of forests disturbed by means other than fires. Of particular interest would be data on the species use of trees killed by beaver flooding given the considerable recent changes in the landscape-scale impact of beavers on some forests in Region 9 (Johnson and Naiman 1990). Dead trees likely resulting from beaver-related flooding were associated with both the Three-toed and Black-backed Woodpeckers in northern New York (Short 1974).

Little information on habitat relationships is available from eastern North America. In Maine, the species is considered a specialist for mature softwood habitats (Hagen et al. 1997). Other work in Maine only detected Three-toed Woodpeckers in unmanaged reserve coniferous stands (Gunn and Hagan 2000). Observations from the Adirondack Mountains in New York suggest that *P. tridactylus* prefers dense areas of spruce-tamarack bogs and avoided the upland beech-maple-hemlock forest on adjacent slopes (Short 1974). Black-spruce-tamarack stands are also the vegetational community most likely to contain the species in Minnesota (Green and Niemi 1980). A lone male sighted in northern Michigan was also found in a spruce-tamarack bog (Van't Hof et al. 1983). Work in Canada on the bird communities of black spruce stands has documented the presence of the species in old growth stands of this cover-type (Imbeau et al. 1999). The species well-known association with disturbed forests is also prevalent in eastern North America, with the species being detected in burns (Imbeau et al. 1999) and flooded areas (Short 1974). In summary, the Three-toed Woodpecker of eastern North America

generally inhabits recently burned or decadent old growth coniferous (primarily spruce) stands. This association results from these habitats harboring the abundant dead and dying trees that support large populations of bark beetles, the chief prey of the Three-toed Woodpecker.

DISTRIBUTION AND ABUNDANCE

The Three-toed Woodpecker has a circumpolar distribution, it is the only woodpecker species found in both North America and Eurasia. In North America, it is broadly distributed across the boreal forests of Canada and the U.S. It breeds throughout most of Alaska and Canada south of tree line except for most of the coastal areas bordering the Pacific Ocean and a contiguous region encompassing southwestern Manitoba, southern Saskatchewan, and southeastern Alberta. In the western U.S., it is found throughout the Rocky Mountains from Idaho and Montana south to northern Arizona and central New Mexico; northern Washington down into the Cascade and Blue Mountains; the Cascade, Blue, and Wallowa Mountains of Oregon; scattered breeding records form the Snake Mountains of Nevada and Black Hills of South Dakota (Leonard 2001).

In the eastern U.S. the Three-toed Woodpecker breeds in the Adirondack Mountains of New York, extreme northeastern Vermont, northern New Hampshire, and northern Maine (Leonard 2001). It is an occasional breeder in northeastern Minnesota with at least 6 confirmed breeding records in the state (Eckert 2000). *P. tridactylus* is believed to be a very rare breeder in northern Wisconsin and the Upper Peninsula of Michigan (Thiel 1978, Robbins 1991, McPeek 1994). There is a single record from 1927 of the species breeding in Massachusetts (Leonard 2001). The breeding season distribution of the Three-toed Woodpecker, based on Breeding Bird Survey (BBS) data, is shown in Appendix 1.

Non-breeding winter observations consist of expansions south of the breeding range into the non-breeding segment of Manitoba, Saskatchewan, and Alberta and farther south into the eastern breeding regions of northeast Minnesota, extreme northern Wisconsin, the Upper Peninsula of Michigan and extreme northern end of Michigan's Lower Peninsula, northeastern New York, northern Vermont, northern New Hampshire, and Maine (Leonard 2001). There are a few records from northern Pennsylvania (McWilliams and Brauning 2000). The distribution of the Three-toed Woodpecker during winter based on the results from the Christmas Bird Count (CBC) is shown in Appendix 2. Based on CBC data, the species seems to be widespread but not abundant anywhere throughout Canada (Root 1988). Unfortunately, this conclusion is based upon interpolation and extrapolation from relatively few sparsely distributed counts, additional counts are needed in this area. Within the conterminous U.S., the highest abundance based on CBC data is in the Rocky Mountains of Colorado (Root 1988).

The Three-toed Woodpecker is considered an irruptive species in winter although to a lesser extent than the Black-backed Woodpecker (Yunick 1985). Additionally, the irruptions of these species do not seem to be synchronous. Reasons given for reduced numbers of irruptive Three-toed Woodpeckers and the lack of synchrony between the

Three-toed and Black-backed Woodpecker irruptions include increased distance from primary range and partitioning of resources with the Three-toed showing increased use of live trees and a preference for denser stands (Short 1974, Yunick 1985).

Absolute abundance estimates of the Three-toed Woodpecker are difficult to obtain due to the general rarity of the species, its extremely quiet nature, challenges associated with accessing its preferred habitats, and the inadequacy of most protocols used to estimate bird abundance for woodpeckers. Despite these formidable obstacles, the BBS and CBC both provide data on general trends. Based on BBS data for the U.S., populations of the Three-toed Woodpecker have declined 5.1% for the period of 1966-2000 although this trend is not statistically significant (Sauer et al. 2001). Appendix 3 presents a map of population trends based on BBS data for the Three-toed Woodpecker. Based on CBC data for the U.S. as a whole, populations of the Three-toed Woodpecker have increased 0.5%per year for the period of 1959-1988 although this trend is not statistically significant either (Sauer et al. 1996). The lack of statistical significance in these trends and the previously detailed problems associated with these protocols for estimating *P. tridactylus* populations means that these results should be viewed with caution.

CONSERVATION STATUS

Globally, The Nature Conservancy (TNC) Heritage Status conservation ranking system gives the Three-toed Woodpecker a "G5" ranking, meaning the species is globally demonstrably widespread, abundant and secure. Nationally, TNC ranks the Three-toed Woodpecker as "N5" in the U.S., meaning the species is demonstrably widespread, abundant and secure at the national level (NatureServe 2002). Risk evaluations conducted by the U.S. Forest Service consider the species to be a regional forest sensitive species on the Superior National Forest in Minnesota, and present but not at risk in the White Mountain National Forest in New Hampshire. Scientific publications from both the Palearctic (Helle and Järvinen 1986, Virkkala 1987, Virkkala et al. 1994) and Nearctic (Hagen et al. 1997, Imbeau et al. 1999, Imbeau and Desrochers 2001) consider *P. tridactylus* to be a species likely to be negatively affected by certain forestry practices. Resident cavity nesting birds, in particular the Three-toed Woodpecker, are considered the species to be most at risk from logging activities in both Fennoscandia and eastern Canada (Imbeau et al. 2001). Specific forestry practices though to be detrimental to Three-toed Woodpeckers include fire suppression, salvage logging, inadequate retention of snags, and short logging rotations (Imbeau et al 1999). Also, designing harvesting activities to minimize the loss and fragmentation of remaining late-successional spruce stands should benefit the species (Virkkala 1987, Imbeau et al. 2001).

POTENTIAL THREATS AND MONITORING

PRESENT OR THREATENED RISKS TO HABITAT OR RANGE

The Three-toed Woodpeckers high reliance on both old growth forests and an ephemeral resource such as recently burned forests creates considerable obstacles to effective conservation planning. A habitat affinity with recently burned forests can put *P.*

tridactylus at odds with fire suppression and salvage logging programs. In addition, its association with old growth spruce forest leaves the species vulnerable to the cover-type and age composition alterations often associated with timber harvest in modern boreal forests. These habitat requirements make the Three-toed Woodpecker one of the boreal bird species most likely to exhibit a negative response to forestry (Hagan et al. 1997, Imbeau et al. 2001). However, the limited distribution of this species in eastern North America means that only the northernmost areas of Region 9 should be targeted as areas of potential conservation concern.

Logging of mature softwood stands, fire suppression, salvage logging of disturbed sites and poor snag retention management plans are generally not beneficial to *P. tridactlyus*. However, these management activities can be altered in ways that promote conservation of the Three-toed Woodpecker while also attempting to minimize the economic impact on the forest products industry. Selective logging rather than clearcutting can benefit both primary and secondary cavity nesting species by providing a continuous supply of nesting and foraging substrates. Longer harvest rotations can help maintain old growth spruce stands in forest landscapes. Larger, more severe crown fires can be incorporated into controlled burning programs to better mimic natural processes and provide excellent woodpecker habitat. Salvage logging operations can be delayed so that early post-fire conditions are allowed to persist for longer periods. Salvage logging operations of burned or other disturbed sites such as blowdowns can be designed to leave a suitable number of dying trees and snags standing to promote woodpecker populations. Because it may be difficult to predict the particular tree species, size, and condition preferred by individual species comprising the post-fire avian community, it may be better to exclude large blocks of the burned habitat from salvage operations rather than selectively removing trees of a specific species or size throughout the entire burn (Hutto 1995). Harvest blocks in undisturbed forests can also be modified so that both live and dead residual trees are retained. Snag management plans should ensure the recruitment of dying and dead trees through time on managed stands. In general, the species of tree is less relevant to snag longevity than how the snag was created. Snags not created by fire often remain in the final stages of decay for 5-10 years before falling while fire-created snags fall in less time (Morrison and Raphael 1993). In general, too little research on the management of dead and dying timber has been conducted in Region 9. Bate et al. (1999) have developed a landscape-scale methodology for sampling snags and large trees on National Forests that may provide valuable management guidance for the Three-toed Woodpecker and other Region 9 cavity nesting birds.

COMMERCIAL, RECREATIONAL, SCIENTIFIC, OR EDUCATIONAL OVERUTILIZATION

No information found though all unlikely to have major effect.

DISEASE AND PREDATION

Fleas have been found in Three-toed Woodpecker nests (Haas and Wilson 1984). No other information on disease or parasites found.

Little information exists regarding predation on *P. tridactylus*. Squires (2000) found Three-toed Woodpecker remains in only 2 of 793 Northern Goshawk (*Accipiter gentilis*) pellets despite woodpecker species in general being present in 52% of samples. Potential mammalian predators include such ubiquitous nest predators as squirrels and mustelids. Although little work has been done in Region 9 on the effect of predation on populations of cavity nesting birds, predation studies on birds with different nesting life histories have detected high predation levels in some bird species (Hanski et al. 1996). Given the lack of research on this subject, it is possible that predation has a much greater impact on Three-toed Woodpecker populations than is currently known.

INADEQUACY OF EXISTING REGULATORY MECHANISMS

In general, woodpeckers are often not adequately surveyed with traditional survey programs such as the BBS, CBC, or standard point count protocols. This problem is exacerbated with species such as the Three-toed Woodpecker that are both relatively rare and may have more of a presence in Region 9 during the non-breeding season. Surveys designed specifically for woodpecker species would provide a better grasp on the population dynamics of all picids. Alternatively, surveys designed specifically to detect the Three-toed Woodpecker would be rather easily implemented due to the species high habitat specificity to recent burns and old-growth softwood stands. Any survey program for the species would have to deal with statistical concerns such as the power of the survey to detect differences between study sites, and cost-benefit concerns if surveys are to be conducted in winter.

Management planning for the species would be greatly enhanced through explicit consideration of the habitat requirements of the Three-toed Woodpecker (and the closely related Black-backed Woodpecker) when designing controlled burns and salvage logging operations. It is possible that both fire management and timber harvest regimes can be modified in ways that could reduce negative impacts to Three-toed Woodpeckers and other cavity-nesting species. An additional management concern in Region 9 for this species would be the maintenance and possible enhancement of current acreage that exists as old-growth spruce forest reserves.

OTHER NATURAL OR HUMAN FACTORS AFFECTING CONTINUED EXISTENCE OF SPECIES

The dependence of the Three-toed Woodpecker on old growth conifer stands and early post-fire successional seres can create conservation and management difficulties. However, the Three-toed Woodpecker, along with other woodpecker species, preys upon insects that often cause severe economic losses to the forestry industry. It is unclear what the ecological and economic tradeoffs are between management for the benefit of Three-toed Woodpeckers and other co-associated species and the economic benefits provided by the woodpecker species itself. It does not seem necessary to promote economically harmful insect populations to maintain these woodpecker species. Therefore, while it does require somewhat rare habitat whose maintenance may impact forestry operations,

the ultimate economic benefit of healthy woodpecker populations may actually be positive for the forest products industry. More research on the tradeoffs between economic and ecological concerns is needed for not only woodpeckers but forest birds in general.

SUMMARY OF LAND OWNERSHIP AND EXISTING HABITAT PROTECTION

No specific habitat protection within Region 9 is known to exist. Due to the boreal distribution of the Three-toed Woodpecker, only the northernmost areas of Region 9 are areas where habitat protection and management may be useful. Current reserved old growth softwoods, specifically spruce, should provide some degree of perpetual habitat for Three-toed Woodpeckers. However, recently burned habitat is rarely protected and often salvage logged. Given the large amount of suitable habitat in Region 9 that is privately owned, a habitat protection plan for the Three-toed Woodpecker should be based on an ecosystem management perspective and be coordinated across ownership and management boundaries. As the primary eastern North American range of the species occurs in Canada, it is also critical to coordinate conservation efforts with provincial government agencies.

The maintenance of old growth coniferous forest is often problematic due to the economic potential of these areas to the forest products industry. Potential areas that may help maintain or increase late-successional spruce-dominated forests include Research Natural Areas (RNA), State Natural Areas (SNA), Shipstead-Newton-Nolan lands, riparian setbacks, scenic rivers, and wilderness areas. Recent large-scale windthrow in the Boundary Waters Canoe Area Wilderness in the Superior National Forest has created a considerable amount of potential habitat for woodpeckers and should be salvage logged only to the extent needed to ensure human safety in areas bordering private land. Late-successional spruce stands could be targets for future RNA, SNA, and wilderness designation is areas where *P. tridactylus* is a component of the cavity-nesting bird community.

SUMMARY OF EXISTING MANAGEMENT ACTIVITIES

Although the Three-toed Woodpecker is considered to be a rare breeder in most of Region 9, this classification is primarily based on a haphazard collection of observational data. Certain habitats likely inhabited by this species, specifically mature black spruce bogs, are difficult areas to conduct biological surveys and thus are often poorly investigated (Niemi 1978). Clearly, more targeted monitoring and science-based research are needed on *P. tridactylus* in Region 9. A more thorough understanding of the distribution and abundance of the Three-toed Woodpecker would permit managers to better design management programs to meet the needs of this species. Despite being a rare breeder whose primary North American range is in Canada, the Three-toed Woodpecker is a fairly regular winter visitor in many areas of Region 9 and deserves some management attention.

Due to extensive stage-specific use of snags by Three-toed Woodpeckers for such activities as drumming, foraging and nesting, simple snag management schemes may not fulfill the habitat requirements of the species (Imbeau and Desrochers 2002). Effective snag management programs should not only provide a supply of dead trees immediately after harvest but provide for future recruitment of snags in successive years. In Oregon, Goggans et al. (1988) suggested that the optimal method to manage for both Three-toed and Black-backed Woodpeckers would be to define special management zones where both traditional and salvage timber harvest are prohibited

PAST AND CURRENT CONSERVATION ACTIVITIES

The adoption of an ecosystem-centered forest management perspective within Region 9 would likely help conserve rare boreal birds such as the Three-toed Woodpecker. Through ecosystem management, forests can be managed not as isolated stands but as large-scale management units that can be used to facilitate the continued persistence of endemic species by preserving a wide range of habitats (Imbeau et al. 2001). This large-scale approach to forest management can help managers use human disturbances such as timber harvest to mimic natural disturbances, an approach that has been suggested as particularly important for boreal birds (Hobson and Schieck 1999). Ideally, by ensuring that silvicultural practices occur at sustainable levels within an ecosystem management perspective, populations of endemic species will be conserved at biologically viable densities while simultaneously minimizing economic impacts to the forest products industry.

Other concerns associated with forest management and the Three-toed Woodpecker include snag and fire management, and the preservation of old-growth forest reserves. Maintaining sufficient numbers of live trees and snags in recently disturbed areas would benefit both the Three-toed Woodpecker and cavity-nesting birds in general. It is important to implement conservative snag management programs in areas where the conservation of *P. tridactylus* is a concern. Effective snag management plans need to be fairly conservative to deal with the often difficult problem of ensuring future snag recruitment (Morrison and Raphael 1993). Also, both fire suppression and controlled burn programs should be scrutinized for their impacts on woodpecker populations. To benefit Three-toed Woodpecker populations, fire should be more widely implemented as a management tool in areas where it is a common natural disturbance. An effective plan may be to use human forest management to mimic the temporal patterns of natural disturbance regimes (Hunter 1993). Permitting larger crown fires to burn in areas where deemed safe would likely be useful for the species. Salvage logging of recent burns may also need to be reduced or modified as industrial forestry often doesn't properly mimic the conditions found in these highly disturbed habitats (Hobson and Schieck 1999). Also, the maintenance and possible increase in the amount of old-growth spruce forest reserves may provide some perpetual habitat for several woodpecker and cavity-nesting species, especially Three-toed and Black-backed Woodpeckers.

RESEARCH AND MONITORING

EXISTING SURVEYS, MONITORING, AND RESEARCH

No known surveys, monitoring, or research is currently ongoing in Region 9 national forests.

SURVEY PROTOCOL

Woodpeckers are often underrepresented on forest breeding bird surveys. To adequately survey for woodpeckers such as *P. tridactylus*, the use of call playbacks is recommended as an adjunct to the standard point-count methodology. Woodpecker species can be adequately surveyed by modifying a standard point-count protocol such as that suggested by Howe et al. (1997) to include call playbacks of woodpecker species assumed present in the survey area. Setterington et al. (2000) recommend the use of call broadcast point counts on fixed-width transects as a suitable method for conducting woodpecker surveys. A survey designed to detect several woodpecker species should play the calls of each potential woodpecker species beginning with the smallest species and progressing to the largest (Martin and Eadie 1999). Calls should be played through a portable cassette player while observers listen for responses for a set time period such as 30 seconds. The listening period will be repeated for every woodpecker species that is being censused by this playback method. To avoid oversampling, playbacks should not be played at every station in transect lines where the distance between stations is not of a sufficient distance to prevent individual woodpeckers from responding to adjacent playbacks (Martin and Eadie 1999).

These techniques can also be used to survey specifically for Three-toed Woodpeckers. Monitoring specifically for *P. tridactylus* would likely consist of a stratified sampling scheme where preferred habitat such as recent burns or blowdowns, old growth spruce, and other softwood stands are targeted along with more randomized forest locations. The high habitat specificity of the species would simplify the detection of suitable survey areas. A species-specific survey could be performed with considerably less overhead cost and person-hours than a generalized woodpecker survey since the data collection process would be reduced and call broadcasts would only be played for *P. tridactylus*.

As with any sampling scheme, statistical concerns such as the power of the surveys to detect change are an important consideration. Power concerns are particularly relevant to surveys performed on rare species such as the Three-toed Woodpecker. Also, given the presumed greater presence of the species in Region 9 during winter, concerns regarding the costs and benefits of performing bird surveys in winter are also important. Avian surveys conducted outside of the breeding season may require a prohibitive amount of time to adequately census a single survey plot. Certainly any protocol designed to survey for Three-toed Woodpeckers should address these type of statistical and methodological concerns prior to implementation.

Outside of surveys designed specifically for woodpeckers, another beneficial research approach would be landscape-level comparisons of entire boreal bird communities inhabiting various habitats such as forest reserves, areas of active forest management, and areas impacted by natural disturbances. Such "natural experiments" could use existing landscape patterns present in Region 9 to investigate the responses of various bird species and guilds to anthropogenic and natural disturbances. This approach has proven successful in recent studies (Schmiegelow et al. 1997, Hobson and Schieck 1999). In these large-scale studies particular emphasis could be applied to woodpecker species using the methodology described above. This community-based approach might be particularly useful given the potential keystone species role of primary cavity-nesting species such as woodpeckers for secondary cavity-nesting birds and mammals (Daily et al. 1993).

RESEARCH PRIORITIES

Leonard (2001) suggests the following future research priorities for the Three-toed Woodpecker:

- Collection of baseline data on population demography across different subspecies and habitat types
- Long-term population studies using banding and radiotelemetry to investigate population spatial structure, movement patterns, and spatial and temporal elements associated with post-fire insect outbreaks and subsequent *P. tridactylus* immigration
- Quantification of demographic response to insect outbreaks both in the presence and absence of fire
- Investigations of *P. tridactylus* response to fires of different intensities and utilization of different areas within burns
- Investigations of *P. tridactylus* response to various forest management practices
- Investigating differences in foraging behavior, habitat selection, and sexual dimorphism between North American and Eurasian populations

Other research priorities for that would provide a greater understanding of the ecology of the species would include:

- A better understanding of the ecology of bark beetles and the effects of beetle population density on the home range size and social spacing of the Three-toed Woodpecker
- The role of other disturbances such as windthrow, flooding associated with beaver dams, insect outbreaks, and disease on resource selection in *P. tridactylus*
- The effect of predation on the population dynamics of *P. tridactylus* and other cavity nesting species in Region 9

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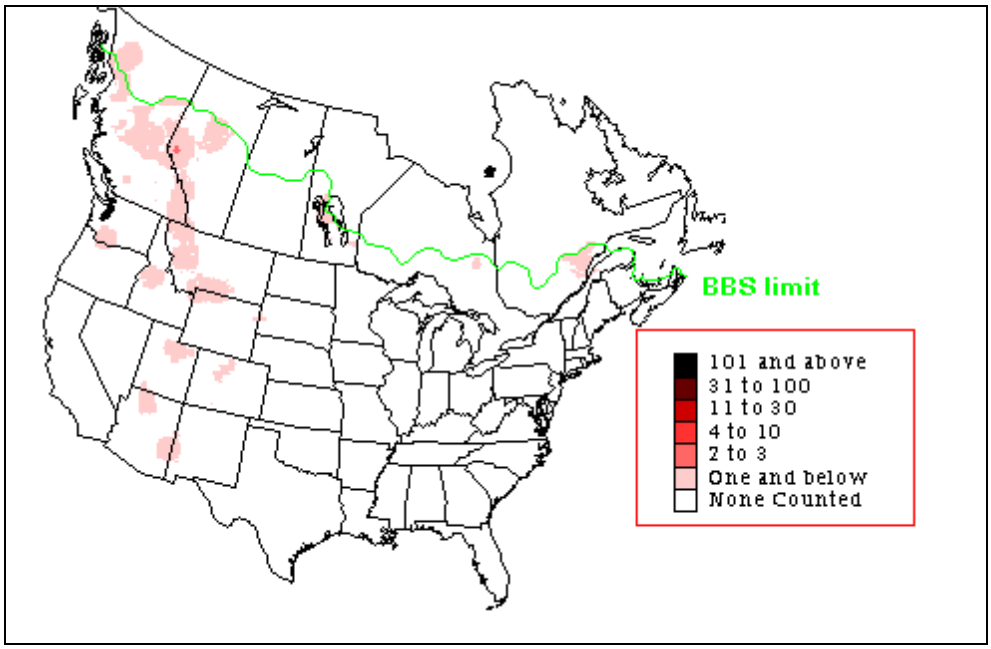
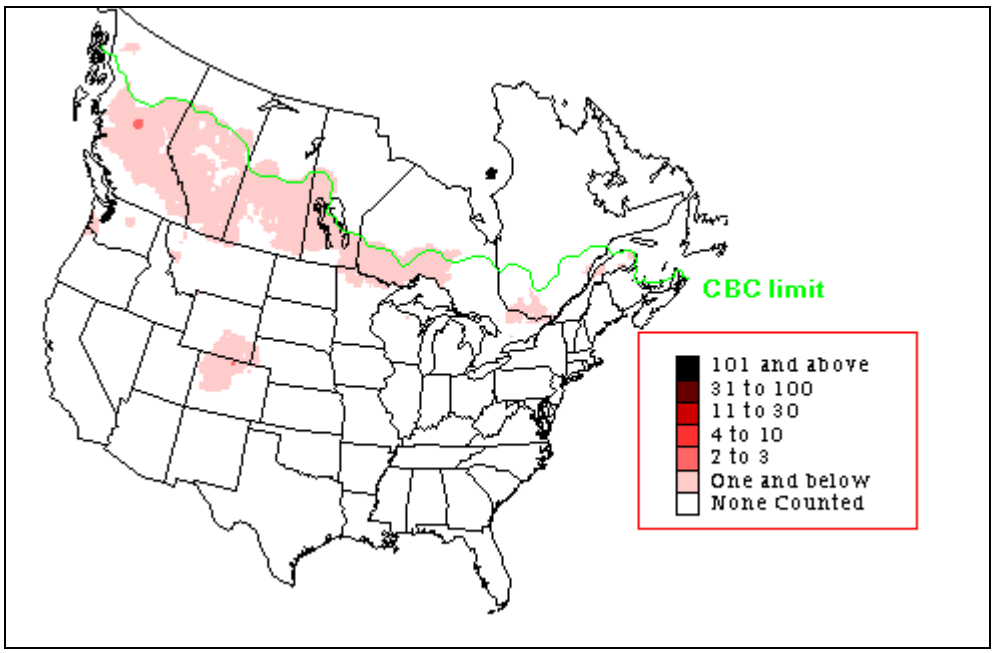
APPENDICES

Appendix 1*:* Summer distribution of the Three-toed Woodpecker as illustrated by BBS data.



Appendix 2*:* Winter distribution of the Three-toed Woodpecker as illustrated by CBC data.



Appendix 3: Population trend map for the Three-toed Woodpecker as determined from BBS data.