Another factor that may contribute to lower abundance peaks, particularly in the window-collision data set, is saturation. All three methods are potentially subject to methodological saturation: Flight call recordings if the gaps between calls are shorter than 100 milliseconds, mist-net samples if full nets deter new captures or if capture rates exceed processing capacity, forcing net closure. However, saturation appeared to be more of an issue with window collisions. Mist nets were never closed due to saturation during our study period, and capture rates rarely exceeded two or three birds per net x hour, hence birds were not likely to have been visually repelled by overly full nets. Experience and anecdotal observations suggest that window collision pickup rates may be more strongly affected by saturation. Birds killed or stunned by window collisions quickly fell prey to gulls, raccoons, crows, squirrels, city sweepers, or power washers if volunteers did not recover them soon after the collisions occurred.

The general correspondence of migratory peaks and troughs between methods (Figure 1), suggests overall spatial homogeneity in the density of migrants across the Chicagoland region on any given day. Our nocturnal flight call recordings and mist-net data were collected 40, and 30 miles north of downtown Chicago, respectively, whereas the window collision data are from the downtown Chicago loop. If migrant density were highly patchy at this spatial scale, we would expect to see more disagreement between the migrant abundance peaks recorded in these different localities.

The disagreements in abundance peaks that we did observe (Fig. 1) can mostly be explained as the result of compositional biases across methods. For example, on 21 May 2006, and 15 May 2007, large numbers of Swainson's Thrushes and warblers caused large abundance peaks in the nocturnal flight call and mist-net data sets (Fig. 1). The lack of peaks in the window collision data set on these days may have resulted from the simple fact that most of the species that came through in big numbers on these days don't tend to hit windows frequently (Table 2). Similarly, large peaks on 25 May 2006 and 19 May 2007 are most pronounced in the mist-net data set, because mist-netting is the only method of these three that effectively samples the Empidonax flycatchers that were present in large numbers on these days.

Our comparisons revealed a strange pattern of methodological bias with respect to thrushes (Fig. 2). Wood Thrushes were recorded in roughly equal abundance in both mist-nets and window collisions, but thrushes in the genus, Catharus (Swainson's, Gray-cheeked, Hermit, and Veery) were recorded in much higher abundance with mist-nets than with window collisions. Do Catharus thrushes avoid windows? If so, why don't Wood Thrushes? This raises questions about the behavior and habitat selection of migrating thrushes that would be profitable subjects for future study. Nocturnal flight calls of thrushes could potentially shed light on this, as all species give diagnostic calls (Evans and O'Brien 2002). However, our 95% confidence standard allowed us to identify thrush nocturnal flight calls to the species level only for Gray-cheeked and Hermit Thrushes.

We found another curious compositional discrepancy across methods with warblers in the genus, Seiurus (Ovenbird and Northern Waterthrush, (Fig. 3). Ovenbird nocturnal flight calls could not be confidently identified, but mist-nets and window collisions recorded similar levels of abundance for this species. In contrast, mist-nets recorded much higher abundances of Northern Waterthrushes than did either of the other methods. Once again, we can only speculate on what caused this pattern. Could Northern Waterthrushes be much better at avoiding window collisions than are Ovenbirds? Might Northern Waterthrushes congregate at the SWAMP study site through the poorly understood, yet presumably highly constrained process of en route habitat selection?

Compositional Complementarity:

To better understand the compositional complementary nature among our three migrant songbird censusing methods, we constructed lists of species over- and under-represented by each method (Table 2). We classified a species as over-represented by a particular method if there were at least three times as many individuals of that species recorded by that method as there were for any of the other two methods in both years (i.e. this difference was observed in each year). We classified a species as under-represented by a particular method if there were fewer than 10 total individuals of that species recorded by that method, excluding species with fewer than 10 records for all methods and years combined.

These comparisons revealed that mist-net and nocturnal flight call data sets were highly complementary in their coverage of species, and that the window collision data set did not provide a significant amount of abundance information for any species not already covered by one of the other two methods (Table 2).

Mist-nets underperformed relative to other methods for 15 species (Table 2). These included open-country species such as swallows, Bobolink, Savannah Sparrow, and American Pipit, as well as a variety of canopy-dwelling species such as Scarlet Tanager and several species of warbler. Mist-nets out-performed other methods for 14 species (Table 2). These were mostly terrestrial and understory species typical of a variety of shrubland and forest habitats, including various thrushes, warblers, and flycatchers in the genus, Empidonax.