with values increasing in both directions to WNW at 9. The wind interaction was obtained by multiplying the wind speed in Beaufort units by our adjusted wind direction value. Similarly, we located the peak date for each species, and then utilized the difference between each date and the peak for that species. Temperature, cloud cover, and the number of minutes were recorded in the field. Changes in high temperature were determined by NWS reports, typically taken at Waukegan airport, the nearest station to our site.

For each species, the models used were determined by stepwise model selection, with a significance level of 0.15 to stay. After we had developed all 15 models, we applied those models to the data for each hour from the previous four years to calculate a 'predicted' value for each hour. We decided to 'disallow' any negative values – we have amply demonstrated that these birds do not migrate north along the lake in the fall. Any negative values were therefore simply assigned a value of zero. We then summed those values over the entire season to arrive at an expected total for each species for each year. There are two caveats that should be mentioned here. First, these models are not based on all of the data from the first three years; we had numerous days of observation, especially the first two years, where people merely noted how many of each species they observed for the day, without any hourly breakdown. Second, because the models are based on the first four years of data, the predicted values, when summed over all four years, should closely approximate the observed totals. Thus, this method is probably not sufficient to detect trends. However, those models, based on the first four years, were then applied to the data from 2004, which was not involved in producing the models. This method, then, should be sufficient to detect trends, with considerably fewer years of data.

Figure 5 shows the same four species as before, but with their predicted values as well, and the predicted value divided by the observed value. It will be noted that the first two years totals, especially, have changed. This is due to the restriction, noted above, on which data was available to use. This problem has now been fixed, and should not occur in the future.

These graphs illustrate that both the actual totals and those predicted based on weather conditions increased fairly consistently the first four years. However, the predicted values for each species were lower than the predicted value from the year before. In other words, the decrease seen in all four species over this last year was primarily a consequence of weather conditions that were less favorable for observing raptors at our site.

To determine whether actual totals differed significantly from predicted ones in 2004, we used paired-sample t-tests. They revealed that five of our 15 species were significantly lower than predicted this year. Those five included Turkey Vulture, Osprey, Northern Harrier, Broad-winged Hawk, and American Kestrel. This can be seen in the Osprey graph, where the ratio between actual and predicted values falls dramatically in 2004.

There are potentially many reasons why our count for a species might be unusually low in any particular year; a single year's drop isn't sufficient cause for alarm. Two of these species, Turkey Vulture and Broad-winged Hawk, prefer to migrate in large flocks (kettles). This creates an inherent variability that is probably too great for simple modeling.

For the other three species, the situation is less clear. Northern Harrier numbers at other sites have shown large year-to-year swings in the past, with no clear trend overall. Osprey migration peaks early, typically the second week in September. In 2004, there were reports of migrating raptors in some numbers through the last two weeks in August, and it is possible that much of the Osprey population simply moved through the area before we began counting. American Kestrels have apparently been declining as a wintering species in Pennsylvania recently, but the only data we are aware of that would show similar declines in Illinois or Wisconsin is CBC data, which we have not attempted to analyze. It is also possible that with a mild fall, fewer Kestrels chose to migrate – they are known to winter well to the north of our site.

In the future, we hope to use five years worth of data to model each of the following five years, at which

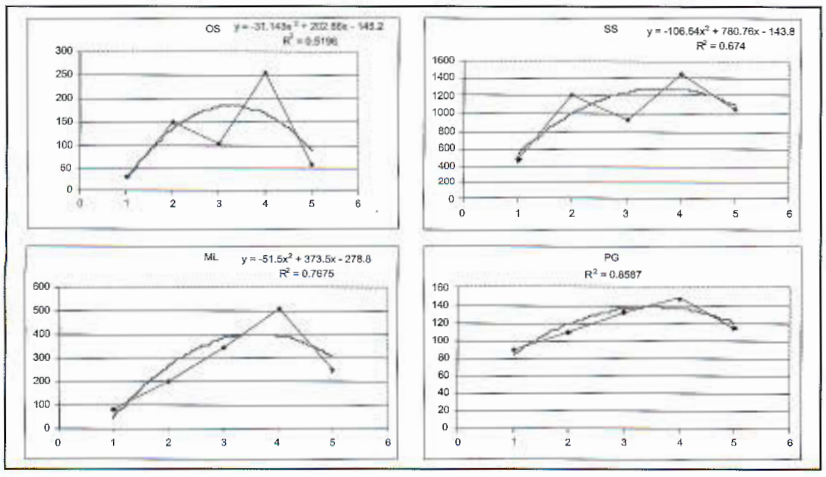

Figure 5: Yearly totals, predicted totals, and the ratio between the two for the following species: Osprey, Sharp-shinned Hawk, Merlin, and Peregrine Falcon. Ratio values well below 1 may indicate a declining population.