Springbok antelope

Monitoring programs to track long-term changes in population size are important for applied ecological studies. Such monitoring programs often have many objectives, such as monitoring trends, estimating abundance, and judging the effects of covariates.

The data in "springbok.csv" come from aerial surveys of springbok antelope around 25 watering holes. On each survey date, an airplane flies a route over the collection of sites (watering holes) at an altitude of 200-300 meters. Springbok are counted at each site. A survey normally includes counts at all 25 sites, but occasionally some sites could not be visited because of poor weather. Each site was circled until the observer was confident that an accurate count had been made. For larger groups of springbok, color photographs were taken and springbok were counted later from the photos. Several surveys, usually 7-10, were made each year. You have data from 1990-2002 for sites 12-21, 23, and 24. The other sites were excluded because they usually don't have many animals. Within a year, springbok are faithful to a single site; if a springbok goes to site i on one day, it will typically return to site i on other days.

Many studies have demonstrated effects of date and time-of-day on springbok counts; therefore, these covariates are included in the dataset. Whether they are relevant in this particular dataset remains unknown, until you say so.

Analyze the Springbok data and summarize your findings. Pay particular attention to long-term trends and the effects of covariates. If you think the dataset cannot address these questions, then explain why.