

# A Geographic Information System Toolset for Aerial Surveying and Tracking of Elk (*Cervus elaphus*) in Sightability-Correction Modeling



Andrew Duff<sup>1</sup>, Scott McCorquodale, and Annemarie Prince

<sup>1</sup>Washington Department of Fish and Wildlife, 600 Capitol Way N. Olympia, WA 98501-1091, (360) 902-2362

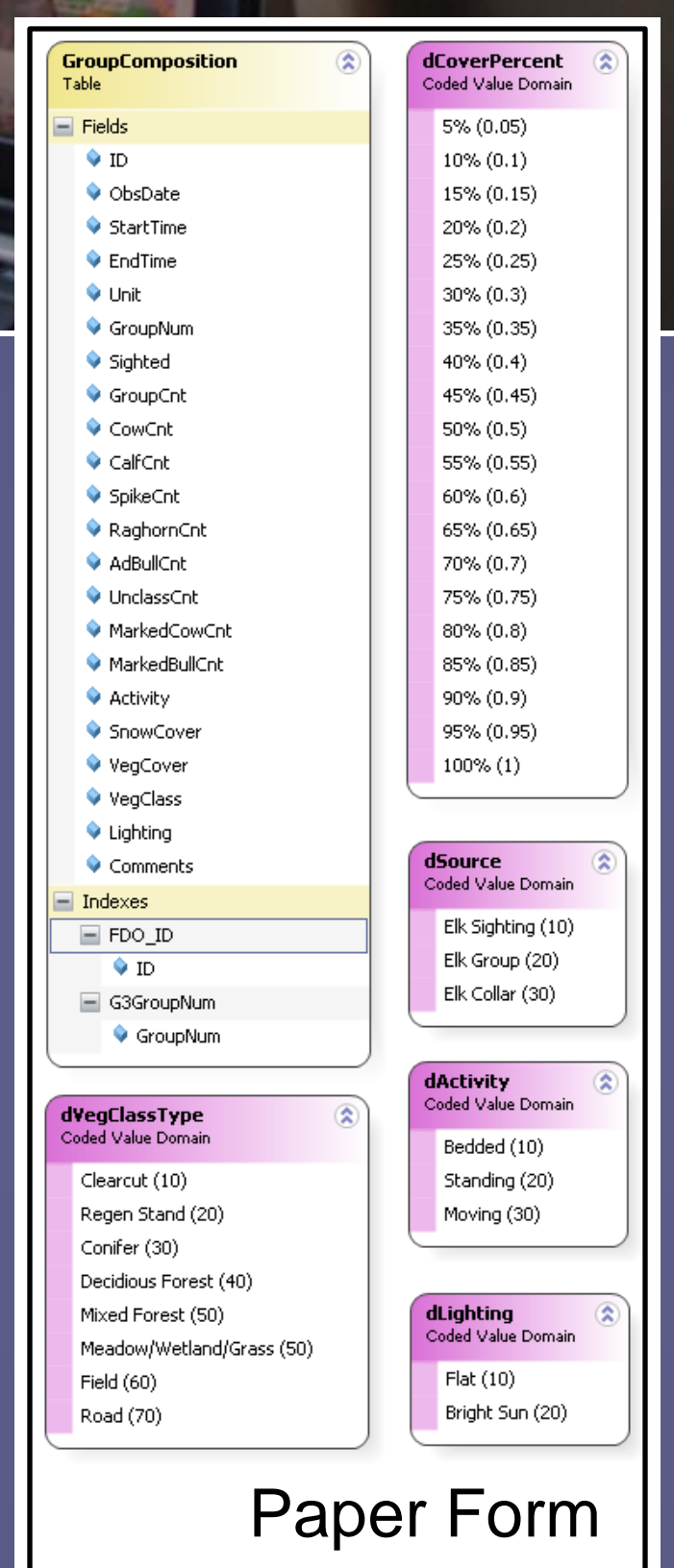
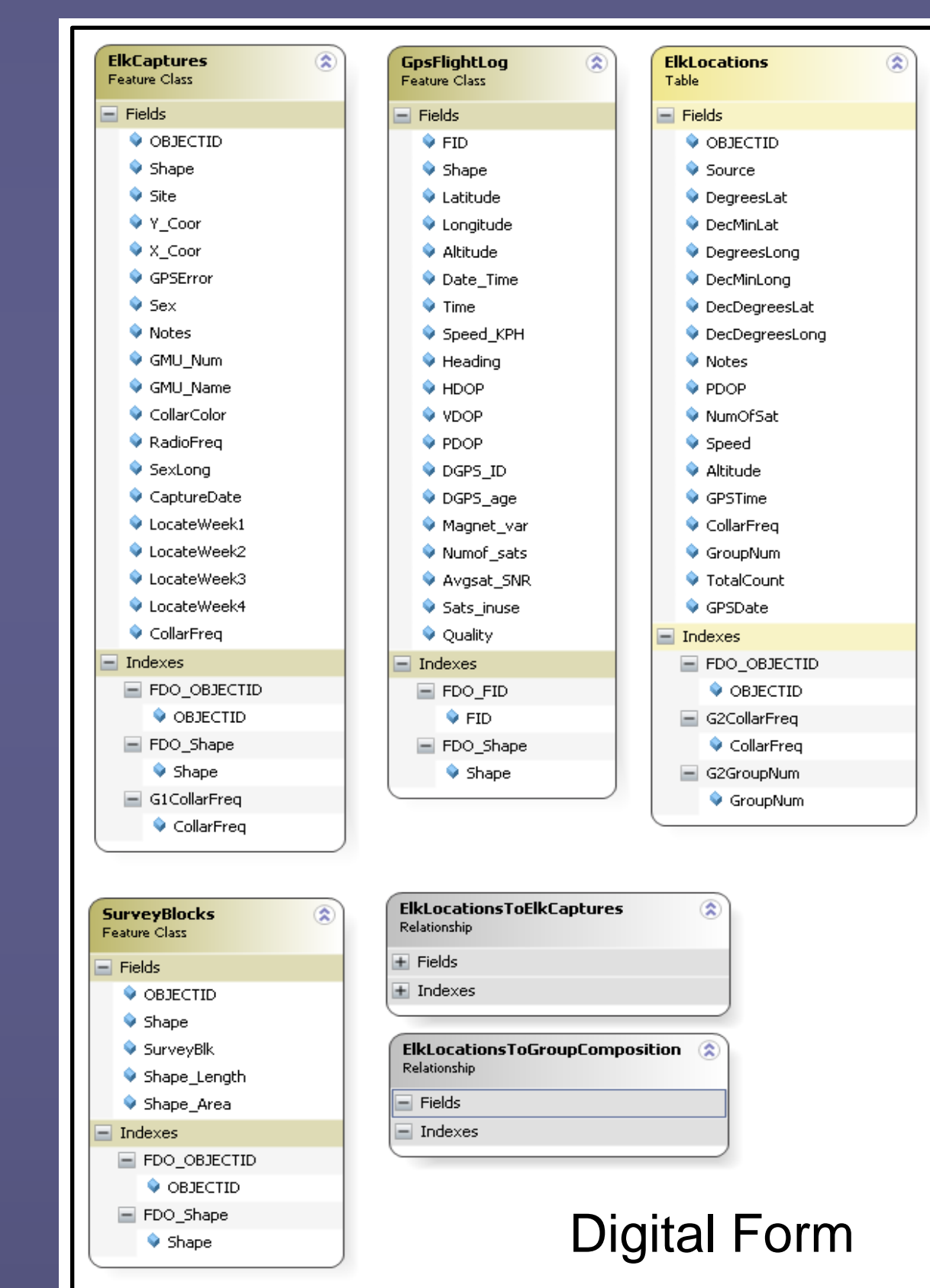
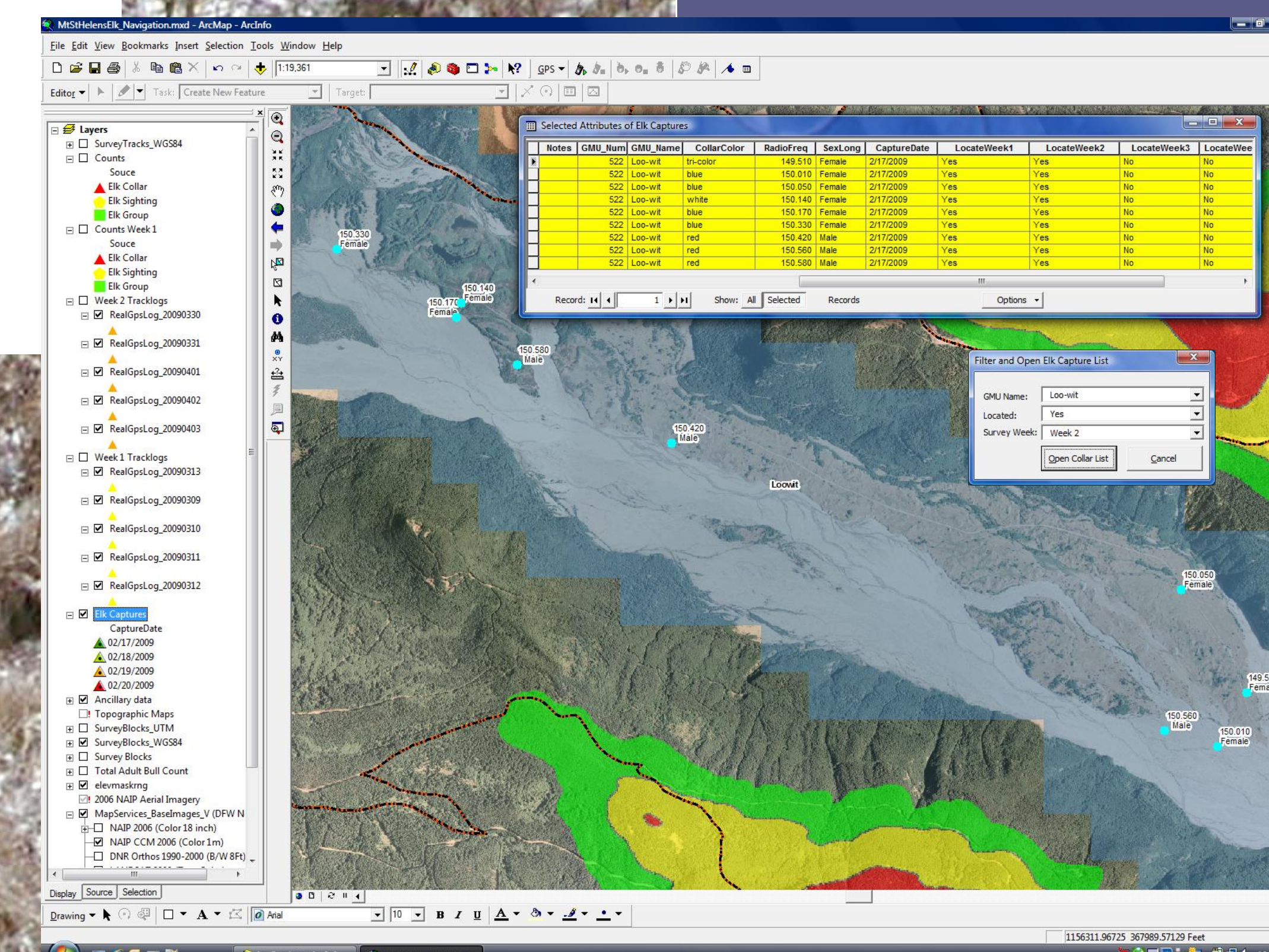
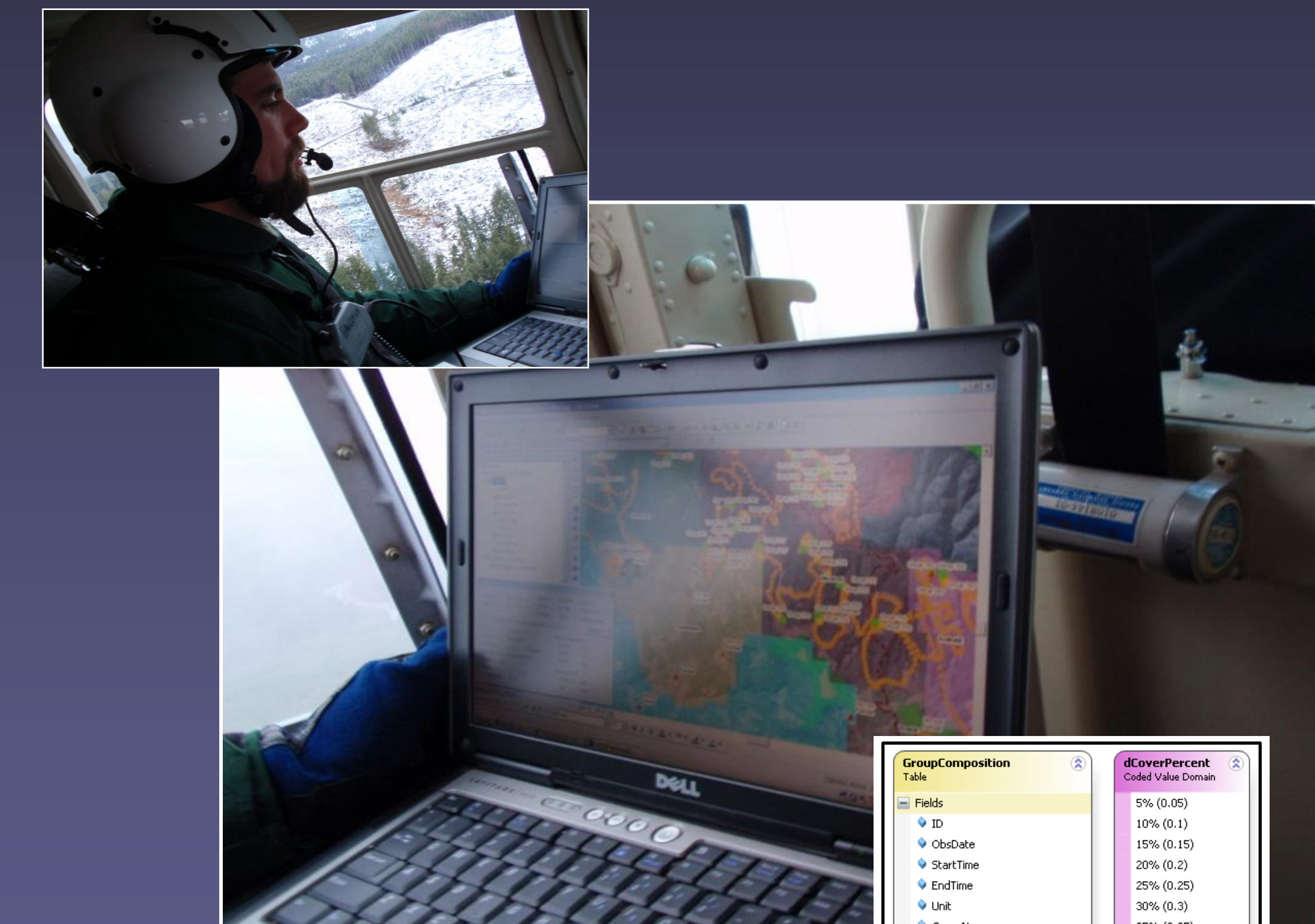
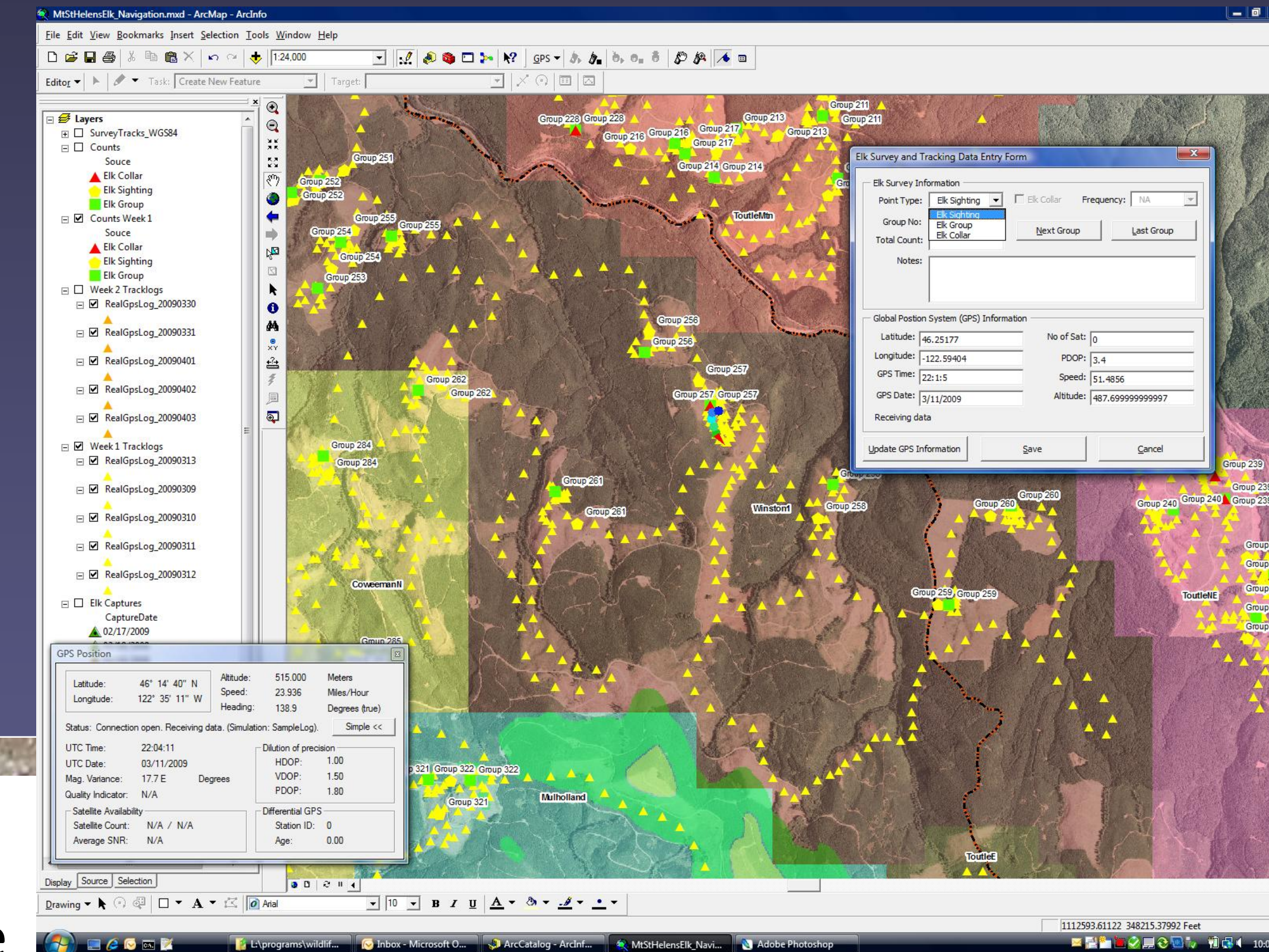


## Introduction

- Aerial surveys are commonly used to monitor elk populations. When probability of detection is <math><1.0</math>, methods such as mark-resight, sightability-correction models, or distance sampling can be used to correct for undercounting bias.
- During Spring 2009, we collected aerial survey data to explore sightability modeling and concurrently support mark-resight estimates for a portion of the Mt. St. Helens elk herd.
- We developed a Geographic Information Systems (GIS) toolset in ArcGIS 9.3 to record Global Positioning System (GPS) data during our surveys.

## Equipment and Data:

- “Recreational grade” Garmin GPSMap60 GPS receiver with external Garmin antennae mounted to the interior roof of the helicopter
- Dell Latitude 630 laptop computer loaded with ArcGIS Desktop 9.3 and Minnesota DNR Garmin
- GIS data layers available for *in-flight* display (e.g., aerial photography, topographic maps, game management units, survey blocks)



Paper Form

Digital Form

## Toolset Functionality:

- Functionality based off 3 ArcGIS layers: **ElkLocations**, **ElkCaptures**, and **GPSLog**
  - **ElkLocations** table stores real-time GPS data and basic elk observation data
    - GPS Information is easily updated by clicking “Update GPS Information” on the data form
    - Five fields store non-GPS data entered in-flight (Source, GroupNum, TotalCount, CollarFreq, and Notes)
    - The GroupNum field links group composition data (paper form) to the digital data recorded in-flight
  - **ElkCaptures** table works in conjunction with **ElkLocations** table
    - Locate fields are used to keep a running list of which collars have been located per survey week
    - At the end of a survey, the “Filter Collars” form uses combo boxes to quickly identify missed collars for radio tracking
- ArcGIS GPS Toolbar logs the flight path to a geodatabase feature class (**GPSLog**) in real-time

## Lessons Learned and Ideas for Future Enhancements

- ArcGIS can be a stable and reliable platform for digital data collection
- Low-cost laptop computers paired with “recreational grade” GPS provide an affordable data collection system
- Appropriate digital data layers (aerial photography, game management unit and survey block boundaries) ensure consistent effort and coverage during replicate surveys
- Creating real-time data in ArcGIS Geodatabase format minimizes post-survey processing
- VBA accelerators and shortcut keys expedite opening forms and updating GPS information while minimizing the use of the laptop’s touch pad
- Our system could be adapted to allow entry (real-time or post survey) of other corollary data