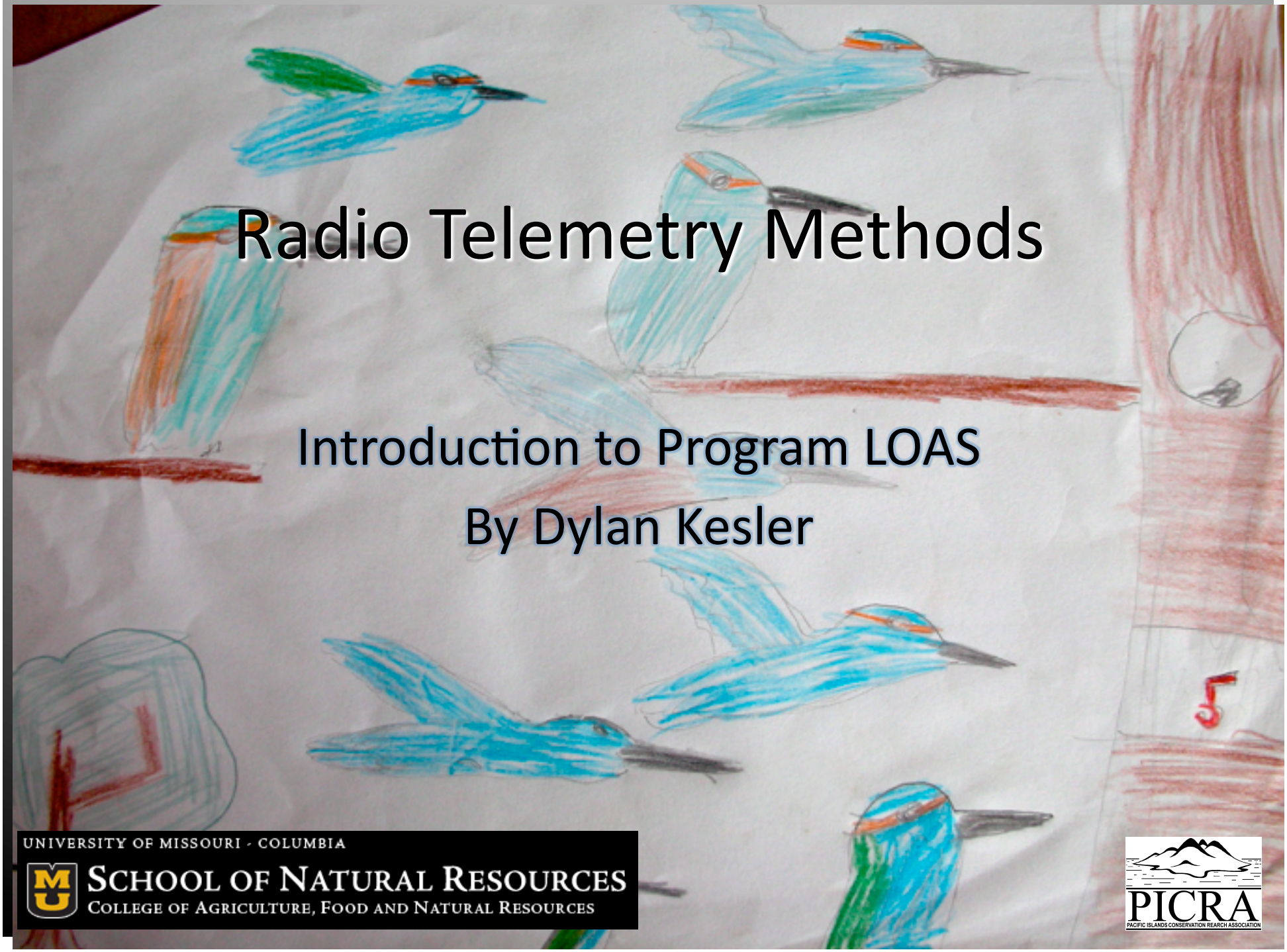

Radio Telemetry Methods

Introduction to Program LOAS

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PICRA
PACIFIC ISLANDS CONSERVATION REARCH ASSOCIATION

Overview

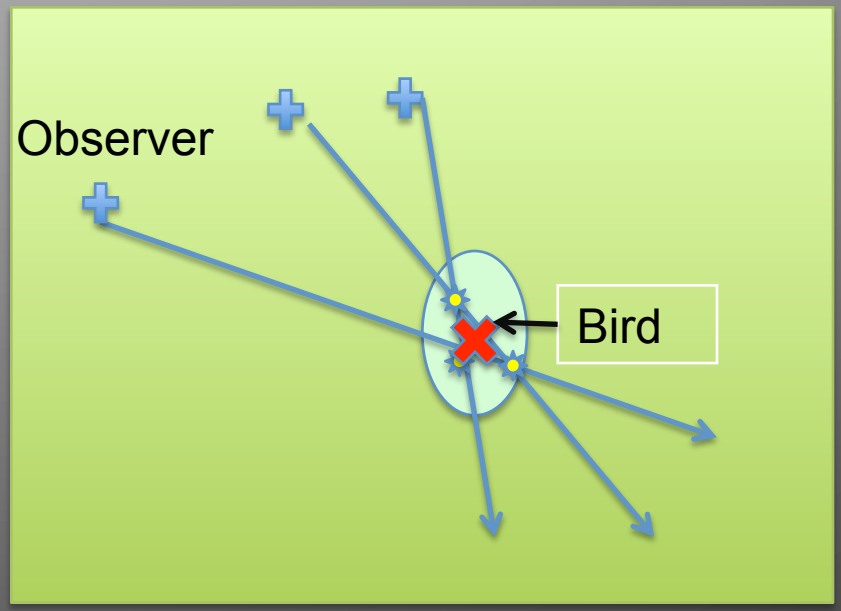
1. *General overview*
2. *Field data*
3. *Data preparation for LOAS*
4. *Importing data into LOAS*
5. *Marking birds and azimuth groups*
6. *Selecting estimators*
7. *Running calculations*
8. *Exporting data*
9. *Field observations*
10. *Field exercise data*

Radio Telemetry

- *Location Estimates*
  - *Two methods*
  - *Actual observation*
    - *Potentially more accurate*
    - *Potential to affect bird behavior*
  - *Triangulation*
    - *Detection from a distance*
    - *Must estimate bird location*
- *Demography*
  - *Not addressed in this talk*

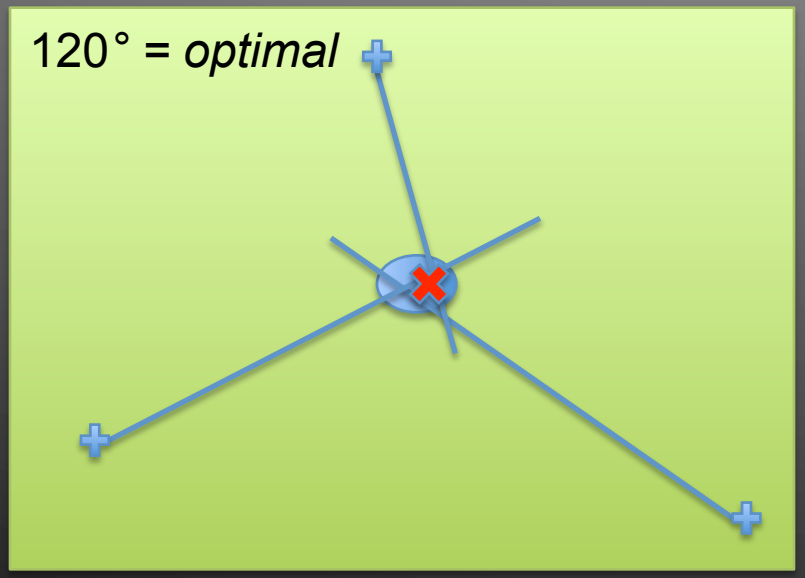
General Overview

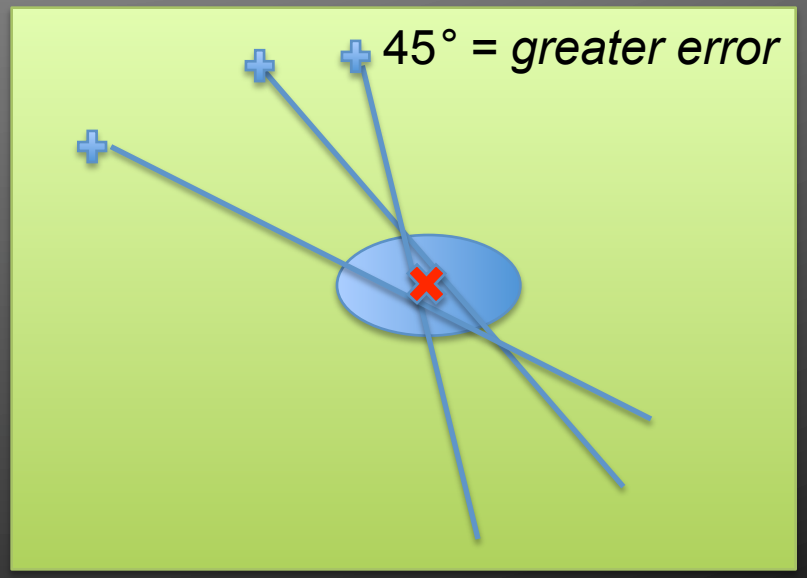
- *Objectives*
  - *Estimate location of bird.*
  - *Estimate error associated with location.*
- *Multiple bearings*
- *Two bearings yield bird location. No estimate of error.*
- *Three+ bearings yield estimate of bird location AND error.*



Field Techniques

- *Optimizing bearing angles*
  - *Best angles = 360°/x, where x = number of bearings.*
  - *E.g. 360° / 3 bearings = 120°*
- *Multiple bearings*
  - *More bearings is better*





Saltz, D. 1994. Reporting error measures in radio location by triangulation. Journal of Wildlife Management 58:181-184.

Correcting Magnetic Declination

- Concept
  - Magnetic north pole
  - True north pole
  - Declination is difference
- Online calculator

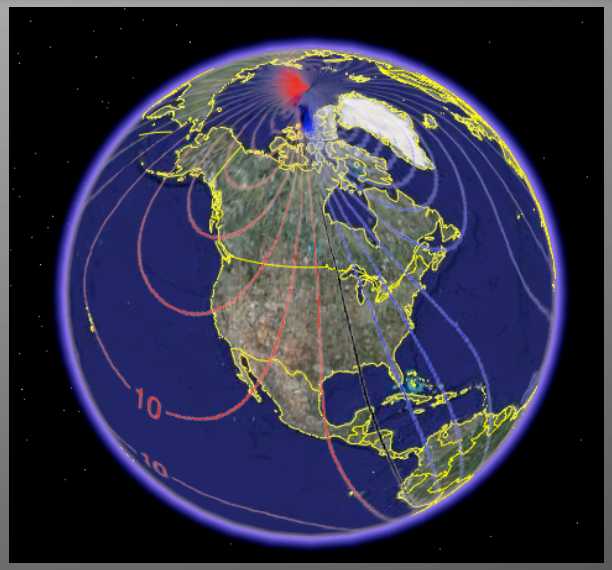
  http://www.ngdc.noaa.gov/geomagmodels/Declination.jsp
- Correction

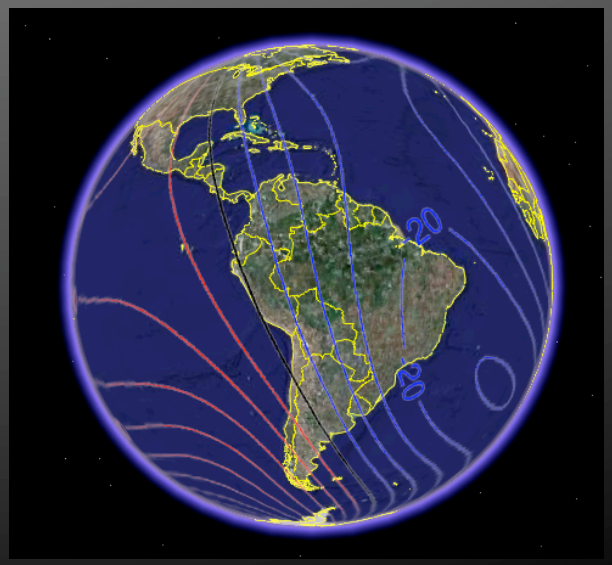
True Azimuth = magnetic bearing – correction
degrees - (correction minutes/60)

e.g.

Newport Oregon = 16° 37' E

True Azimuth = magnetic bearing - 16° - (37'/60')





Data Required for Location Estimate

Data Needed

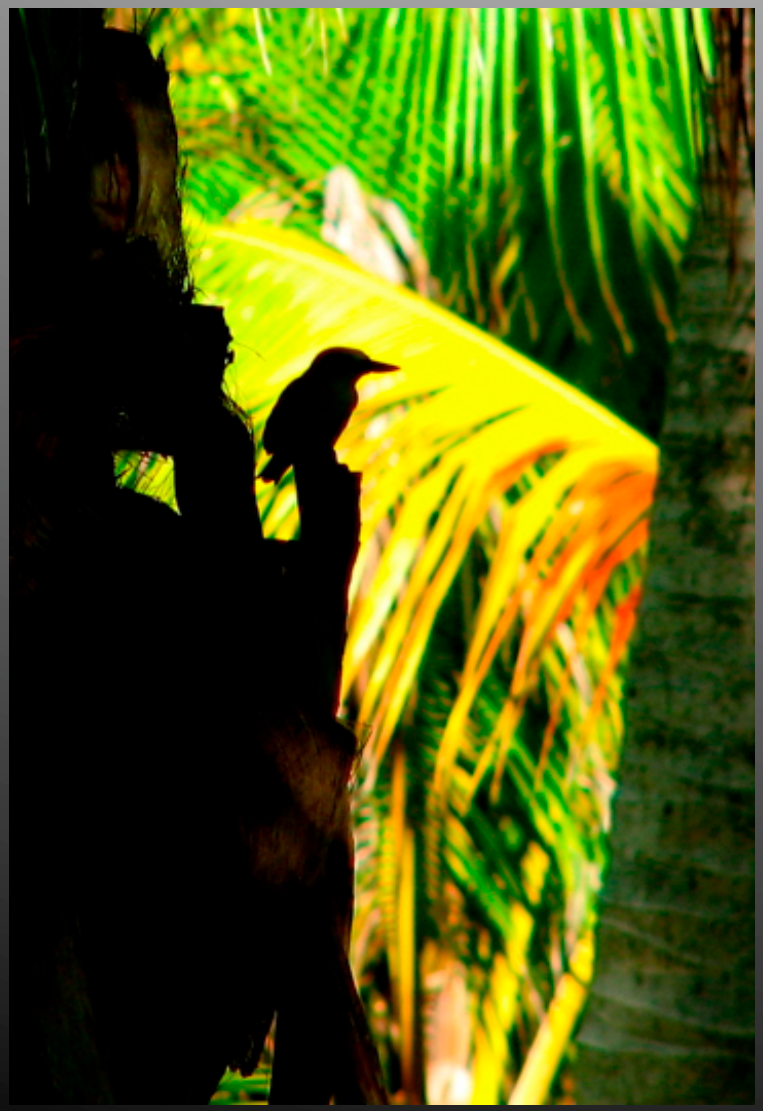
1. Your location
2. Azimuth to bird
3. Magnetic declination

http://www.ngdc.noaa.gov/geomagmodels/Declination.jsp

Assumptions

1. Bird is not moving
2. Accuracy of telemetry, azimuth, and declination

Field Exercise



- 1. Record bearing information on data sheets.
- 2. Send one member of group to main computer to enter data.
- 3. Work with data.

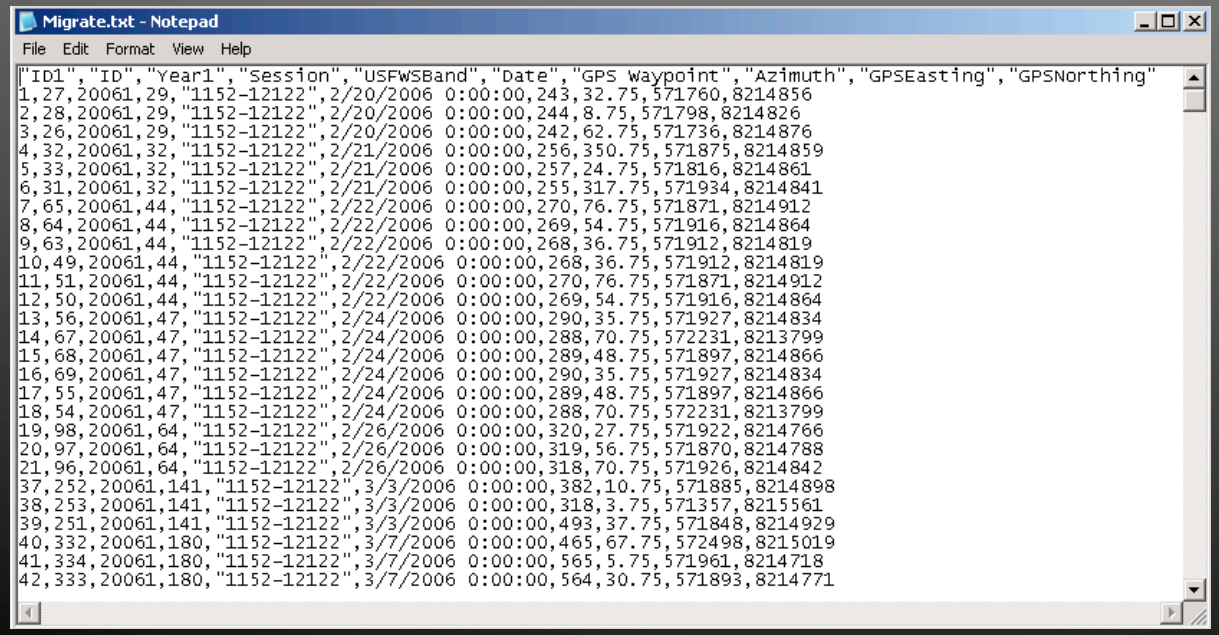
Working with Large Data Set

1. *Tuamotu Kingfisher data!!*
   - *Collected over several years.*
   - *Filtered for your benefit.*
   - *Skewed for my benefit.*
   - *Compiled for this exercise.*

Data Organization

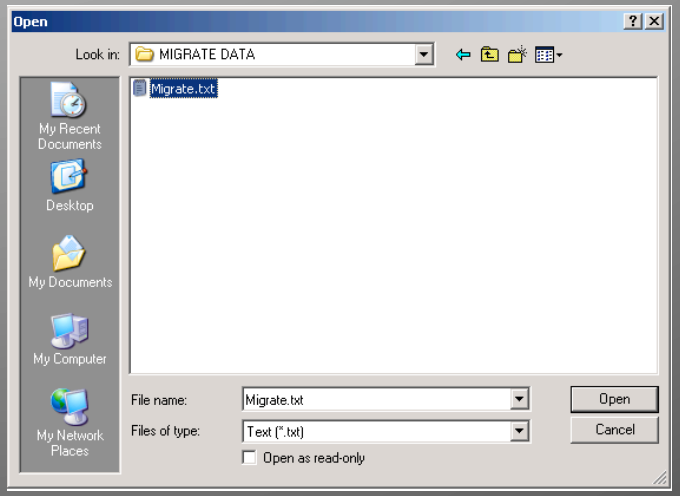
- *Data organization*
  - Tab delineated
  - Coma delineated text file
  - Use any text editor

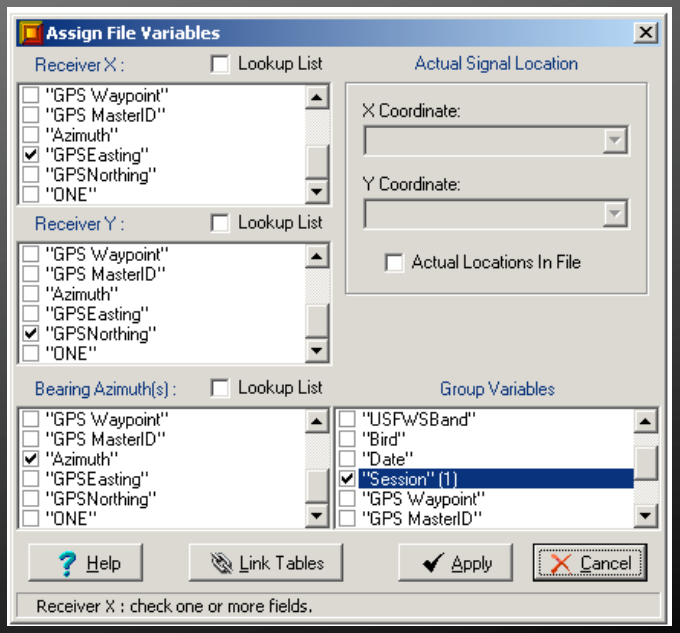
- Required fields
  1. Bird identification
  2. Bearing group identification
  3. Corrected azimuth
  4. Observer Location (X and Y coordinates)



Opening Data

1. *Start LOAS*
2. *Open File*
   a. *File, Open Data File*
   b. *Navigate to the Desktop*
   c. *Look in "MIGRATE" folder*
   d. *At bottom, select "File of Type = Text (*.txt)"*
   e. *Double click "Migrate.txt"*
3. *Defining File Variables*
   a. *Receiver X – select "GPSEasting"*
   b. *Receiver Y – select "GPSNorthing"*
   c. *Bearing Azimuth – select "Azimuth"*
   d. *Group Variables – select "Session"*
4. *Click Apply*

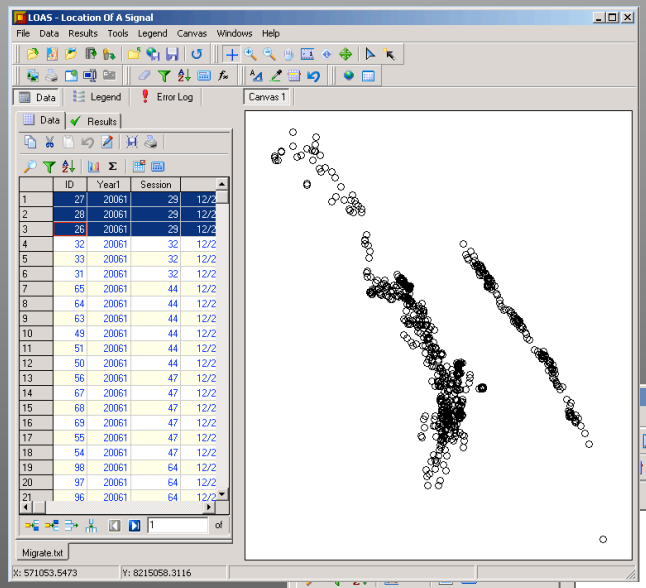


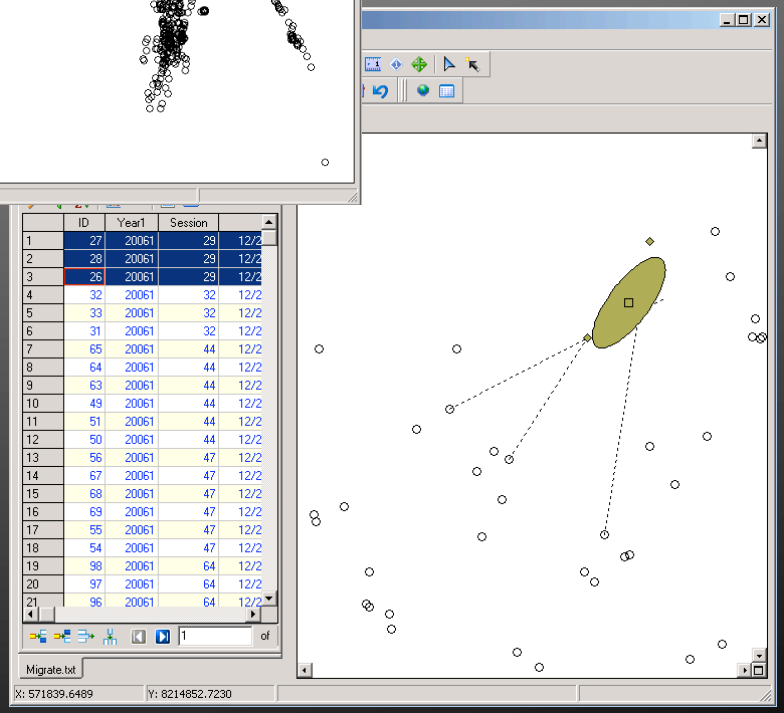


LOAS Screen Overview

- *Data tab*
- *Results tab*
- *Observer locations*
- *Highlighting bearing groups (sessions)*

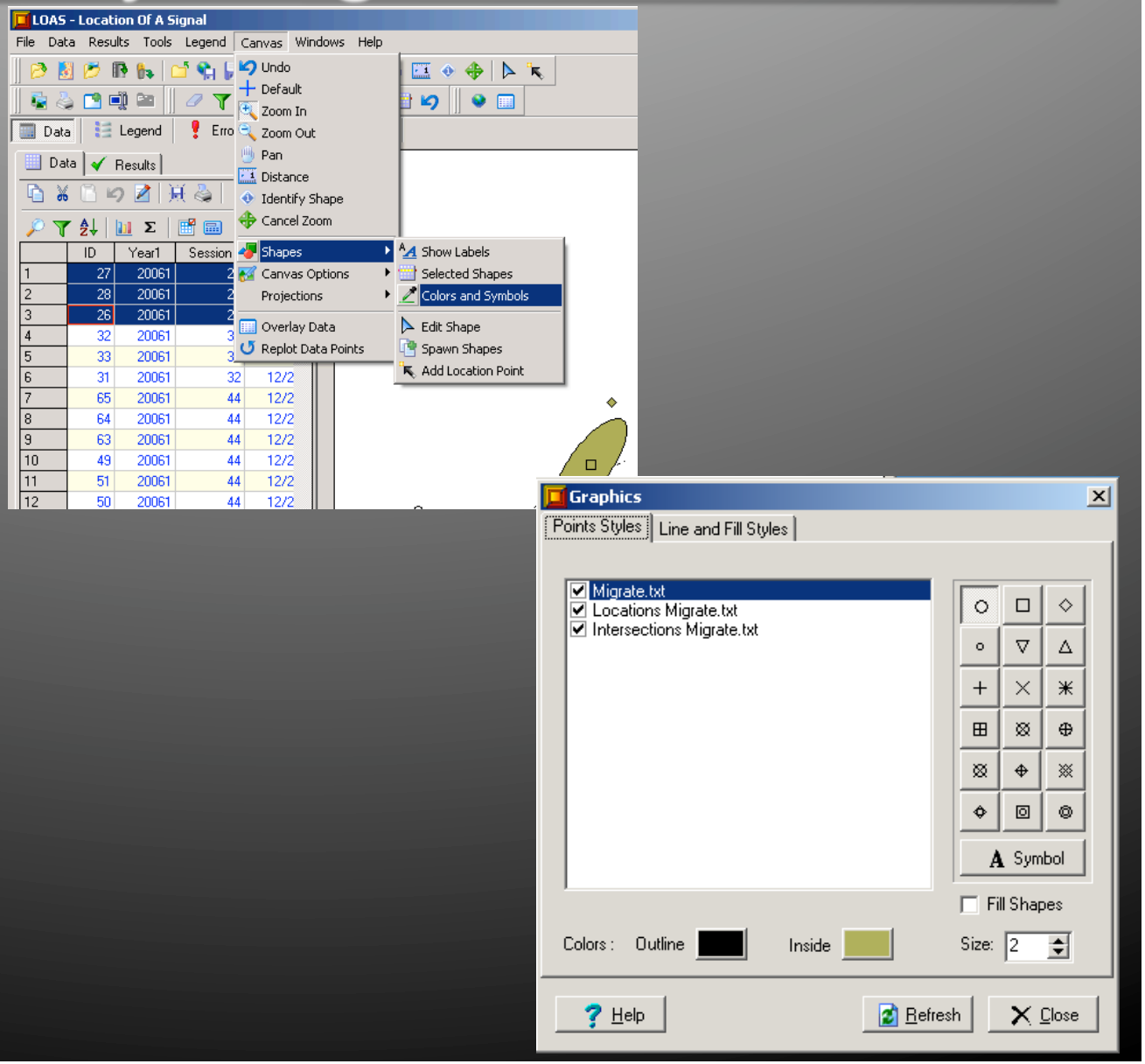
- *Exercise*
  - *a) Highlight lines 1,2,3 (session 29)*
  - *b) Click calculate*
  - *c) Zoom into center*
  - *d) Notice three bearings, intersections, estimated location.*
- *This is your estimated location.*
- *Click the "Results" tab for coordinates.*





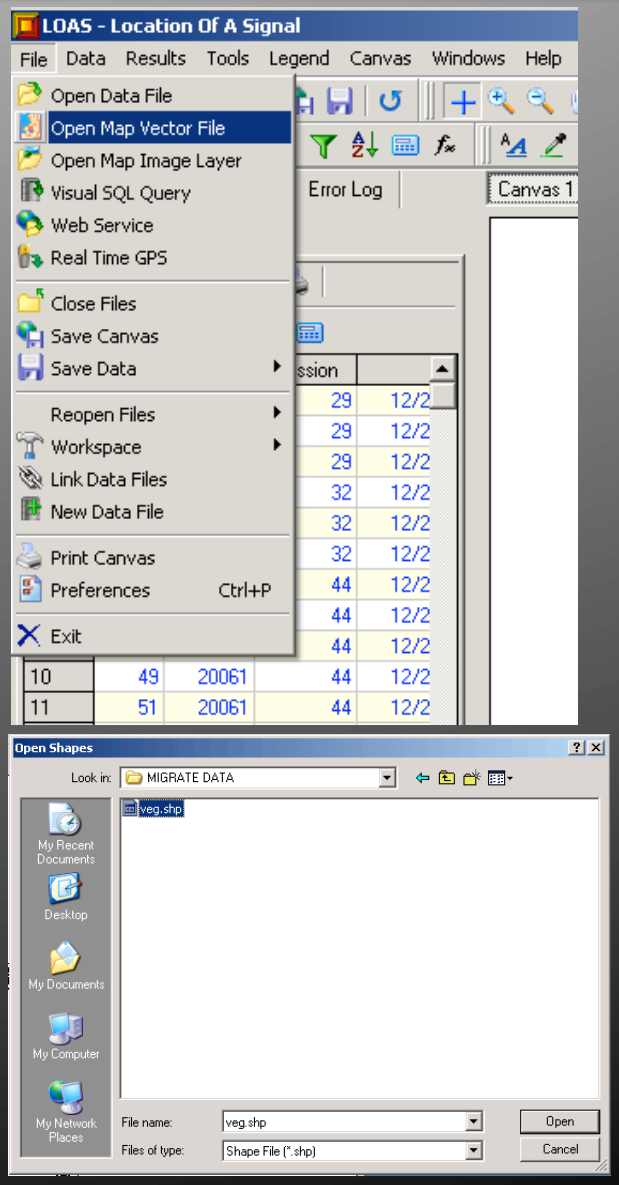
Adjusting View

- *Adjust symbols and colors*
  - *a) Click "Canvas"*
  - *b) Click "Shapes"*
  - *c) Click "Colors and Symbols"*
  - *d) Adjust colors and symbols.*

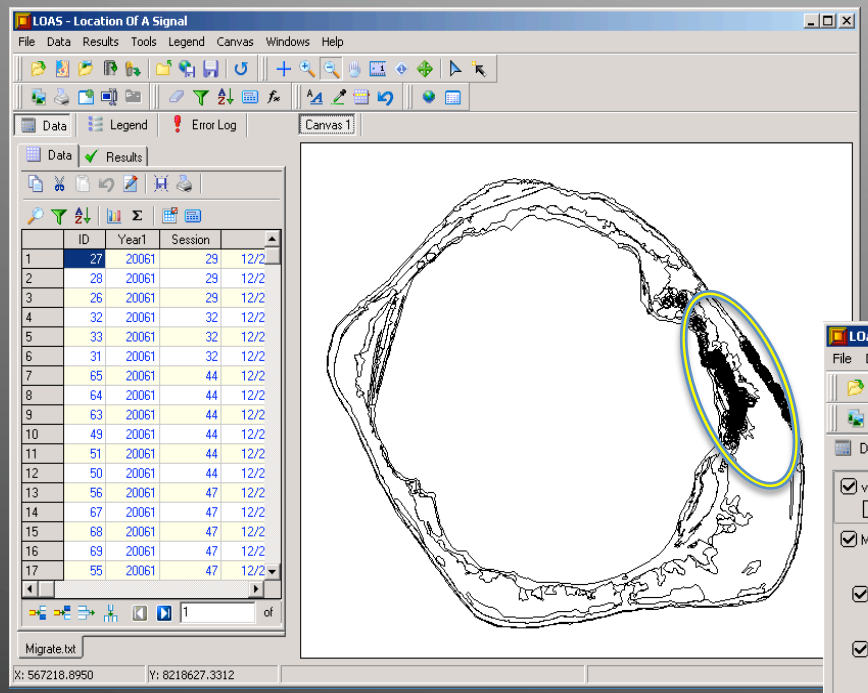


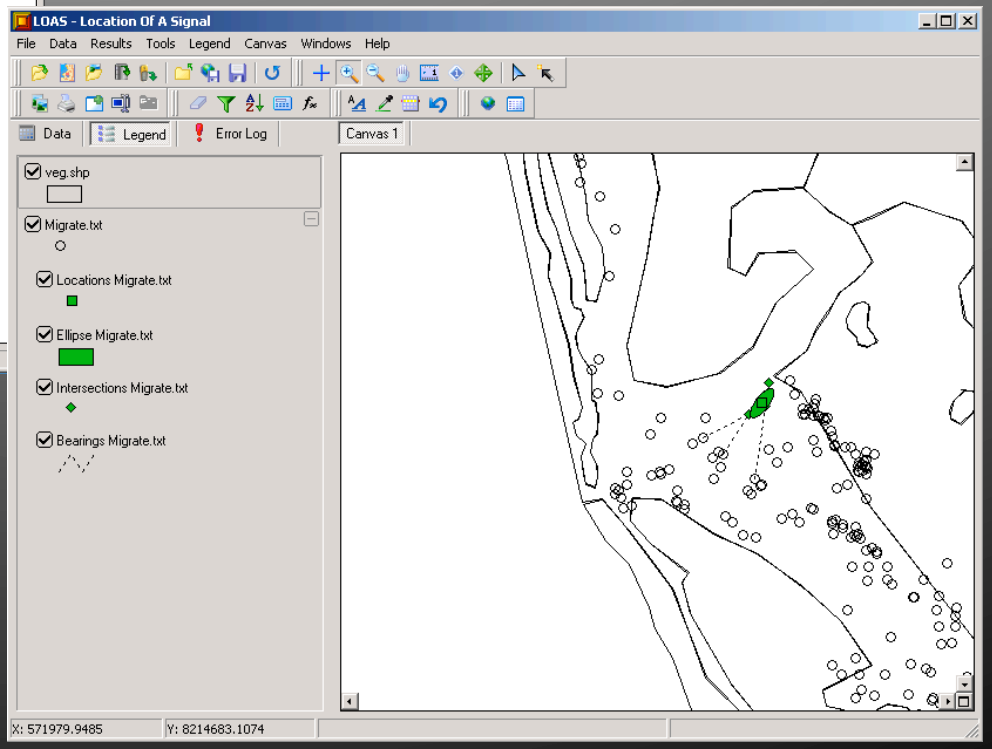
Adding Arc Shapefiles

- *Add Vegetation Cover Layer*
  - *a) Click "File"*
  - *b) Click "Open Map Vector File"*
- *Navigate to the desktop and MIGRATE folder.*
  - *a) Select "Veg.shp"*
  - *b) You will see vegetation coverages for the island of Niau.*
  - *c) Observations are on the right*



Adding Arc Shapefiles



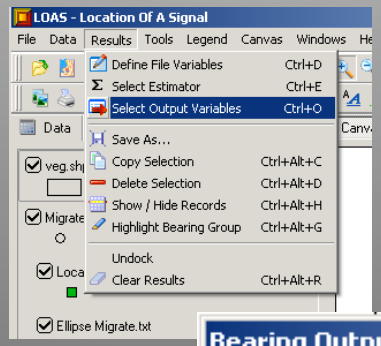


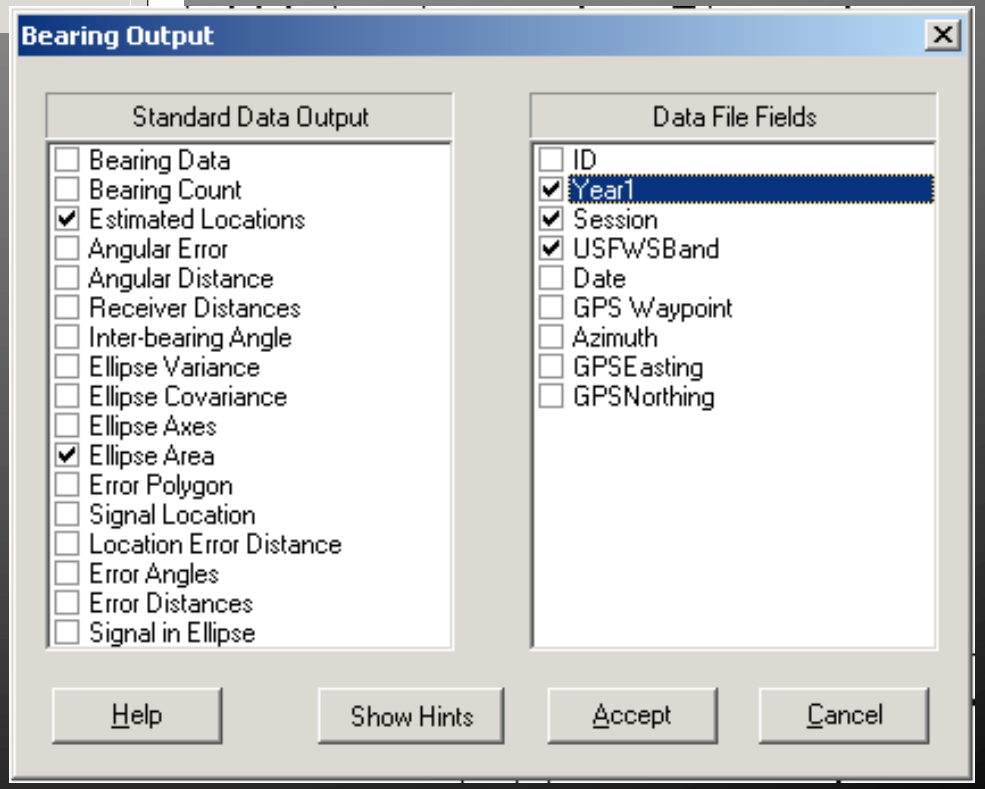
- *Zoom in with magnifying glass to see bird location within vegetation.*
- *This bird was located in coconut plantation!!!*

Running Batches of Data

- *Click Results tab*
- *Clean Results*
  a) *Click results tab*
  b) *Erase results*

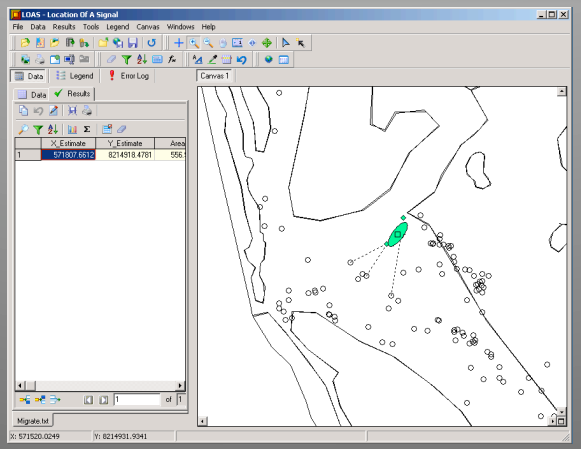
- *Select Output Variables*
  a) *Click "Results"*
  b) *Click "Select Output Variables"*
  c) *Select*
     - ✓ *Estimated locations*
     - ✓ *Ellipse area*
     - ✓ *Year1*
     - ✓ *Session*
     - ✓ *USFWS band*
  d) *Click Accept*

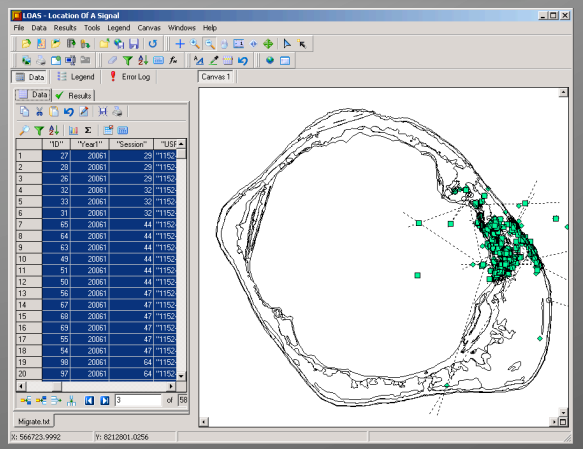


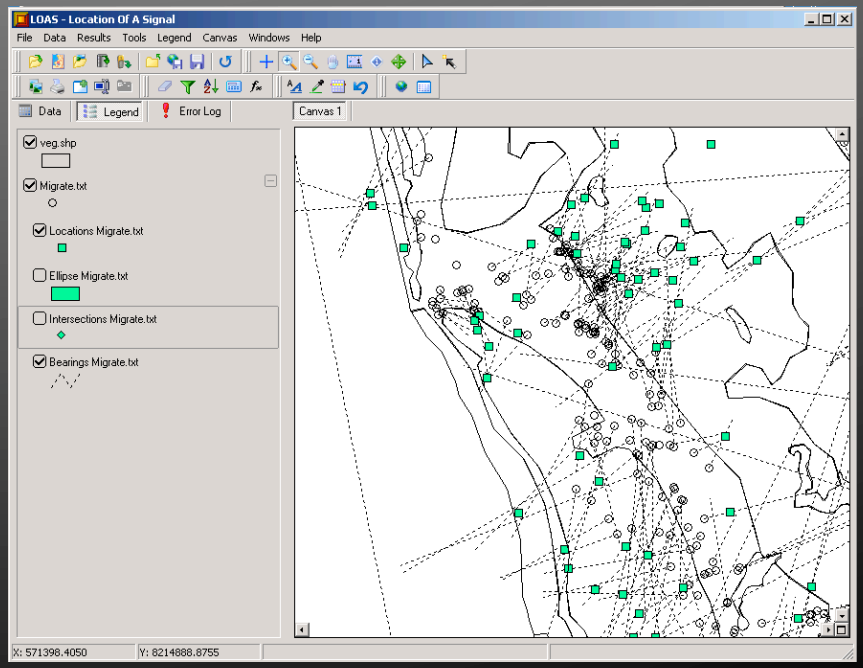


Generating Results

- *Run bearing session 29*
- *Click on "Results" tab*
  - a) *Scroll through*
  - b) *Notice estimated bird location coordinates "X_Estimate" "Y_Estimate"*
  - c) *Notice the area within the error ellipse "Area".*
- *Run all data together*
  - a) *Clear results table*
  - b) *Select all rows*
  - c) *Click calculate*
  - d) *Look at results table!*
  - e) *Zoom in and look at points on map!*

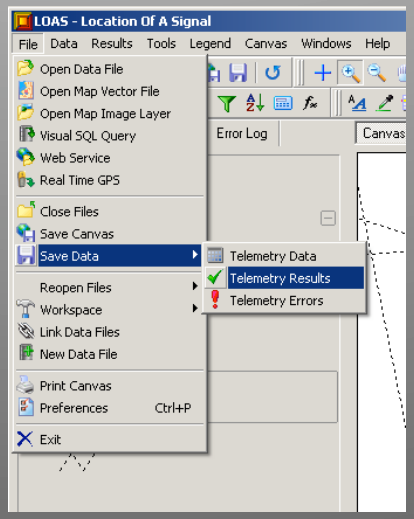


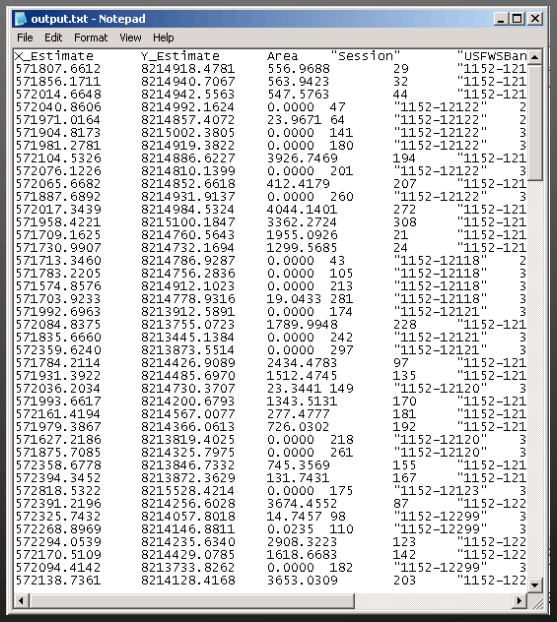




Exporting Results

1. Click File, Save Data, Telemetry Results.
2. Save all data in grid, and click “Accept”
3. Select the file name, file type (txt works well for arc), and location. Click “Continue”
4. Click “Accept”
5. Done!
6. Double click file to open!
7. These data can be imported into ArcView and analyzed there.





output.txt - Notepad

File Edit Format View Help

X_Estimate	Y_Estimate	Area	"Session"	"USFWSBan
571807.6612	8214918.4781	556.9688	29	"1152-121
571856.1711	8214940.7067	563.9423	32	"1152-121
572014.6648	8214942.5563	547.5763	44	"1152-121
572040.8606	8214992.1624	0.0000 47	"1152-12122"	2
571971.0164	8214857.4072	23.9671 64	"1152-12122"	2
571904.8173	8215002.3805	0.0000 141	"1152-12122"	3
571981.2781	8214919.3822	0.0000 180	"1152-12122"	3
572104.5326	8214886.6227	3926.7469	194	"1152-121
572076.1226	8214810.1399	0.0000 201	"1152-12122"	3
572065.6682	8214852.6618	412.4179	207	"1152-121
571887.6892	8214931.9137	0.0000 260	"1152-12122"	3
572017.3439	8214984.5324	4044.1401	272	"1152-121
571958.4221	8215100.1847	3362.2724	308	"1152-121
571709.1625	8214760.5643	1955.0926	21	"1152-121
571730.9907	8214732.1694	1299.5685	24	"1152-121
571713.3460	8214786.9287	0.0000 43	"1152-12118"	2
571783.2205	8214756.2836	0.0000 105	"1152-12118"	3
571574.8576	8214912.1023	0.0000 213	"1152-12118"	3
571703.9233	8214778.9316	19.0433 281	"1152-12118"	3
571992.6963	8213912.5891	0.0000 174	"1152-12121"	3
572084.8375	8213755.0723	1789.9948	228	"1152-121
571835.6660	8213445.1384	0.0000 242	"1152-12121"	3
572359.6240	8213873.5514	0.0000 297	"1152-12121"	3
571784.2114	8214426.9089	2434.4783	97	"1152-121
571931.3922	8214485.6970	1512.4745	135	"1152-121
572036.2034	8214730.3707	23.3441 149	"1152-12120"	3
571993.6617	8214200.6793	1343.5131	170	"1152-121
572161.4194	8214567.0077	277.4777	181	"1152-121
571979.3867	8214366.0613	726.0302	192	"1152-121
571627.2186	8213819.4025	0.0000 218	"1152-12120"	3
571875.7085	8214325.7975	0.0000 261	"1152-12120"	3
572358.6778	8213846.7332	745.3569	155	"1152-121
572394.3452	8213872.3629	131.7431	167	"1152-121
572818.5322	8215528.4214	0.0000 175	"1152-12123"	3
572391.2196	8214256.6028	3674.4552	87	"1152-122
572325.7432	8214057.8018	14.7457 98	"1152-12299"	3
572268.8969	8214146.8811	0.0235 110	"1152-12299"	3
572294.0539	8214235.6340	2908.3223	123	"1152-122
572170.5109	8214429.0785	1618.6683	142	"1152-122
572094.4142	8213733.8262	0.0000 182	"1152-12299"	3
572138.7361	8214128.4168	3653.0309	203	"1152-122

Field Exercise

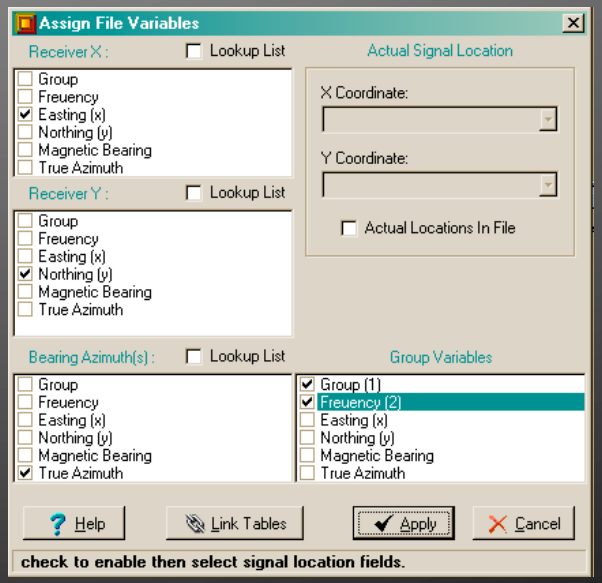
1. *Working with data*
2. *Download file from:*

**** click the arrow at the lightning bolt!*

1. *Start LOAS*
2. *Open File*
   a. *File, Open Data File*
   b. *Open file you downloaded*

3. *Defining File Variables*
   a. *Receiver X – select "Easting (x)"*
   b. *Receiver Y – select "Northing (y)"*
   c. *Bearing Azimuth – select "True Azimuth"*
   d. *Group Variables – select "Group and Frequency"*

4. *Click Apply*



Play With Field Data

Additional Information

Millspaugh, J. J., and J. M. Marzluff. 2001. Radio Tracking And Animal Populations. Academic Press, San Diego.

White, C. C., and R. A. Garrott. 1990. Analysis of Wildlife Radio-tracking Data. Academic Press, San Diego.

Kenward, R. E. 2001. A Manual for Wildlife Radio Tagging. Academic Press, San Diego.