Managing Grizzly Bear Data

ESRI 2009 International User Conference, San Diego, California

Presented by: Julie Duval, July 15, 2009

Agenda

1) Overview of the Foothills Research Institute

2) Grizzly Bear Program Overview

3) Data Management

> ➢ Database design changes

> ➢ Including genetic data

4) Handling Telemetry Data

> ➢ Transition from AML to python

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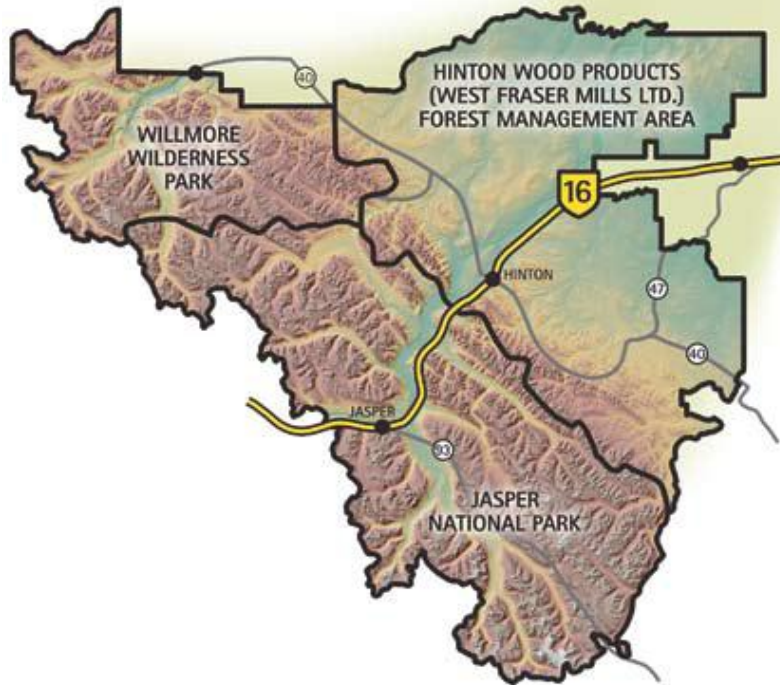
Our Mission:

The Foothills Research Institute is a unique community of partners tied to the land and its people through a common concern for the welfare of the land and its resources.

Foothills Research Institute Landbase

What We Do...

- Applied research

- Generate knowledge and develop management tools

- Communications and Extension

Research Programs

Grizzly Bear

Natural Disturbance

Fish & Watershed

Aboriginal Involvement

Social Sciences

Adaptive Forest Management

Mountain Pine Beetle Ecology

Foothills Stream Crossing

Local Level Indicators

Grizzly Bear Program

Overview

Foothills Research Institute

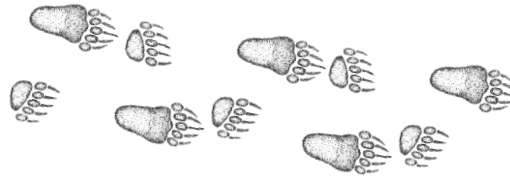Grizzly Bear Program

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Grizzly Bear Program (1998-today)

To provide resource managers with the necessary knowledge and planning tools to ensure the long-term conservation of grizzly bears in Alberta

The Grizzly Bear Program (GBP) was initiated in 1998 as an outcome of environmental hearings on the proposed Cheviot coal mine southwest of Hinton.

The GBP began tracking grizzly bears in 1999 using GPS radio-telemetry collars, to increase our understanding of how grizzly bears respond to human use on the landscape.

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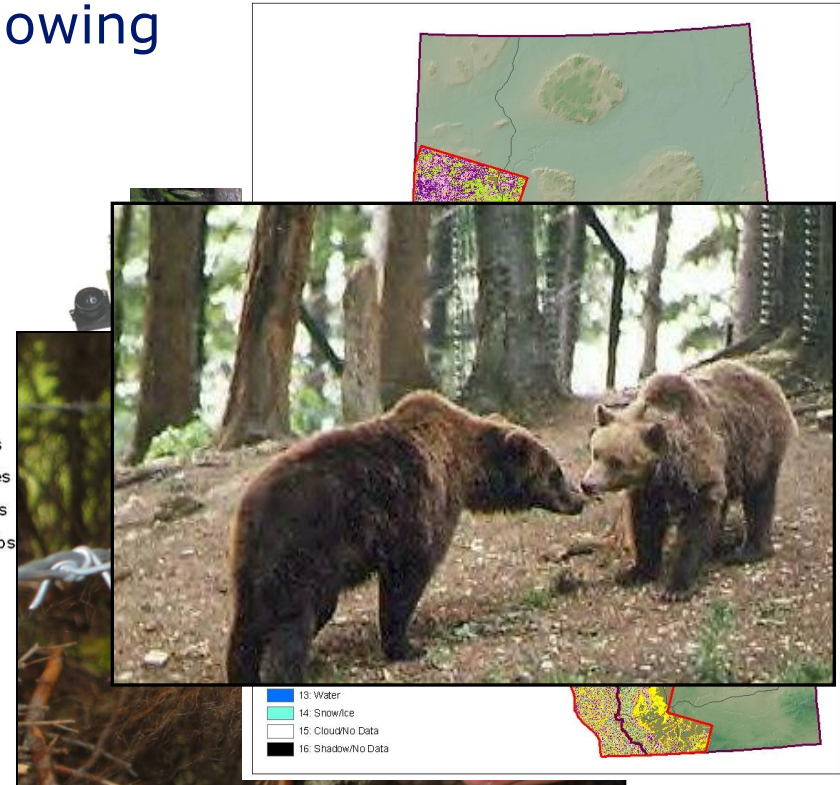
Grizzly Bear Program - Research Areas

Research for the GBP is the work of a multidisciplinary team in the following areas:

- ◆ Habitat Mapping and Landscape Change
- ◆ Graph Theory Modeling
- ◆ Statistical Analysis and Modeling
- ◆ Camera Collars
- ◆ Bear Capture/Ecology
- ◆ DNA – Status and Trends
- ◆ Wildlife Health
- ◆ GIS Applications

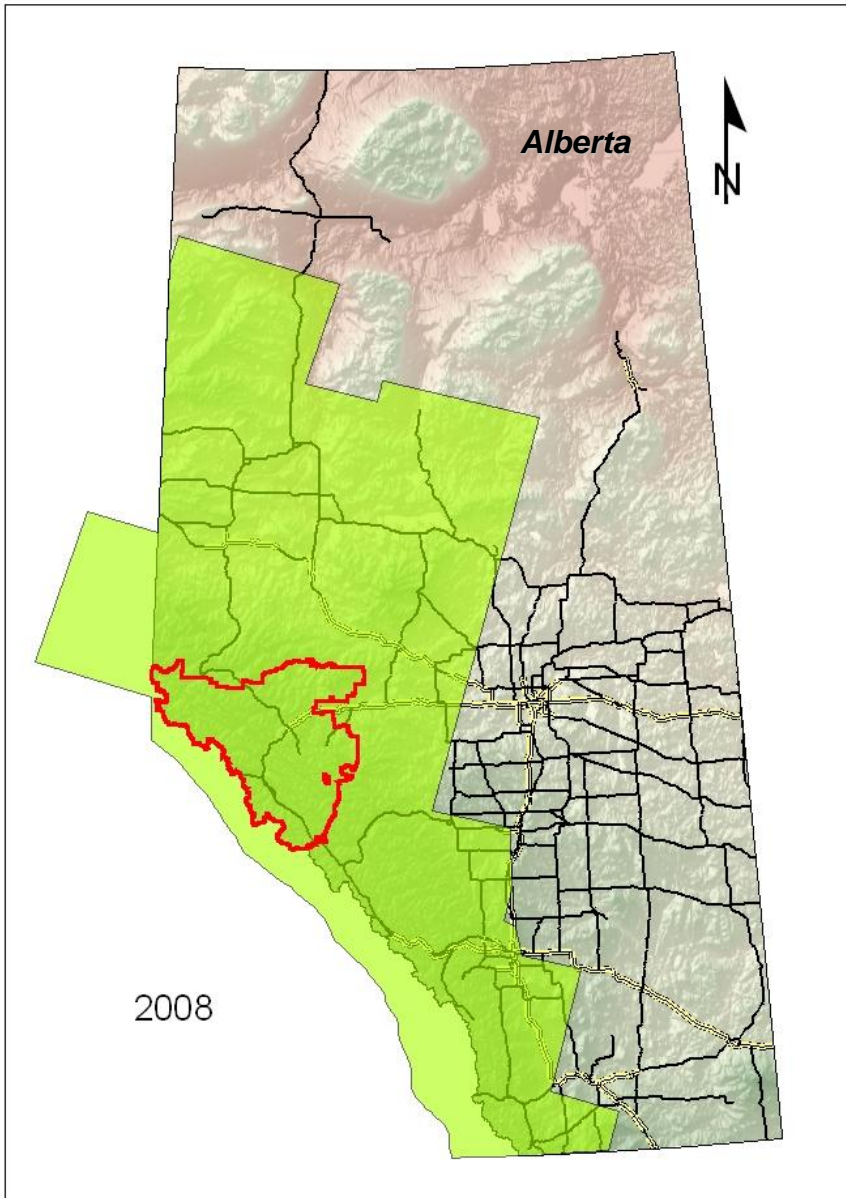http://foothillsresearchinstitute.ca

Grizzly Map

Legend

- 1: Upland trees
- 2: Wetland trees
- 3: Upland herbs
- 4: Wetland herbs
- 5: Shrubs
- 6: Water
- 7: Barren land
- 8: snow/ice
- 9: cloud
- 10: shadow

- 13: Water
- 14: Snow/Ice
- 15: Cloud/No Data
- 16: Shadow/No Data

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Alberta

N

2008

Foothills Research Institute

Grizzly Bear Program

Legend

FRI Boundary

Research Boundaries

GPS Locations

Year	Number of GPS Locations
1999	6121
2000	9015
2001	11860
2002	9198
2003	11812
2004	11523
2005	57609
2006	39019
2007	19612
2008	29841

Grizzly Bear
GPS Locations
1999-2008

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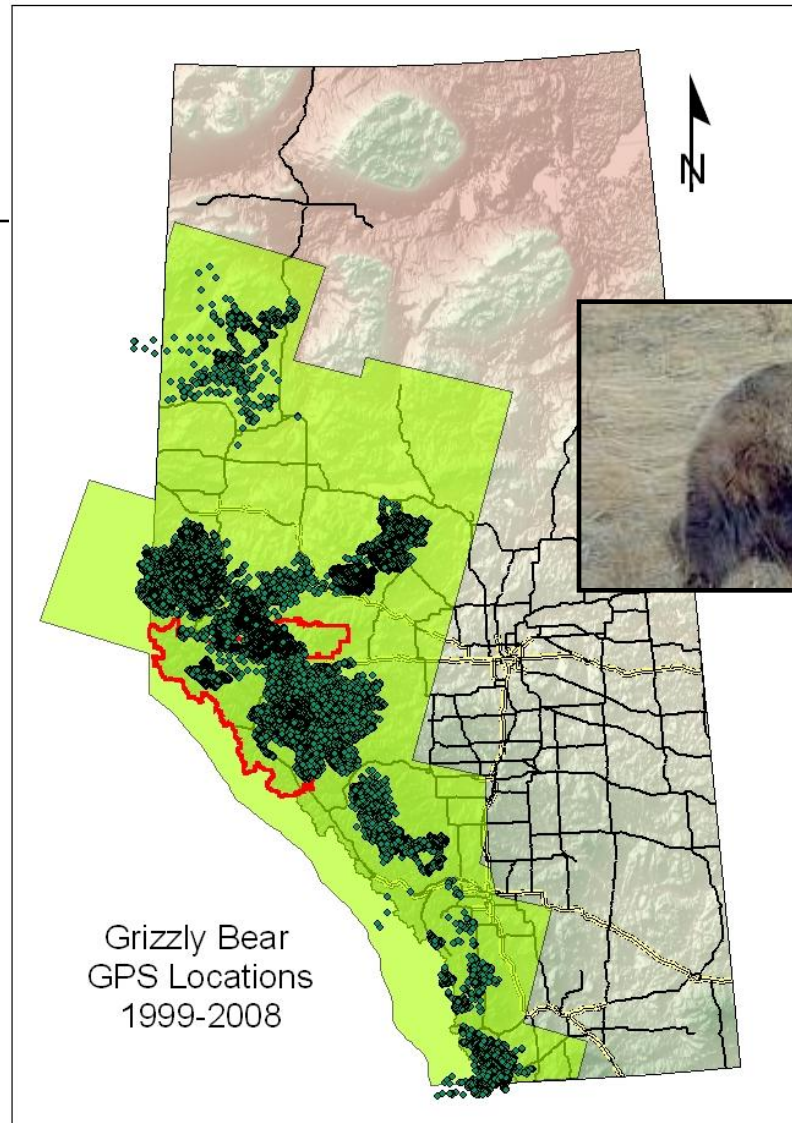
Grizzly Bear Program - Data Collection

Since 1999, 147 grizzly bears have been captured by the program's researchers and fitted with GPS collars (a few with cameras).

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Grizzly Bear Program - Data Capture Costs

Since spring of 1999:

334 grizzly bear capture events
@ $6,000 per capture

131 collars have been used
@ $4,000 (avg) per collar
(96 collars available for use --> ~25 currently on bears)

$75,000 to $90,000 per year spent on flying
(for capture efforts, tracking and telemetry 'uploads')

Program Total:
$14 Million (2008)

Compare to
$60/location in the
early 1980s

On 210,000 valid GPS locations:

~ $16 per location

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Old Database Structure
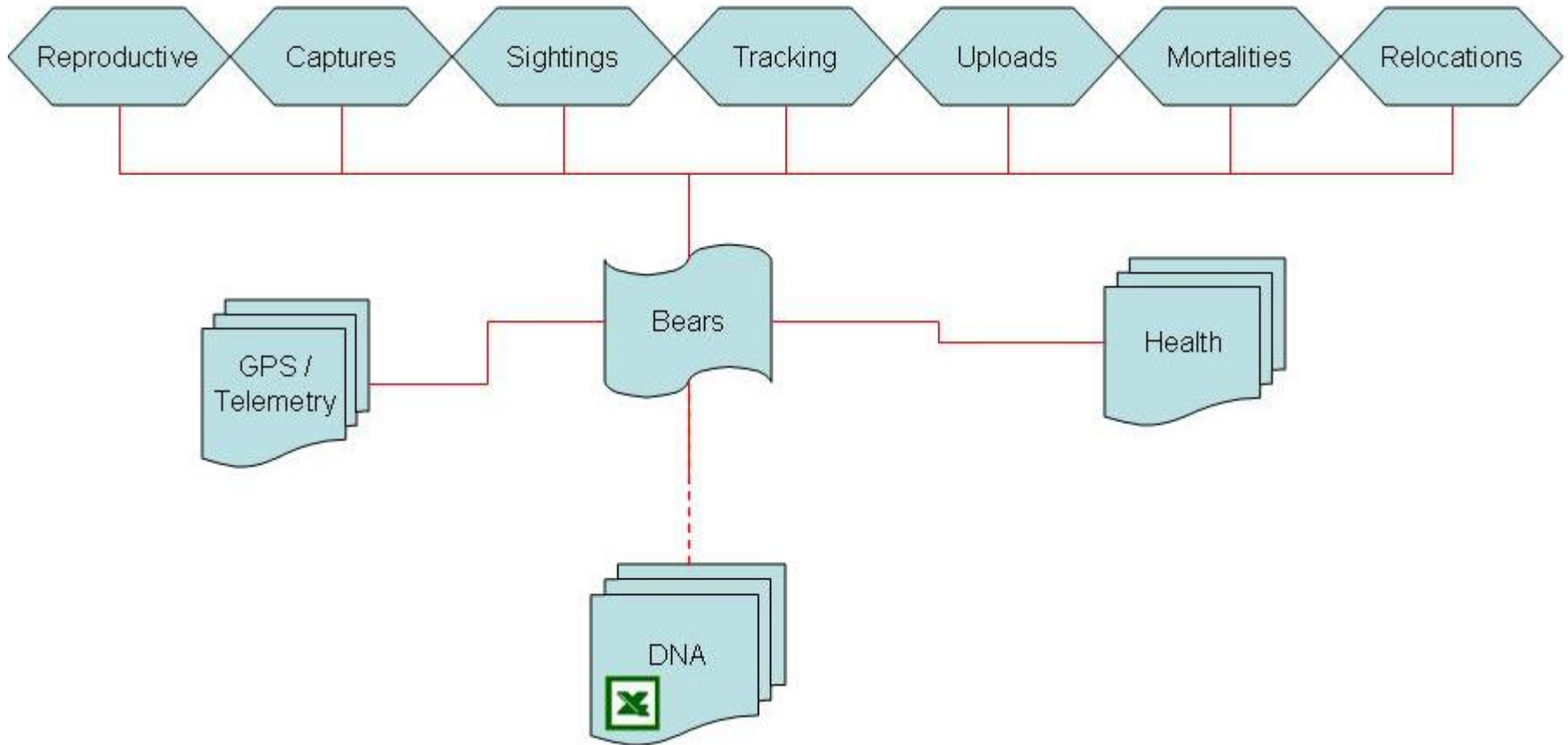
New Database Structure
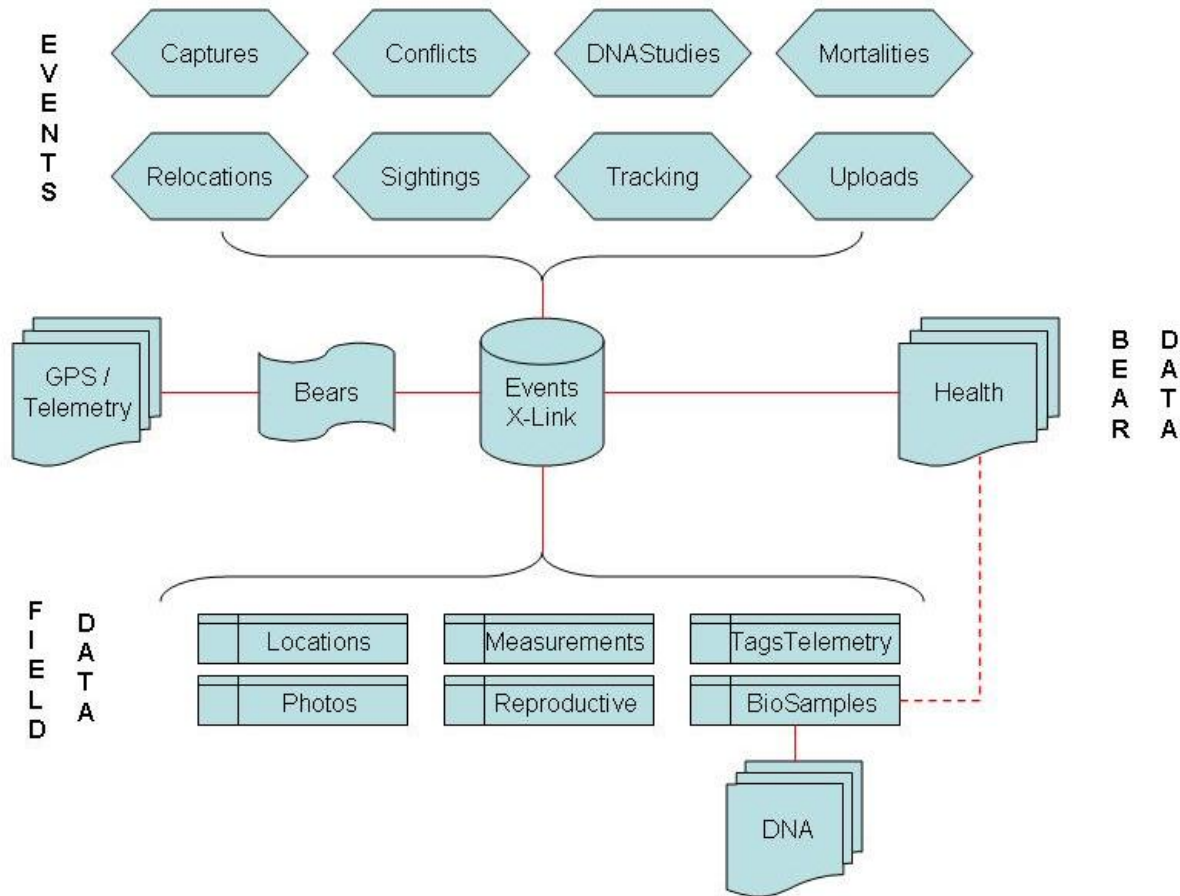
Database Swithboard

Data Entry: Events

Foothills Research Institute Grizzly Bear Program

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Grizzly Bear Research Database

Done

Today's Date: 6/26/2009 2:00:32 PM

Events

| Bear: | G020 | Date (>=): | 01-Jan-99 | **Apply Filter** |
| Event Type: | | Date (<=): | 26-Jun-2009 | **Remove Filter** |

---

event ID	46		**Bear**	G020	
Date	13-Jun-99				
Time	11:14 AM		**Alias**	Mary	**Primary Event**	Capture	Open Event 1
Occurence #	-999		**Bear ID**	21203	**Secondary Event**	na	Open Event 2
Enterred By	JDuval		**Other ID**		**Tertiary Event**	na	Open Event 3
Date Enterred	23-Jan-09		**Sex**	F			
Comments	Loading of Existing Data		**Birth Date**	01-Feb-95	View Location Data	View Temperature Data	Track Modifications
			Age	4			

---

event ID	1354		**Bear**	G020	
Date	14-Jun-99				
Time			**Alias**	Mary	**Primary Event**	Tracking	Open Event 1
Occurence #	-999		**Bear ID**	21203	**Secondary Event**	na	Open Event 2
Enterred By	JDuval		**Other ID**		**Tertiary Event**	na	Open Event 3
Date Enterred	23-Jan-09		**Sex**	F			
Comments	Loading of Existing Data in GB_Tracking		**Birth Date**	01-Feb-95	View Location Data	View Temperature Data	Track Modifications
			Age	4			

---

event ID	1364		**Bear**	G020	
Date	28-Jun-99				
Time	10:50 AM		**Alias**	Mary	**Primary Event**	Tracking	Open Event 1
Occurence #	-999		**Bear ID**	21203	**Secondary Event**	na	Open Event 2
Enterred By	JDuval		**Other ID**		**Tertiary Event**	na	Open Event 3
Date Enterred	23-Jan-09		**Sex**	F			
Comments	Loading of Existing Data in GB_Tracking		**Birth Date**	01-Feb-95	View Location Data	View Temperature Data	Track Modifications
			Age	4			

Record: |◄ ◄ 1 ► ►| ►* of 80 (Filtered)

Capture Events

Foothills Research Institute Grizzly Bear Program
Capture Events

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Bear:	G020	Date:	20-Oct-00	Time:	10:19 AM

Relocations	Modifications	Sightings	Conflicts	Mortalities

Capture Data	Location Details	Tags and Telemetry	Measurements	Bio Samples	Reproductive Info

CAPTURE INFORMATION

Standard **Arrival** **Drugged** **Reversed** **Departure**
[?] Times [ ] [10:19 AM] [ ] [ ]

Capture Team Stenhouse/Goski/Munro/Bell

Capture Method heli dart   **Snare Site** [ ]   ☐ **Trap Monitor**   **Time Sprung**
Delivery System pneu dart rifle   **Limb Caught** na   ☐ **Trap Alarm** [ ]
Dart System n/a   **Restraint Time** 9999 hrs   ☐ **Trap Video**

ANIMAL DATA:

Age:
  Estimated 5
  Actual 5 [Calculate]
  Age Class adult

Recapture? yes
[Review Capture History]

ADDITIONAL INFORMATION:

Injury/ Abnormality [ ]

Pre- Dart Behaviour [ ]

Injury Category 9999

Comments [ ]

Locations

Bear ID	Name	LOC no	UTM Easting	UTM Northing	Date	Time	Year	Month	Day
21203	G020	1	468317.625029544	5886547.60651785	6/13/1999	10:06:00 PM	1999	6	13
21203	G020	2	468836.190744241	5887263.98015201	6/14/1999	6:01:00 AM	1999	6	14
21203	G020	3	468970.500109958	5887444.44256971	6/14/1999	2:01:00 PM	1999	6	14
21203	G020	4	469449.58923074	5887979.80335498	6/14/1999	6:02:00 PM	1999	6	14
21203	G020	5	466794.409712023	5890662.99494111	6/14/1999	10:01:00 PM	1999	6	14
21203	G020	6	465762.995556427	5890037.25411859	6/15/1999	6:02:00 AM	1999	6	15
21203	G020	7	465693.65114625	5890251.3490958	6/15/1999	10:01:00 AM	1999	6	15
21203	G020	8	465759.453055474	5890196.36581148	6/15/1999	2:02:00 PM	1999	6	15
21203	G020	9	465662.914217738	5889974.55892822	6/15/1999	6:02:00 PM	1999	6	15
21203	G020	10	465835.555731124	5890179.13464516	6/15/1999	10:02:00 PM	1999	6	15
21203	G020	11	466318.137636545	5889107.72440879	6/16/1999	10:01:00 AM	1999	6	16
21203	G020	12	466524.529011462	5888782.5430454	6/16/1999	6:02:00 PM	1999	6	16
21203	G020	13	467568.322940737	5888348.16617956	6/16/1999	10:02:00 PM	1999	6	16
21203	G020	14	466858.881641512	5886161.42855152	6/17/1999	10:02:00 AM	1999	6	17
21203	G020	15	466613.487830333	5886479.07689963	6/17/1999	2:02:00 PM	1999	6	17
21203	G020	16	468246.655704718	5886642.63700949	6/17/1999	6:02:00 PM	1999	6	17
21203	G020	17	467587.425599711	5886227.64509964	6/18/1999	10:02:00 AM	1999	6	18
21203	G020	18	467596.635974972	5886204.22072612	6/18/1999	2:02:00 PM	1999	6	18

Date (>=): 01-Jan-99
Date (<=): 26-Jun-2009

Filter by Date **Clear Date Filter** **Done**

Record: 1 of 2195 (Filtered)

Fix	DOP	Collar	Data Status	Full Date	Locations_ID	Reloc?	Denning?	Time of Day	Data Ownership
3	3	TEL	FINAL	6/13/1999 10:06:00 PM	5309	No	No	NightTime	FRI
2	2	TEL	FINAL	6/14/1999 6:01:00 AM	5310	No	No	DayTime	FRI
2	2	TEL	FINAL	6/14/1999 2:01:00 PM	5311	No	No	DayTime	FRI
2	7	TEL	FINAL	6/14/1999 6:02:00 PM	5312	No	No	DayTime	FRI
2	2	TEL	FINAL	6/14/1999 10:01:00 PM	5313	No	No	NightTime	FRI
2	3	TEL	FINAL	6/15/1999 6:02:00 AM	5314	No	No	DayTime	FRI
3	3	TEL	FINAL	6/15/1999 10:01:00 AM	5315	No	No	DayTime	FRI
2	2	TEL	FINAL	6/15/1999 2:02:00 PM	5316	No	No	DayTime	FRI
3	4	TEL	FINAL	6/15/1999 6:02:00 PM	5317	No	No	DayTime	FRI
3	4	TEL	FINAL	6/15/1999 10:02:00 PM	5318	No	No	NightTime	FRI
2	6	TEL	FINAL	6/16/1999 10:01:00 AM	5319	No	No	DayTime	FRI
2	2	TEL	FINAL	6/16/1999 6:02:00 PM	5320	No	No	DayTime	FRI
2	2	TEL	FINAL	6/16/1999 10:02:00 PM	5321	No	No	NightTime	FRI
2	2	TEL	FINAL	6/17/1999 10:02:00 AM	5322	No	No	DayTime	FRI
2	3	TEL	FINAL	6/17/1999 2:02:00 PM	5323	No	No	DayTime	FRI
3	5	TEL	FINAL	6/17/1999 6:02:00 PM	5324	No	No	DayTime	FRI
2	2	TEL	FINAL	6/18/1999 10:02:00 AM	5325	No	No	DayTime	FRI
2	2	TEL	FINAL	6/18/1999 2:02:00 PM	5326	No	No	DayTime	FRI

Grizzly Bear Program

Handling Telemetry Data

Grizzly Bear Program

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Raw GPS Data Processing

Processing Tools

GPS Data Management

- Originally used aml code and menus to process the raw data. Data was appended to MS Access database using DBMSCursor.

- Converted aml code to python in summer 2007 and added as tools in the toolbox. Data is now appended to a Feature Class in a Personal Geodatabase.

Benefits:

- No longer require ArcInfo license to process data - ArcView license is sufficient.

- The task of processing incoming raw data is now done by the wildlife biologist.

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Summary

- As the Grizzly Bear Program continues to grow, spatial and non-spatial datasets are continually evolving to meet research requirements. These multi-user datasets are managed to be flexible and functional and to allow efficient GIS analysis.

- The database design changes will be beneficial in supporting multiple types of users, ensuring that everyone has the most recent information available.

- The tools for loading the raw GPS telemetry locations enable the researchers to process their own data and move on to their analyses quickly.

Thank You!