LYNX PROJECT 2011 and 2012

This project **LYNX, *Lynx canadensis*, PROJECT 2011** would not have been undertaken in 2011 by the CEI without the two male lynx and without contributions from The Eden Conservation Trust, Alberta Wildlife Rehabilitator's Association, provision of GPS telemetry collars, lent by University of Alberta, donation of a research vehicle by CP Rail, in addition to advice from lynx researchers in the Northern hemisphere and individual Fish &Wildlife officers.


Lynx kitten at CEI

NEED:

In 1758, *Lynx lynx*, the Eurasian Lynx, Order Carnivora, family Felidae was identified by Linnaeus. This was the first scientific description of a group of four **rare**, largely solitary, mid sized wild cat species that are nowadays only found in the Northern hemisphere. These animals are in the Neararctic : Canada Lynx, *L. canadensis* and the Bobcat, *L. rufous,* and in the Palaearctic: the Eurasian Lynx, *L .lynx* and, restricted to the Iberian Peninsula, the little, **severely endangered** Iberian Lynx, *L. pardinus.*

In the USA, throughout those States which once comprised their range Canada Lynx, *L. canadensis*, are classified as **Species of Concern (Threatened, Endangered, or Extirpated)**.

In March, 2000, lynx were listed as Threatened under the U.S.
Endangered Species Protection Act (USA Fish & Wildlife Service 2000) an action which clearly demonstrates the need to restore viable populations of lynx.

LYNX IN EUROPE:

Palaearctic Lynx population: In Spain the **Iberian Lynx**, *L.pardinus*, is nearly extinct and severely protected and a reintroduction programme is underway. The **Eurasian Lynx**, *L. lynx* has been extirpated over much of its range in the European Union. To address this loss, in the countries of, and in association with, the European Union, EU, three International Treaties (Bern Convention, CITES, EU Habitat Directive) have been signed. These three Treaties have relevancy to the conservation of the **Eurasian Lynx**, *L. lynx*, populations and, as result, Lynx reintroductions in France, Germany, Switzerland and Italy have been undertaken. The Lynx reintroductions undertaken within these member countries of European Community have clearly demonstrated that it is possible for released lynx to survive in suitable habitat, even though that habitat might be unfamiliar to them.

WHY SAVE LYNX? All of the four lynx species, Canada lynx, bobcat, Eurasian lynx and Iberian lynx, are keystone species and all their numbers are dwindling to a greater or lesser degree. Keystone species are those species whose benefit to the ecosystems they inhabit is both "large, and disproportionately large relative to its abundance" Power et al. (1996). Lynx are solitary, extremely secretive, largely crepuscular and/or nocturnal creatures of woodland, marsh, and taiga, all of which make it very hard to reliably document their populations in the wild. What is known is that as a direct result of the industrial and agricultural activities of man, the world's populations of these beautiful animals have been reduced to a fragment of what they once were.

But now, in the 21st Century, the activities of man, through conservation, reintroduction, and habitat protection are trying, in some areas, to turn this from a depressing biodiversity loss to an exciting and unique population gain. **Research done on any one of these four lynx species will benefit all four species**. Rescue, rearing and release of Canada Lynx, *L. canadensis*, and bobcat, *L. rufus*, will contribute towards Canada's dwindling biodiversity.

LYNX CONSERVATION:
To ensure that keystone species continue to occupy their niche in the wild, it should always be remembered that it is much, much less expensive and infinitely more successful to maintain existing populations within suitable protected habitat, than to reintroduce those keystone species back into the habitat from which they have been extirpated (rendered extinct).

A vital part of understanding how to best to conserve keystone species is to know their population numbers and behavioural and habitat requirements. For Canada Lynx, this knowledge is very difficult to obtain because the animals are so secretive. Therefore, because tracking lynx in the wild is so difficult, the most consistently used method of monitoring lynx has been by using telemetric devices, GPS and VHF radio collars. It is worth noting that, in papers published by lynx researchers, a surprising number of collared animals are 'lost" and a high number of documented deaths attributed to starvation. Ref available on request.

GPS telemetry collar on Lynx

In general, researchers when using VHF and Satellite collars on lynx for monitoring purposes, trap the animals, render the animals unconscious, collar, and release them. The do not monitor the animal's behaviour prior to collaring nor after collaring and are not aware of any behavioural changes which could be attributed to wearing quite intrusive equipment (see illustration above) with two antennae. The goal is to ensure ease of monitoring for the researcher, considerations on the possibility of an averse effects on the animals wearing the equipment have only recently become an object of concern.

Although GPS-based locations provide robust spatio-temporal datasets with the potential for fine-scale associations between animals and habitat features, GPS-based locations do not provide information on the actual resources that animals use or information on activities of animals. The researchers who observed their animals directly 50 years ago, before the advent of telemetry (and those who still observe their animals today), could see what resources their animals used and could watch and note their behaviours (Cagnaccil *et Al* 2010), although, with cryptic species such as Lynx this is a very difficult achievement. Therefore, we were extremely grateful to borrow the

satellite/VHF collars, used in a previous Lynx study, from the University of Alberta. We did not realize the quantifiable impact that putting the collars on the lynx would have on their behaviour.

An integral part of the CEI Lynx study incorporated behavioural study, ethograms, validation of Hair-trap (to collect hair for DNA analysis), and faecal glucocorticosteroid analysis to obtain information on stress hormone levels in the lynx. All these studies meant that the CEI was in an ideal position to evaluate the suitability of the post release monitoring method chosen (satellite collaring).

In recent years new research into the adverse impact of telemetric devices on animal behaviour and survival has begun to be documented within a wide variety of different species (2000 Marc Bekoff). It has begun to be acknowledged that various telemetric devices (e.g. trapping, marking, fitting telemetric devices) have proven impact on the behaviour, health, reproductive success, and survival of the species studied. The impact and resulting behaviour changes caused by research methods is marked enough to be known as the Instrument or Researcher Effect and should be factored in to any conclusions drawn and management decisions made based upon research. The results of the instrument/researcher effect can be biased data or incorrect assumptions "...data generated by studies in which heavy radio-collars were used would have generated misleading information on survival and longevity"(1997 Cypher).

Animals in the wild or animals reintroduced or released back into the wild are more difficult, but not impossible, to study. Naturalists, from Pliny, Linnaeus and Darwin on studied animals through observation, and by getting their boots dirty, by spending hours in the field, by staying up all night, and by walking for miles and miles. Modern researchers don't want to expend that energy or time therefore various mechanistic methods (e.g. trapping, marking, fitting telemetric devices) are commonly accepted as the most efficient method of monitoring. "New GPS-based telemetry is a formidable technological advance but it is not the best technology for all purposes. Perhaps more researchers should observe their research animals directly today" (Cagnaccil *et al* 2010).

Often the built-in bias in data collected using mechanistic methods and caused by the Instrument or Researcher Effect is ignored for many reasons: reasons to do with cost, the greater ease of monitoring from a computer desk and the tidiness of the resulting models generated as result. It is worth noting that "…models that are generated from these studies can be misleading because of human intrusions that appear to be neutral" (Bekoff, 2000), a statement supported by other researchers Brua, 1998, Cypher, 1997, Major, 1990, Travaini, Palomares, and Delibes, 1993.

Until the late 1980's there was little evaluation of the impact of telemetric devices on the animals wearing them. Now, as result of 30 years of research using mechanistic methods and a greater frequency of evaluation of the impact of the Instrument/Researcher Effect on studied wildlife, the fact can not be ignored. In animals wearing telemetric devices, both internally (M.J.Lichtenne *et Al*) and externally, or even something as apparently minor as wearing coloured leg rings to identify individuals on birds (N. Burley, *et Al.*1982,Pearson, FD, Mann, NI, Slater, 1999. JB Johnsen A, Lifjeld JT, Rohde PA, 1997), have provably caused behavioural changes in the species studied




The adverse impact upon lynx behaviour of wearing radio collars has not as yet been examined in detail.

In **LYNX PROJECT 2011** there were three key aspects which had to be addressed:.

- **The first key aspect** was that the animals be released in optimum condition and an optimum time with optimum chances of survival. To bring this about the next three key aspects must be addressed and fulfilled.
- **The second Key aspect** is release site suitability; the CEI, using the CEI's two-step four point Release Site Selection Criteria and the vehicle donated by CPR undertook research into selecting a suitable release site for the release of our two orphaned lynx. To be successfully released the CEI has, over its 38 years of Endangered species reintroduction (swift fox) and wildlife rescue, rehabilitation and release, developed and proven a Two part Four-step Release Criteria. This Criteria requires that rescued captive raised carnivores, prior to being released back into the wild, have to conform to the following:

BEHAVIOURAL REQUIREMENTS
1. They need to be able to identify predators and prey,
2. The ability to hunt, or forage, successfully,
3. The ability to interact normally with members of the same species,

AVOIDANCE OF HUMAN/WILDLIFE CONFLICT
4. release site evaluation must include knowledge of:
(a) land usage, present and future,
(b) land ownership,
(c) government jurisdiction
(d) suitability of habitat to species released
(e) knowledge of prey availability and predator pressure
(f) numbers of individuals of the same species occupying the proposed release site,
(g) the behavioural requirements of the species to be released.

This knowledge reduces the possibility of Human/Wildlife conflict and increases survival in the animals released.

To know that a release of captive reared carnivores has been successful, the released animals must be monitored post-release and that monitoring must include what they do (behaviour) as well as where they go (movement).

- **The third key aspect** of **LYNX PROJECT 2011** was:

(a) to study lynx behaviour, pre collaring, to ensure that the animals had the necessary survival skills to survive post release and

(b) to monitor the lynx after their collars were put on but before they were released to ensure the equipment was working properly and that the animals were not distressed by wearing GPS telemetry collars. Refurbished GPS collars used in a previous lynx study were lent to the CEI for the **LYNX PROJECT 2011** by the University of Alberta.

The Lynx were studied intensively for one month prior to collaring. (See attachment) They demonstrated an ability to stalk and kill a wide variety of wild species within their enclosure and behaved in the same secretive ways that lynx in the wild behave. Where the trees are suitable, lynx spend a lot of time up them as they are creatures of the boreal forest and well treed riparian habitat, The lynx at the CEI spent a significant time, over 33% up trees (See Attachment).

Following the third aspect of **LYNX PROJECT 2011** and monitoring the lynx after they were wearing the GPS telemetry collars but before they were released, CEI researchers did discover significant behavioural changes that could compromise survival of GPS collared lynx post release.

LYNX PROJECT 2012
As result the primary aspect of the **LYNX PROJECT 2011** (that animals be released in optimum condition and an optimum time with optimum chances of survival) could not be fulfilled. Adverse effects from capturing and radio-tagging an animal can range from short to long-term and from apparently tolerable to severe or fatal (Birgham 1989) It has been observed in some species that "Many of the usual deviant behaviors last only 1-2 weeks. Therefore, some workers recommend that data should not be considered reliable until after at least 1 week of acclimation to the radio-tag (White and Garrott 1990). In the case of the to male lynx at the CEI the "deviant behaviour" their reluctance to climb trees and utilize them as hunting, resting, viewing platforms, lasted until the collars were removed, one month later. Due to the findings resulting from the Post-collaring ethogram research, the GPS collars were removed and lynx were not released in 2011 as we had missed the ideal time for releasing them.

After deciding that it would not be in the lynx' best interest to release them when the optimum release window had closed, the decision was made to overwinter the Lynx and release in the Spring of **2012.**

LYNX PROJECT 2012 (see attachment).
Extensive research on a new release site was undertaken over winter and a site on private land next to Crown Land on the northern Alberta/B.C. Border was offered and accepted. Trail Cameras were set up and the cameras recorded Lynx, female with cub, over the winter on the site. The Alberta government wolf poisoning programme had occurred there in 2011, so the programme would not be run over that land again for at least 5 years. There were no trap line concessions. The landowner offered the site. (see attachment) Ample prey species were recorded on the site and the area was an undisturbed native ecosystem with good stands of trees, good water sources and mixed riparian and dryland habitat.

A university student from a German University (Eberswald) as part of his Degree undertook a study to evaluate the validity of using Hair-traps to collect rubbed hair from lynx (McDaniel, 2000). His results did not succeed in validating the use of the hair-traps as they did not succeed in obtaining any hair.

A second student from the University of Eberswald, Germany, also as part of her Degree research, undertook the monitoring of the Lynx behaviour from August, 2011 until February 2012. The lynx took a significant time before their behaviour reverted completely to what it was prior to collaring. Although from the time the collars were removed they climbed a tree to remove an aged and desiccated beaver, *Castor Canadensis*, carcass which had been hoisted up to a tree top soon after the collars had been put on them in an attempt to verify if or if not the lynx would freely climb trees wearing collars. Beaver is a primary attractant for lynx.

We collected scat from the lynx for faecal glucocorticosteroid analysis to obtain information on stress hormone levels (See Attached results). It has been demonstrated that high stress levels in animals result in poor decision-making. The scat collection was sent to the Metro Toronto Zoo laboratory for analysis (see attached Budget expenditures) with result that can be viewed on the attached graph.

The research on Lynx at the CEI before the lynx were collared, after the lynx were collared, and after the collars were taken off the lynx provided significant information that will be of benefit should more lynx kittens be brought in to Wildlife Rehabilitation Centres, such as the CEI, which have the facilities to hold them.

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Lynx Release Experiment
Financial Reporting
AWRA 2012

Item	Description	Item cost/unit	No. of Units	Total
1	Wildlife Technician (cost /month)	$2,500.00	3	$7,500.00
2	Per Diem (10.00/day)	$10.00	20	$200.00
3	Gas and Vehicle	$661.00	1	$661.00
4	Lynx Feed	$414.00	1	$414.00
5	Trail Cams	$114.45	2	$228.90
6	Vacum Sealer (for samples)	$125.98	1	$125.98
7	Vet Charges for Collars	$1,582.16	1	$1,582.16
8	Scat Analysis (Fecal Cortisol)	$720.00	1	$720.00
			Total	**$11,432.04**

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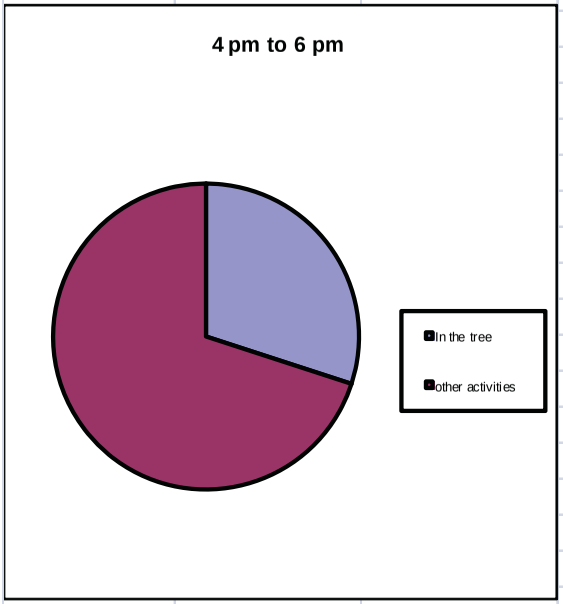
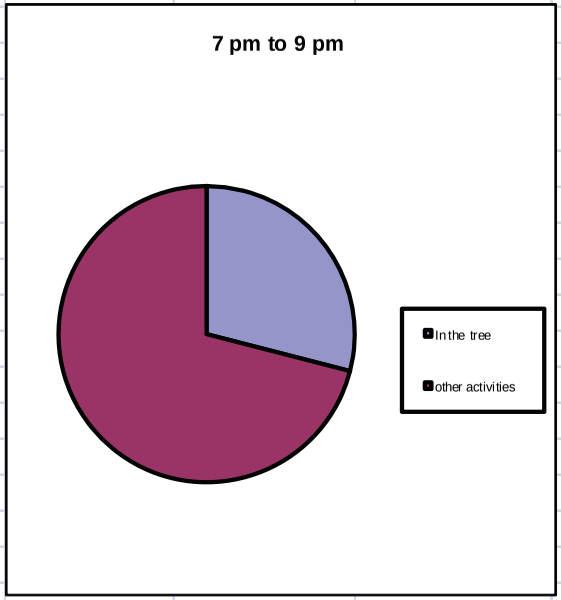
Phone (403) 932-5632 FAX (403) 932-6303
Email cei@nucleus.com Web Page www.ceinst.org

Pre Collaring

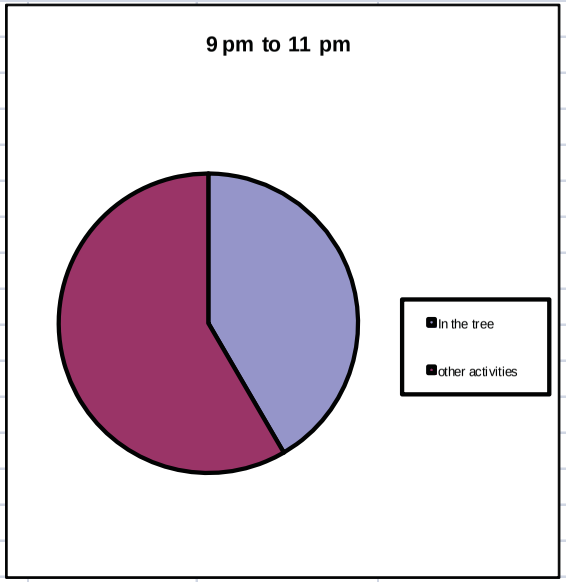
Time	4 pm to 6 pm	
Behavior	In the tree	other activities
Percentage	30.00	70.00
Minutes	40 Min. out of	120 Min.



Time	7 pm to 9 pm	
Behavior	In the tree	other activities
Percentage	29.00	71.00
Minutes	35 Min. out of	120 Min.

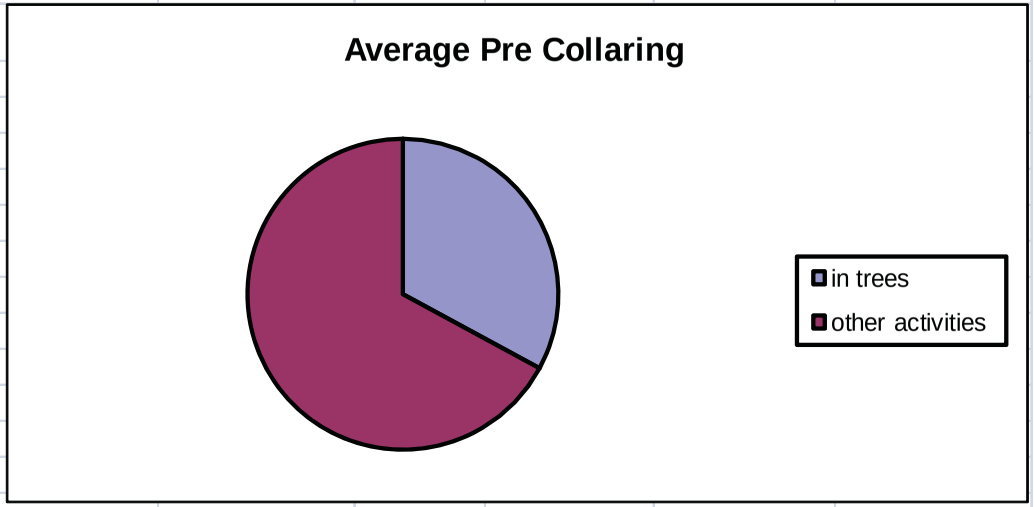


Time	9 pm to 11 pm	
Behavior	In the tree	other activities
Percentage	41.60	58.40
Minutes	50 Min. out of	120 Min.



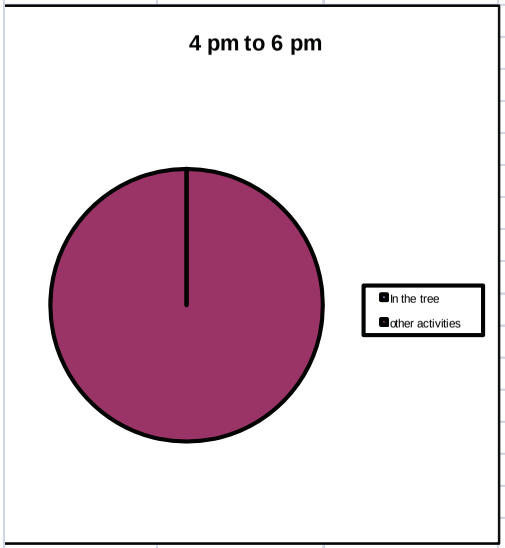
Average spent in trees over 6 hours - PRE COLLARING

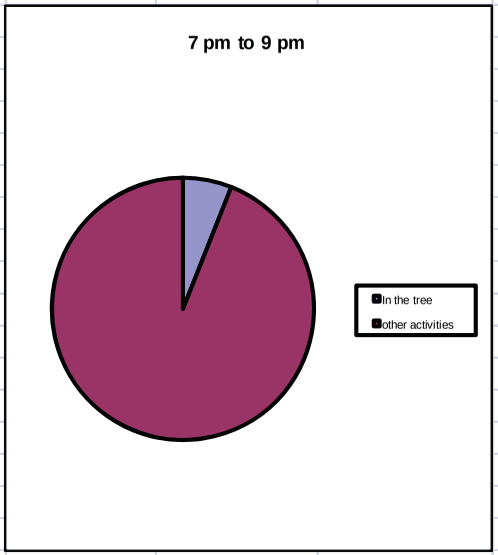
Behavior	in trees	other activities
Percentage	32.89	67.11
Minutes	125 Min out of	380 Min.

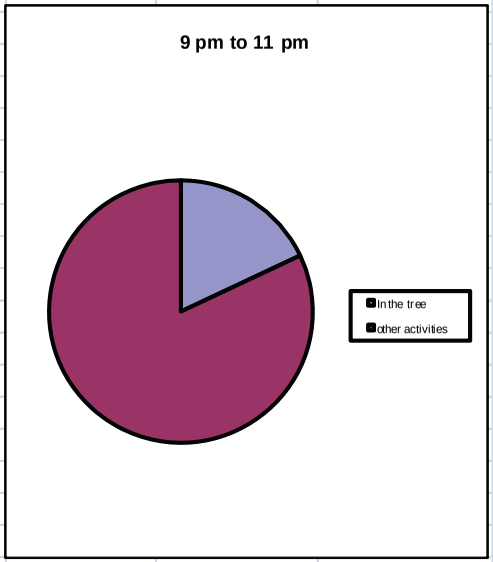


Post Collaring

Time	4 pm to 6 pm		**Time**	7 pm to 9 pm			**Time**	9 pm to 11 pm	
Behavior	In the tree	other activities	**Behavior**	In the tree	other activities		**Behavior**	In the tree	other activities
Percentage	0.00	100.00	**Percentage**	6.00	94.00		**Percentage**	18.00	82.00
Minutes	0 Min. out of	120 Min.	**Minutes**	5 Min. out of	120 Min.		**Minutes**	15 Min. out of	120 Min.





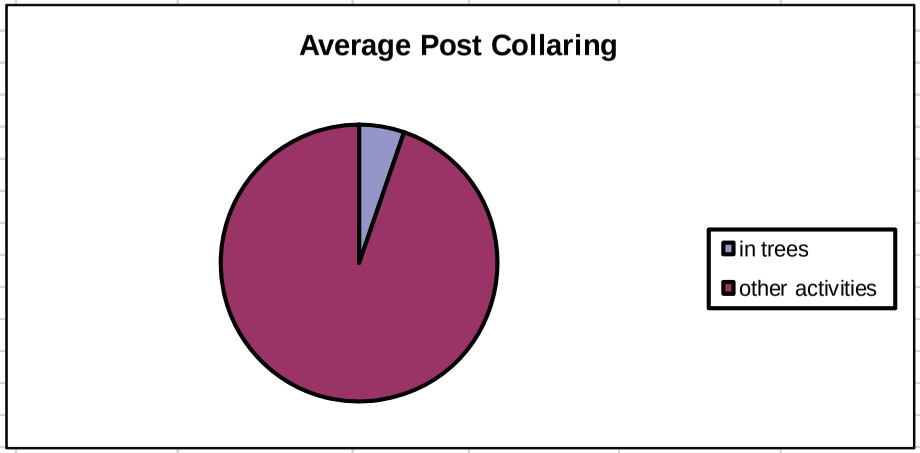


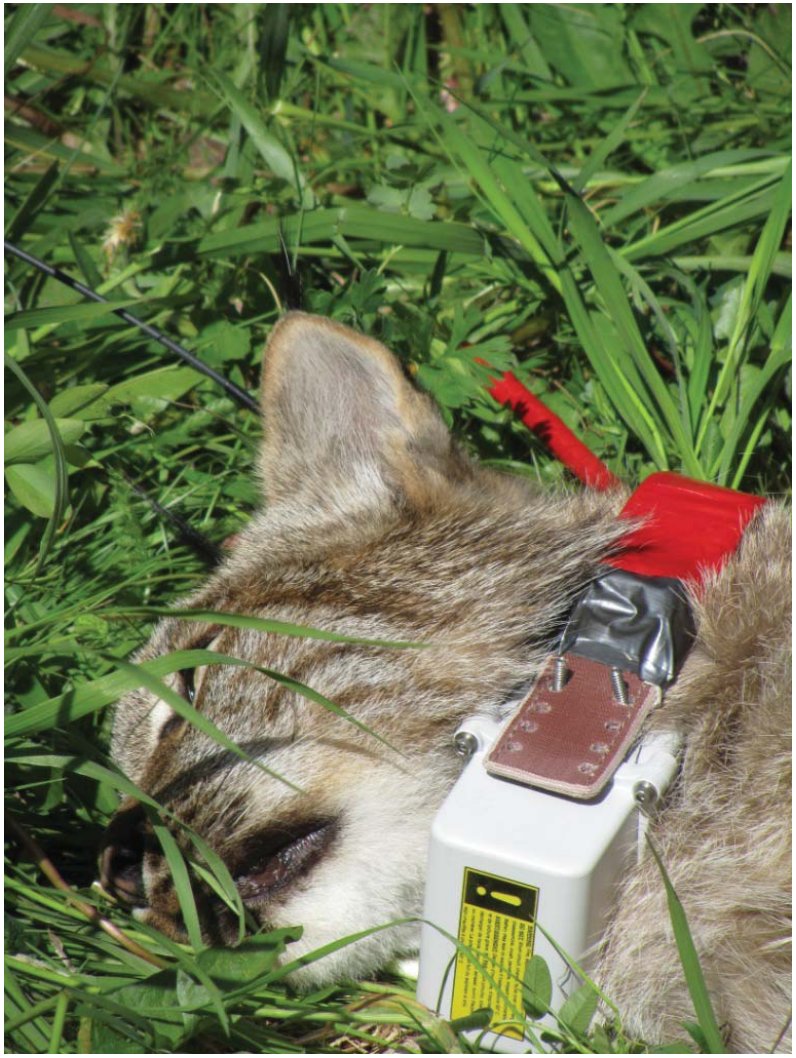
Note: Retrieving Hen

Note: Retrieving Beaver

Average spent in trees over 6 hours - POST COLLARING

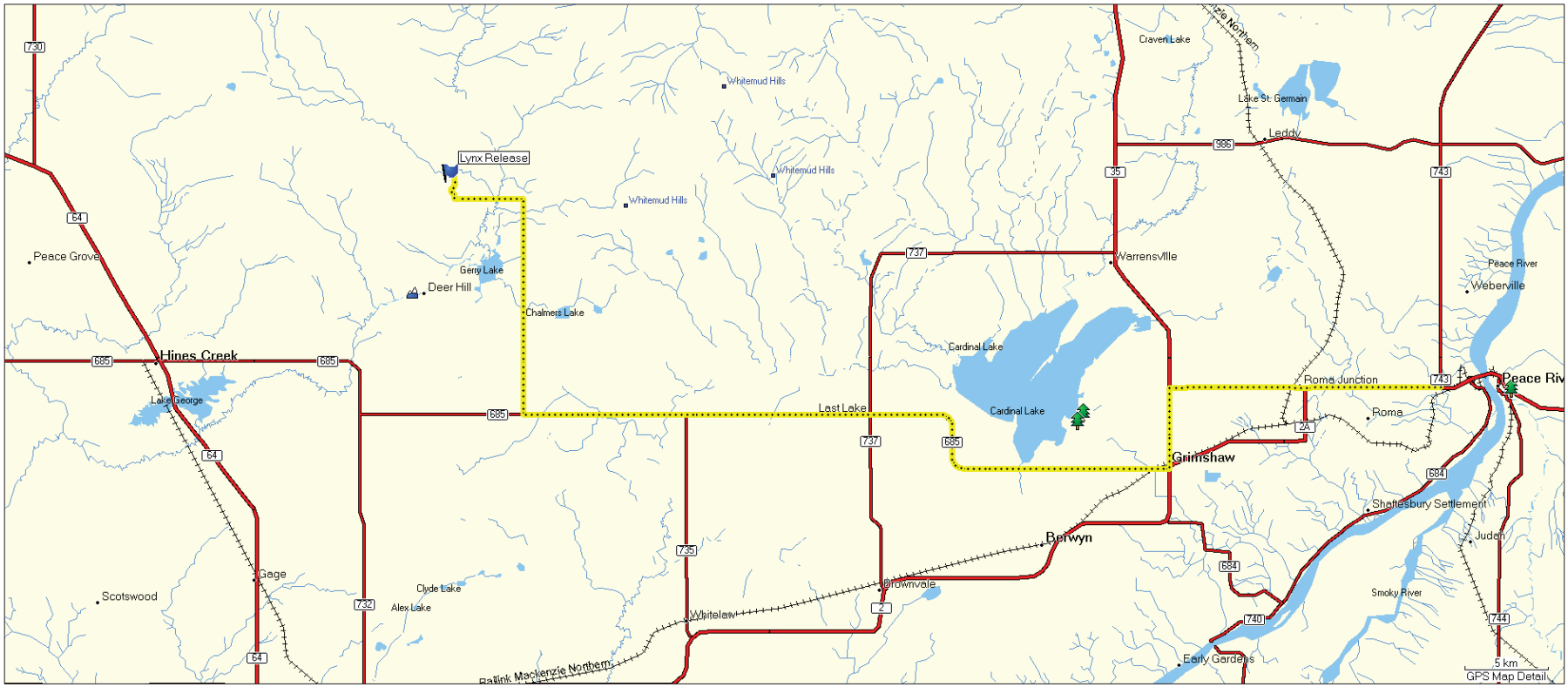
Behavior	in trees	other activities
Percentage	5.26	94.73
Minutes	20 Min out of	380 Min.





Newly Collared Lynx June 30, 2011

Collar removal July 28, 2011



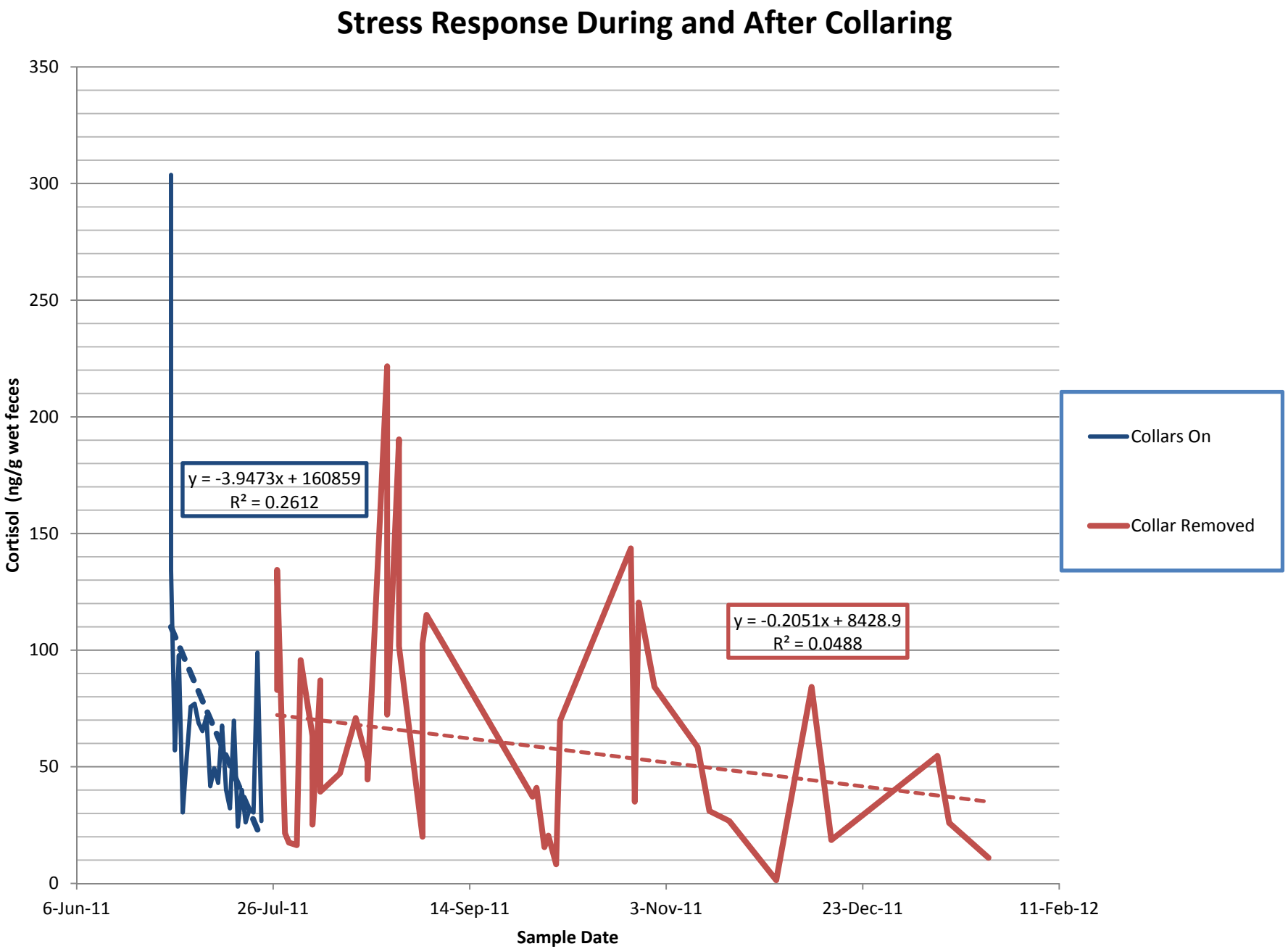
Map of Release Location

Pre-release trapping.

Release Site Transfer to ATV

Lynx Cages At Release Site

Lynx Leaving Cage at Release


Stress Response During and After Collaring
350
300
250
200
150
100
50
0
Cortisol (ng/g wet feces
y = -3.9473x + 160859
R² = 0.2612
y = -0.2051x + 8428.9
R² = 0.0488
Collars On
Collar Removed
6-Jun-11
26-Jul-11
14-Sep-11
3-Nov-11
23-Dec-11
11-Feb-12
Sample Date