

# 2012 Research Season Summary Report

With Contributions by





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## Research Season Objectives

In 2012, the Spirit Bear Research Foundation (SBRF) identified and implemented the following research objectives:

1. *Explore the Potential Change in Grizzly Bear Distribution to Include Island Habitation*-Current BC Ministry of Environment designation suggests that grizzly bears are only found on the mainland of British Columbia; however, local observations by community members suggests that the distribution of grizzly bears may be changing to include islands.
2. *Better Understand the Movement of Grizzly, Black, and Spirit Bears*- As species' with high spatial needs, bears' movements occur on a landscape scale, and vary both temporally and spatially. Assessing seasonal movement within the Territory will lead to a better understanding of this variation. Moreover, quantifying bears common to both Heiltsuk and Kitasoo/Xai'Xais Territory may highlight the necessity for a collaborative coast wide bear monitoring and conservation strategy.
3. *Investigate the Dietary Impacts of Grizzly Bears on Black and Spirit Bears*- The presence of grizzly bears likely impacts the foraging strategies of the less dominant black and Spirit bears. Effects may include a reduction of salmon consumption by black and Spirit bears, which would significantly influence their population dynamics
4. *Long-term Population Monitoring*- Longitudinal population monitoring is necessary to gain an understanding of bear population dynamics and how they may vary over time. The building of a genetic inventory of individuals within the Territory is the first step towards implementing such a program.
5. *Identifying the Location of Grizzly and Spirit Bears for the Ecotourism Program*- The success of ecotourism at Spirit Bear Lodge relies heavily on the accurate accounting and predictable presence of grizzly and Spirit bears. Identification of bear species, sex, and individuals over time and space can direct the guiding operations foci within the Territory, highlighting watersheds that are hotspots for abundance, and/or particularly charismatic bears.

## Sampling Methods

Three different sampling methods were used to investigate SBRF objectives in the 2012 research season; non-invasive hair snags, remote cameras, and Traditional and Local Ecological Knowledge interviews. All were non-invasive and had no impact on bears.

Hair snags were used as a method to collect bear hair around the Territory. The hair collection process began in early May with the building of 34 hair snags in areas where bears were thought to be present, as informed by local experts. Strategically placed sites consisted of a barbed wire fence surrounding a large pile of debris, meant to mimic a kill (Figure 1). Upon completion of site construction, a non-reward bait was poured on the debris pile. Sites were then left and revisited three times; once every 8-12 days. During a revisit, hair was collected from the barbed wire, the state of the site was recorded, and the site was re-baited. These samples were known as "spring samples".

After spring sampling was complete, sites were left over the summer and revisited again in the fall. Samples collected from previously baited spring sites were used as a proxy for summer presence and referred to as "summer samples". In an effort to detect grizzly bears, the above sampling protocol was implemented again in the





fall with a focus on islands. Across spring, summer, and fall sampling seasons, hair snags were placed in a total of 36 drainages, and yielded over 1200 bear hair samples. These samples were sent to Wildlife Genetics International where they used DNA-based laboratory methods to identify individuality, sex, and species of the bear.



**Figure 1.** Remote camera image of grizzly bear in hair snag site on June 6, 2012.

Remote cameras were also deployed across the Territory to monitor bear presence/absence and temporal variation in resource use. Remote cameras record data by capturing images or videos at specific time intervals or when infrared triggers are detected (Figure 1). In the 2012 research season, 44 cameras were placed around Kitasoo/Xai'Xais Territory, including at many of the hair snag sites described above. During the 5 months they were active in the Territory, cameras were continually relocated to new areas or drainages in order to better capture the spatial distribution of bear populations. Thousands of images and videos were collected over this time period, and subsequently reviewed for presence/absence of grizzly, black, and Spirit bears. A full report on the conclusions of this data is forthcoming from Phil Charles of the University of Cumbria.

In addition to field based methods, the 2012 SBRF research program included interviews with members of the Kitasoo/Xai'Xais and Heiltsuk communities about their experiences with grizzly bears on islands. This involved the recording of Traditional Ecological Knowledge (TEK) and Local Ecological Knowledge (LEK). In this context, TEK refers to the knowledge acquired by First Nations people over thousands of years through intimate contact with their natural surroundings, and passed on from one generation to another. During the TEK interviews conducted, interviewees were asked questions regarding historical grizzly bear distributions, such as whether or not there were any traditional stories of grizzly bears existing on islands. Similar to TEK, LEK refers to the evolving and ground-truthed knowledge of community members that are active in the Territory of interest. Some interviewees



in this context were not members of the Kitasoo/Xai'Xais or Heiltsuk communities but were scientists or mariners active in the Territories for many years. During the LEK interviews, interviewees were asked to describe in detail sightings of grizzly bears on islands. Members of the communities were chosen for the TEK and LEK interviews through a 'snowball' referral strategy, whereby every interviewee was asked to refer a potential interview candidate who they thought would be knowledgeable about bears in the Territory. Initial interview candidates were selected based on recommendations from the nations' Resource Stewardship Council. Upon completion of the interviews, the number of grizzly bear sightings on each island was summed and analyzed on a temporal scale. As promised, the results of this study will be shared with interested interviewees.

Data sharing protocols are in place between the Kitasoo/Xai'Xais Nation and Raincoast Conservation Foundation. These protocols include no-harm clauses that ensure research done in the Territory will not harm the band or its members in anyway. In accordance with these protocols, data from the 2012 research season will be shared with the Nation's Resource Stewardship Council.

## Hair Snag Sampling Sites

A total of 36 hair snag sites were set up in both mainland and island systems. Islands with sites in Kitasoo/Xai'Xais Territory included:

- Princess Royal
- Swindle
- Roderick
- Pooley
- Price

A total of 22 island sites were sampled across spring, summer and fall seasons (Table 1). Additionally, there were 14 mainland sites that were sampled in the spring and summer (Table 2).

**Table 1.** Number of grizzly, black, and Spirit bears detected per season at each **Island** hair snag site

Site Name	Site Number	Season	Grizzly Bears Detected	Black Bears Detected	Spirit Bears Detected
	1	Spring		0	
		Summer		2	
	2	Spring		1	
		Summer		4	
	3	Spring		1	
	4	Spring		0	
		Summer		2	
		Fall		1	
	5	Spring		1	
		Summer		1	
	6	Spring		2	
		Summer		2	
	7	Spring		0	
		Summer		0	
	8	Spring		0	
		Summer		0	
		Fall		0	



	9	Spring Summer Fall		1 0 1	
	14	Spring Summer		0 1	
	15	Spring Summer		5 2	
	16	Spring Summer Fall		0 2 5	
	17	Spring Summer Fall		0 2 2	
	18	Spring Summer		0 1	
	26	Spring Summer Fall		0 1 0	
	30	Spring Summer		0 1	
	31	Fall		0	
	32	Fall		2	
	33	Fall		4	
	34	Fall		2	
	35	Fall		0	
	36	Summer		1	

\*Many bears were detected in multiple seasons meaning the numbers in this table do not reflect the total number of individuals detected.

\*\*Samples collected at Chapel (Site 36) were opportunistic (i.e. not from a hair snag).

**Table 2.** Number of grizzly, black, and Spirit bears detected per season at each **Mainland** hair snag site

Site Name	Site Number	Season	Grizzly Bears Detected	Black Bears Detected	Spirit Bears Detected
	10	Spring Summer		2 1	
	11	Spring Summer		0 2	
	12	Spring Summer		0 1	
	13	Spring Summer		0 1	
	19	Spring Summer		1 2	
	20	Spring Summer		0 1	
	21	Spring Summer		2 1	



	22	Spring Summer		1 0	
	23	Spring Summer		4 3	
	24	Spring Summer		0 10	
	25	Spring Summer		0 0	
	27	Spring Summer		3 0	
	28	Spring Summer		3 2	
	29	Unknown		0	

\*Many bears were detected in multiple seasons meaning the numbers in this table do not reflect the total number of individuals detected.

\*\*Samples collected at Culpepper Cabin (Site 29) were opportunistic (i.e. not from a hair snag).

## Results

The hair snag sites yielded 1251 bear hair samples during the field season. Of these 1251 samples, 418 were eligible for DNA extraction based on subsampling rules that optimize the probability of detecting new individuals and minimizing costs. The success of DNA amplification, which allows individuals to be identified, varied seasonally. The spring, summer, and fall samples had a success rate of 78%, 51%, and 71%, respectively. The low success rate of summer samples is attributed to the extended period of time that the samples were left in the field (up to 132 nights), which likely increased the degradation of genetic material. Despite this low laboratory success rate, the summer samples allowed for 90 detections, as shown in Tables 1 and 2. Overall, the 2012 field season samples identified 108 individuals, of which 74% (n=80) were black bears and 26% (n=28) were grizzly bears. The resultant genetic inventory can be found below in Table 3.

As expected, we found that mainland and island sites differed markedly in the proportion of species detected. For example, 43 black bears were detected at island sites, compared to 37 at mainland sites (Figure 2). Furthermore, Spirit bears were only detected at island sites, as illustrated in Table 1 and 2. Comparatively, the opposite spatial trend was found with grizzly bears; 18 more individuals were detected on the mainland than on islands (Figure 2).

**Table 3.** Inventory of individuals genetically detected in Kitasoo/Xai'Xais Territory during the spring, summer and fall of 2012.

Individual	Sex	Species	Site Detected	Season
10992	M	GB		Spring
13783	M	BB		Summer
13991	M	BB		Summer
10598	M	BB		Spring
13772	M	BB		Summer
13834	F	BB		Summer
13870	F	BB		Summer



<b>13905</b>	M	BB		Summer
<b>10592</b>	M	BB		Spring Summer
<b>10822</b>	M	GB		Spring Unknown
<b>13821</b>	F	BB		Summer
<b>13828</b>	F	GB		Summer Fall
<b>14837</b>	F	BB		Summer Fall
<b>10792</b>	M	BB		Spring Fall
<b>10320</b>	M	BB		Spring
<b>10342</b>	M	BB		Summer
<b>10820</b>	M	BB		Spring Summer
<b>13880</b>	F	BB		Summer
<b>10822</b>	M	GB		Spring
<b>10367</b>	M	SB		Summer
<b>10370</b>	M	SB		Summer
<b>10767</b>	M	BB		Spring
<b>14651</b>	F	BB		Fall
<b>10607</b>	M	BB		Spring
<b>10862</b>	M	BB		Spring
<b>14983</b>	M	BB		Summer
<b>10665</b>	M	GB		Spring
<b>10667</b>	F	GB		Spring
<b>10846</b>	F	GB		Spring
<b>10680</b>	F	GB		Spring
<b>14835</b>	M	BB		Summer
<b>14975</b>	M	BB		Summer
<b>10981</b>	M	GB		Spring Unknown
<b>10640</b>	M	GB		Spring
<b>14642</b>	F	GB		Summer
<b>14701</b>	F	GB		Summer
<b>14706</b>	M	BB		Summer
<b>10663</b>	M	GB		Spring
<b>10466</b>	F	GB		Spring
<b>10853</b>	M	GB		Spring
<b>13974</b>	M	BB		Summer
<b>13501</b>	F	BB		Summer
<b>10429</b>	M	BB		Spring Summer
<b>10622</b>	M	BB		Spring

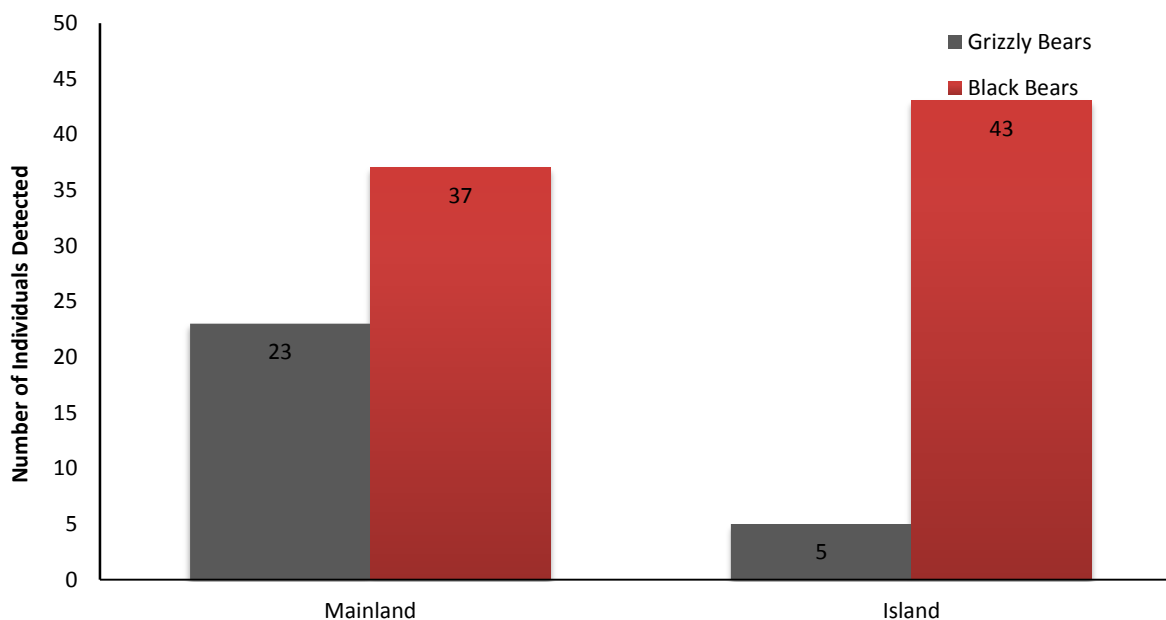




				Fall
10646	F	BB		Spring
10913	M	BB		Spring
10915	M	BB		Spring Summer Fall
10936	F	BB		Spring Summer
13907	M	BB		Summer
13716	F	BB		Fall
13723	F	BB		Fall
14968	M	BB		Fall
13746	M	BB		Fall
10727	M	SB		Summer Summer Fall
13753	M	BB		Summer Fall
13741	M	BB		Summer
10718	M	BB		Spring Summer
13799	M	BB		Summer
10303	M	GB		Spring Spring
10786	M	GB		Spring Unknown Spring
10911	F	GB		Spring
13695	F	GB		Summer
13697	F	GB		Summer
13708	F	GB		Summer Summer
13709	F	GB		Summer
13718	F	GB		Summer
13727	M	BB		Summer
13732	F	GB		Summer
10585	F	BB		Spring
10695	M	BB		Spring
13818	M	GB		Summer
13960	M	BB		Summer
10484	M	BB		Spring
149691	M	GB		Spring Unknown
10352	M	BB		Summer
10602	F	BB		Spring

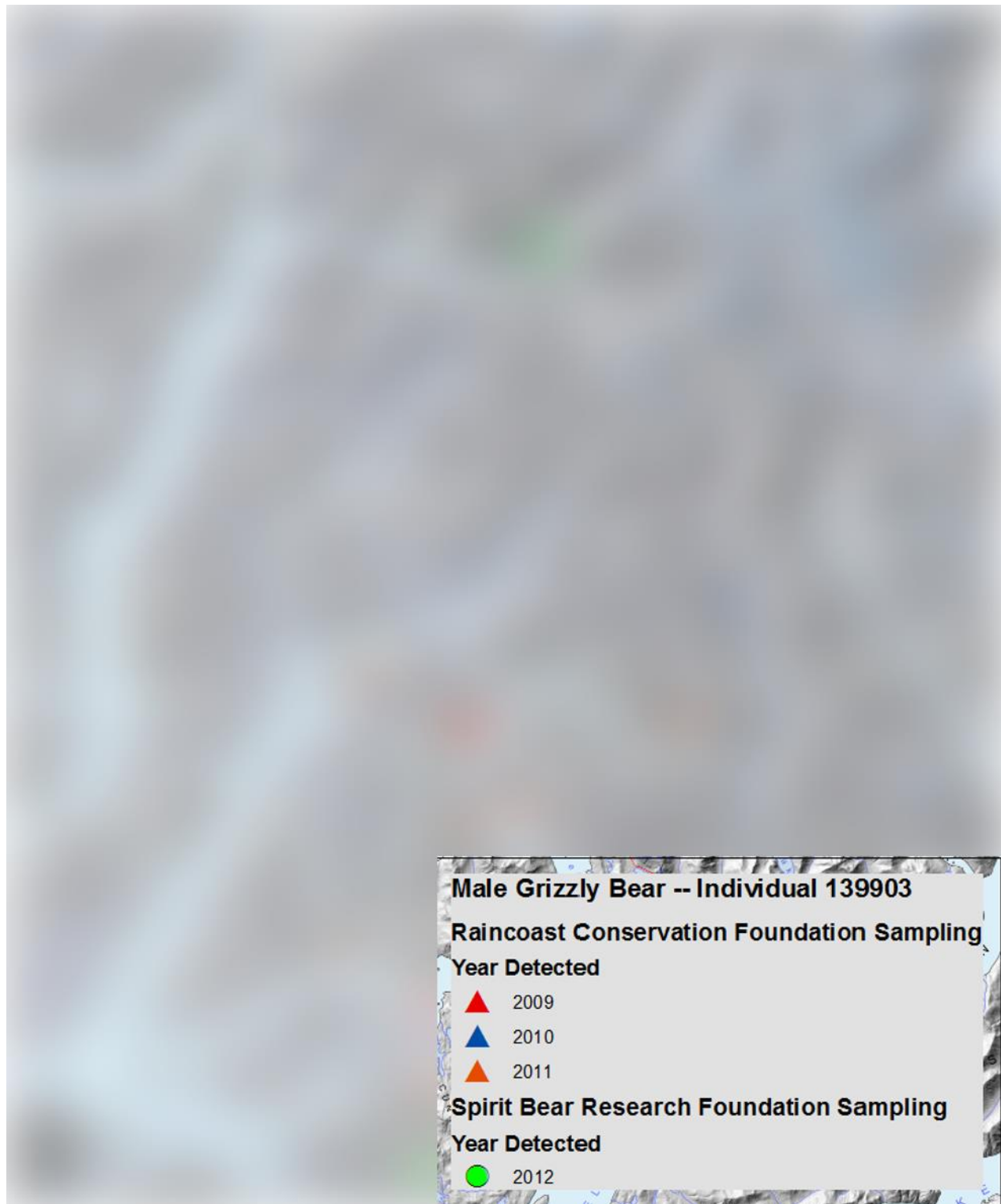


<b>10603</b>	M	BB		Spring
<b>10635</b>	F	BB		Spring
<b>10885</b>	M	BB		Spring
<b>13825</b>	M	BB		Summer
<b>13945</b>	M	BB		Summer
<b>10332</b>	M	BB		Summer
<b>10334</b>	M	BB		Summer
<b>10379</b>	M	BB		Summer
<b>10386</b>	M	BB		Summer
<b>10435</b>	M	BB		Summer
<b>10738</b>	M	BB		Summer
<b>10740</b>	M	BB		Summer
<b>10742</b>	M	BB		Summer
<b>10744</b>	M	BB		Summer
<b>10758</b>	M	BB		Summer
<b>10567</b>	M	GB		Spring
<b>13482</b>	M	BB		Summer
<b>10714</b>	M	BB		Spring
<b>10526</b>	M	BB		Spring Spring
<b>10660</b>	M	BB		Spring Spring
<b>10533</b>	M	BB		Spring
<b>14634</b>	F	BB		Summer
<b>14827</b>	F	BB		Summer
<b>139903</b>	M	GB		Unknown
<b>13995</b>	M	BB		Summer
<b>14635</b>	M	BB		Fall
<b>13679</b>	F	BB		Fall
<b>13685</b>	M	BB		Fall
<b>14940</b>	M	BB		Fall
<b>14840</b>	M	BB		Fall
<b>14844</b>	F	BB		Fall
<b>14742</b>	M	BB		Summer

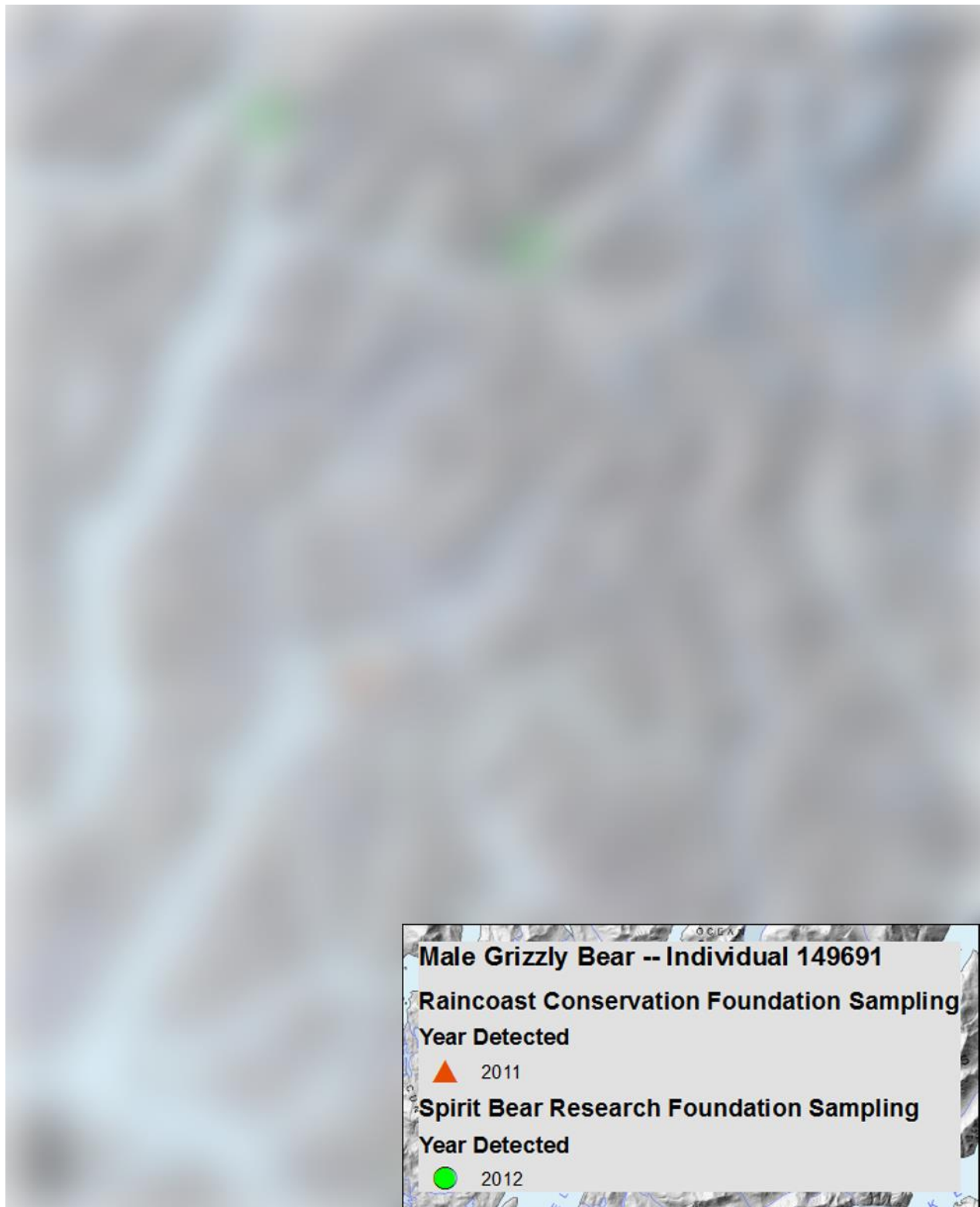


**Figure 2.** Number of individual black and grizzly bears detected on mainland and island sites in Kitasoo/Xai'Xais Territory

The 2012 research season yielded preliminary results regarding the landscape scale movement of bears. The movement of coastal bears spatially was analyzed by comparing bears detected in Kitasoo/Xai'Xais with those detected by Raincoast Conservation Foundation in Heiltsuk Territory. Two male grizzly bears were detected in the SBRF's sampling season that have been previously detected in Heiltsuk Territory (see Figure 3 and 4). The large range that these bears use, which overlaps two traditional First Nations Territories, demonstrates that a collaborative approach would assist conservation planning at a landscape scale that is most appropriate for bears. Evidence of spatial and temporal variation in coastal bear movement within Kitasoo/Xai'Xais Territory is illustrated in Table 3. For example, one male black bear (10915) was detected at a different site each season.



**Figure 3.** Multi-year detection of male grizzly bear #139903 across SBRF and Raincoast Conservation Foundation monitoring programs (2009-2012).



**Figure 4.** Multi-year detection of male grizzly bear #149691 across SBRF and Raincoast Conservation Foundation monitoring programs (2011-2012).



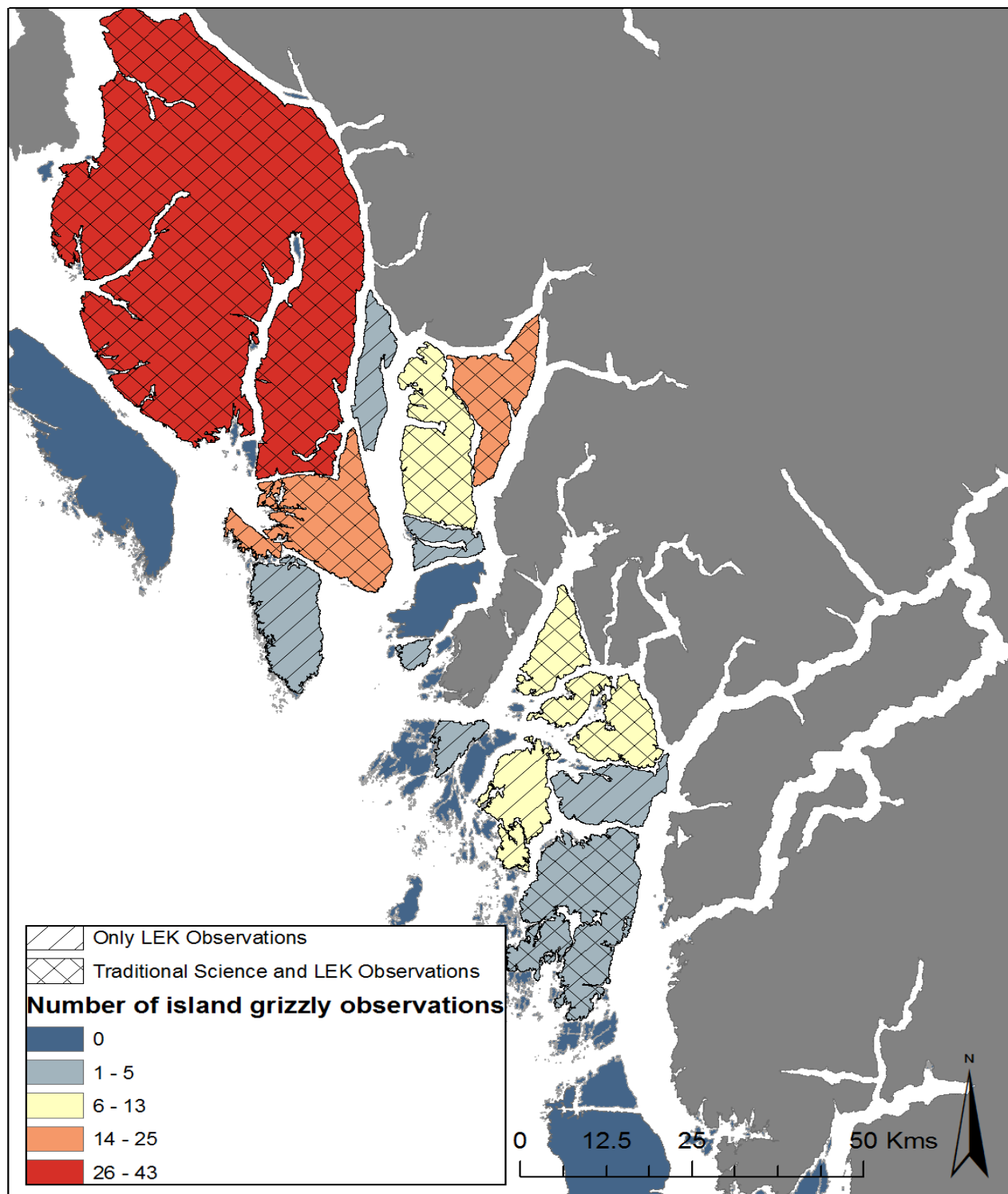


The evidence for island occupancy by grizzly bears was apparent with the genetic, LEK, and remote camera data collected in the 2012 research season. As shown in Table 4, all but two sampled islands in Kitasoo/Xai'Xais Territory (Aristazabal and Dowager) showed evidence of grizzly bear occupation. The frequency of detection of grizzly bears on islands varied spatially. Princess Royal had the most evidence for occupancy with 0.0287 remote camera observations per trap night, 0.0044 hair snag observations per trap night, and 14 LEK observations of grizzly bears. Resulting from limitations in time, finances, and human resources, we could only sample a certain number of sites. Accordingly, half the islands referred to in Table 4 lack genetic and remote camera evidence. Despite this absence of conventional scientific evidence, LEK sightings suggest the presence of grizzly bears on these islands (Figure 5).

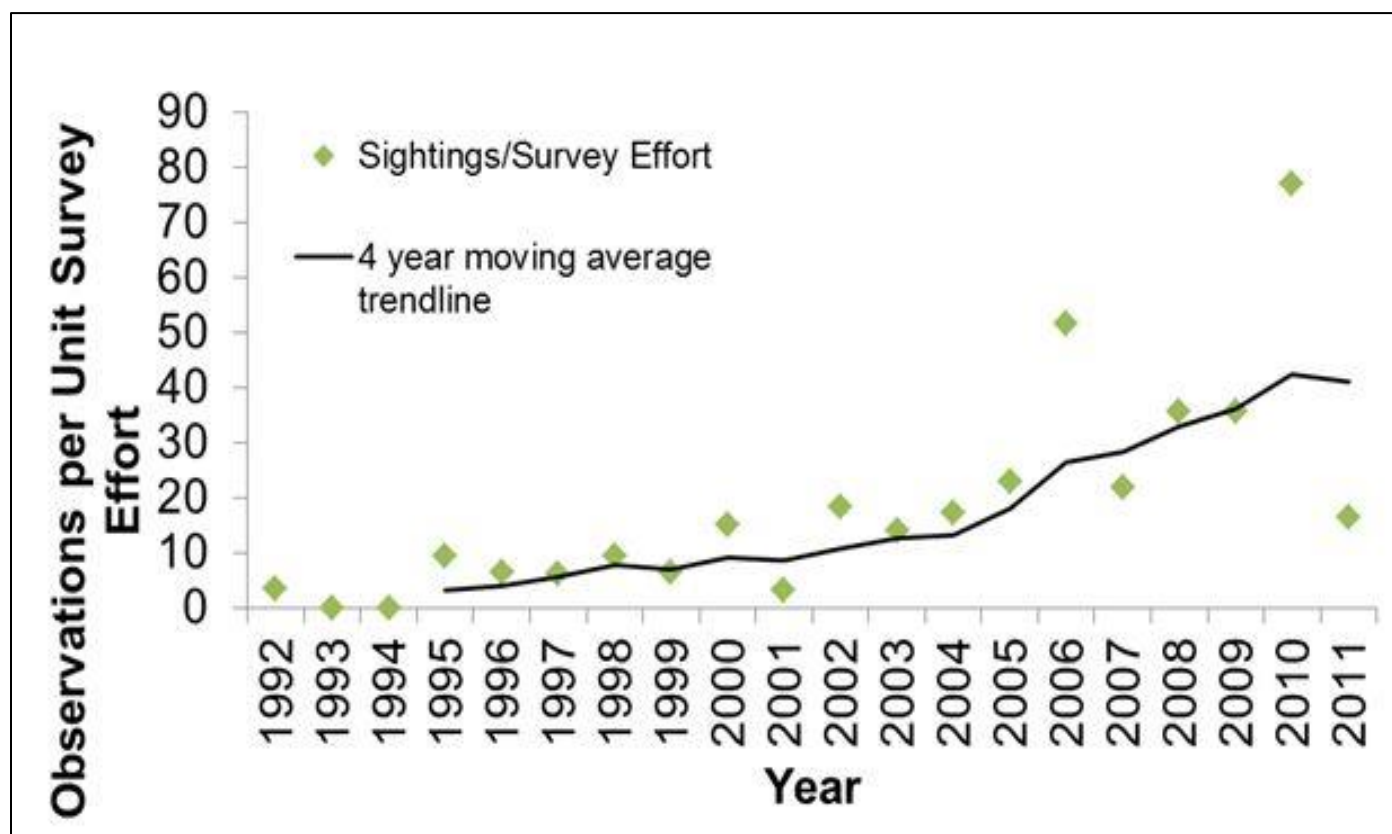
LEK interviews revealed an increasing temporal trend of grizzly bear occupancy on islands (Figure 6). These observations were normalized for sampling effort, and show trends between 1992- 2011.

**Table 4.** Genetic, TEK/LEK, and remote camera evidence of grizzly bears inhabiting islands in Kitasoo/Xai'Xais Territory.

	Pooley	Price	Princess Royal	Roderick	Sarah	Susan	Swindle	Lady Douglas
<b>Remote camera present</b>	Y	Y	Y	Y	N	N	Y	N
<b>Number of remote camera observations</b>	6	0	19	1	-	-	1	-
<b>Number of remote camera observations per trap night</b>	0.0168	0	0.0287	0.0052	-	-	0.0286	-
<b>Hair snag present</b>	Y	Y	Y	Y	N	N	Y	N
<b>Number of hair snag sites with detection</b>	1	0	2	0	-	-	1	-
<b>Hair snag observations per trap night</b>	0.0024	0	0.0044	0	-	-	0.0083	-
<b>BC Ministry of Environment Observation</b>	1	0	1	1	0	0	0	-
<b>LEK observations</b>	15	1	14	12	3	2	22	1



**Figure 5.** Total number of genetic, remote camera and TEK/LEK observations of grizzly bears on islands in Kitasoo/Xai'Xais and Heiltsuk Territory, with hash lines indicating presence of TEK and/or LEK observations.



**Figure 6.** Number of LEK grizzly bear observations on islands between 1992- 2011.

The consumption of salmon by each individual bear detected during spring sampling (17 grizzly and 26 black) was documented through the use of stable isotope analysis (SIA). SIA provides estimates of how salmon consumption (as a proportion of yearly diet) fluctuates with variable salmon returns, and how salmon consumption may vary for competitively sub-dominant black and Spirit bears in the presence of grizzly bears. Data collected this 2012 research season marks the beginning of SBRF's investigation into how the changing distribution of grizzly bears could affect populations of black and Spirit bears in the Territory. Analysis of this data, combined with SIA data from longitudinal bear monitoring in Heiltsuk Territory, will commence in fall 2014.

## Community Involvement

A community feast was hosted by SBRF in the fall of 2012 to introduce community members to SBRF's objectives and general purpose. Over 250 community members were in attendance at the event where researchers and Resource Stewardship Council members presented on the current research being undertaken in the Territory and its relevance to the community.

Current research objectives and methods were briefly presented by SBRF researchers at the Resource Stewardship Council meeting in July, 2012.

Interviews with community members also served as an exemplary method to engage community members with research. Most importantly, this approach honored community members who have been collecting knowledge on



bears in the Territories for far longer than the SBRF monitoring program has been in place. A total of 11 community members were interviewed, 4 for LEK and 7 for TEK.

Throughout the 2012 research season, SBRF employed nine different Klemtu community members as field technicians and skippers, totaling approximately 152 days of employment. The training associated with the SBRF program offered employees a new suite of biological technician skills that may enhance employability in the future. These skills included proficiency in the recording of accurate data, sterile sampling procedures, remote camera deployment, and non-invasive research methods. SBRF aims to provide meaningful conservation based employment which not only gives community members a chance to spend time in their Territory, but provides the opportunity for researchers to learn from their Kitasoo/Xai'Xais colleagues.

## **2013 Season**

In the 2013 research season SBRF will continue to employ remote camera and hair snag methods across approximately 30 watersheds in Kitasoo/Xai'Xais Territory. With a similar design as 2012, sampled locations will represent island and mainland sites. Spring sampling is planned to start ~May 10<sup>th</sup> and finish June 20<sup>th</sup>. As was done in the 2012 field season, un-baited hair snags will be left up for the summer season, then resampled and deconstructed in the fall season. Remote cameras will once again be paired with hair snag sites during the spring, and relocated to select watersheds with several cameras per watershed for the summer and fall seasons.

## **Acknowledgements**

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