

# Anthropogenic Landscapes & Historical Ecology in the Skeena Watershed

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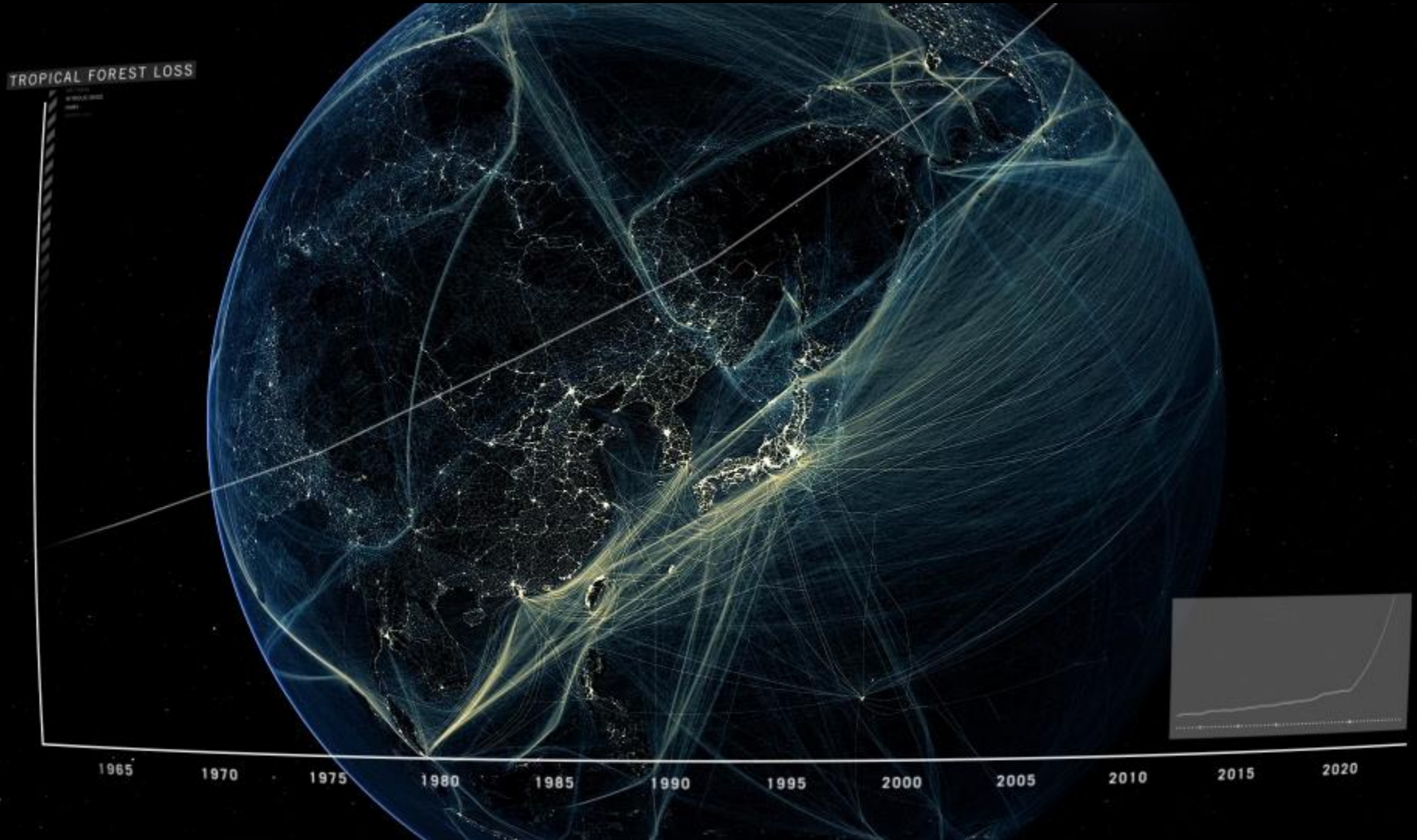
# Skeena Watershed



ONLY ONE  
LOAD TRUCK  
ON BRIDGE  
AT ONE TIME



# The Anthropocene







# 3,500+ Years of Land Use

Science

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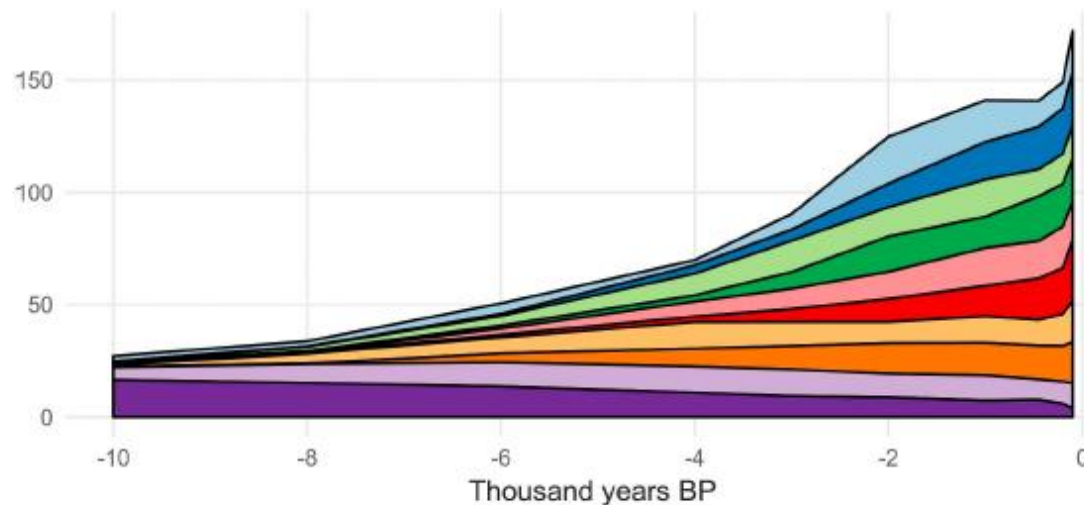


## Archaeological assessment reveals Earth's early transformation through land use

Lucas Stephens, Dorian Fuller, Nicole Boivin, Torben Rick, Nicolas Gauthier, Andrea Kay, Ben Marwick, Chelsey Geralda Ar...

♦ See all authors and affiliations

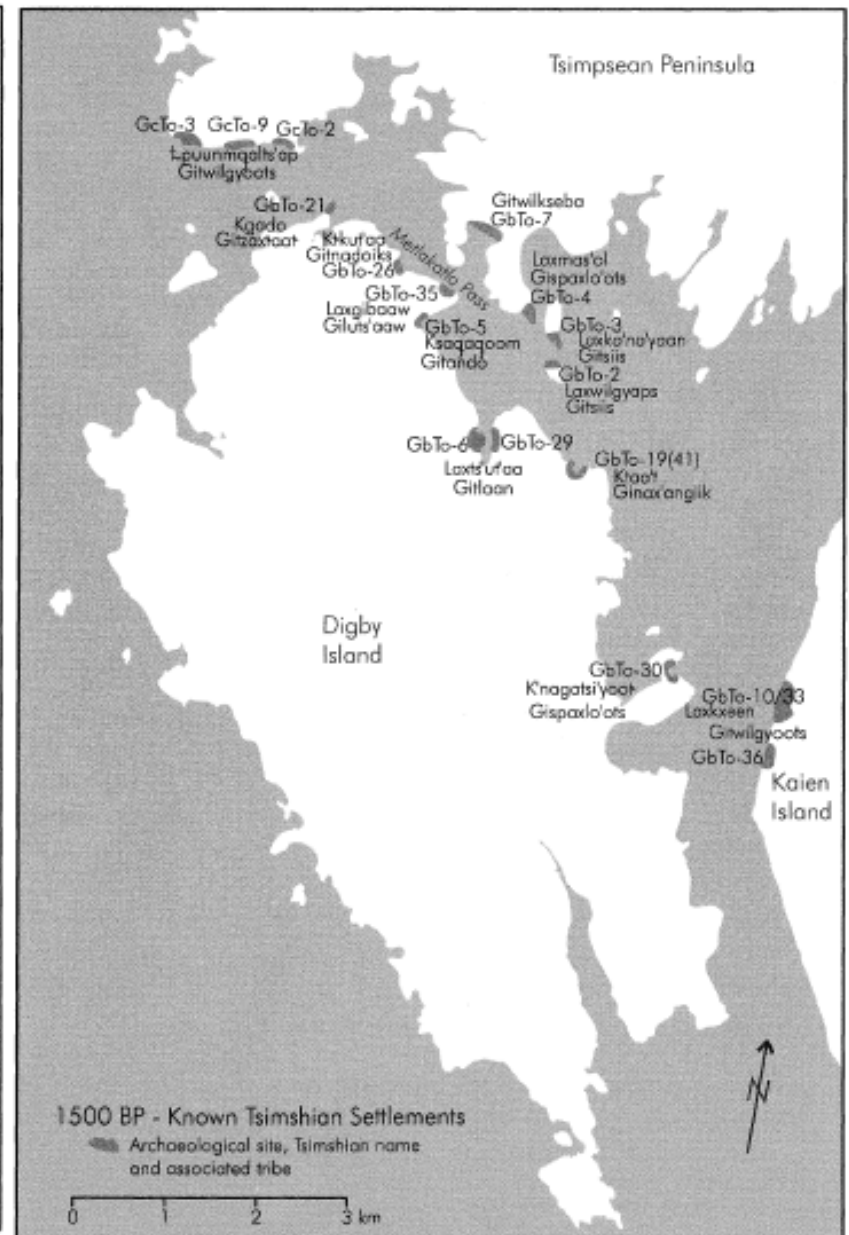
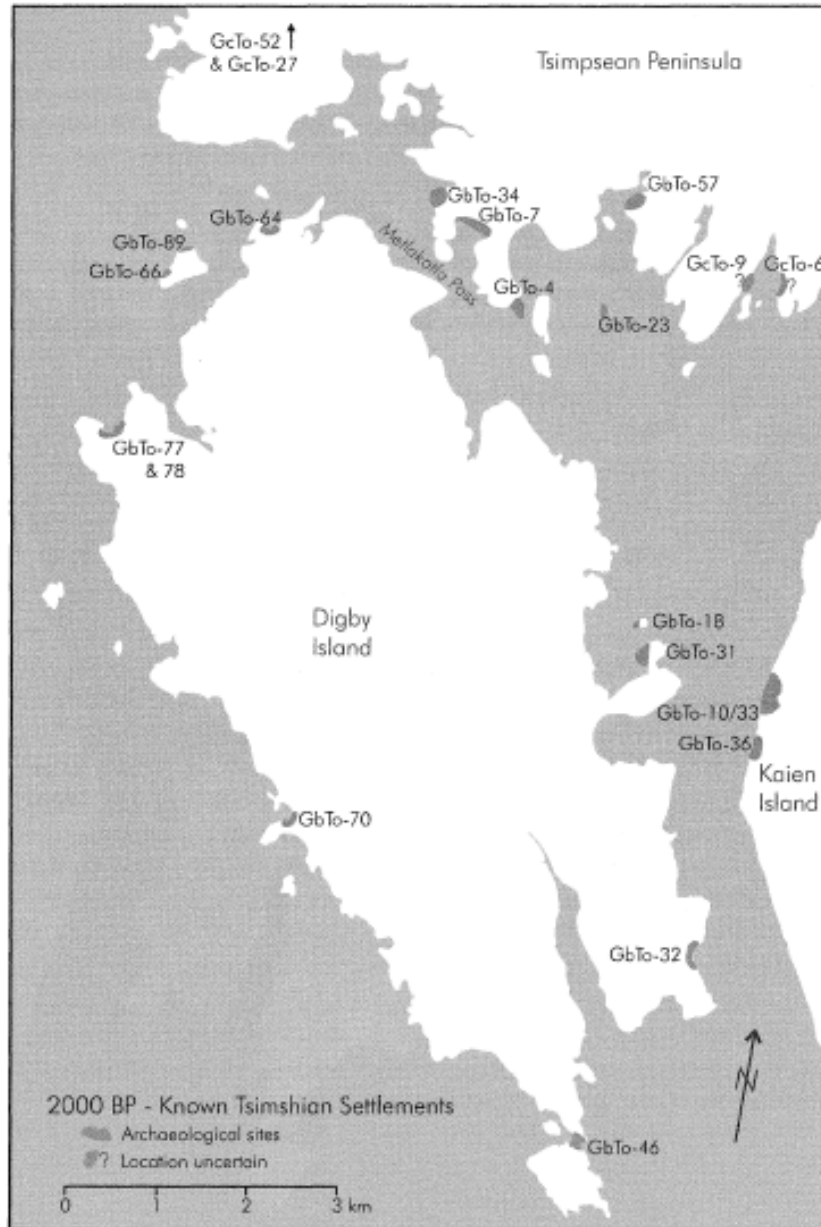
Percent of all regions



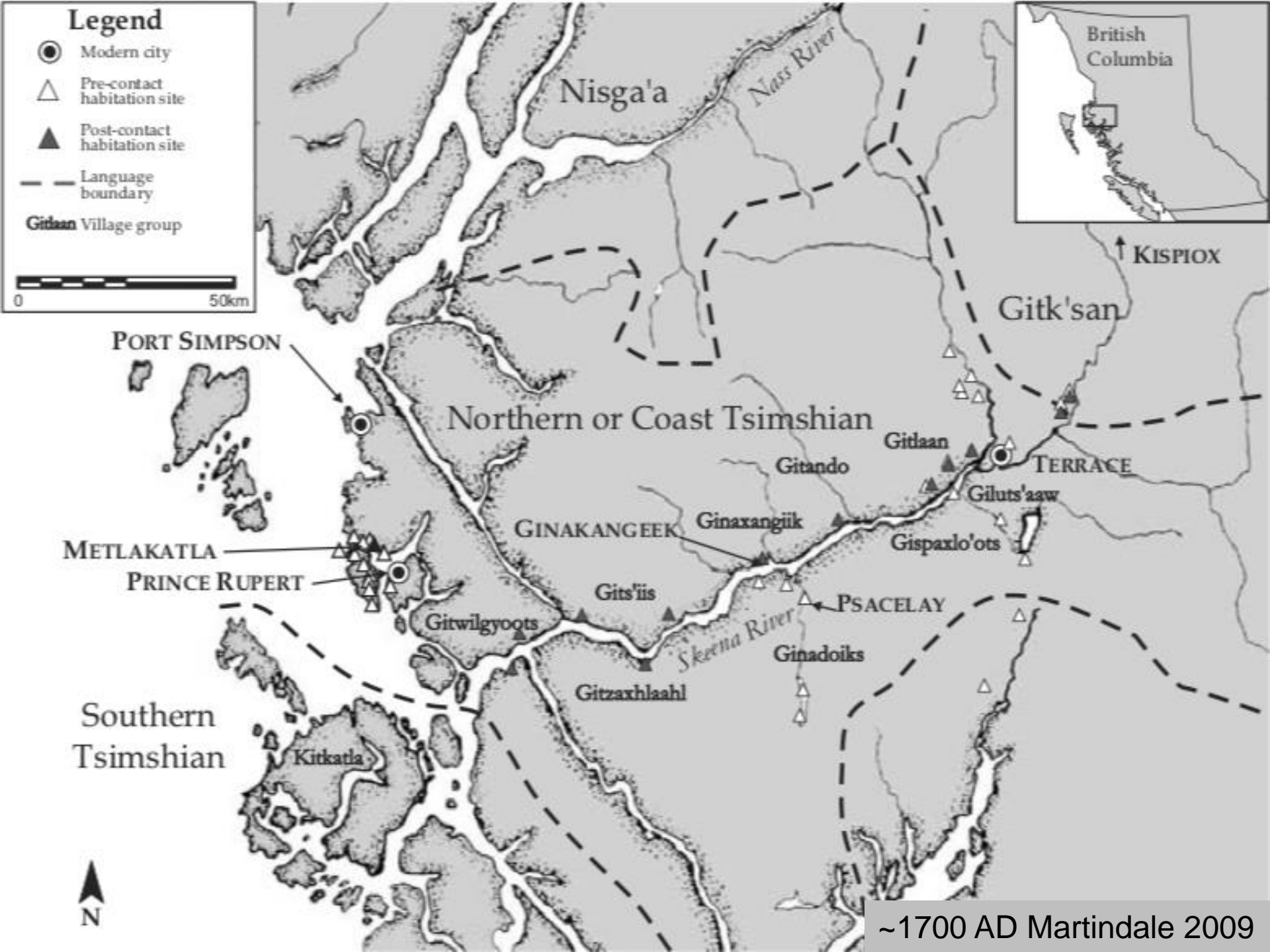
# Húyat, Heiltsuk Territory



# Tsm'syen villages 1,500 / 2000 ya









# Today

- Documenting ancient and ongoing land-use patterns in Skeena Watershed
- Untangling social-ecological dynamics
  - Plant translocations (species)
  - Enhancement of novel ecosystems, resource management (niche space/landscape)
- = complex biophysical and cultural interactions over 1000s of years
- “Positive” vs. “Negative” impacts



# Acknowledge and Thanks



Christina Stanley



Nancy Turner



Richard Wright



Tony Mclean



Dana Lepofsky



Morgan Ritchie



Dawn Charlie



Spencer Greening



Leslie Main Johnson



# Translocations





# Hazelnut (*Corylus cornuta*, Betulaceae)





# Hazelnut (*Corylus cornuta*, Betulaceae)

*“Around our home yeah, you take hazelnut ...just plant them so that they’re all together...that was my job in the spring. So when you go out to harvest them in the fall, they’re all in one spot...more like we do with apples.... You know, you transplant them.”*

**Marion Wal’ceck<sup>w</sup>u Dixon  
(Nlaka’pamux)**



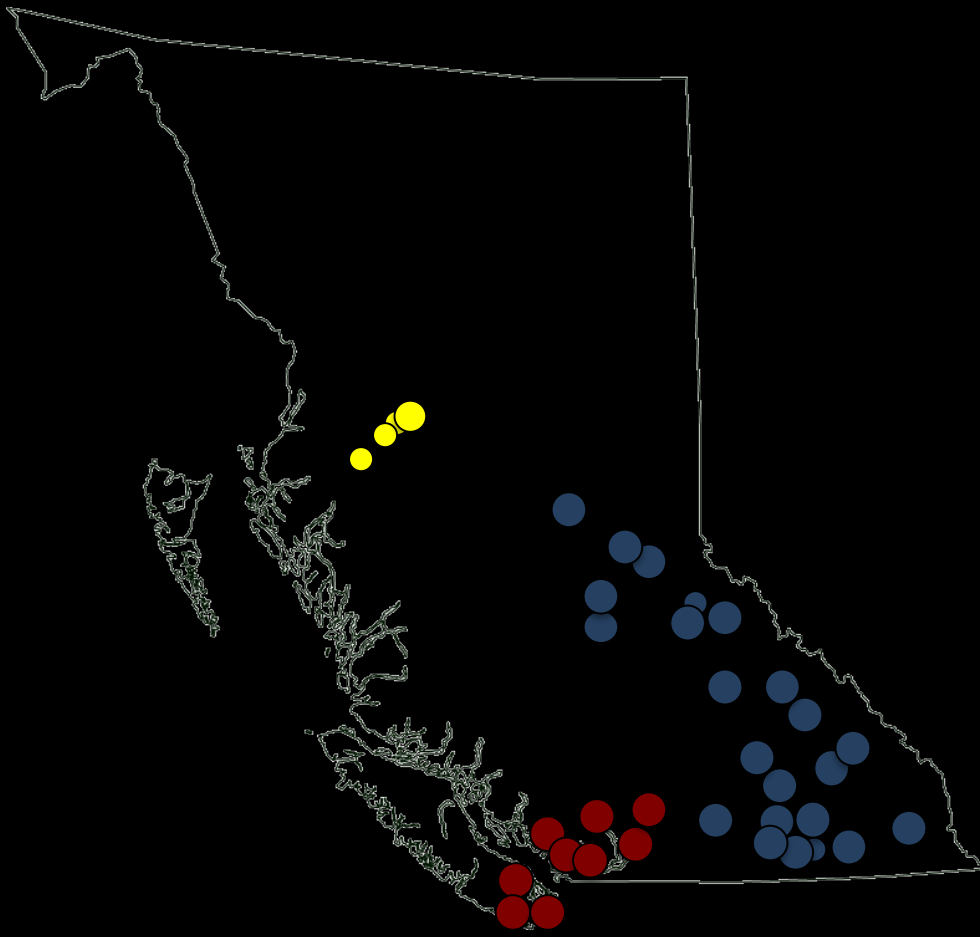
Marion in the Coquihalla, 1939

# Modern Hazelnut Distribution

● Southern variety (*Corylus cornuta* var. *californica*)

● Interior variety (*Corylus cornuta* var. *cornuta*)

● Disjunct



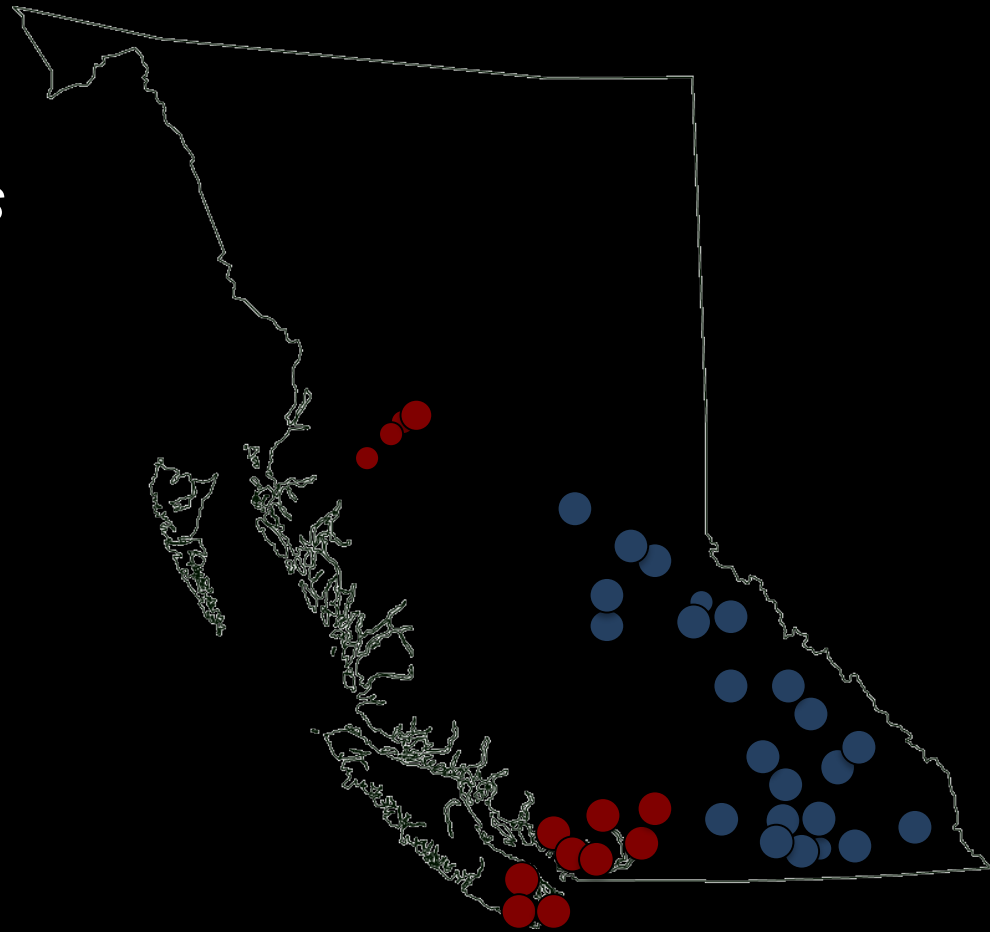


# Hazelnut Disjunct?

● Southern variety (*Corylus cornuta* var. *californica*)

● Interior variety (*Corylus cornuta* var. *cornuta*)

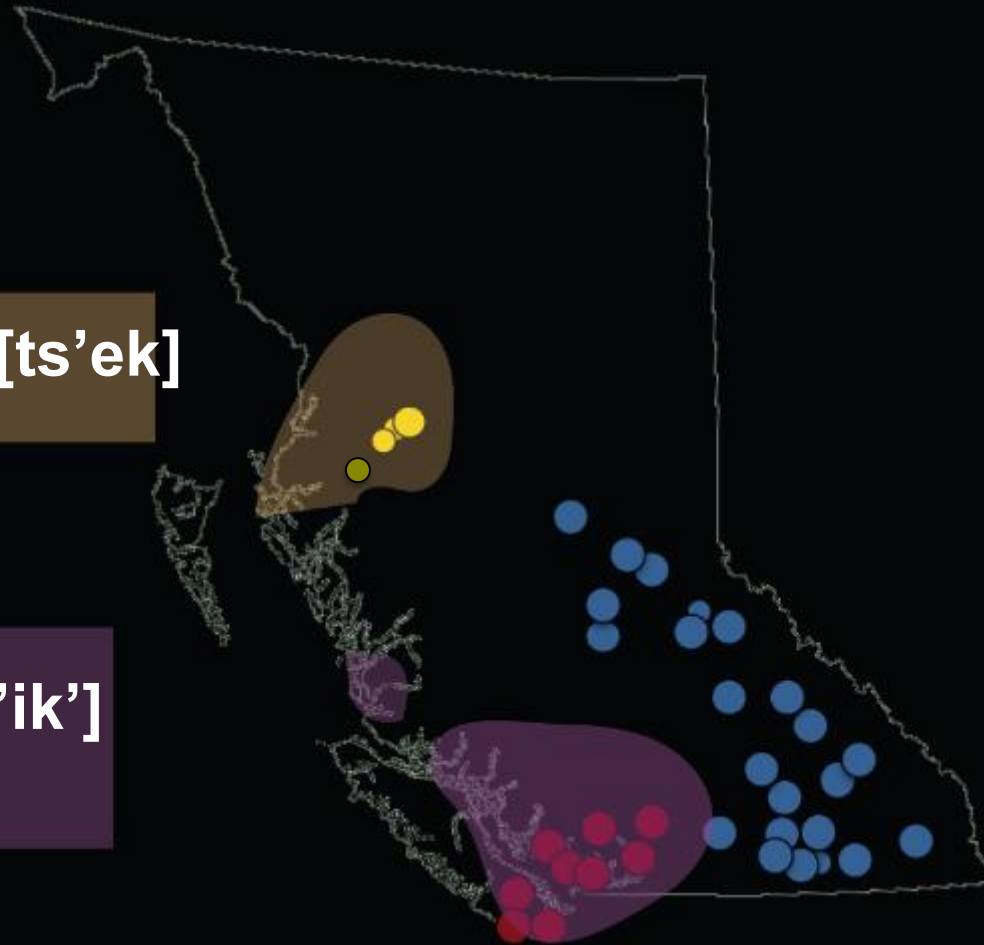
● *Corylus californica*?



# Hazelnut Paleobiolinguistics

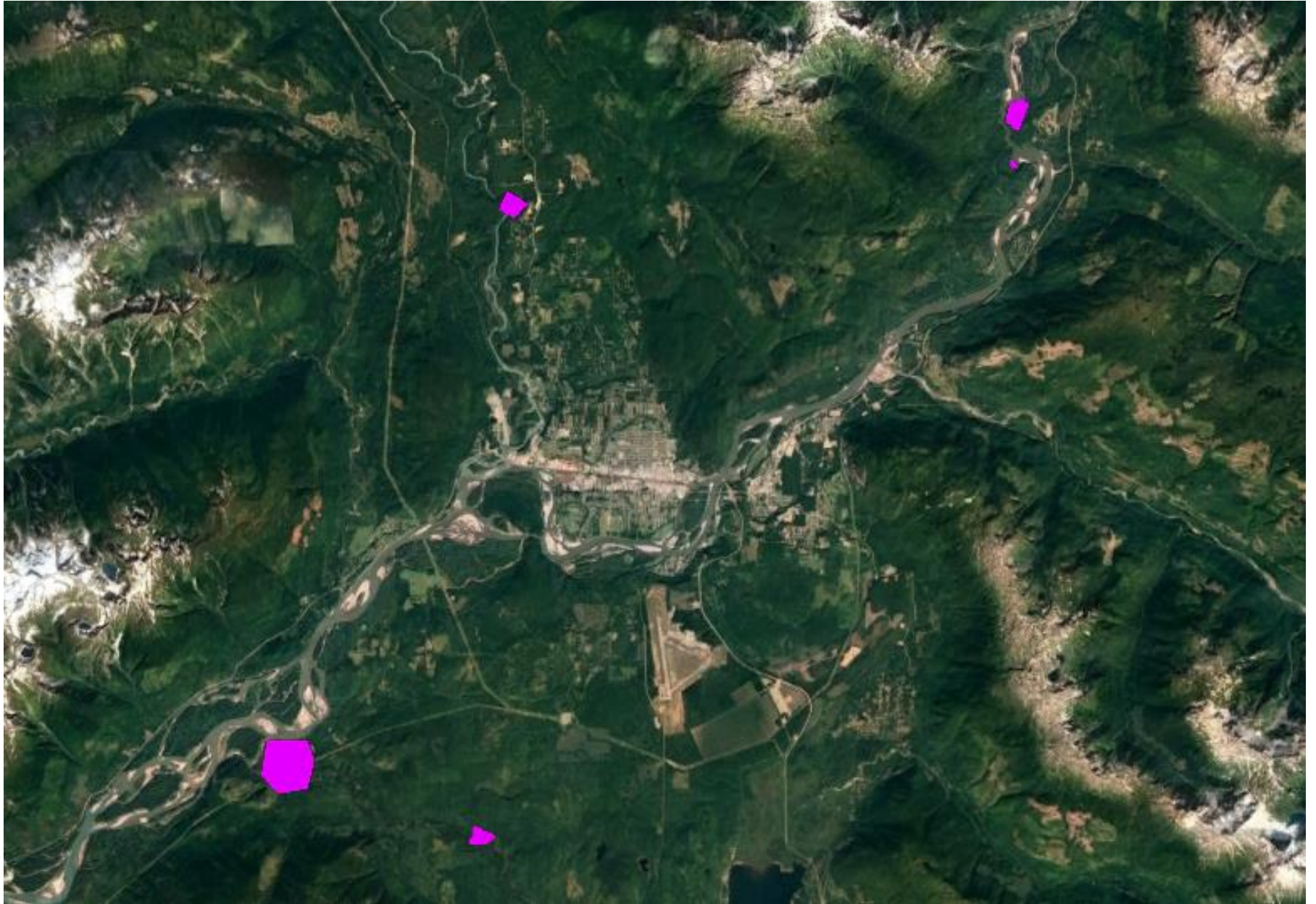
Gitxsan (Tsimshianic): [sgan] [ts'ek]

Proto Salish: \*[ts'ik] or \*[ts'ik']  
Skwxwú7mesh: [ts'ik]

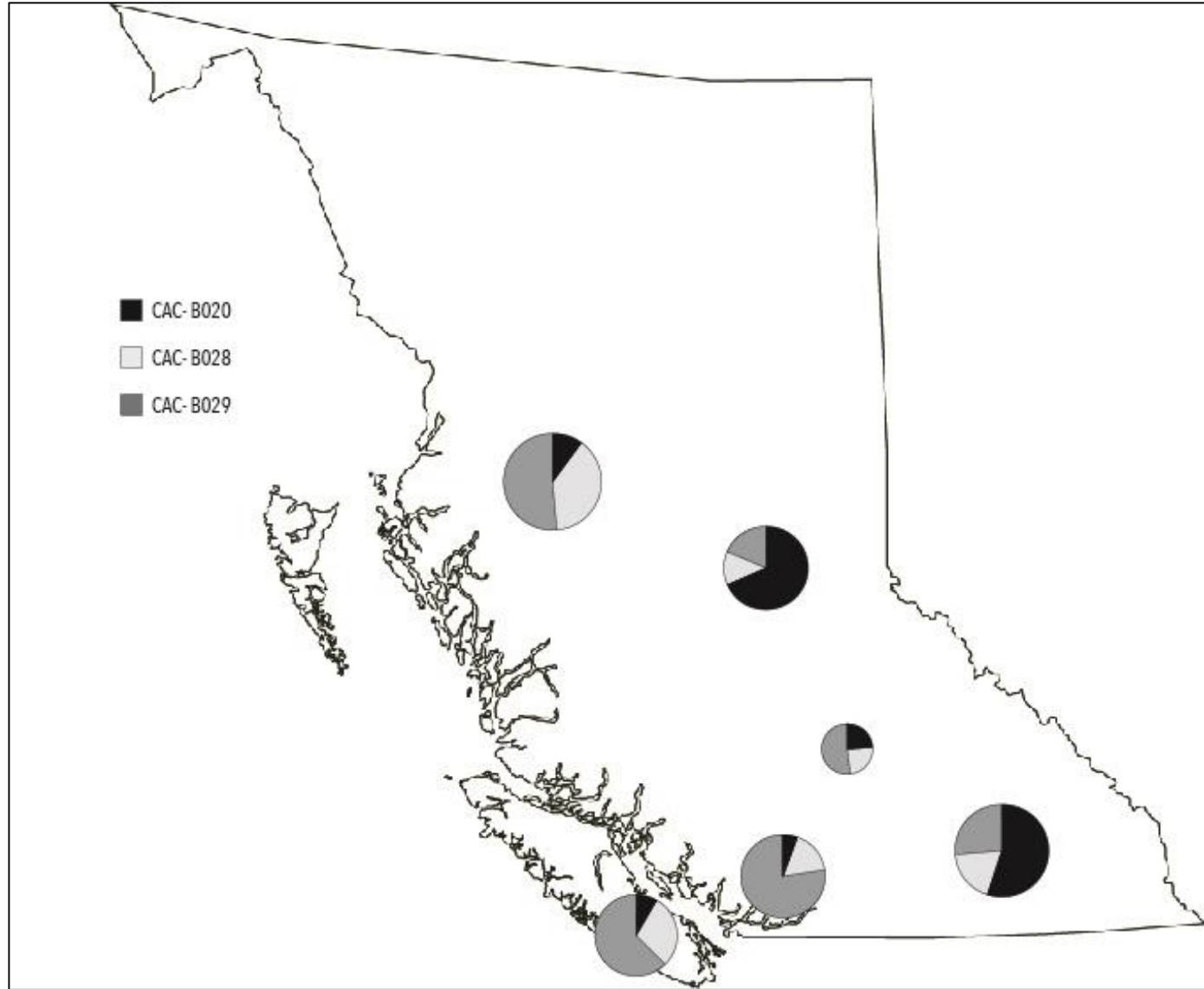




# Hazelnut Distribution in Terrace



# Hazelnut Pop Gens: 3/12 Microsatellites (SSR)



Alleles in each "population"

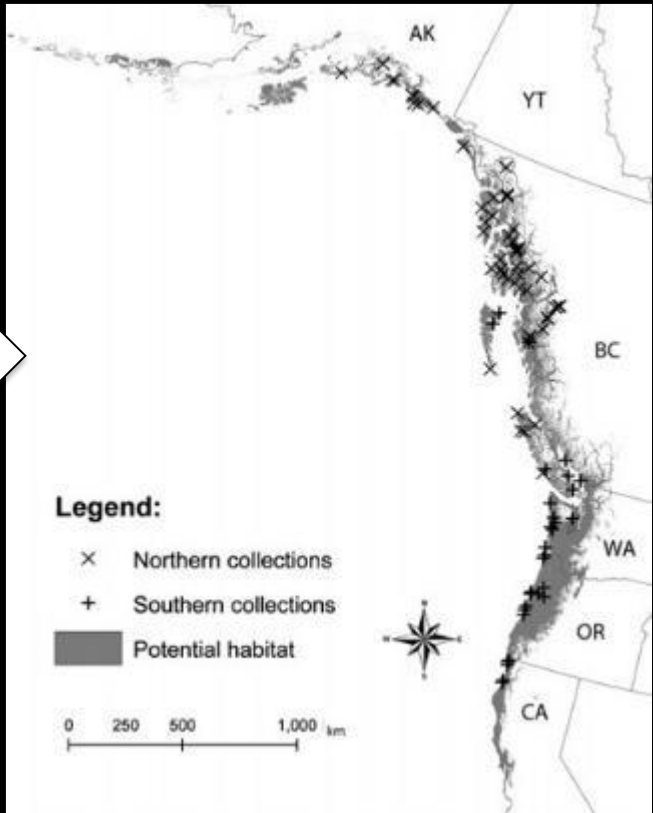


# Pacific Crabapple (Moolks, *Malus fusca*)



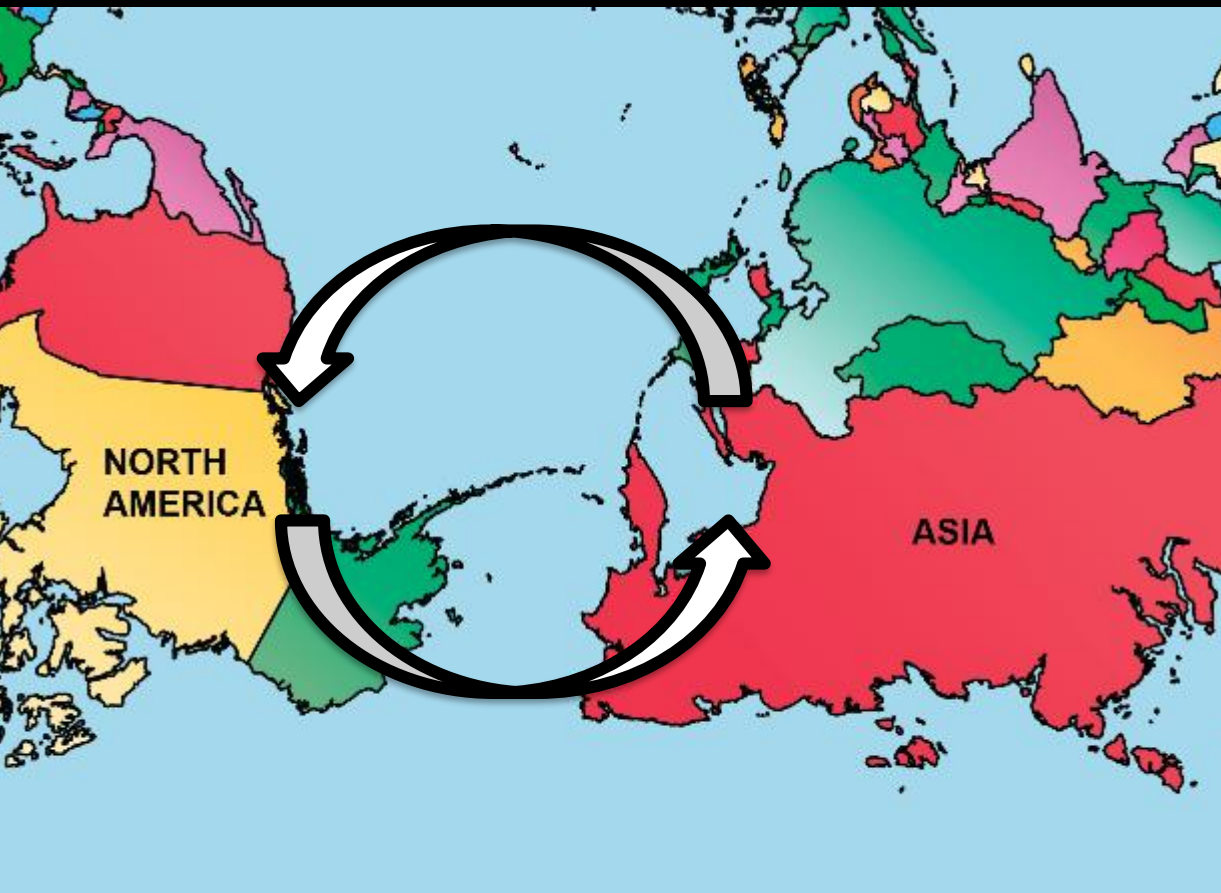


# Pacific Crabapple and Siberian Crabapple





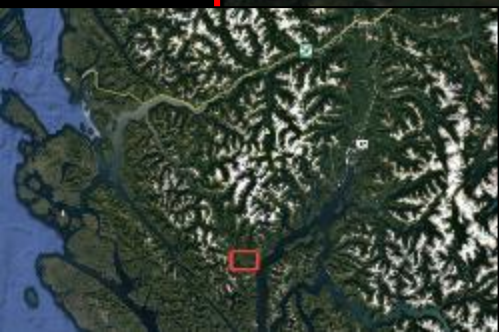
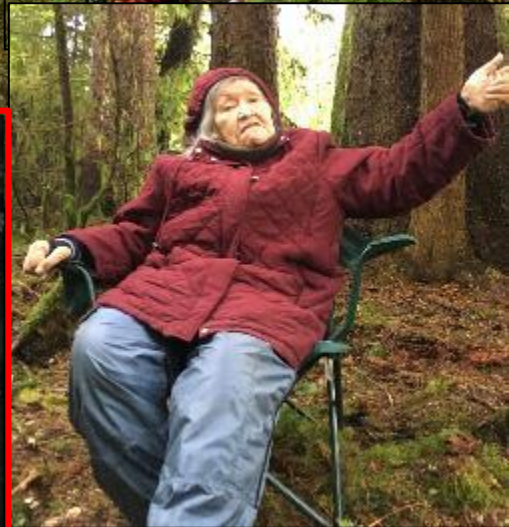
# Pacific Crabapple Genome Project





# Bringing Mookks Back to Old Town

Łaaya no'os





# Ecosystem Enhancement ("novel ecosystems")



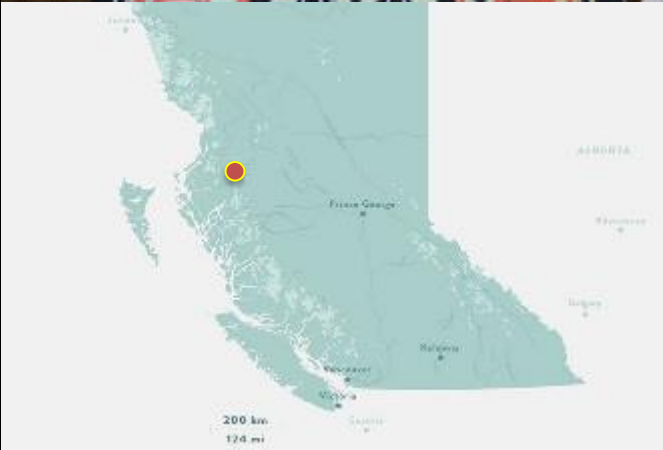
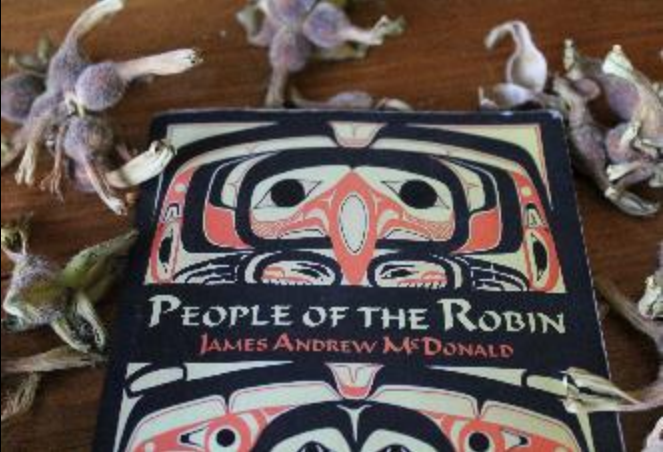
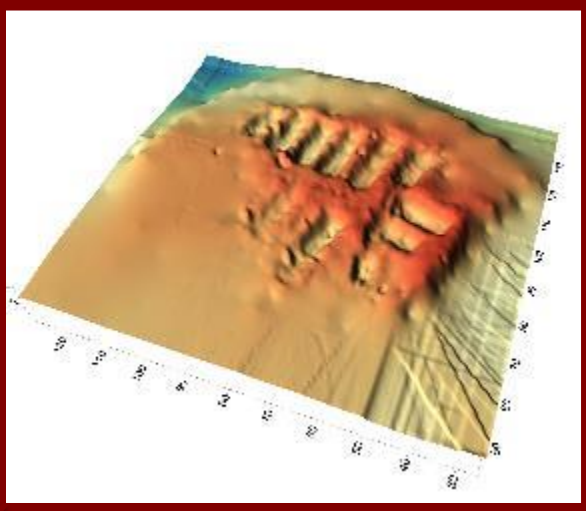


# Forest Gardens





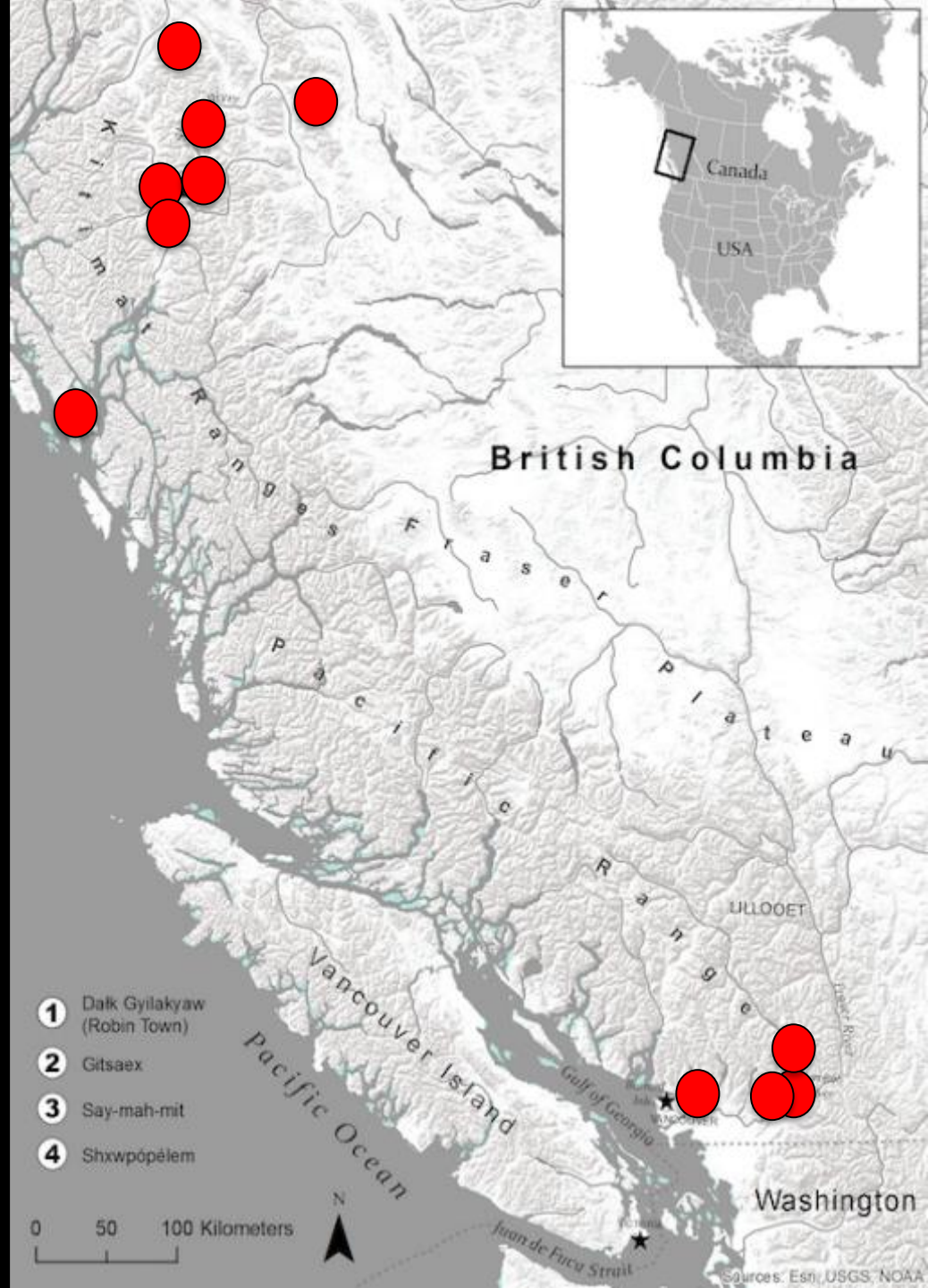
# Dałk Gyilakyaw (Robin Town) – Gitsm'geelm, Tsm'sye





# Forest Gardens in BC

## Gitseax (Kitselas Canyon)





# Indicator Species Analysis

Species	Indicators			Ethnobotanical Significance				
	Type of Site	Indicator		Edible (Stored)	Edible	Tech (Fuel)	Technology	Medicine
	Indicator	Confidence	P. value					
<i>Corylus cornuta</i> (Beaked hazelnut)	Village	0.97954	0.001	X	X	x	X	X
<i>Malus fusca</i> (Pacific crabapple)	Village	0.97693	0.001	X	X		x	
<i>Viburnum edule</i> (Highbush cranberry))	Village	0.91132	0.027	X	X		x	X
<i>Sambucus racemosa</i> (Red elderberry)	Village	1.0000	0.029	X	X		x	x
<i>Maianthemum racemosum</i> (Solomon's plume)	Village	1.0000	0.031		x			x
<i>Rosa nutkana</i> (Nootka rose)	Village	0.71933	0.034	X	X		x	X
<i>Cornus sericea</i> (Red osier dogwood)	Village	1.0000	0.04				X	X
<i>Rubus spectabilis</i> (Salmonberry)	Village	0.7563	0.042	X	X		x	
<i>Crataegus douglasii</i> (Black hawthorn)	Village	1.0000	0.043	x	x		x	X
<i>Lonicera involucrata</i> (Black twinberry)	Village	1.0000	0.05				x	X
<i>Tsuga heterophylla</i> (Western hemlock)	Periphery	0.91442	0.001	X	x	X	x	x
<i>Alnus rubra</i> (Red alder)	Periphery	0.90114	0.004			x	x	x
<i>Thuja plicata</i> (Western redcedar)	Periphery	0.88835	0.008			X	X	
<i>Rubus armeniacus</i> (Himalayan blackberry)*	Periphery	0.93166	0.035		x			
<i>Epilobium angustifolium</i> (Fireweed)	Periphery	0.86155	0.045		x		X	x



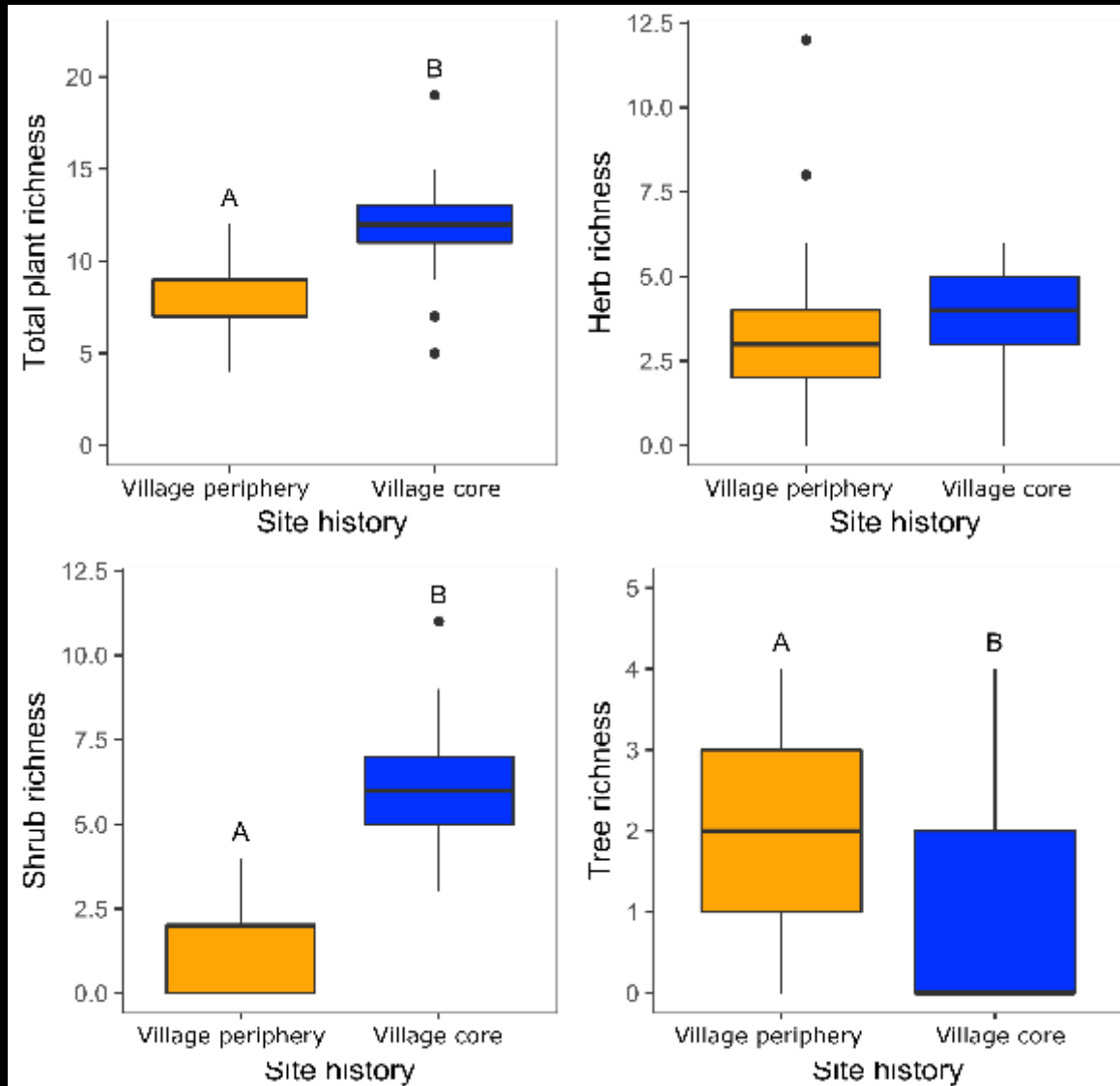
Village Core



Village Periphery



# Species Richness





# Beyond Species Composition:

Forest gardens **more rich** = likely to provide a suite of **ecosystem functions** that peripheral forests do not...



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What are those functions?





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What are those functions?



Functional ecology uses **plant traits** to understand plant impacts on ecosystems

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Forest gardens **more rich** = likely to provide a suite of **ecosystem functions** that peripheral forests do not...



What are those functions?



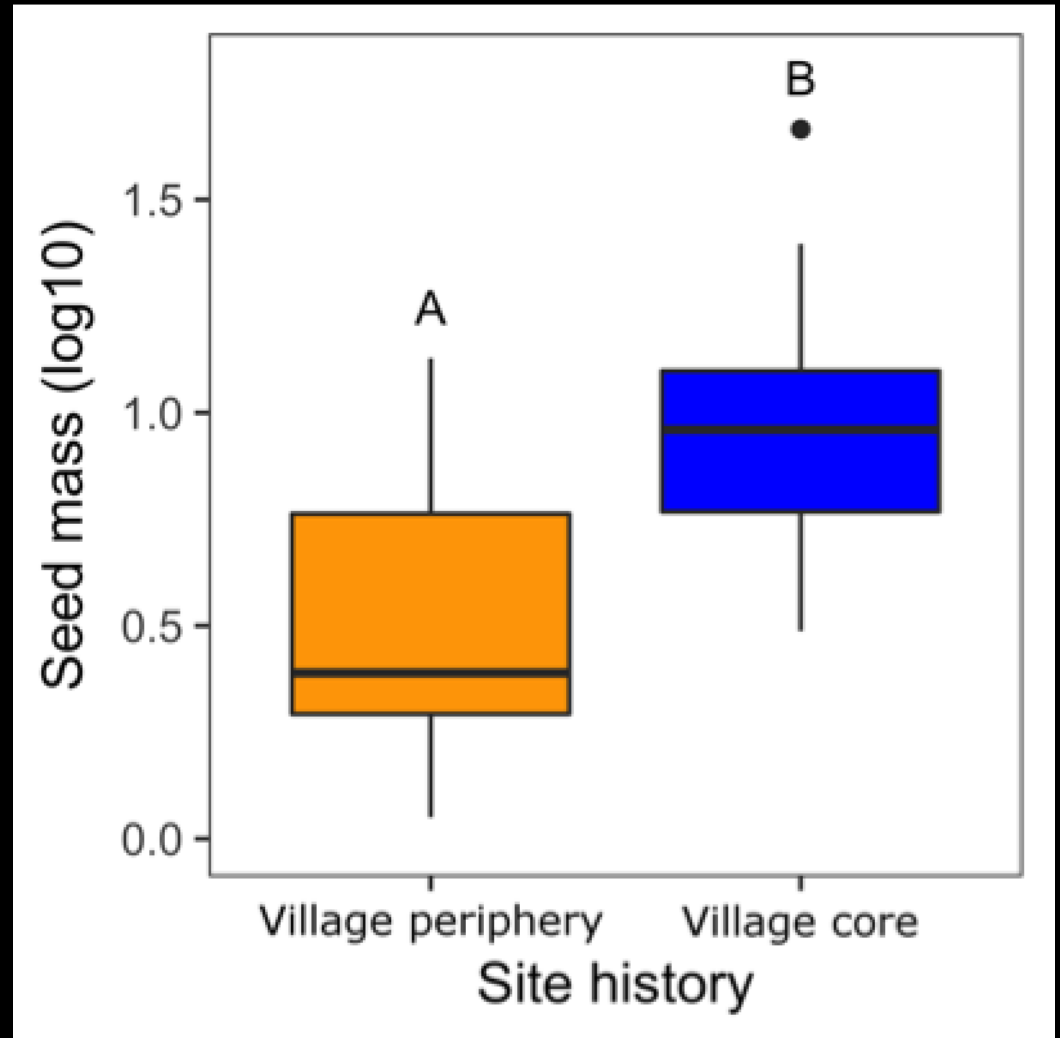
Functional ecology uses **plant traits** to understand plant impacts on ecosystems



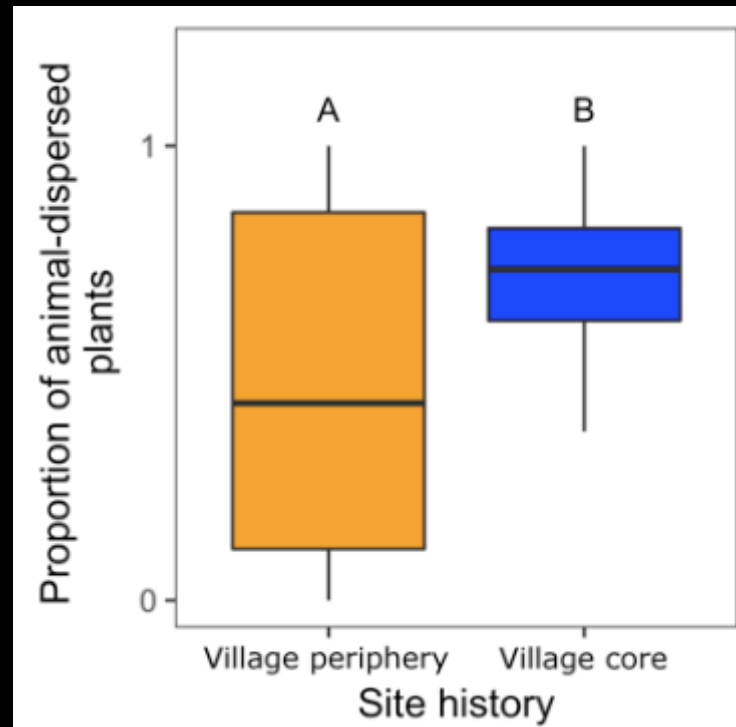
3 traits (seed mass, pollination & dispersal syndrome) to **compare functions** between villages and peripheries



# Functional Trait: Seed Mass

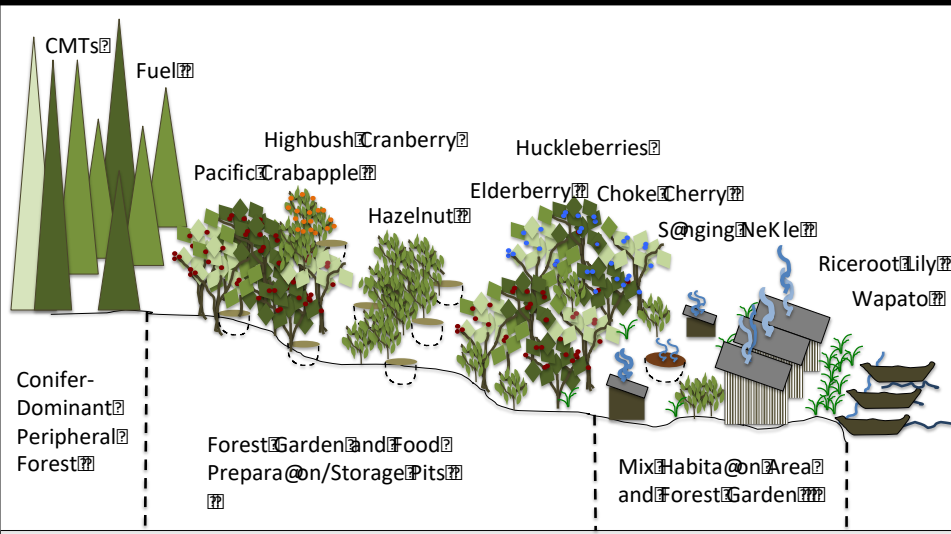


# Functional Trait: Animal Dispersed/Pollinated

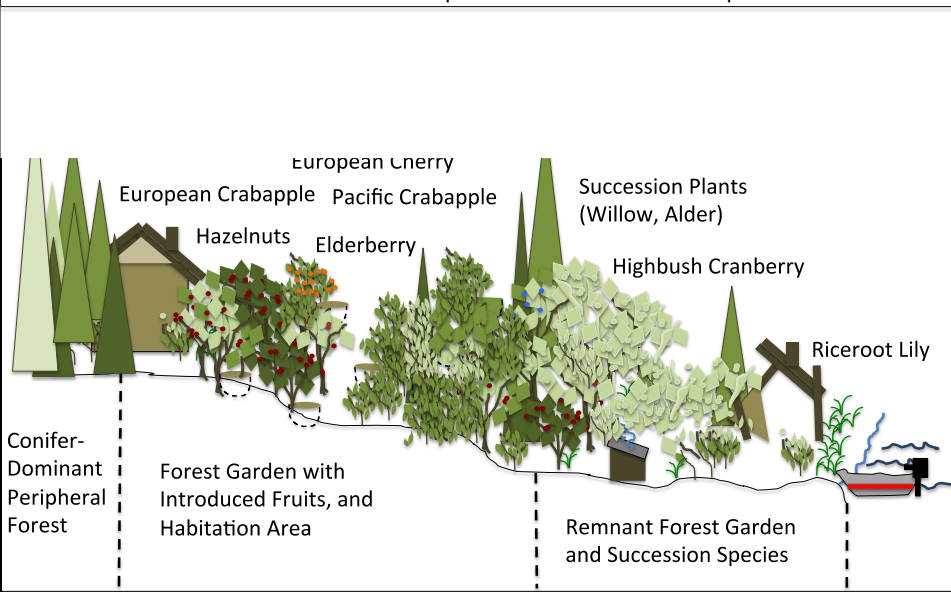




# Forest Gardens and Sts'ailes Land Claims



Idealized Forest Garden Landscape Before Settler Colonial Displacement

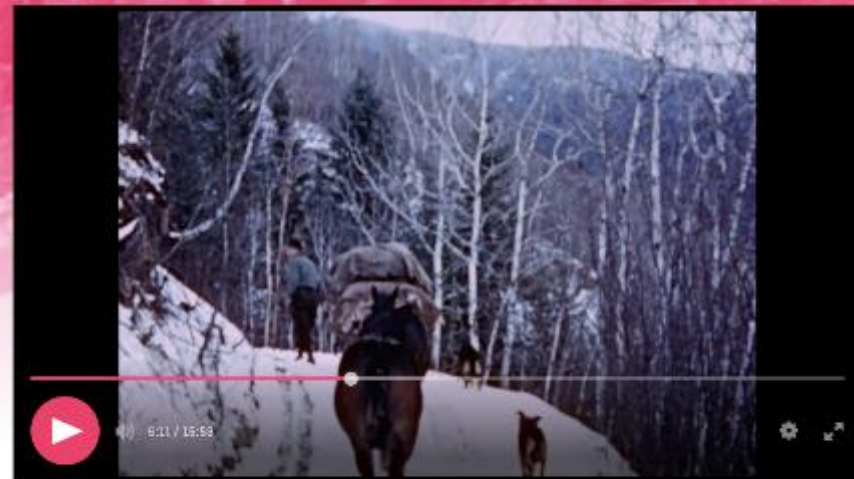
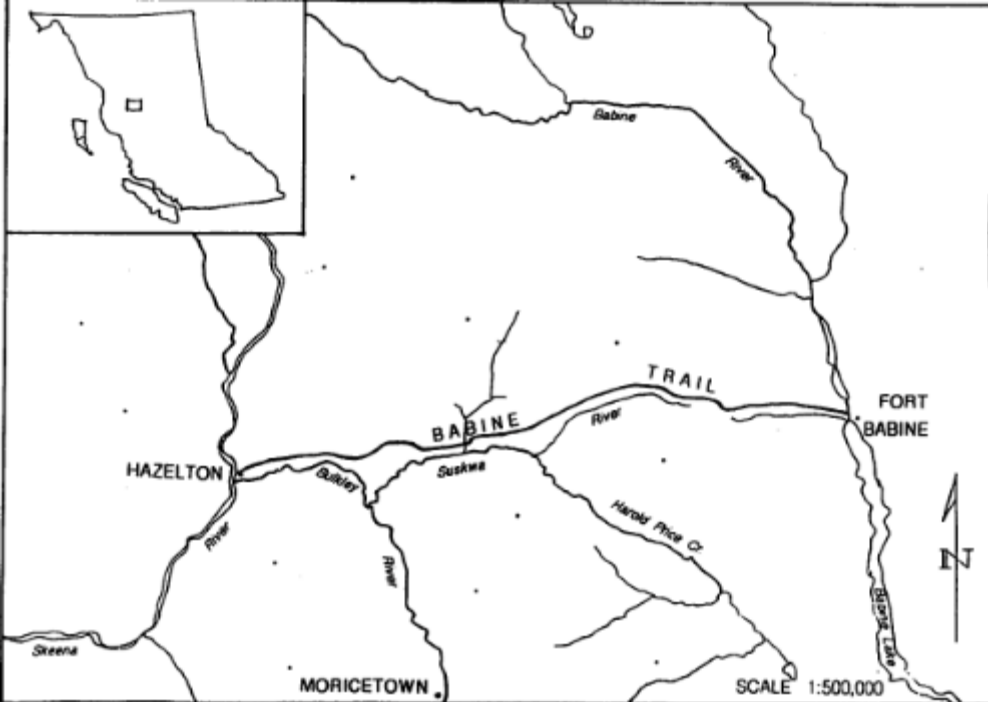


Idealized Forest Garden Landscape After Settler Colonial Displacement

# Luutkudziiwus Lax 'yip (Suskwa Watershed)







Skeena River Trapline

Canada Film Board 1946





# Terra-forming



Lithics and Fire Cracked Rock



Black Midden Soils





# Suskwa Cultural Landscape





# Sim ma'ay Burning/Management

(Black huckleberry, *Vaccinium membranaceum*)



*Gathering What  
the Great Nature  
Provided, 1980*





# Sim ma'ay Burning/Management

(Black huckleberry, *Vaccinium membranaceum*)





# Global Land-Use and Climate Change..

nature  
sustainability

ANALYSIS

<https://doi.org/10.1038/s41893-018-0100-6>

## A spatial overview of the global importance of Indigenous lands for conservation

Stephen T. Garnett<sup>1\*</sup>, Neil D. Burgess<sup>2,3</sup>, John E. Fa<sup>4,5</sup>, Álvaro Fernández-Llamazares<sup>6</sup>, Zsolt Molnár<sup>7</sup>, Cathy J. Robinson<sup>8,9</sup>, James E. M. Watson<sup>10,11</sup>, Kerstin K. Zander<sup>8</sup>, Beau Austin<sup>1</sup>, Eduardo S. Brondizio<sup>12</sup>, Neil French Collier<sup>1</sup>, Tom Duncan<sup>1</sup>, Erle Ellis<sup>13</sup>, Hayley Geyle<sup>1</sup>, Micha V. Jackson<sup>1,14</sup>, Harry Jonas<sup>15</sup>, Pernilla Malmer<sup>16</sup>, Ben McGowan<sup>1</sup>, Amphone Sivongxay<sup>1</sup> and Ian Leiper<sup>1</sup>

*“We estimate that at least 28.1% of the world’s land surface is owned or managed by Indigenous Peoples, including some of the most ecologically intact and biodiverse landscapes remaining on Earth.”*



# Anthropogenic Impacts ≠ Negative Impacts/Climate Change

- Landscape modifications do not always produce negative impacts
- Impacts are not stagnant
- Relationship/interactions depend on a culture/community/society's actions and values

## Adaptation through space and time?

- Don't expect the past to be a blueprint for the future...but...
  - We can learn how anthropogenic impacts effect species distributions and functions
  - ...how they relate to applied issues of sovereignty and title
  - Social-ecological feedbacks are incredibly **complex!**
    - But we should strive to model management practices that are designed *by* and *for* the right communities
  - Contribute to wiser management decisions in an uncertain future

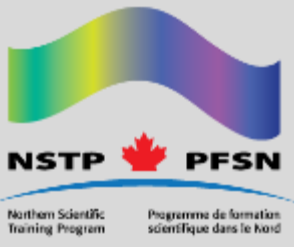


# Thank You

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