Changes to the number of sampled years and fitness streams in PWS and SEAK to maximize statistical power

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Gene Conservation Laboratory
Alaska Department of Fish and Game
AHRP Informational Meeting
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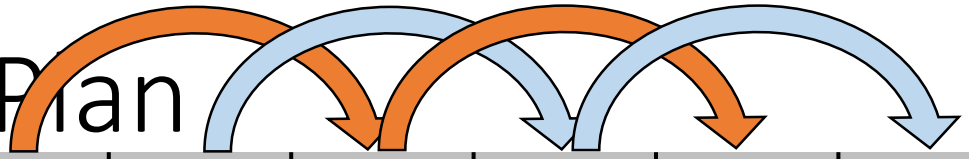
Alaska Hatchery Research Program

1) What is the genetic structure of pink and chum in PWS and SEAK?
2) What is the extent and annual variability of straying?
3) What is the impact on fitness (productivity) of natural pink and chum stocks due to straying hatchery pink and chum salmon?

AHRP Fitness Study: PWS Pink Salmon

Original Plan



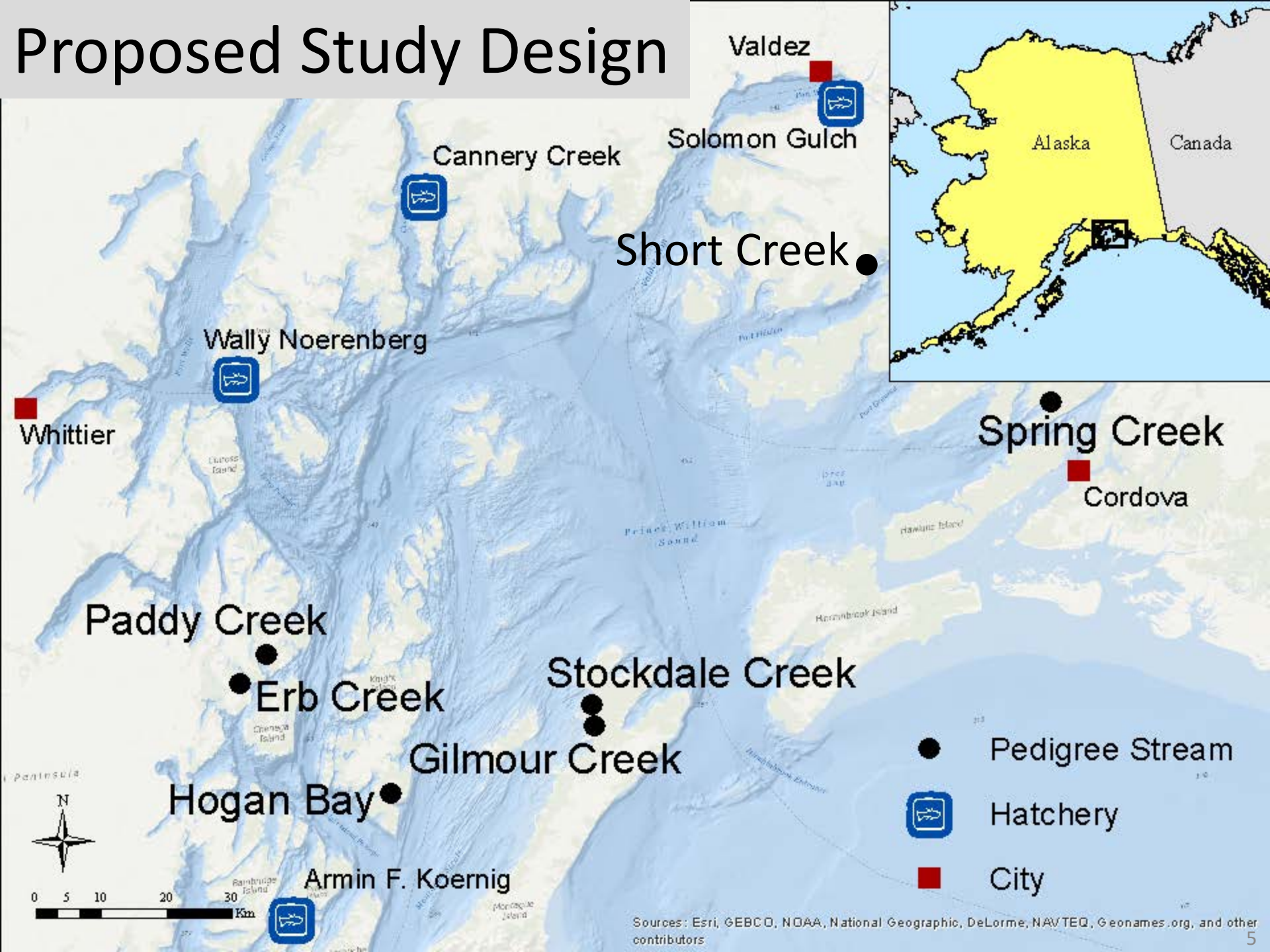
Stream	2013	2014	2015	2016	2017	2018
Short	P	P	P,O	P,O	O,G	O,G
Spring	P	P	P,O	P,O	O,G	O,G
Stockdale	P	P	P,O	P,O	O,G	O,G
Hogan	P	P	P,O	P,O	O,G	O,G
Paddy	P	P	P,O	P,O	O,G	O,G
Erb	P	P	P,O	P,O	O,G	O,G

P – parents
O – offspring
G – grand-offspring

Odd-lineage

Even-lineage

Proposed Study Design



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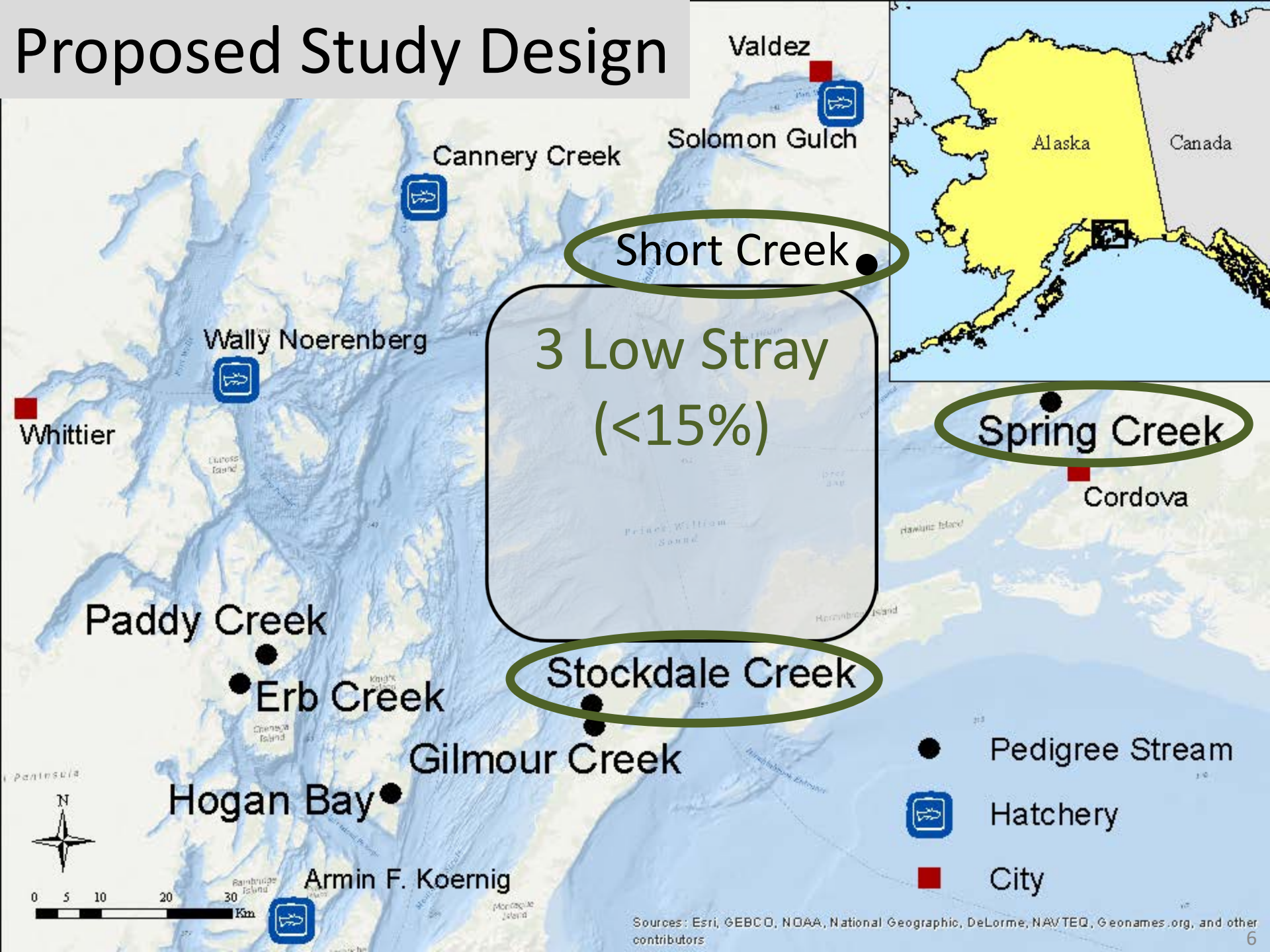

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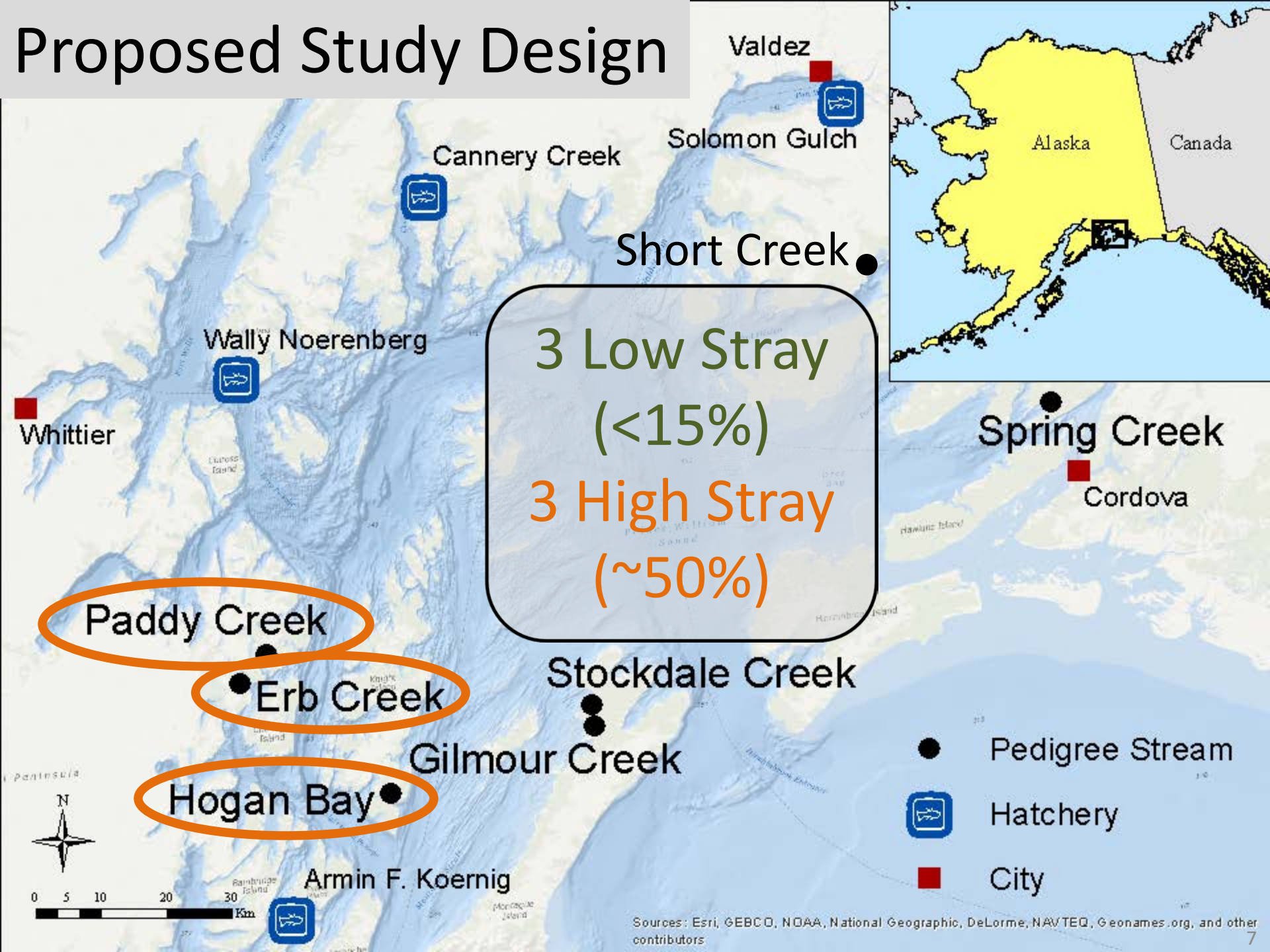

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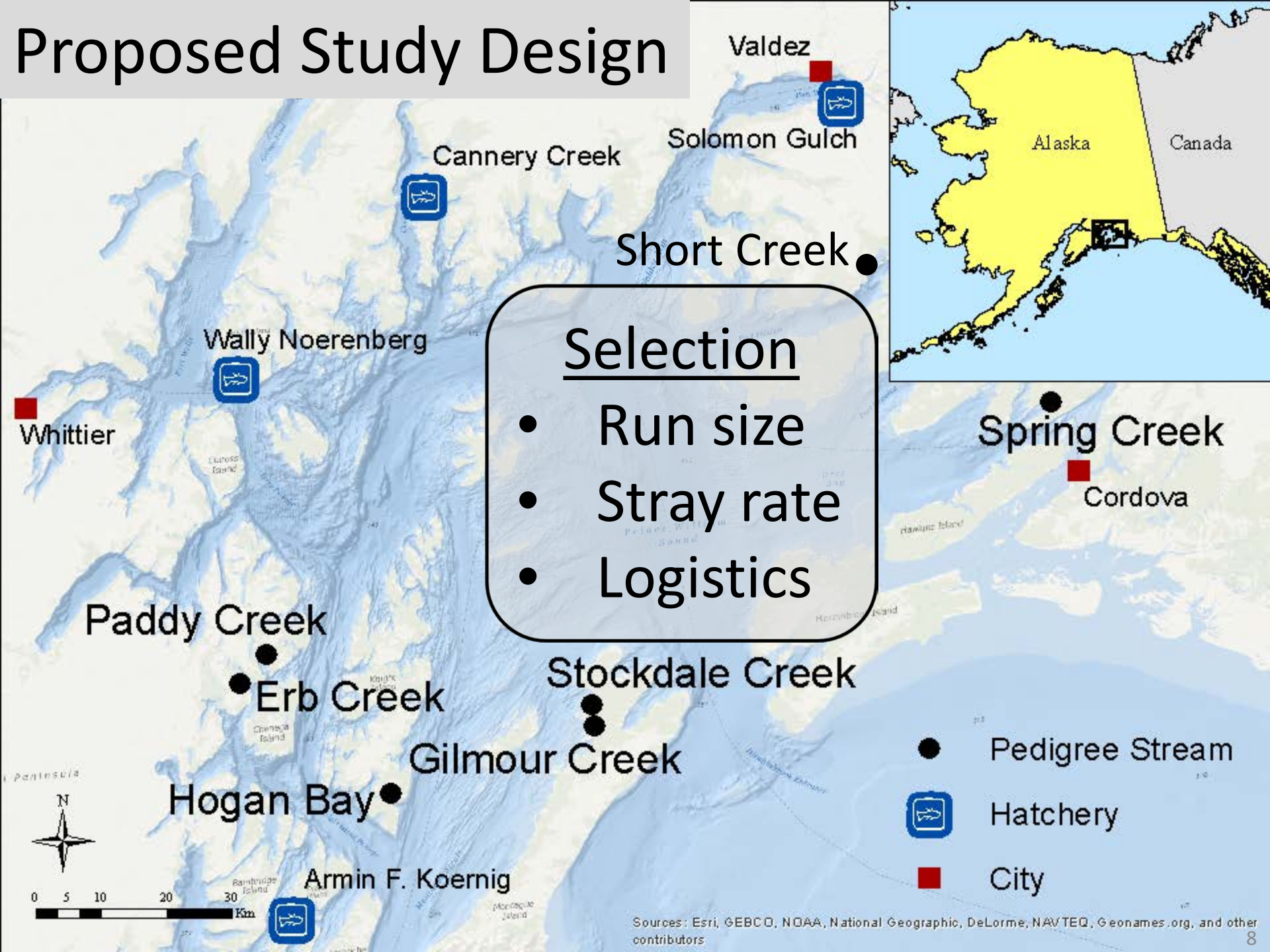

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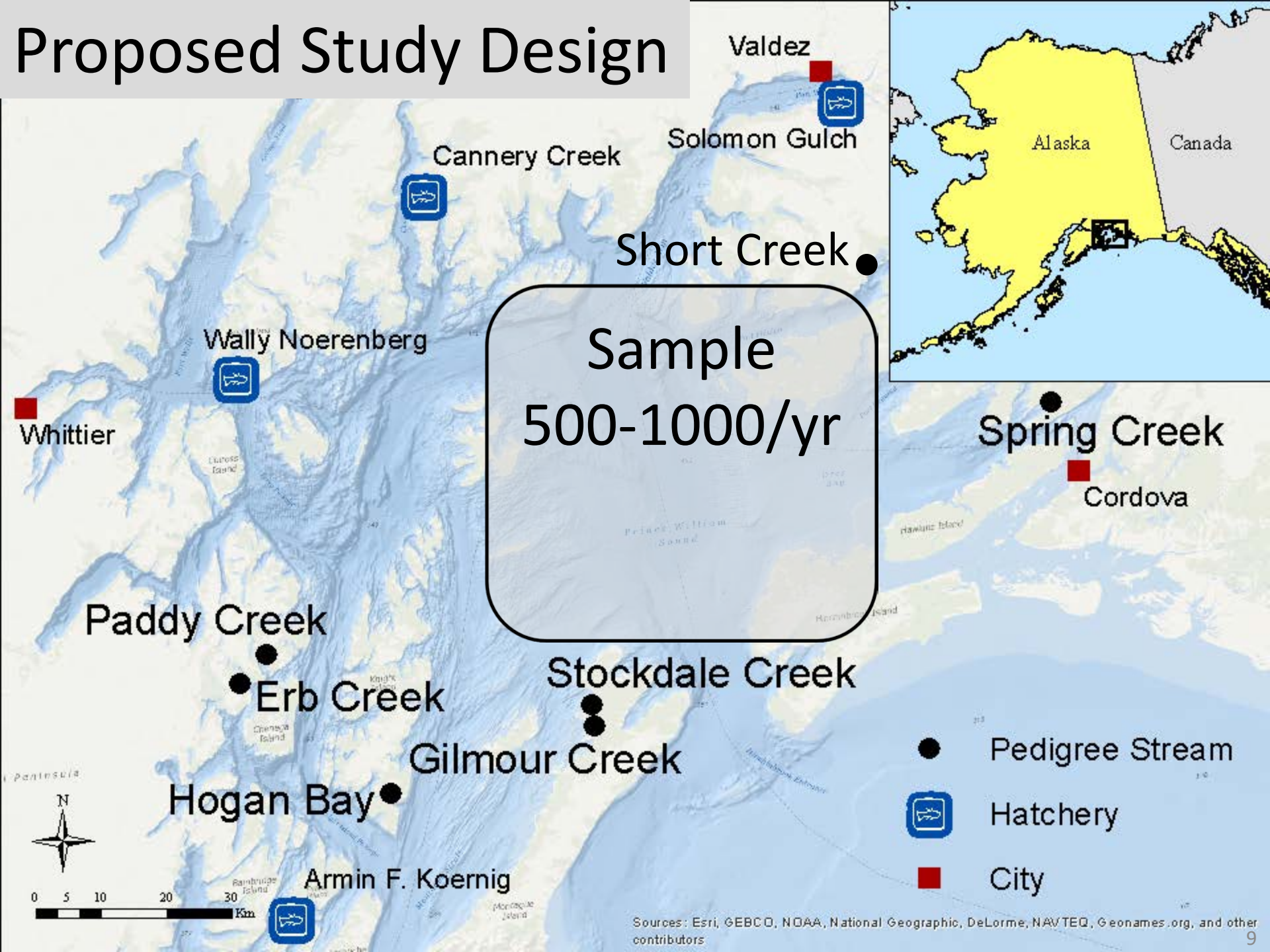

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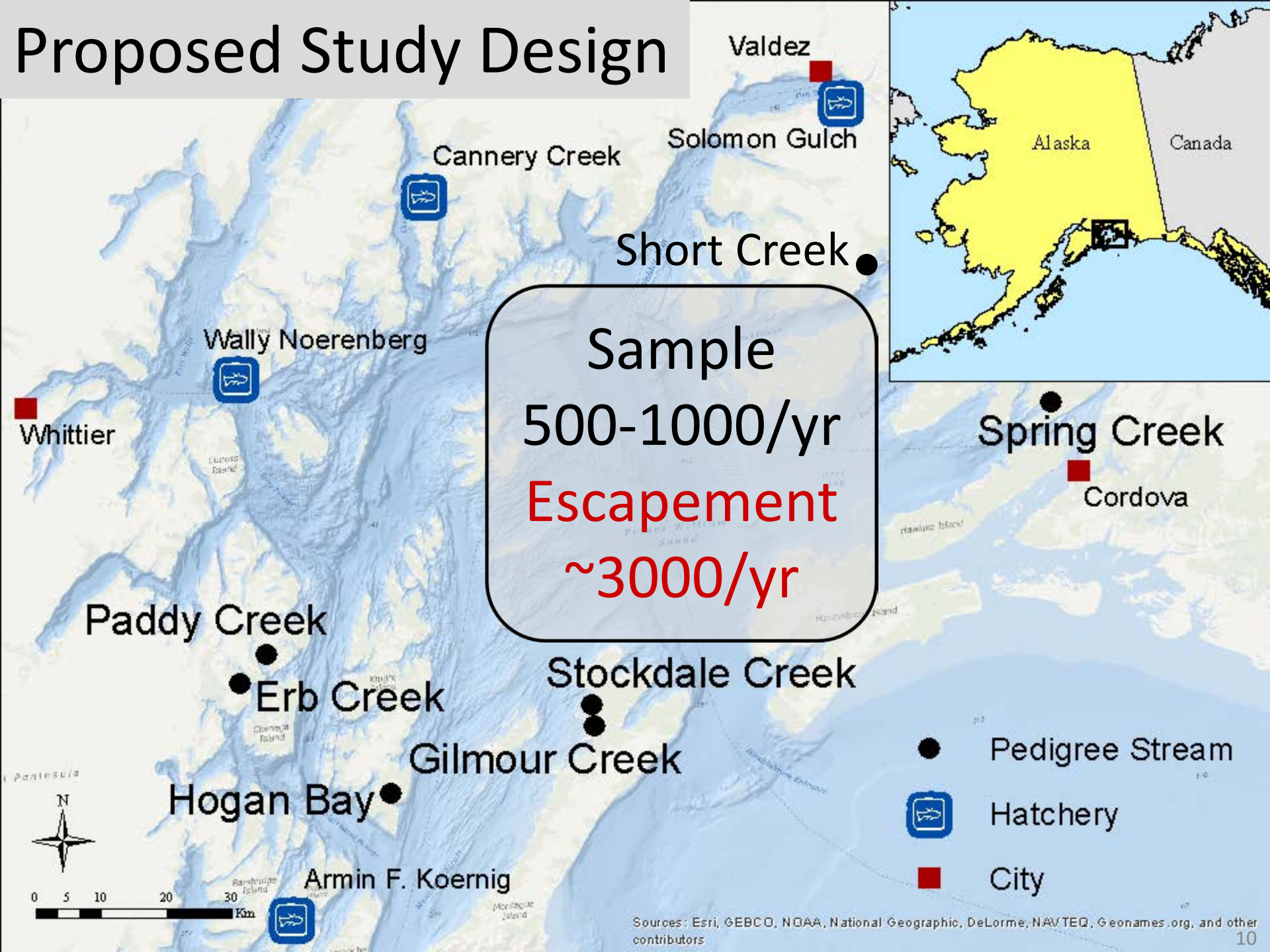

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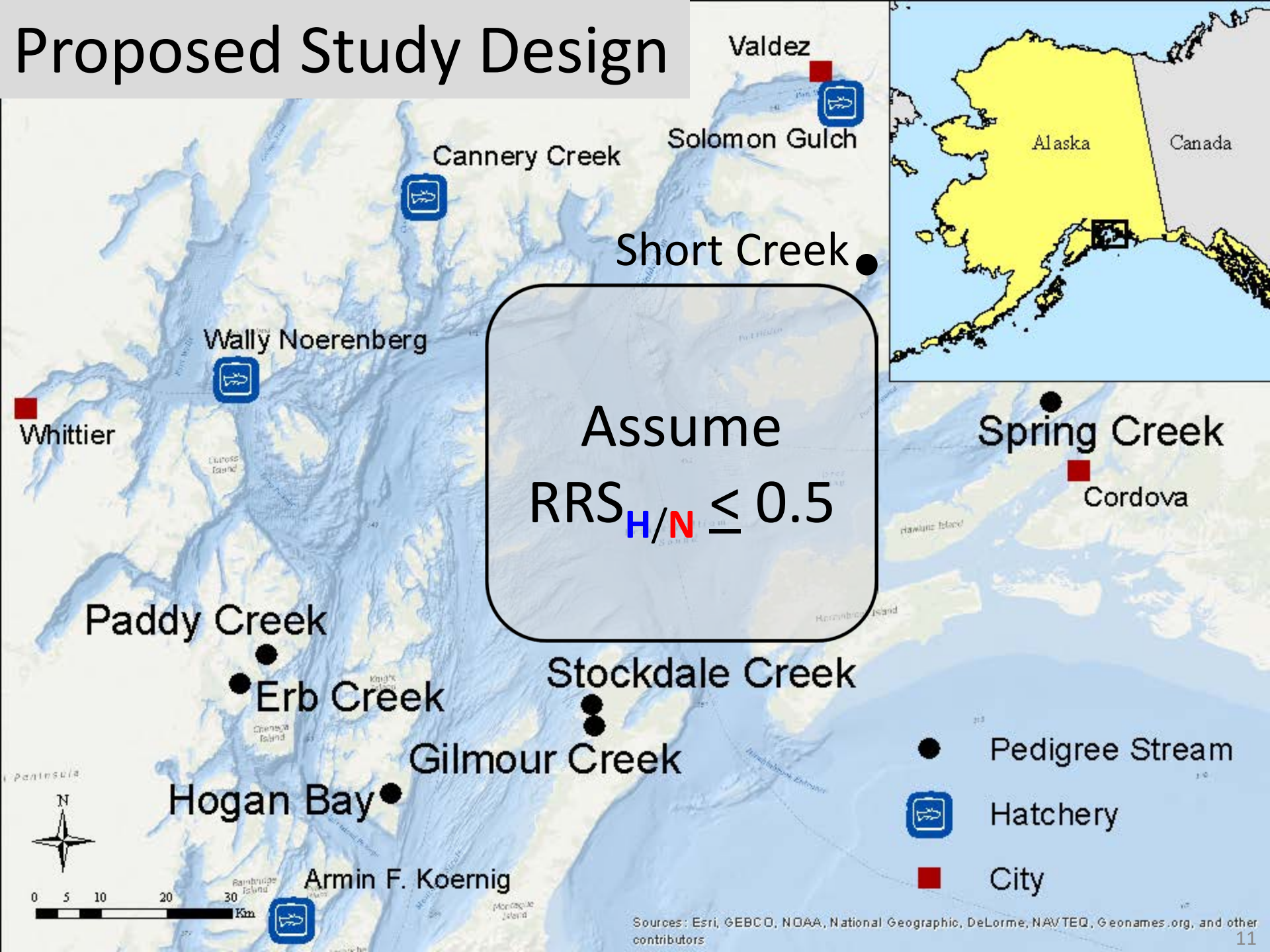
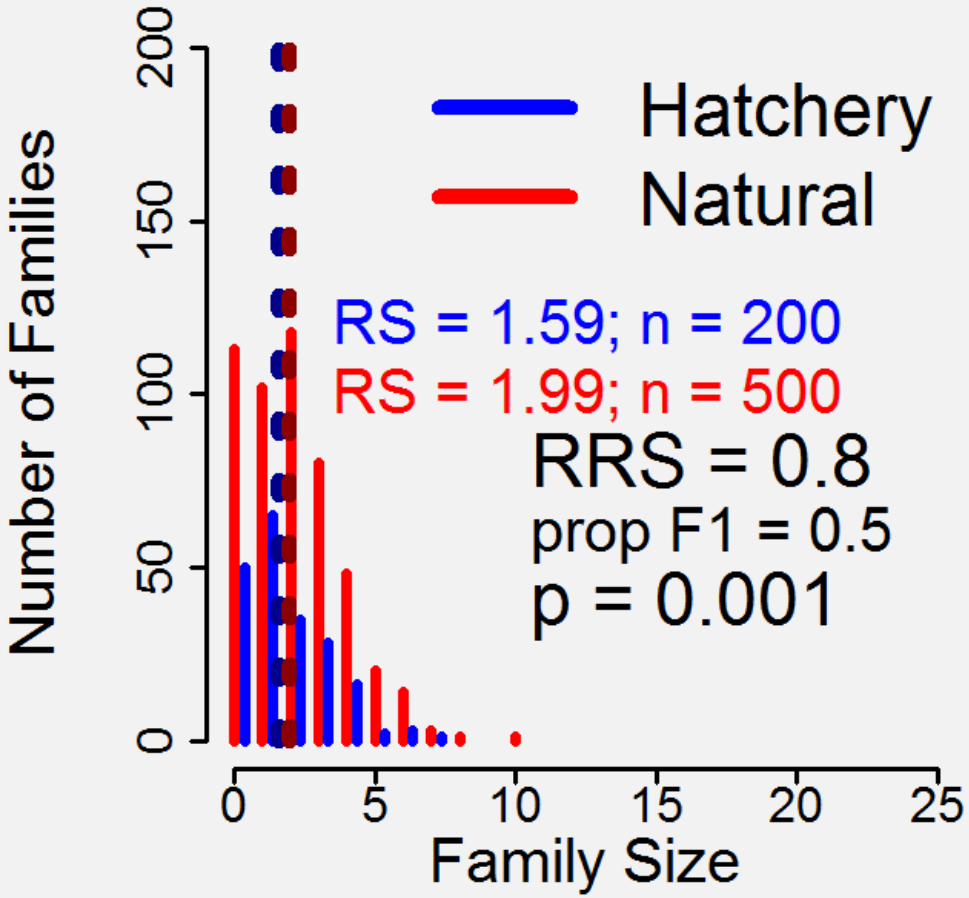


Power:

How often we expect to detect an effect



Depends on:

- Number parents (F_0) sampled
  - Hatchery ~ f(stray)
  - Natural
- Proportion offspring (F_1) sampled
- Distribution of RS (productivity)
  - Mean
  - Dispersion
- RRS
  - Difference between H and N
  - Benchmark RRS = 0.5

Power:
How often we expect to detect an effect

Power increases with…

- In our control
  - ↑ Number families
  - Stray rate > 10%
  - ↑ Proportion offspring
- Out of our control
  - Distribution of RS
    - ↑ Mean
    - ↑ Dispersion
  - ↓ True RRS

Depends on:

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Original Plan

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Paddy	P	P	P,O	P,O	O,G	O,G
Erb	P	P	P,O	P,O	O,G	O,G

P – parents
O – offspring
G – grand-offspring

Odd-lineage

Even-lineage

Revised Plan

Stream	2013	2014	2015	2016	2017	2018	2019	2020
Short	P	Too few hatchery strays						
Spring	P	P	P,O	Too few hatchery strays				
Stockdale	P	P	P,O	P,O	P,O,G	O,G	O,G	
Hogan	P	P	P,O	P,O	P,O,G	O,G	O,G	
Paddy	P	P	P,O	P,O	O,G	P,O,G		O,G
Erb	P	P	P,O	P,O	O,G	P,O,G		O,G
Gilmour		P	Replace Short	P,O		O,G	O,G	

P – parents

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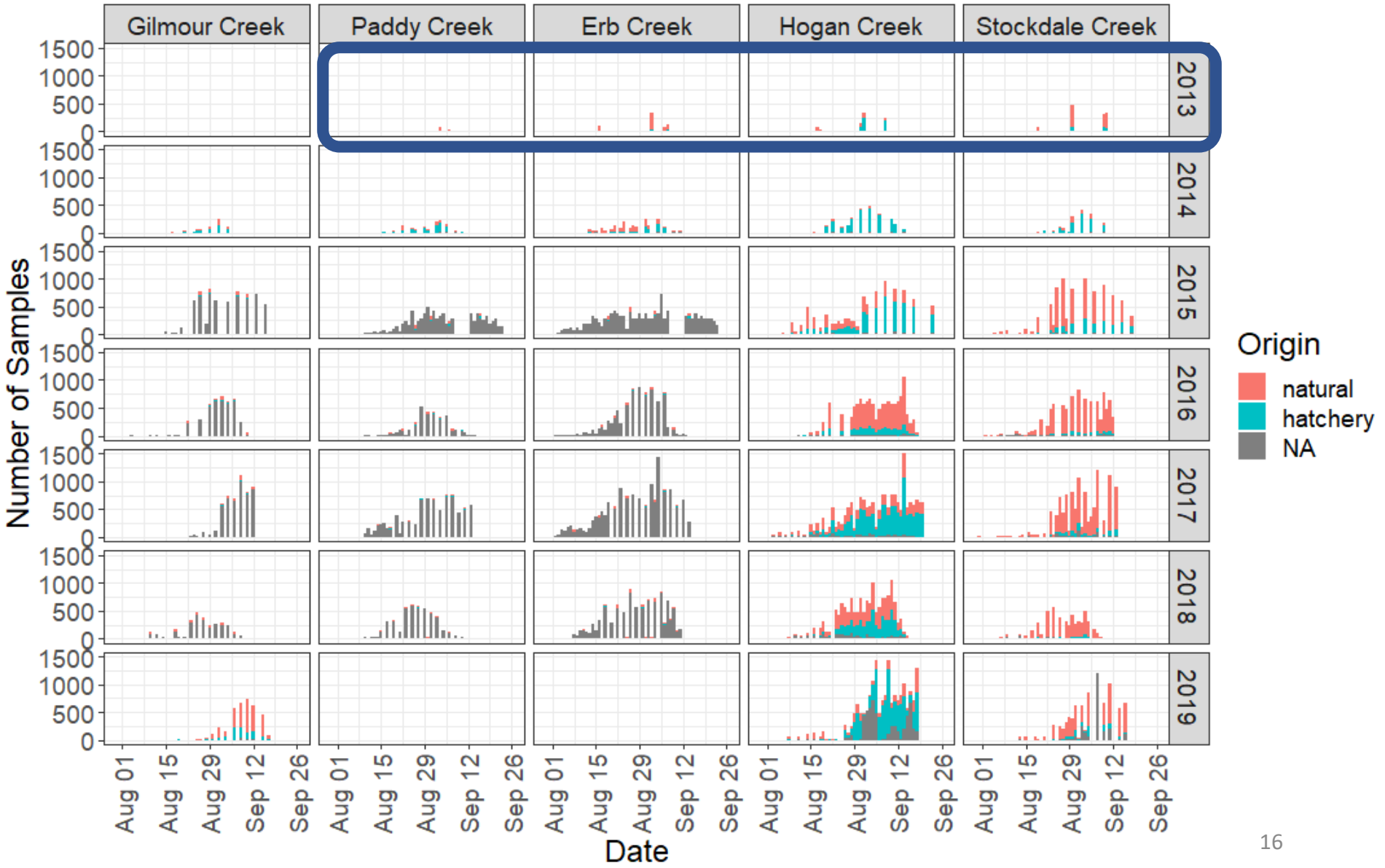
Even-lineage

Future Analyses




Questions?
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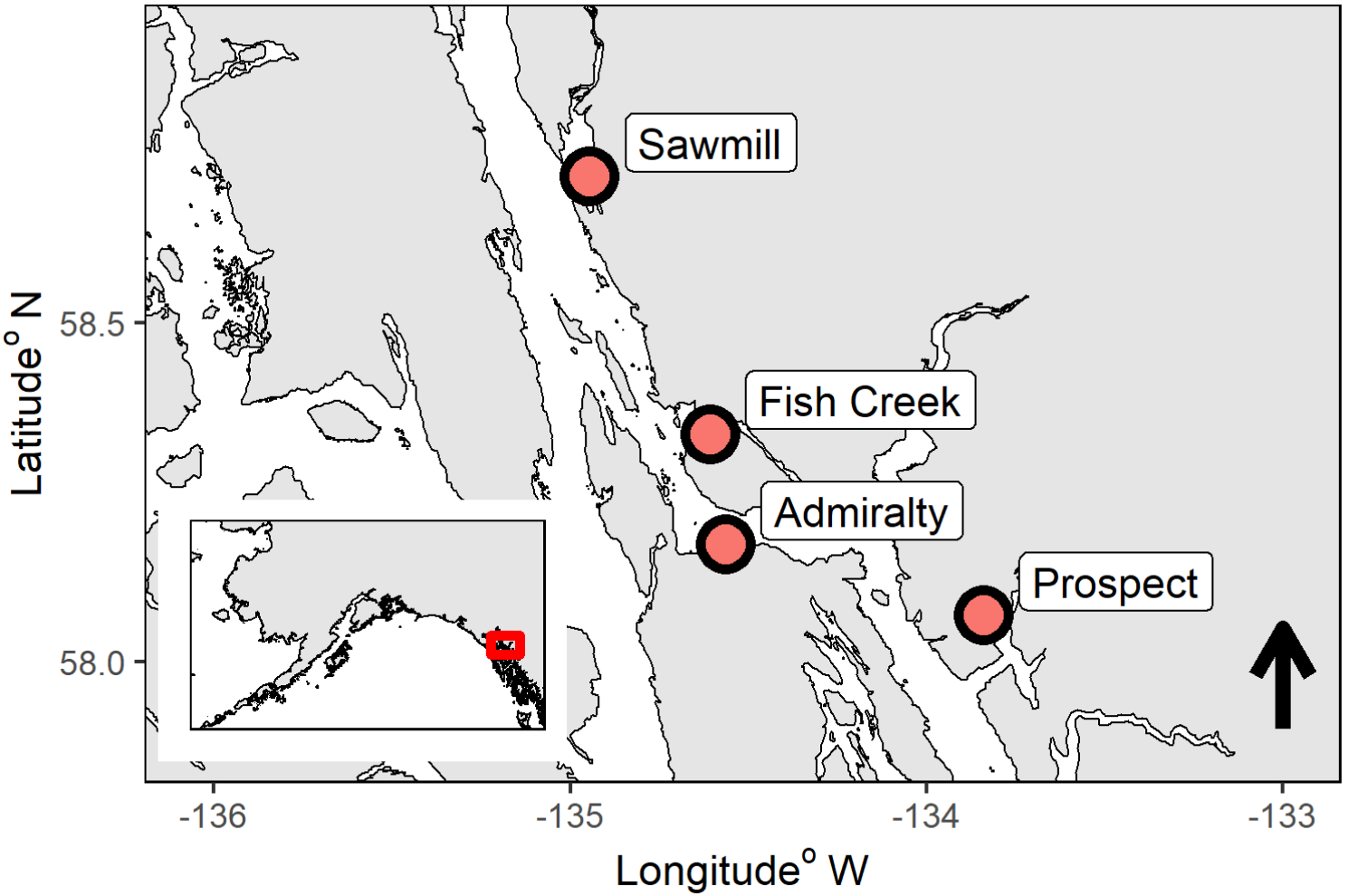
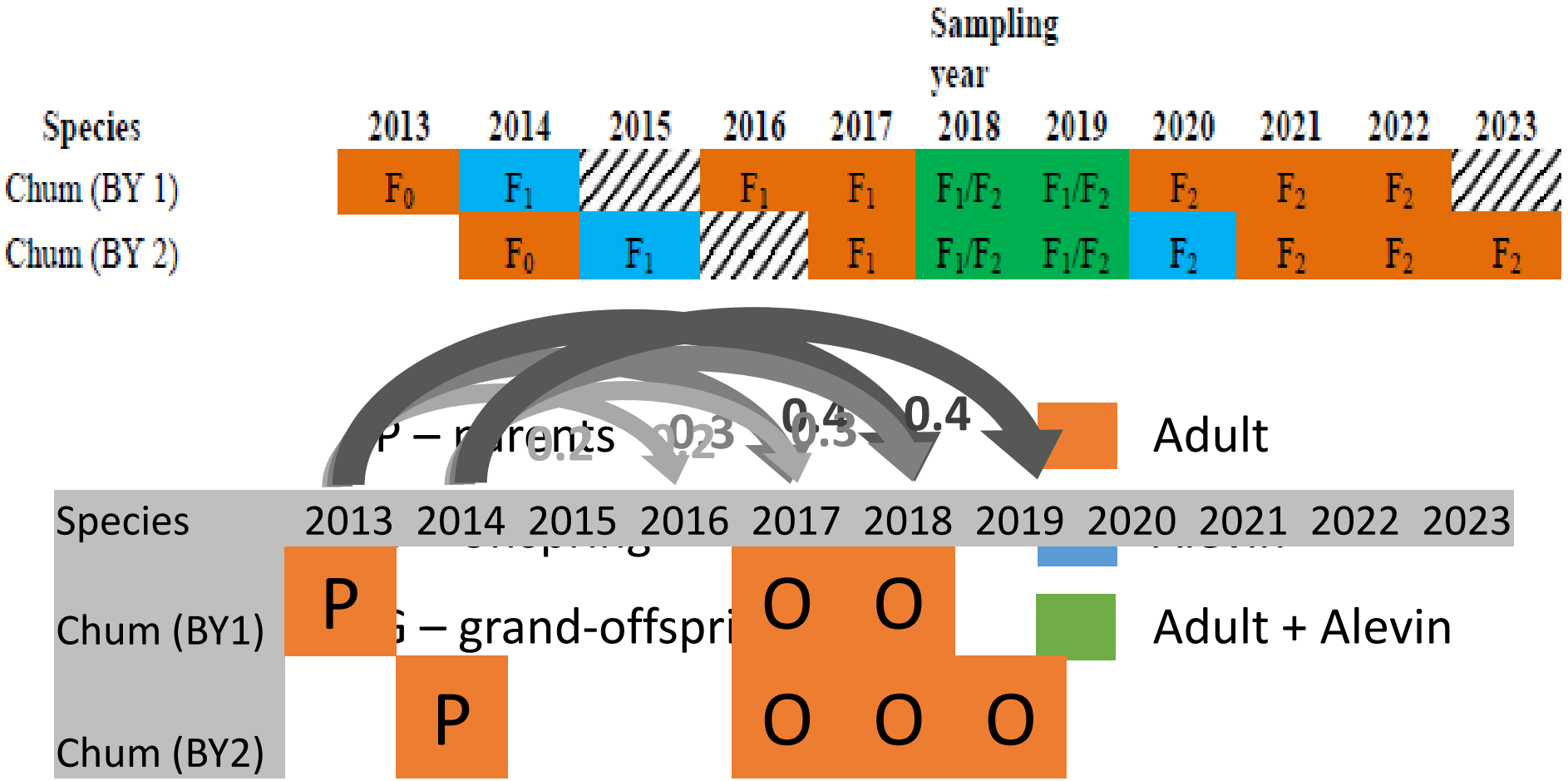
AHRP Fitness Study: SEAK Chum Salmon

Map of SEAK Chum fitness streams



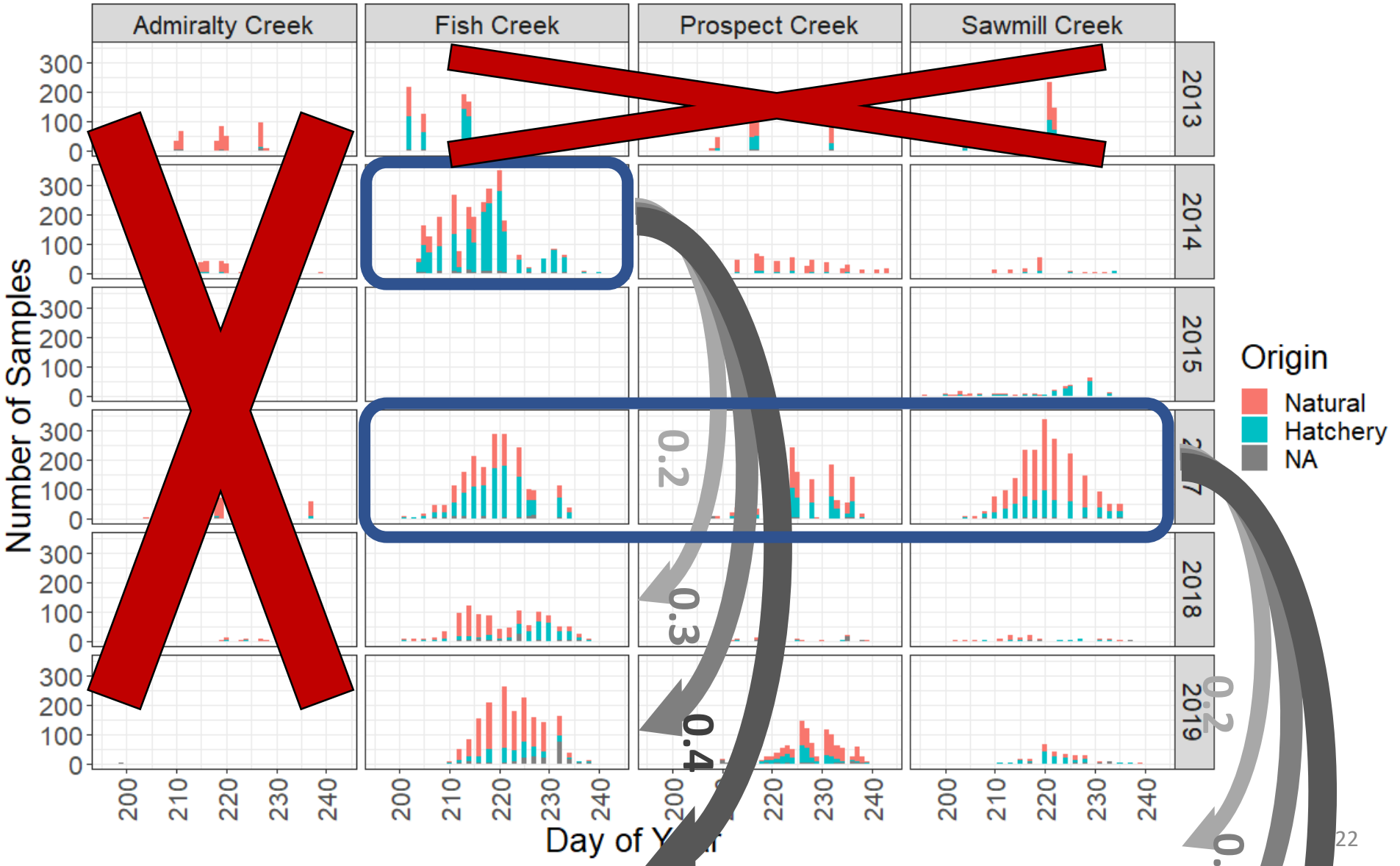
Study plan


Sampling year
Species
2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
Chum (BY 1)
F0 F1 F1 F1 F1/F2 F1/F2 F2 F2 F2
Chum (BY 2)
F0 F1 F1 F1/F2 F1/F2 F2 F2 F2 F2
0.2 0.3 0.3 0.4 0.4
Adult
Species
2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
Chum (BY1)
P
O O
Adult + Alevin
Chum (BY2)
P
O O O

Statistical power of study plan

- Need minimum ~100 parents of each sex/origin
- Ideally a high proportion of parents
  - Hogan Bay 2013/2015
    - Low sampling rate = few parent-offspring assignments
- Sample high proportion of offspring
  - Consistent proportion for all return years
  - Differences in age at return?

Samples by origin, stream, and year



Questions?