Homing patterns of hatchery-reared and wild Yakima River Spring Chinook salmon

Andrew Dittman
Donald Larsen
Mary Moser
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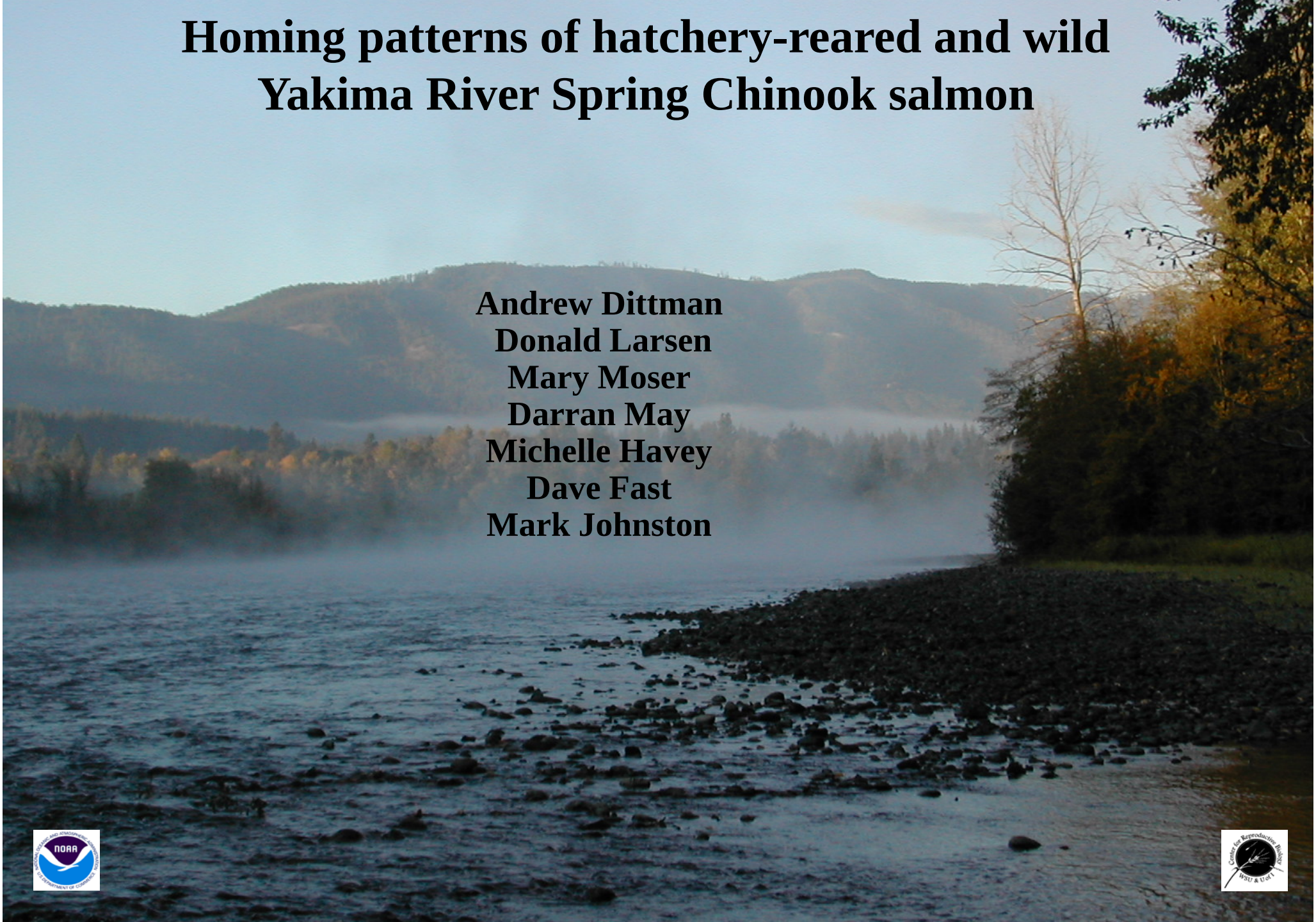
Michelle Havey
Dave Fast
Mark Johnston



Outline

-Homing and imprinting

-The role of satellite acclimation facilities in supplementation and salmon recovery

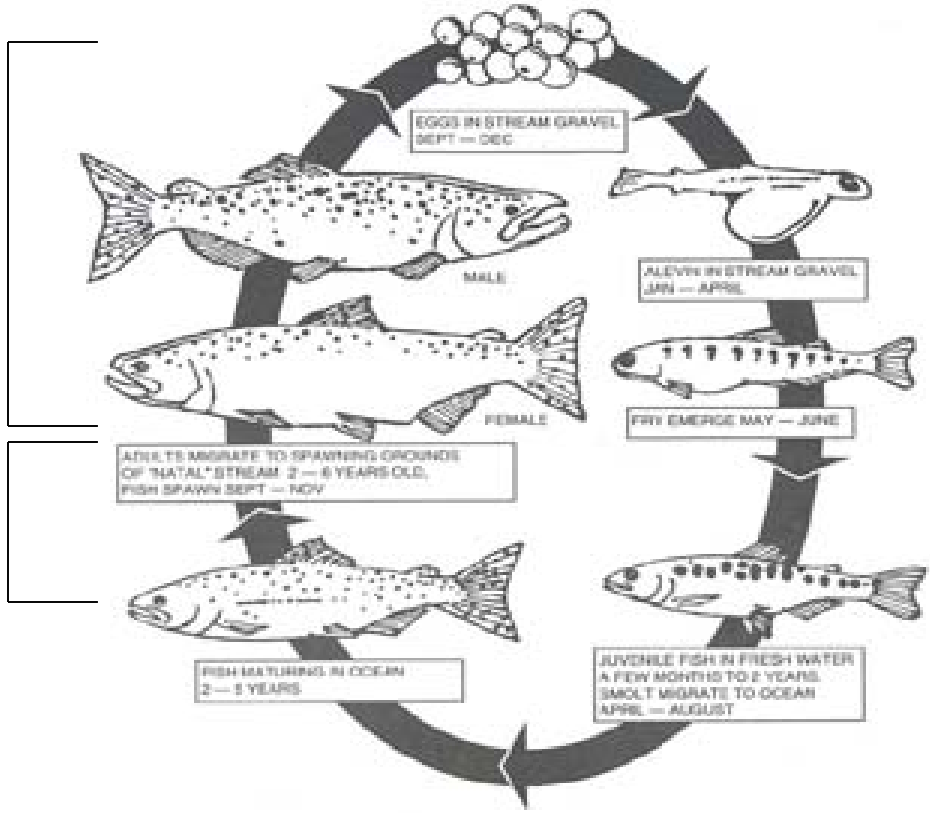
-The YKFP project

-Homing patterns of Yakima Spring chinook

Spring chinook salmon: imprinting and homing

Homing to the natal site, acclimation site; Spawning site selection; Mate choice

Homing to the natal watershed; holding areas



LIFE CYCLE OF CHINOOK SALMON

Presumed sensitive periods for imprinting

Smolting: sensitive period for imprinting; transfer to acclimation sites

Outline

-Homing and imprinting

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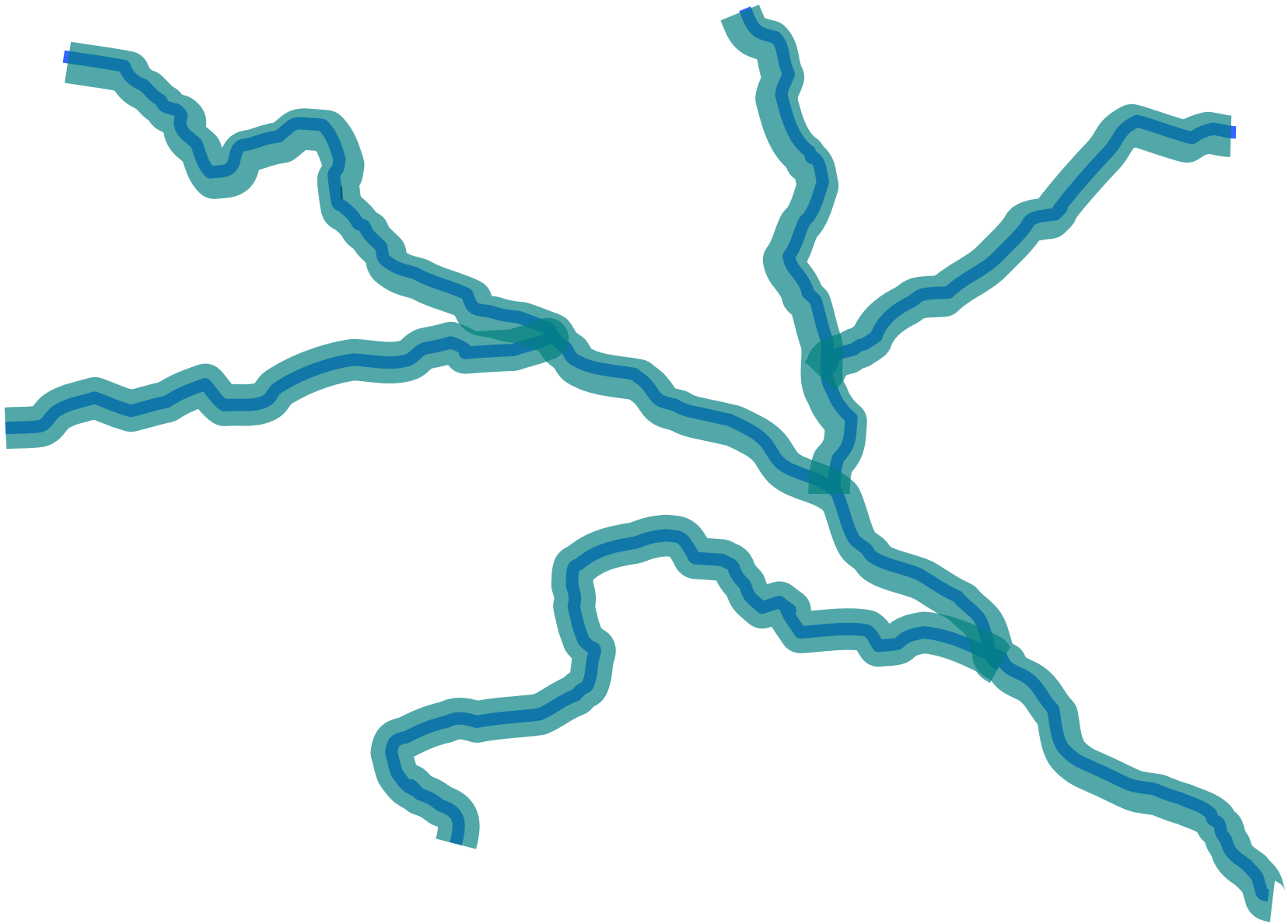

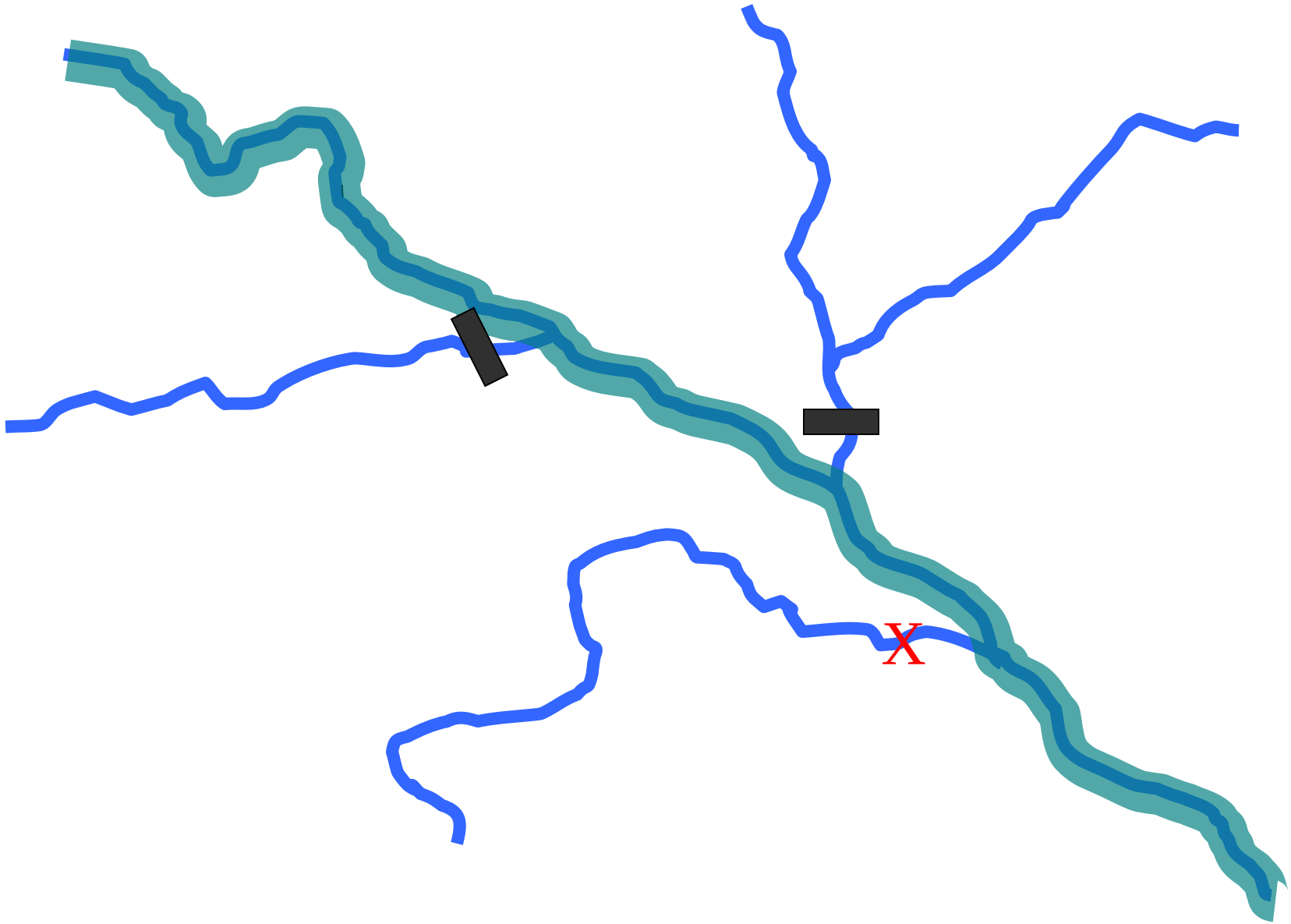
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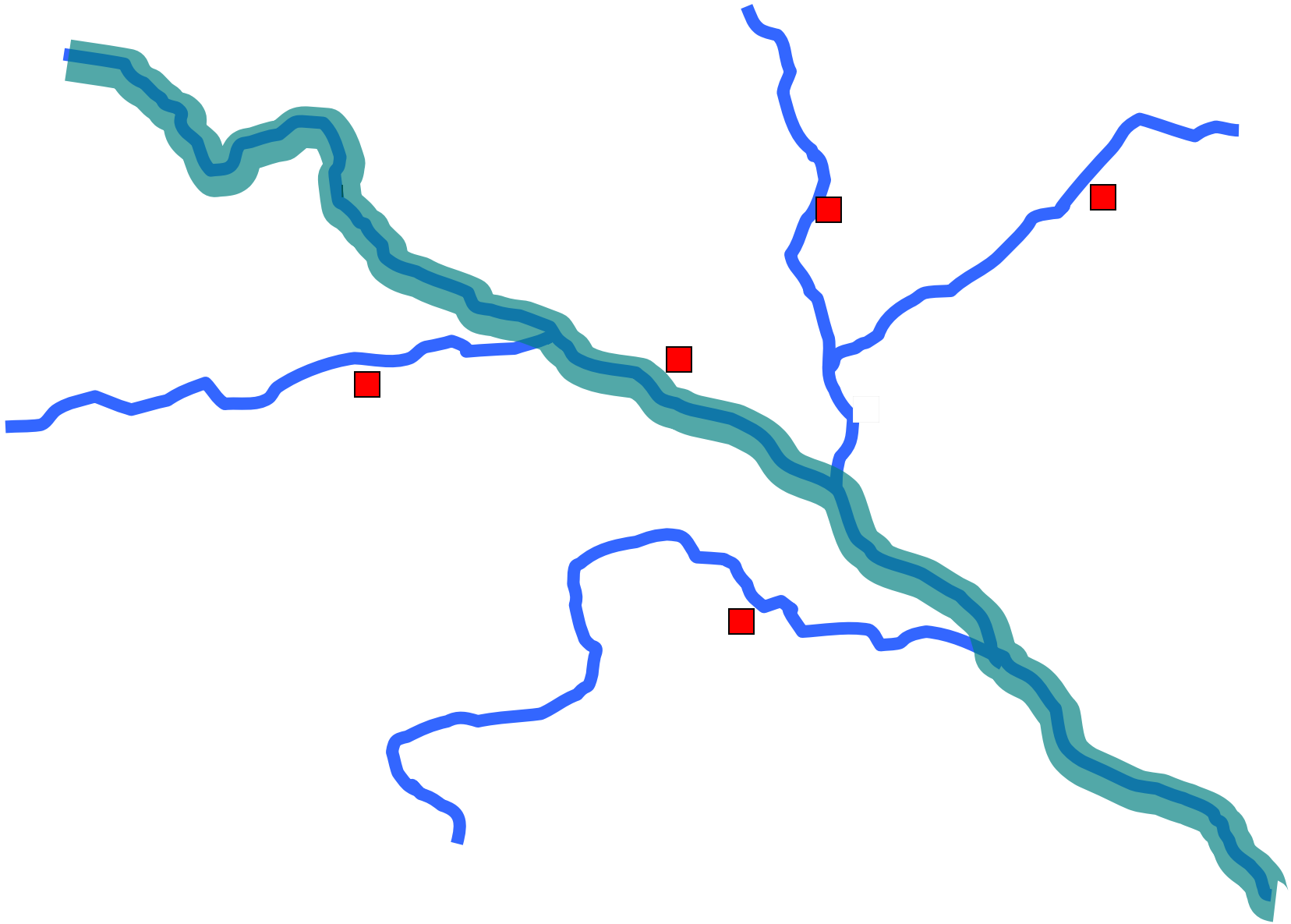
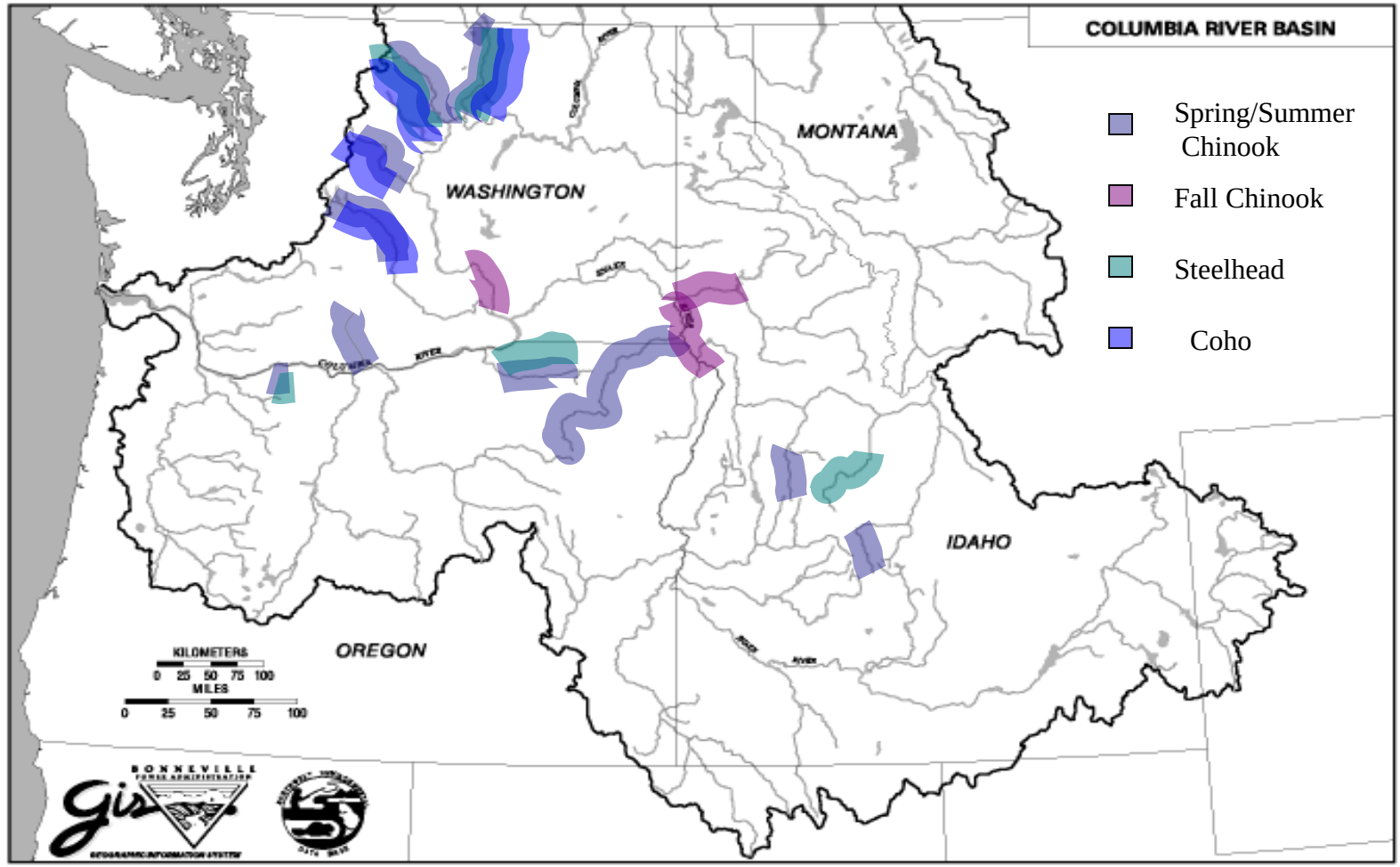


The growing role of acclimation facilities in supplementation programs



Outline

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-The role of satellite acclimation facilities in supplementation and salmon recovery

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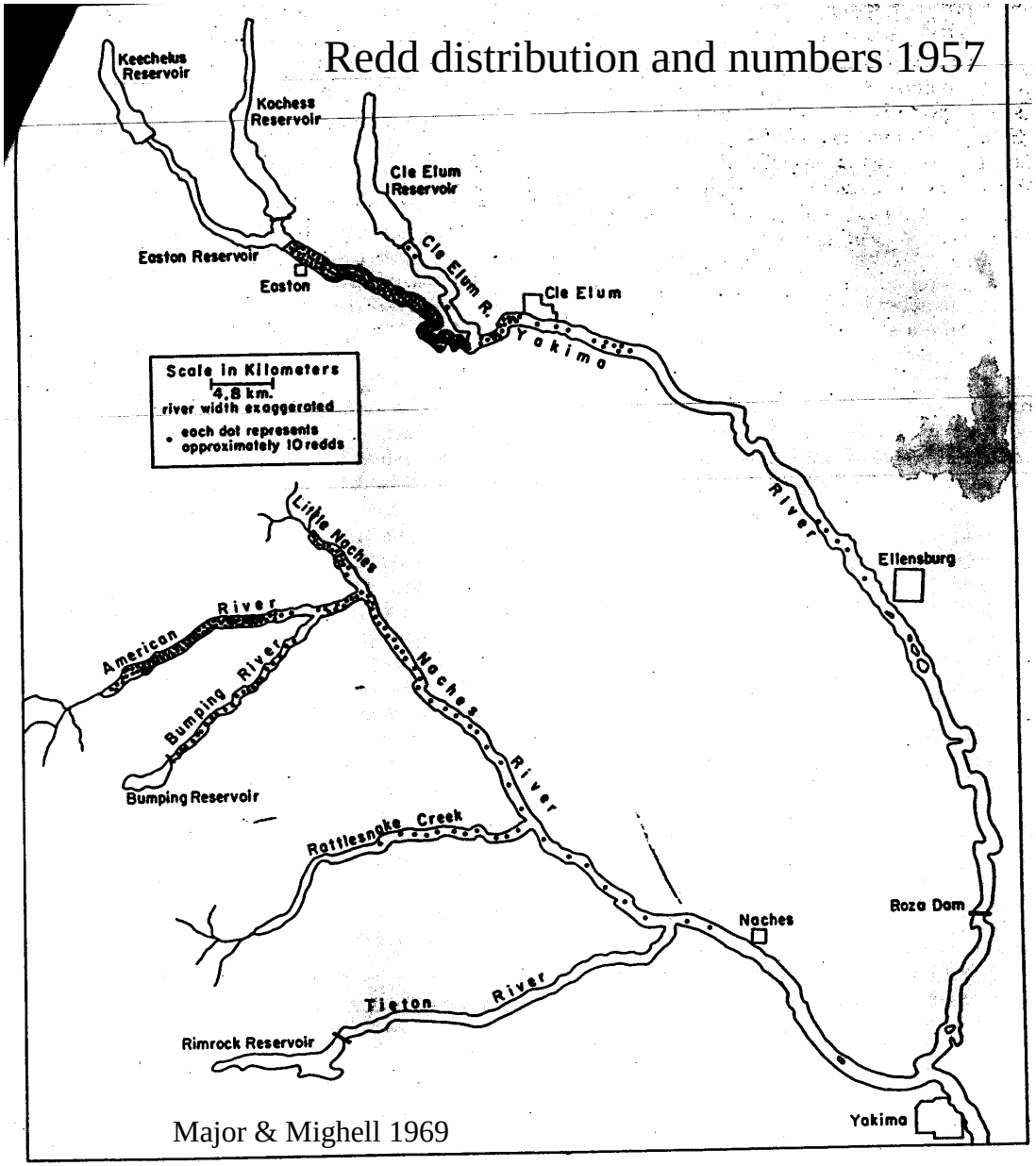
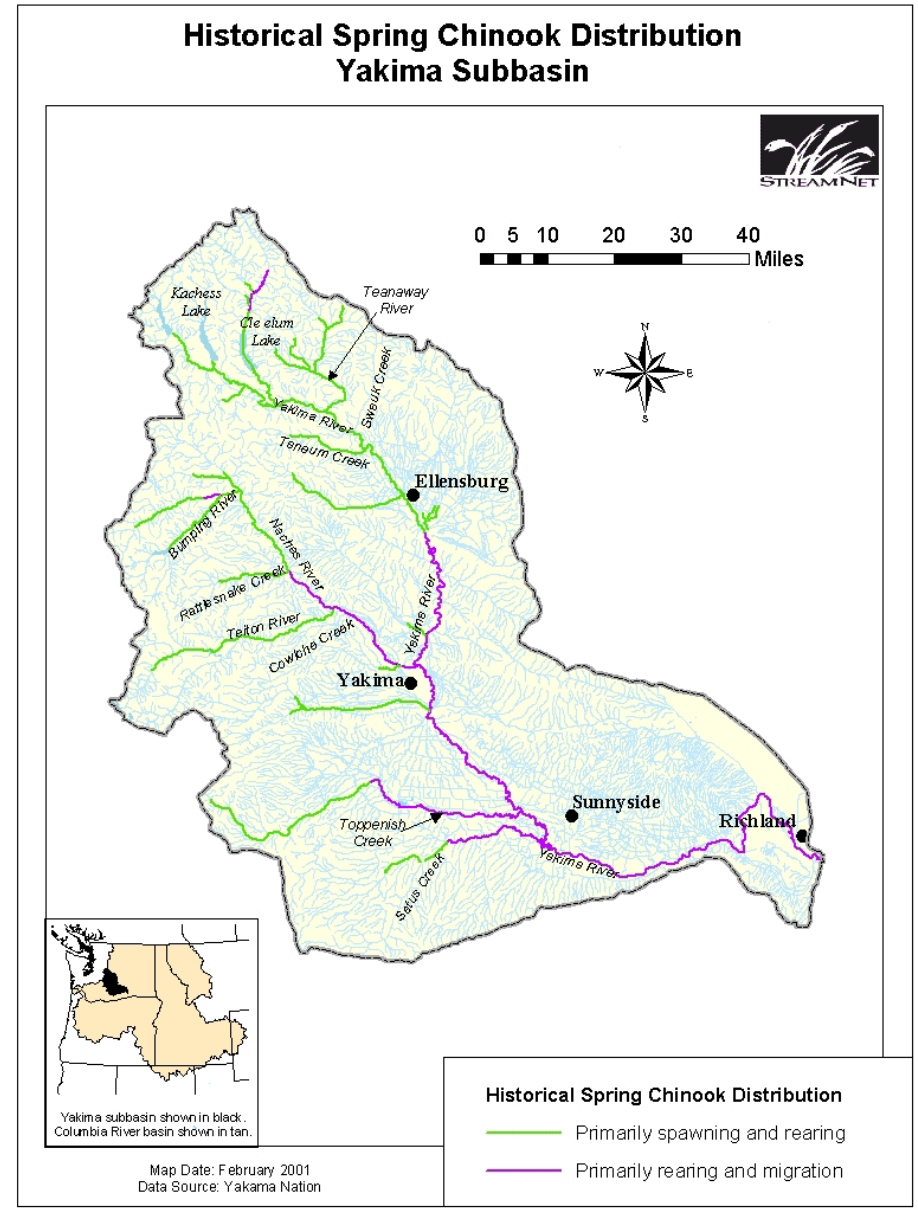
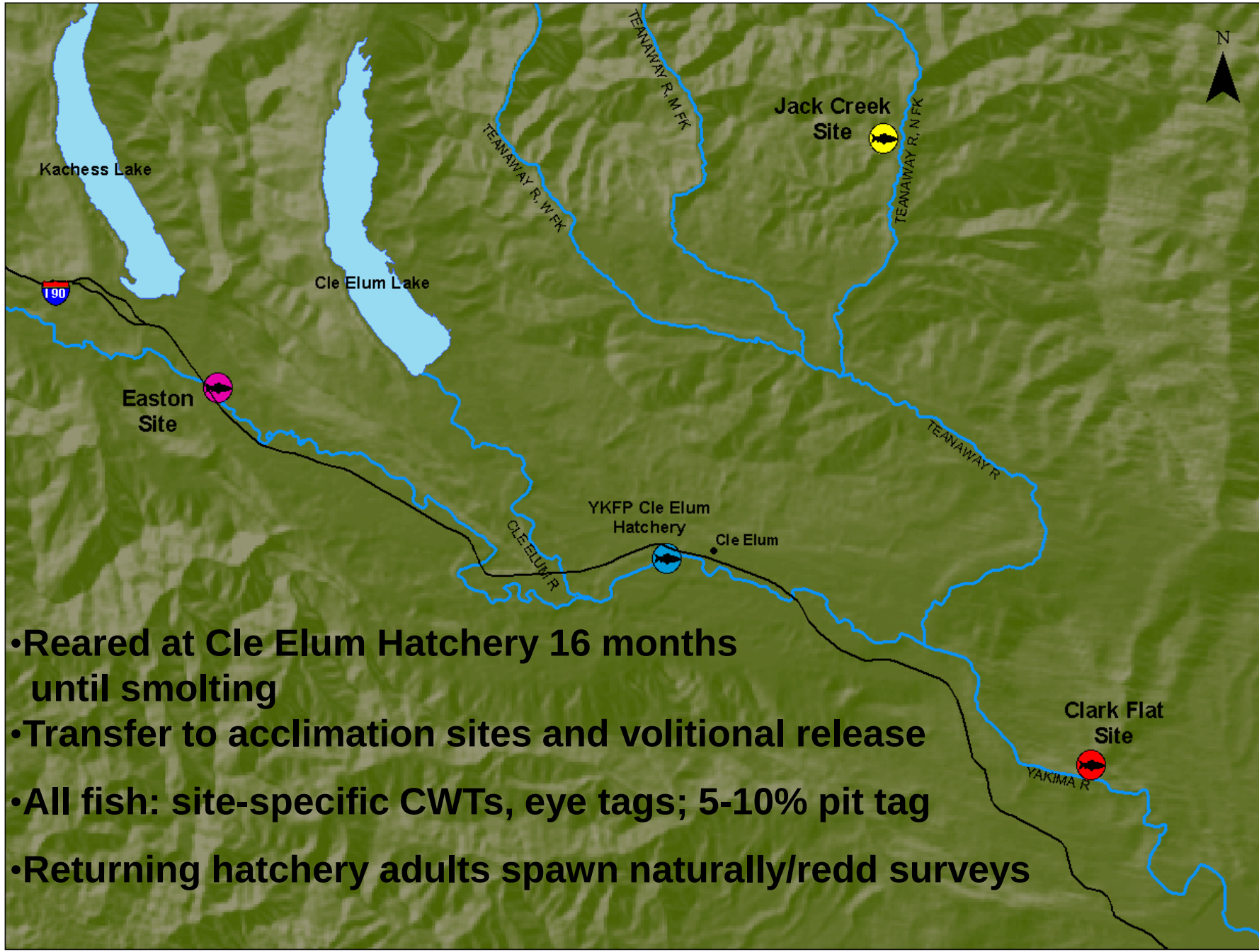
-Homing patterns of Yakima Spring chinook

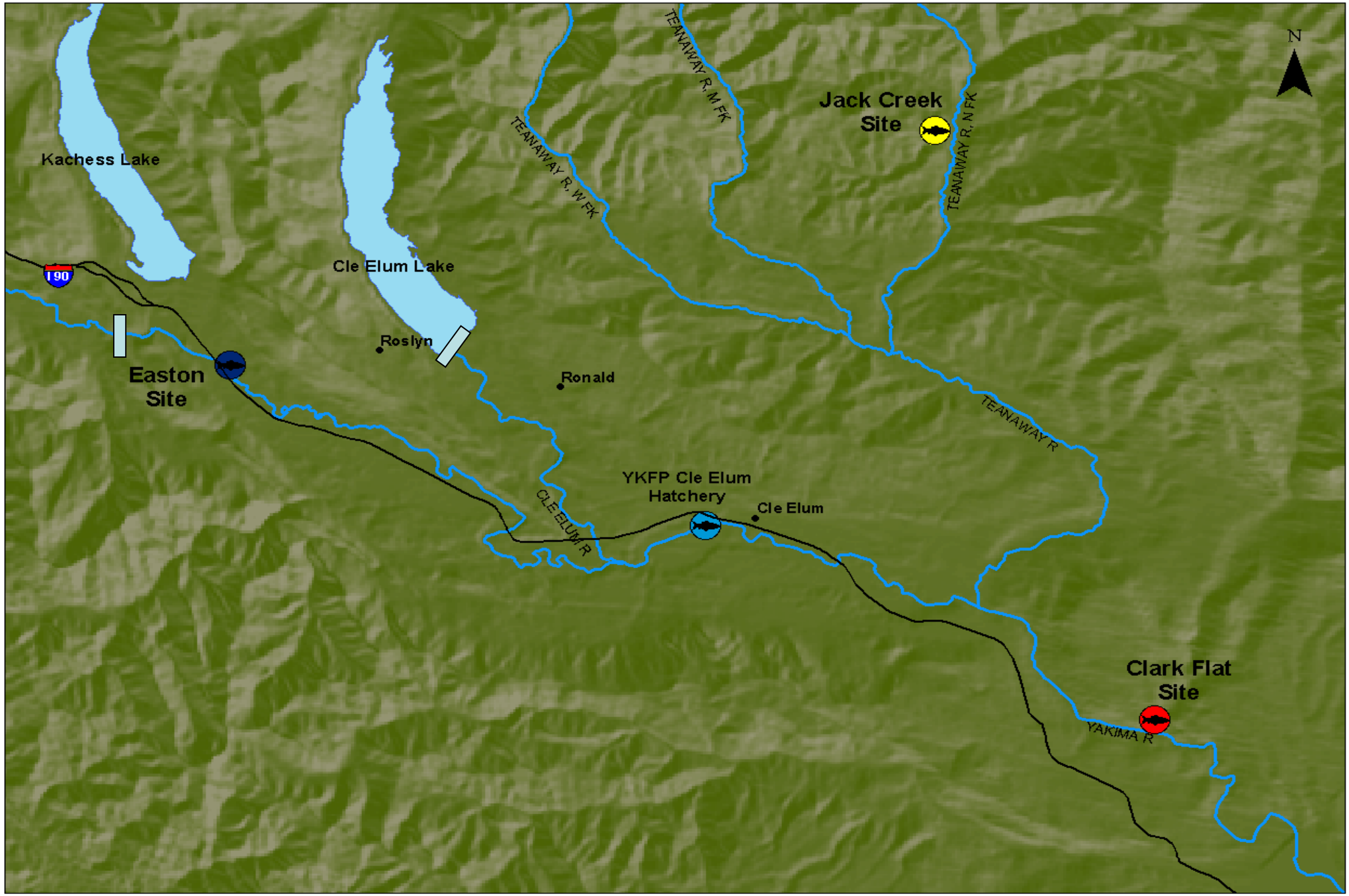
Yakima River Spring chinook population

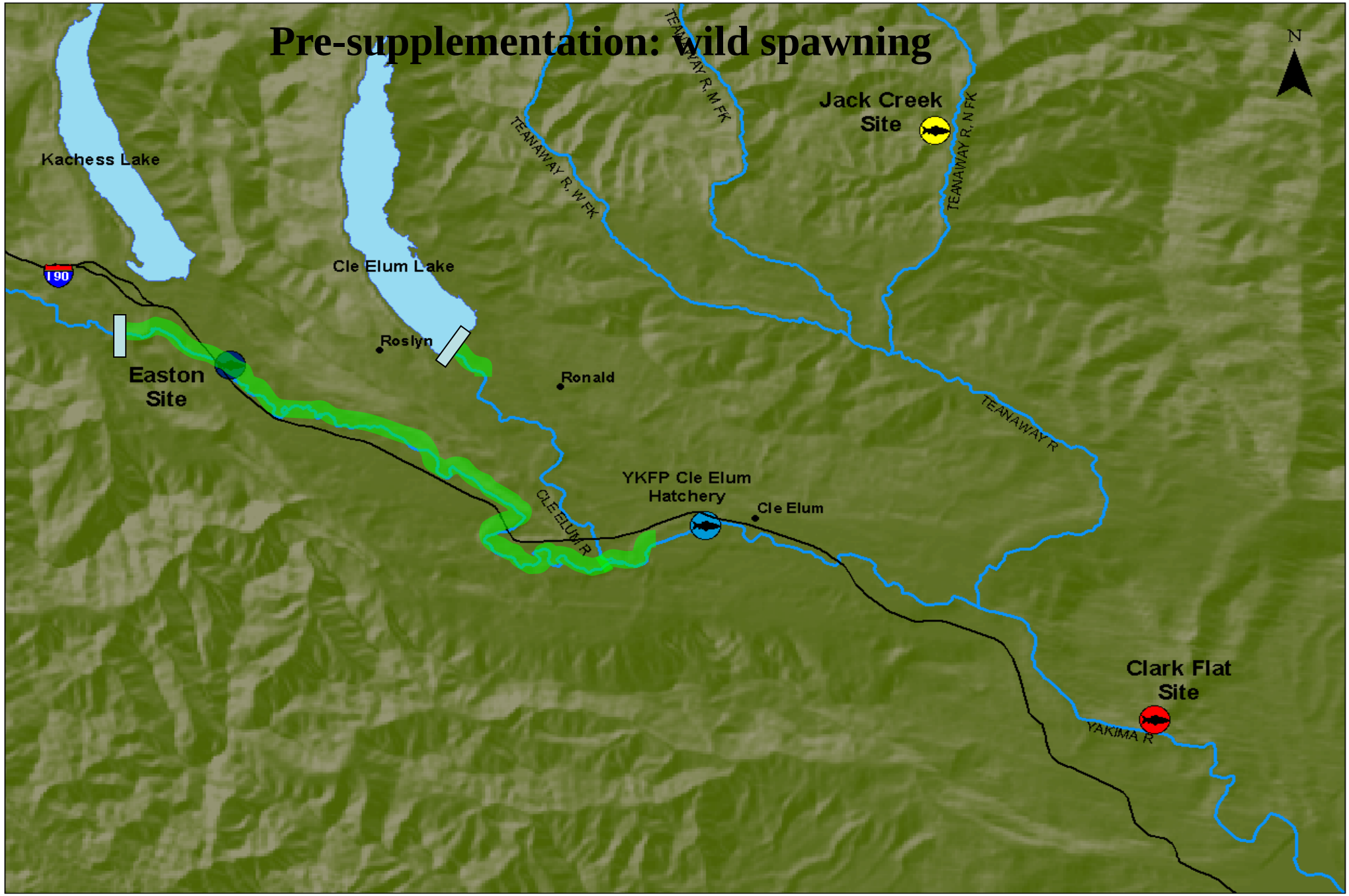


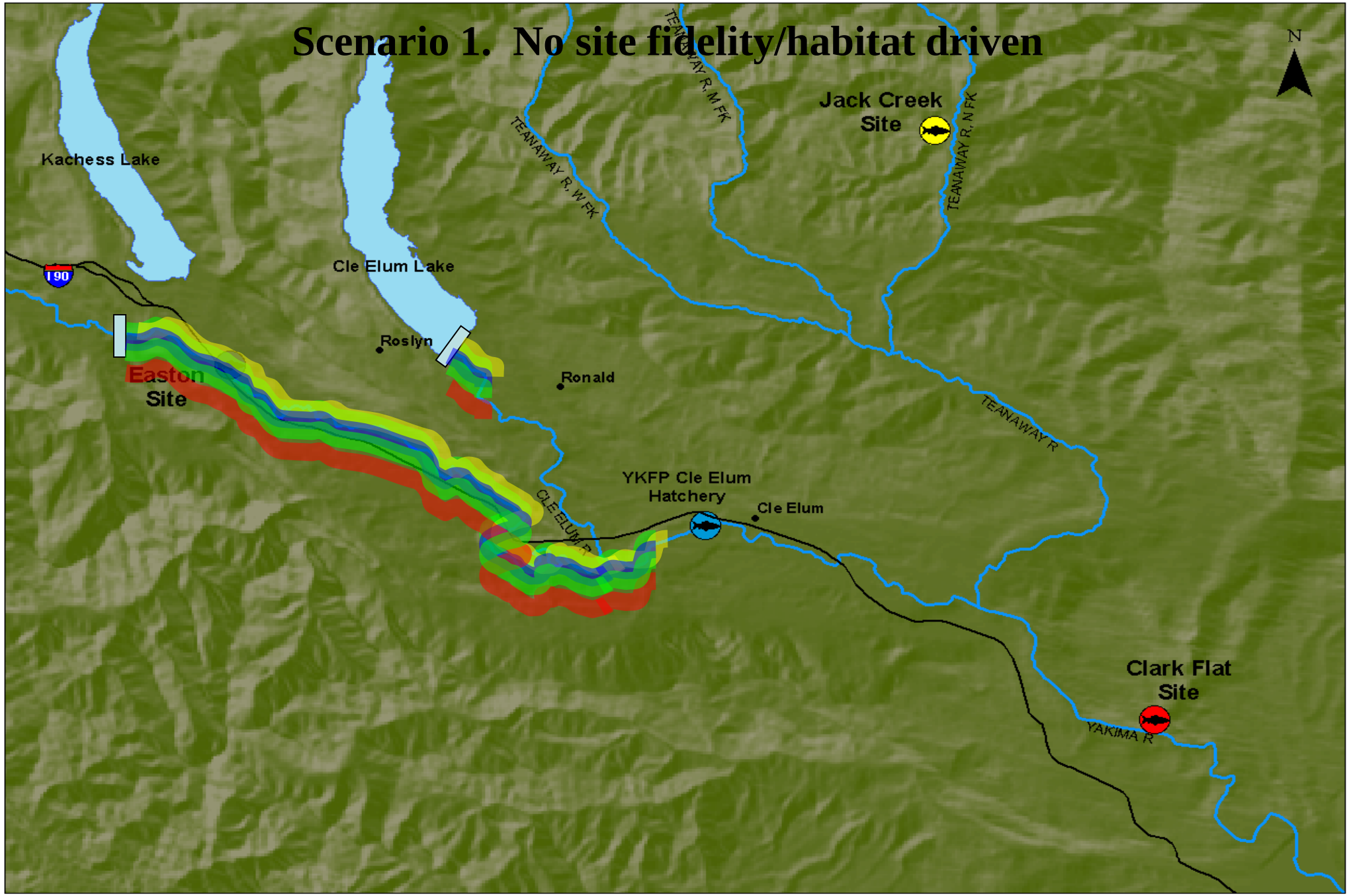


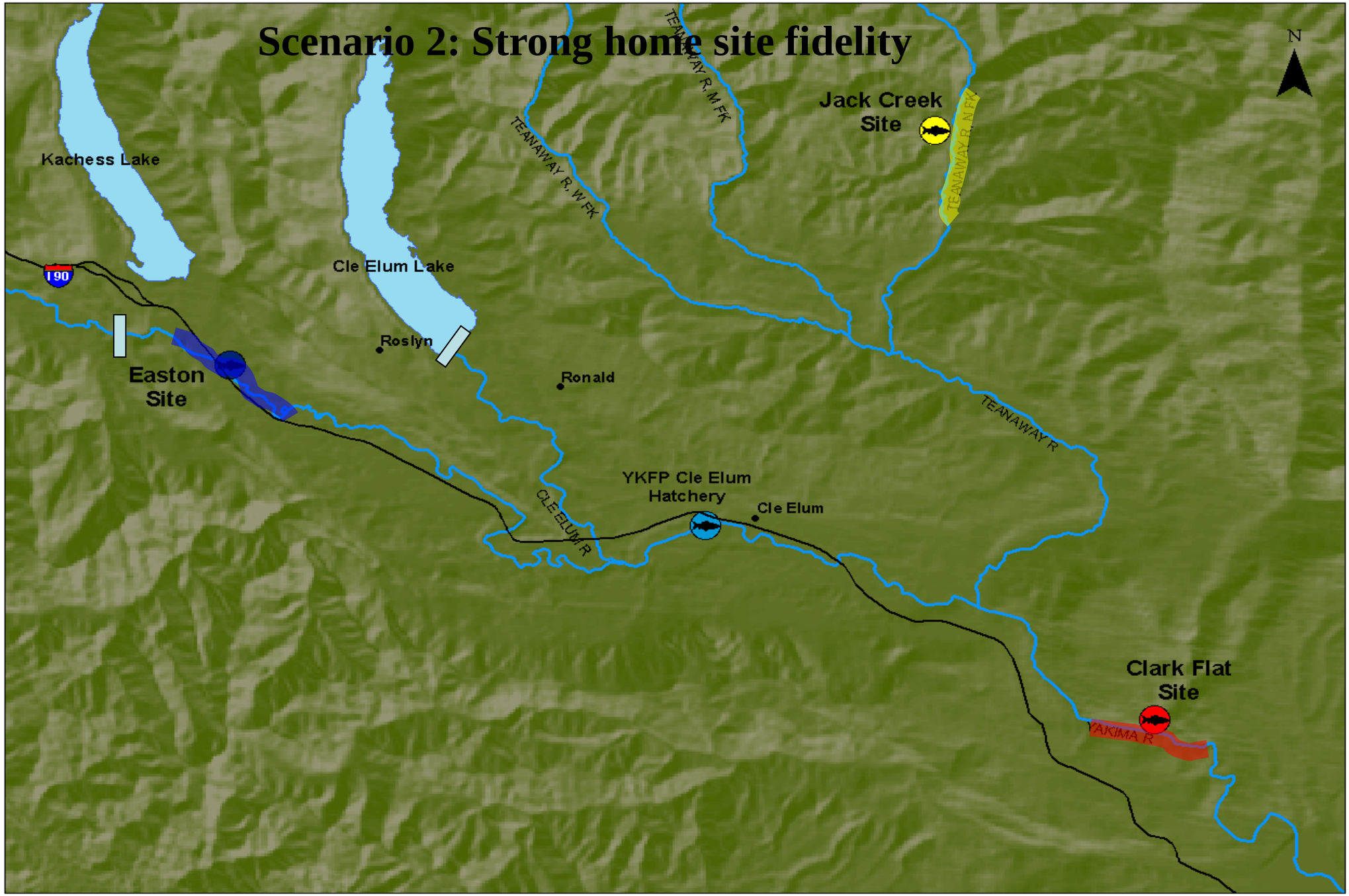
YKFP Spring chinook supplementation research program

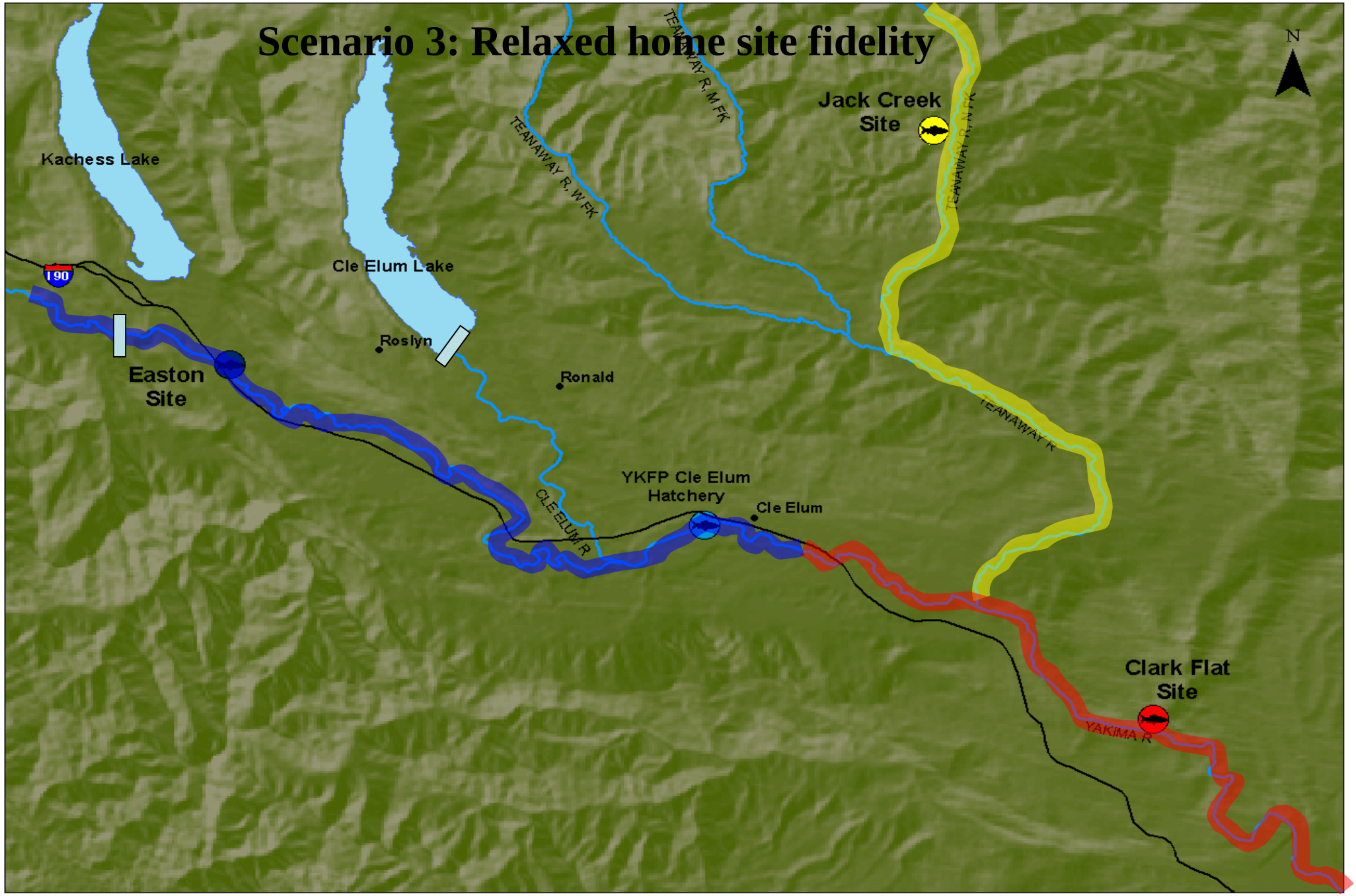


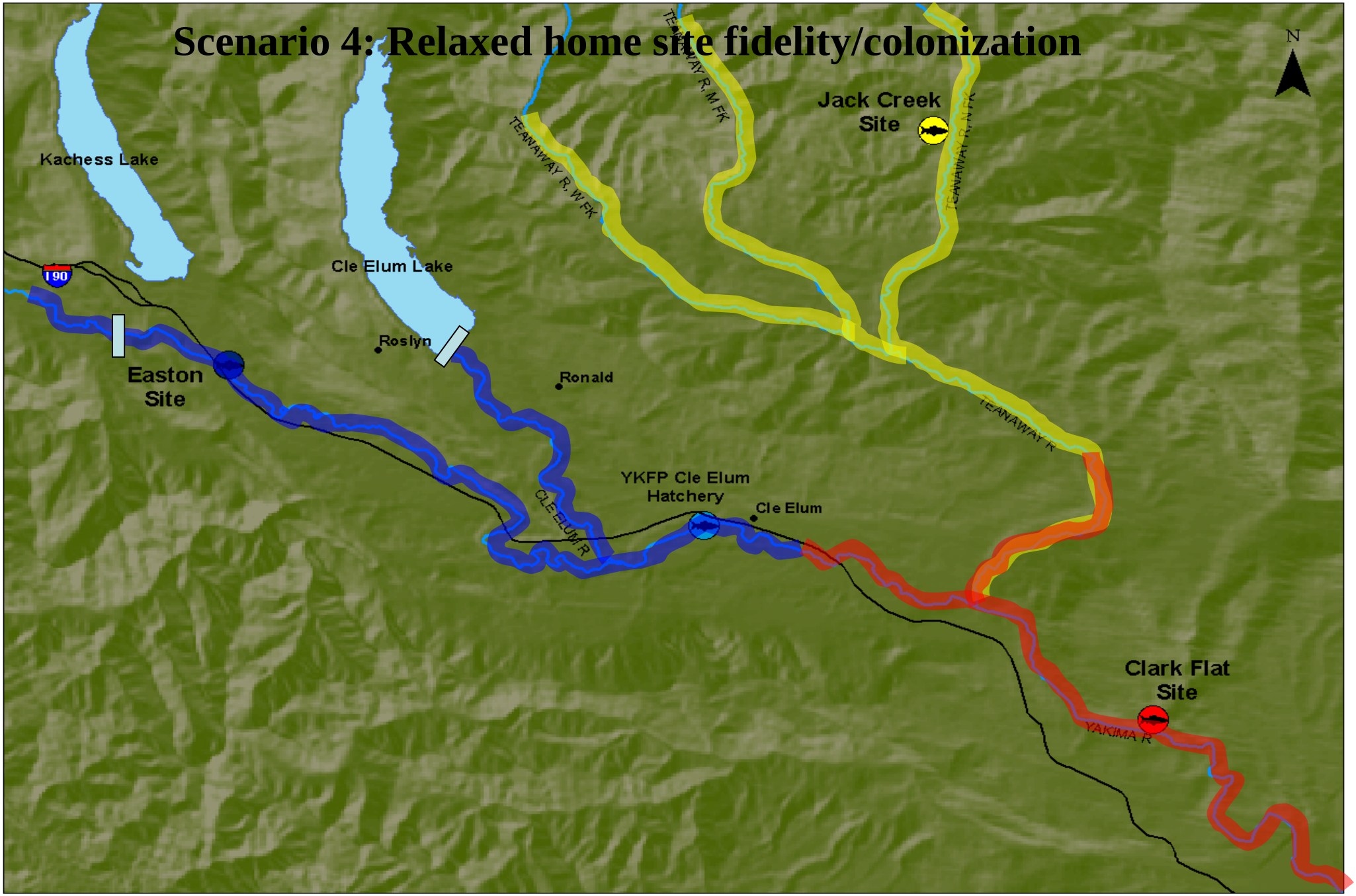

N
Kachess Lake
Cle Elum Lake
I90
Roslyn
Easton Site
Ronald
TEANAWAY R, M FK
TEANAWAY R, W FK
TEANAWAY R, N FK
Jack Creek Site
TEANAWAY R
YKFP Cle Elum Hatchery
Cle Elum
CLE ELUM R
Clark Flat Site
YAKIMA R


Pre-supplementation: wild spawning
N
Kachess Lake
Cle Elum Lake
I90
Easton Site
Roslyn
Ronald
TEANAWAY R, M FK
TEANAWAY R, W FK
TEANAWAY R, N FK
Jack Creek Site
TEANAWAY R
YKFP Cle Elum Hatchery
Cle Elum
CLE ELUM R
Clark Flat Site
YAKIMA R


Scenario 1. No site fidelity/habitat driven
N
Kachess Lake
Cle Elum Lake
I90
Roslyn
Easton
Site
Ronald
TEANAWAY R, M FK
TEANAWAY R, W FK
TEANAWAY R, N FK
Jack Creek
Site
TEANAWAY R
YKFP Cle Elum
Hatchery
Cle Elum
CLE ELUM R
Clark Flat
Site
YAKIMA R


Scenario 2: Strong home site fidelity
N
Jack Creek Site
TEANAWAY R, M FK
TEANAWAY R, W FK
TEANAWAY R, N FK
Kachess Lake
Cle Elum Lake
I90
Roslyn
Easton Site
Ronald
TEANAWAY R
YKFP Cle Elum Hatchery
Cle Elum
CLE ELUM R
Clark Flat Site
YAKIMA R


Scenario 3: Relaxed home site fidelity
N
Jack Creek Site
Kachess Lake
Cle Elum Lake
I90
Roslyn
Easton Site
Ronald
YKFP Cle Elum Hatchery
Cle Elum
Clark Flat Site
TEANAWAY R, M FK
TEANAWAY R, W FK
TEANAWAY R, N FK
TEANAWAY R
CLE ELUM R
YAKIMA R


Scenario 4: Relaxed home site fidelity/colonization
N
Kachess Lake
Cle Elum Lake
190
Roslyn
Ronald
Easton Site
Jack Creek Site
TEANAWAY R, M FK
TEANAWAY R, W FK
TEANAWAY R, N FK
TEANAWAY R
YKFP Cle Elum Hatchery
Cle Elum
CLE ELUM R
Clark Flat Site
YAKIMA R

Objectives

Identify and compare the spatial and temporal patterns of homing in wild/naturally spawning vs. hatchery-reared fish

-Efficacy of Acclimation

-Recolonization of underutilized habitat

-Wild vs. Hatchery

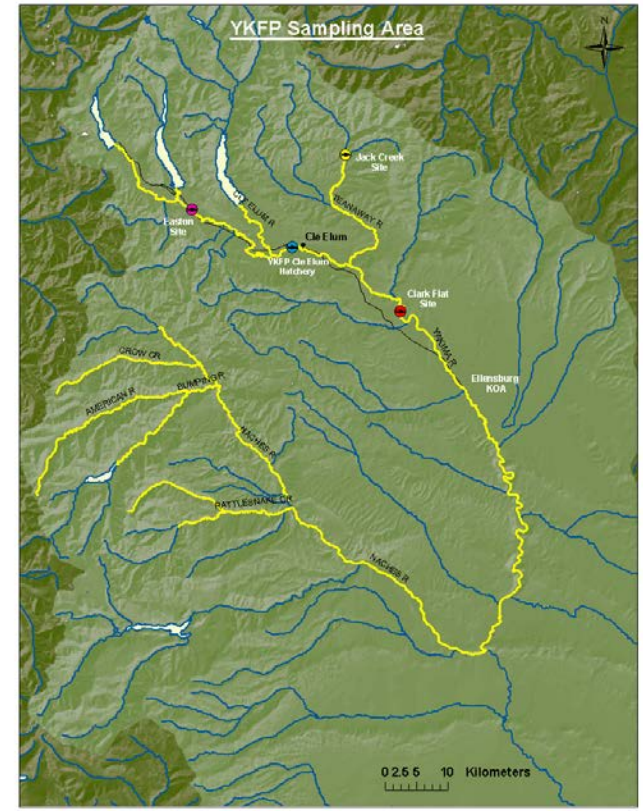
-Pre- vs. post supplementation

Methods

Comprehensive surveys of upper Yakima Basin

Carcasses

- -GPS location (3 m accuracy); date
- -hatchery/wild
- -male/female; jack, precocious
- -length, scale
- -tag location, recovery
- -egg retention; disease
- -dna, otolith
- -carcass mark/recapture
- -goo factor



Redds

- -Yakama biologists survey and flag (color coded by date) all redds in upper Yakima
- - GPS mapping of all redds in the upper Yakima at end of spawning season


NRS

Results

Wild vs. Hatchery

Efficacy of Acclimation

Carcass % recovery rates

	2002	2003	2004
Total	**2112/8091(26.1)**	**655/3258 (20.1)**	**3025/10187 (31.9)**
Hatchery Adults	1508/6112 (**24.7**)	337/1036 (**32.5**)	935/2876 (**32.5**)
Wild Adults	395/1820 (**21.7**)	107/394 (**27.2**)	1909/6436 (**29.7**)
Hatchery Jacks	9/71 (**12.6**)	146/1105 (**7.6**)	33/204 (**16.2**)
Wild Jacks	3/89 (**3.4**)	57/723 (**7.8**)	73/671 (**10.9**)

Carcass survey data summary

2002

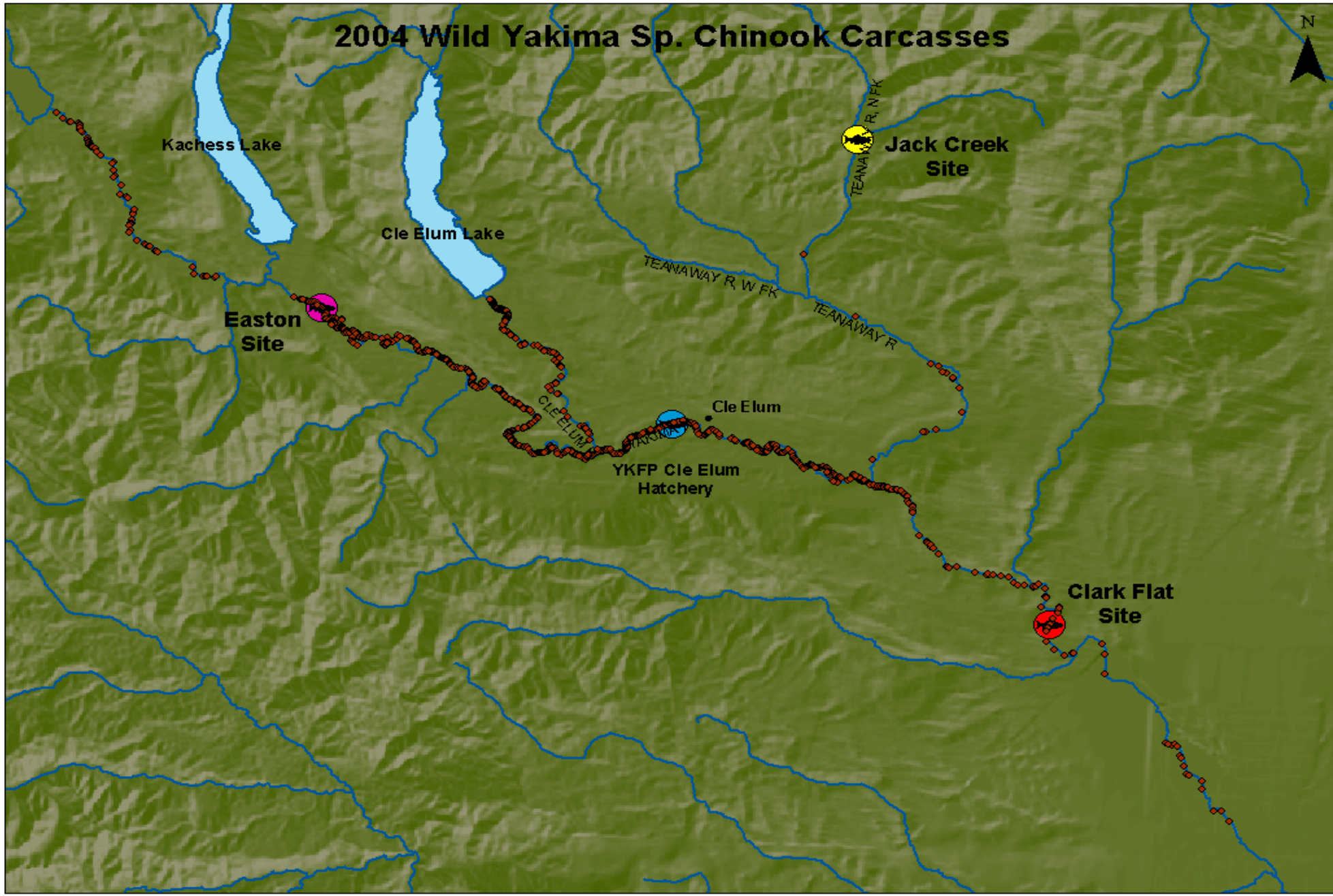
	Male	Female	Jack	MJ/PP
Hatchery	530 (34.9) (35.1)	978 (64.4) (64.9)	9 (0.6)	1(0.1)
Wild	169 (42.5) (42.8)	226 (56.8) (57.2)	3 (0.7)	0

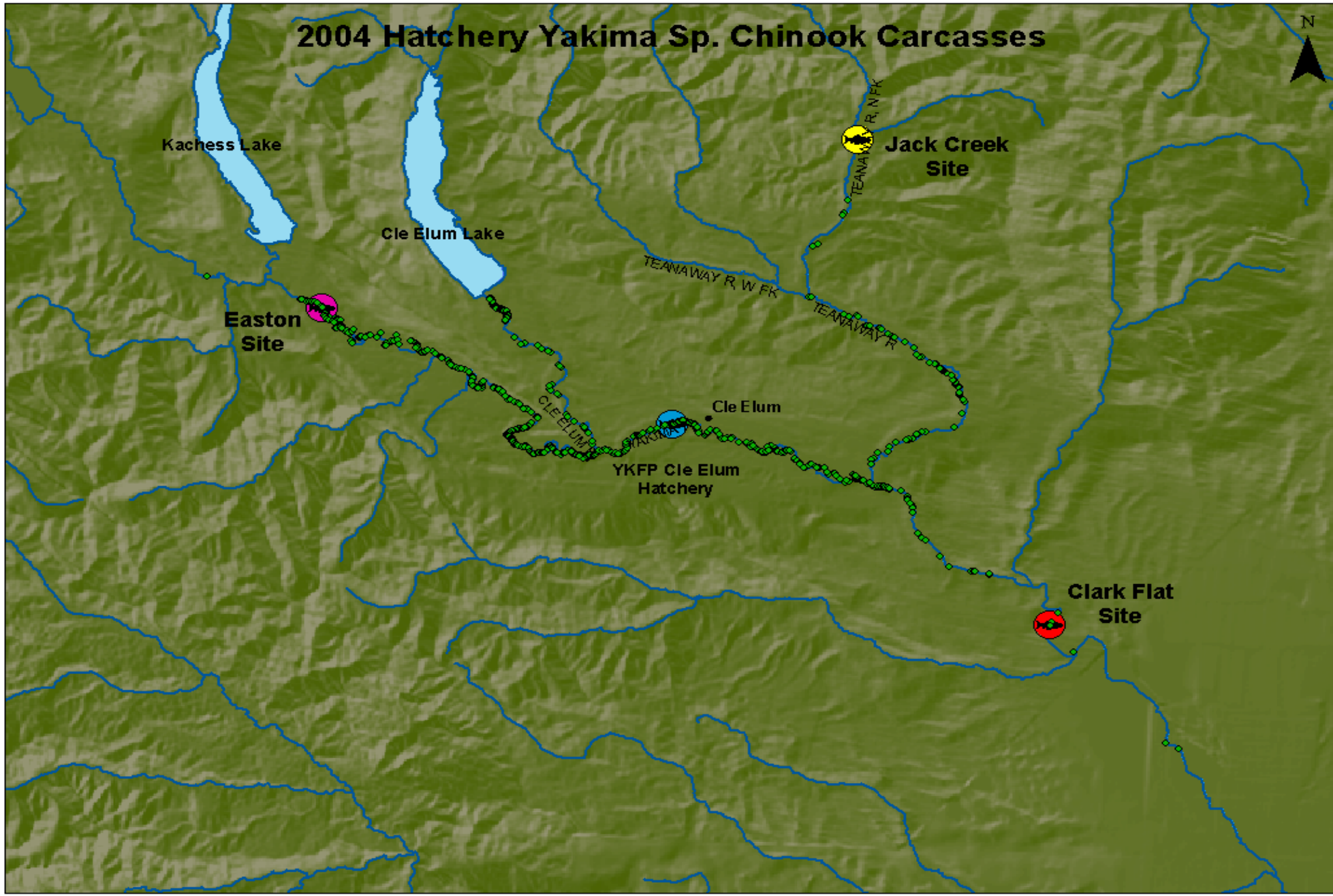
2003

	Male	Female	Jack	MJ/PP
Hatchery	119 (24.6) (35.3)	218 (45.1) (64.7)	146 (30.3)	0
Wild	51 (31.1) (47.7)	56 (34.1) (52.3)	57 (34.8)	0

2004

	Male	Female	Jack	MJ/PP
Hatchery	362 (37.6) (39.0)	567 (58.9) (61.0)	33 (3.4)	1(0.1)
Wild	871 (44.0) (45.8)	1032 (52.1) (54.2)	73 (3.7)	3(0.2)


2004 Wild Yakima Sp. Chinook Carcasses
N
Kachess Lake
Cle Elum Lake
TEANAWAY R, N FK
Jack Creek Site
TEANAWAY R, W FK
TEANAWAY R
Easton Site
CLE ELUM
YAKIMA
Cle Elum
YKFP Cle Elum Hatchery
Clark Flat Site

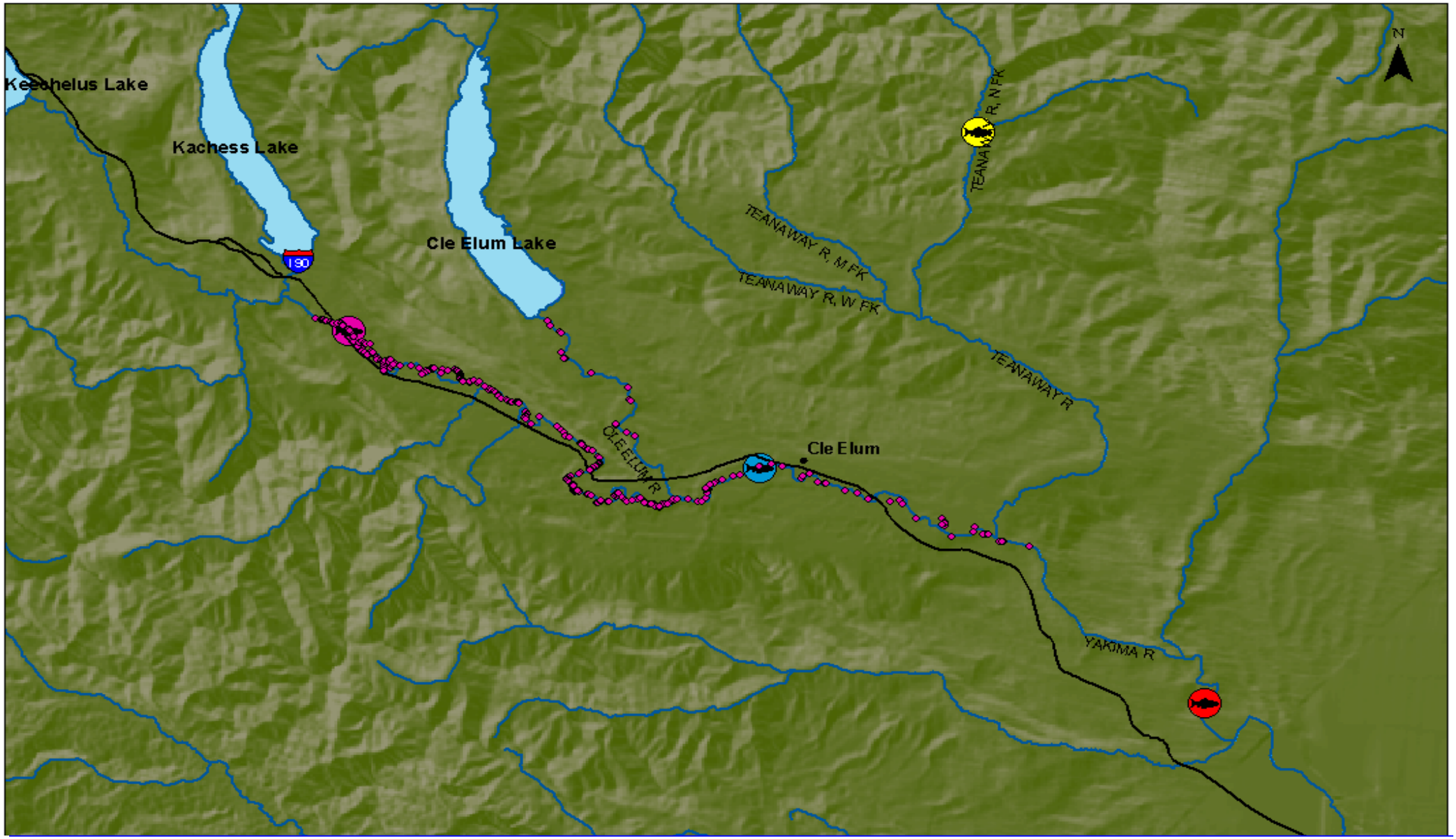

2004 Hatchery Yakima Sp. Chinook Carcasses
N
Kachess Lake
Cle Elum Lake
TEANAWAY R, N FK
Jack Creek Site
TEANAWAY R, W FK
TEANAWAY R
Easton Site
CLE ELUM R
YAKIMA R
Cle Elum
YKFP Cle Elum Hatchery
Clark Flat Site

Results

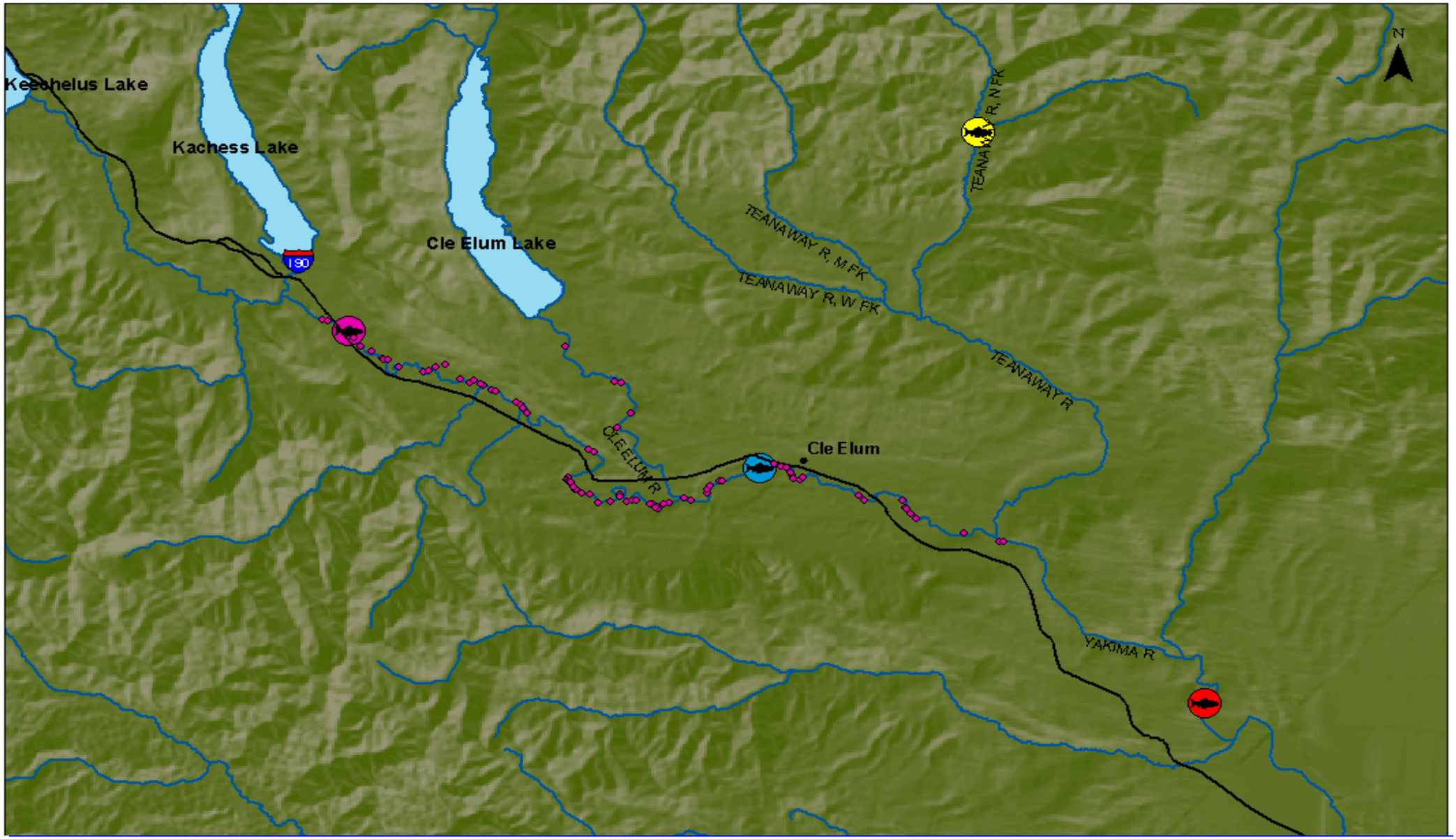
Wild vs. Hatchery

Efficacy of Acclimation

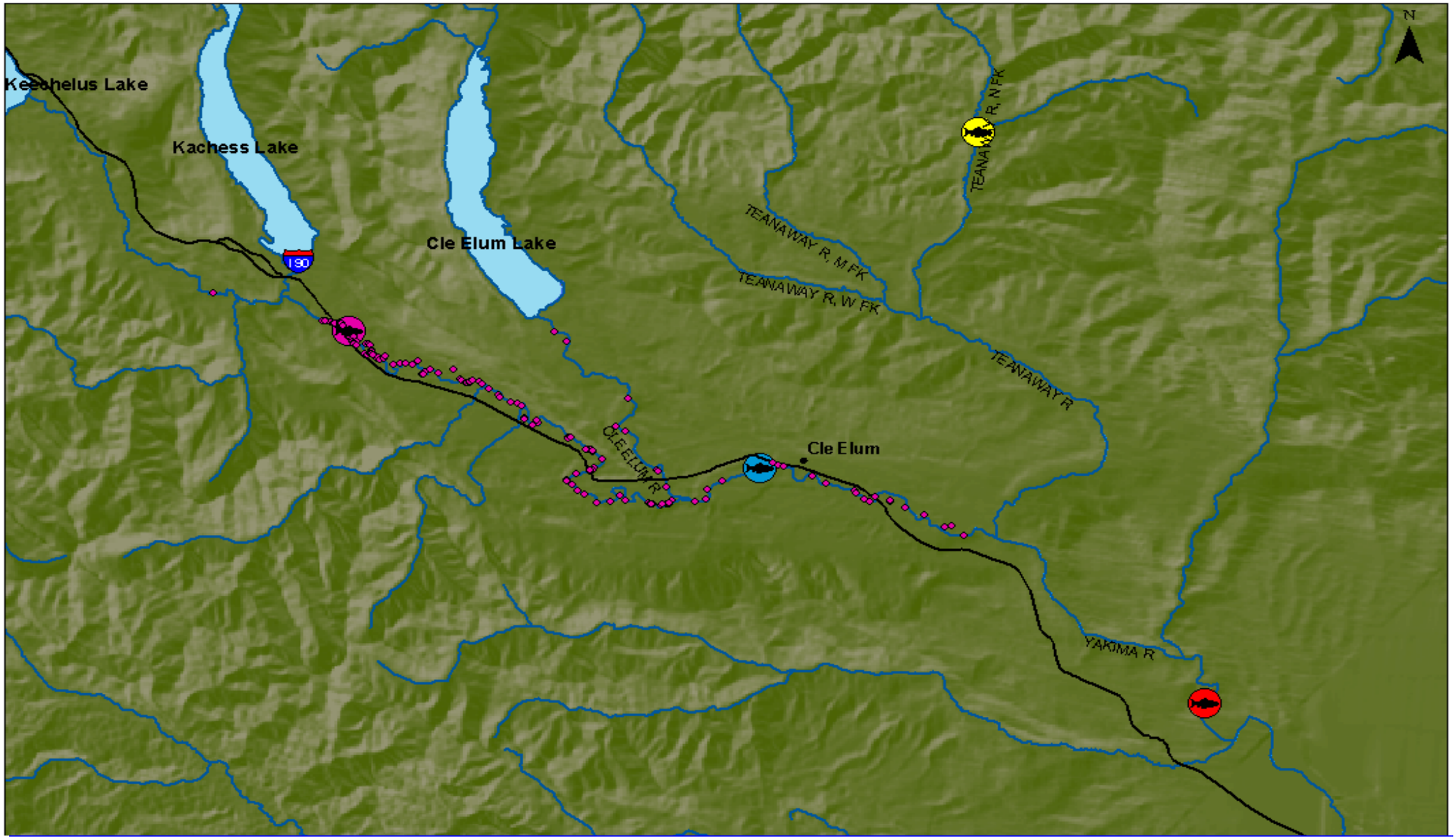
Easton 2002


Keechelus Lake
Kachess Lake
Cle Elum Lake
I90
TEANAWAY R, N FK
TEANAWAY R, M FK
TEANAWAY R, W FK
TEANAWAY R
CLE ELUM R
Cle Elum
YAKIMA R
N

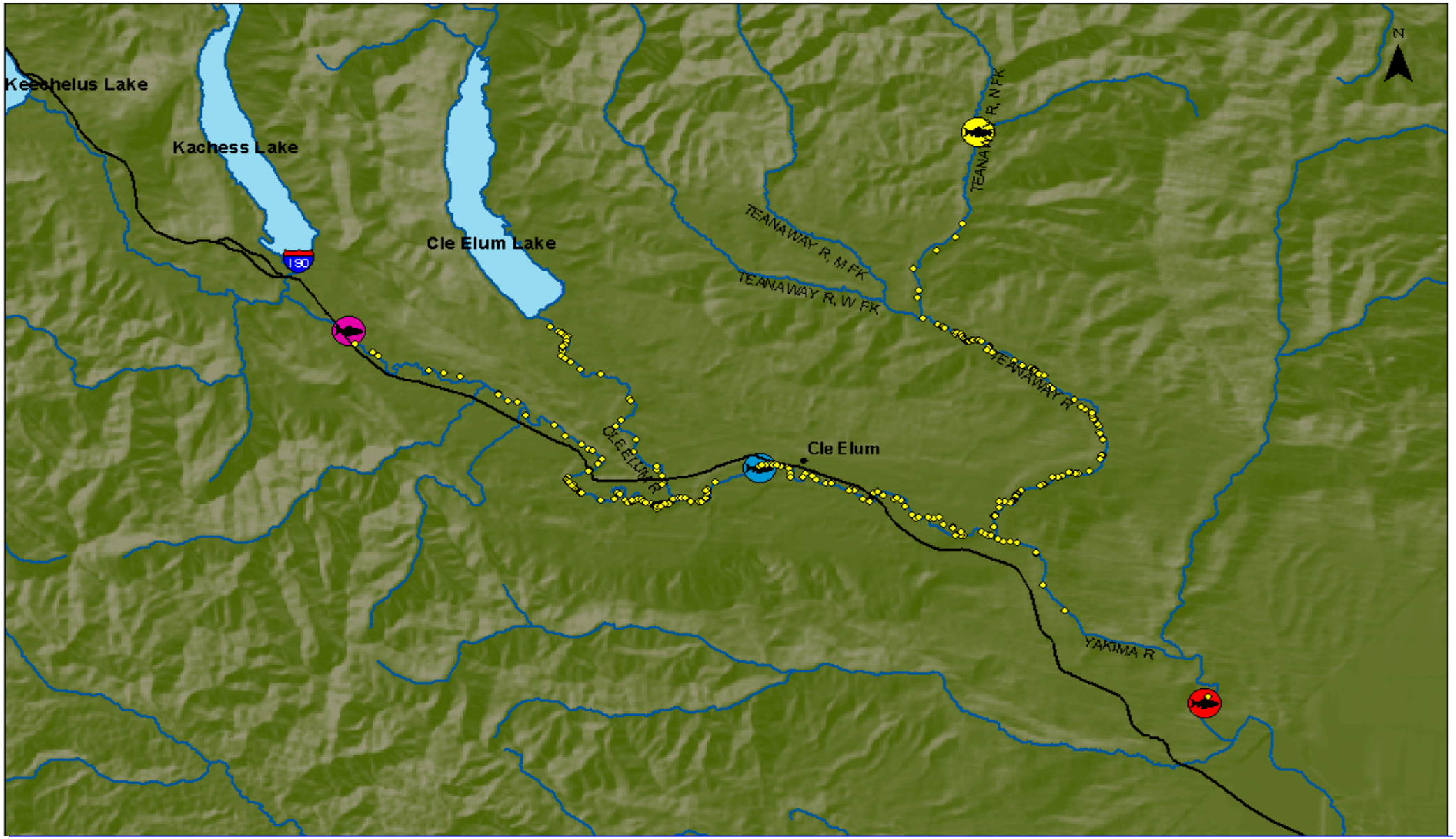
Easton 2003


Keechelus Lake
Kachess Lake
Cle Elum Lake
I90
TEANAWAY R, N FK
TEANAWAY R, M FK
TEANAWAY R, W FK
TEANAWAY R
CLE ELUM R
Cle Elum
YAKIMA R
N

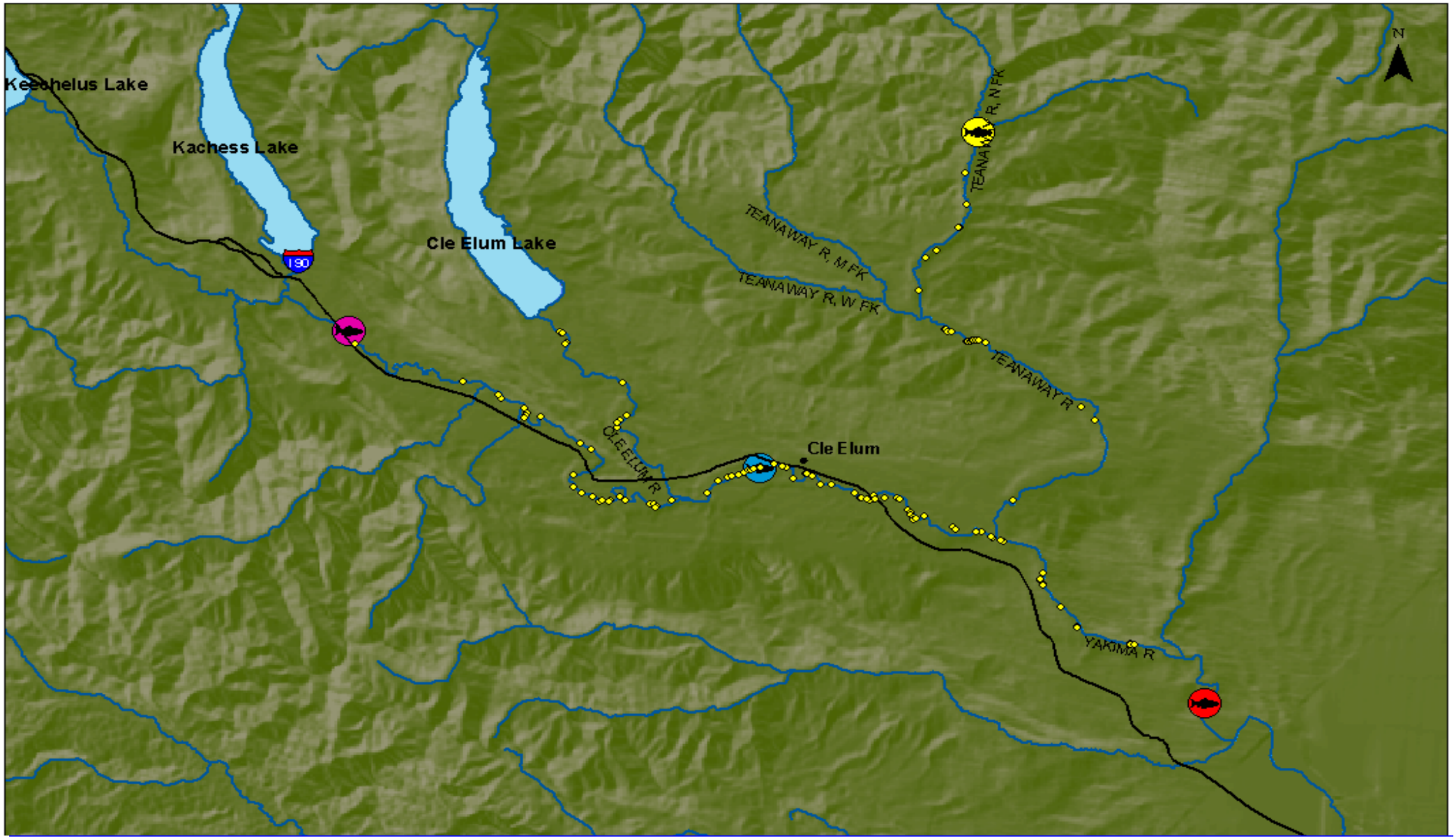
Easton 2004


Keechelus Lake
Kachess Lake
Cle Elum Lake
I90
TEANAWAY R, N FK
TEANAWAY R, M FK
TEANAWAY R, W FK
TEANAWAY R
CLE ELUM R
Cle Elum
YAKIMA R
N

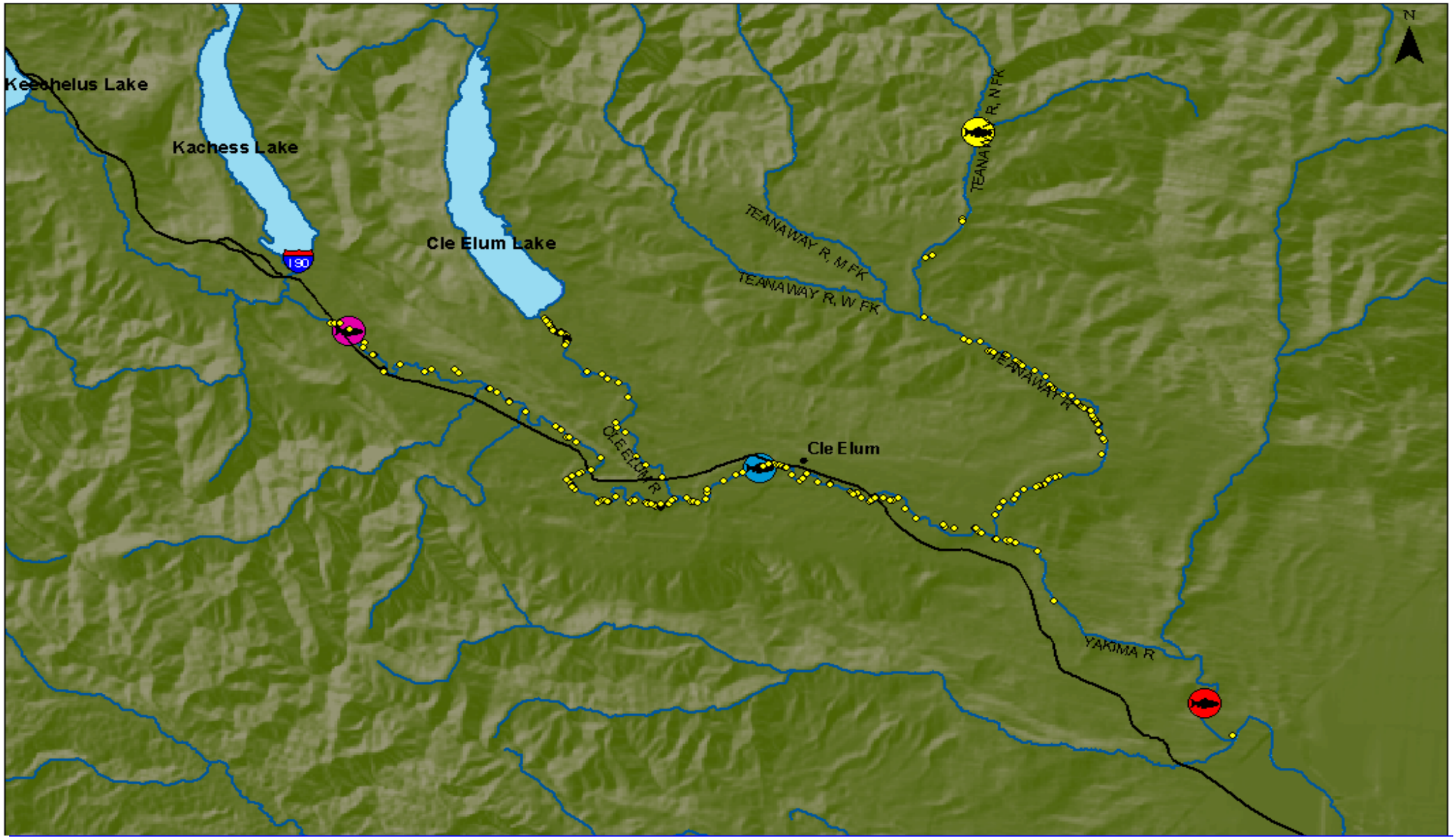
Jack Creek 2002



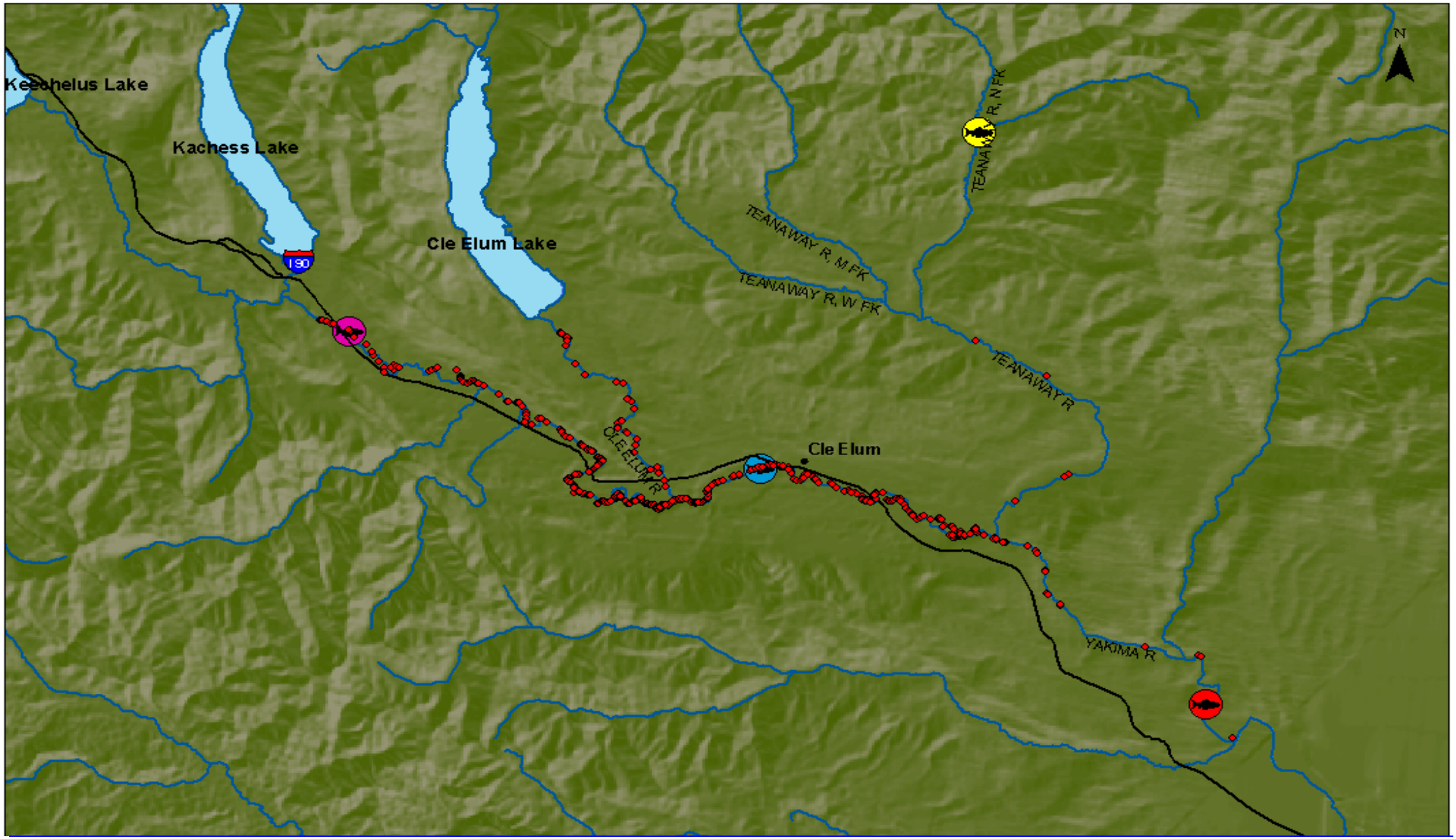
Jack Creek 2003



Jack Creek 2004



Clark Flat 2002



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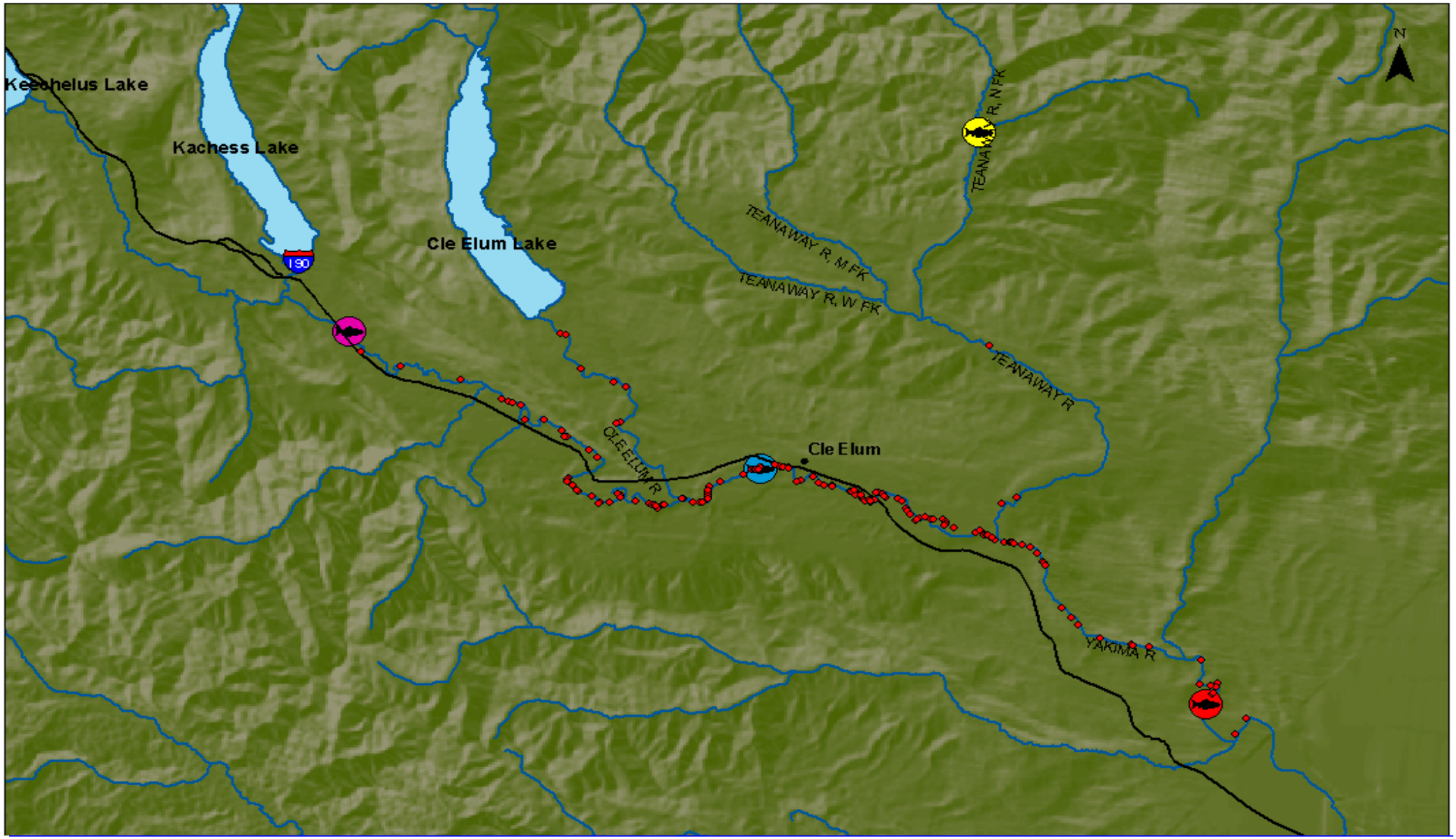
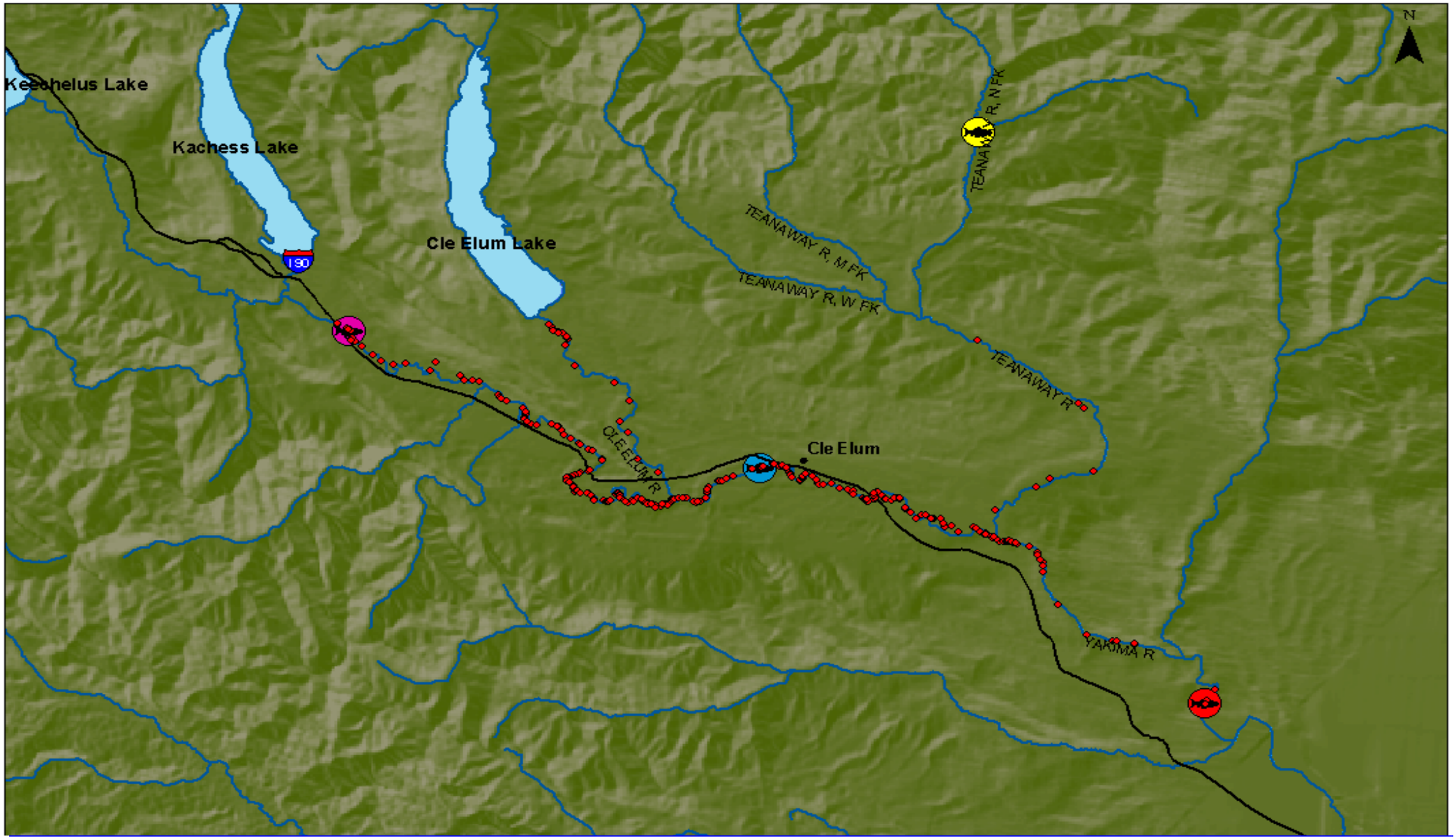
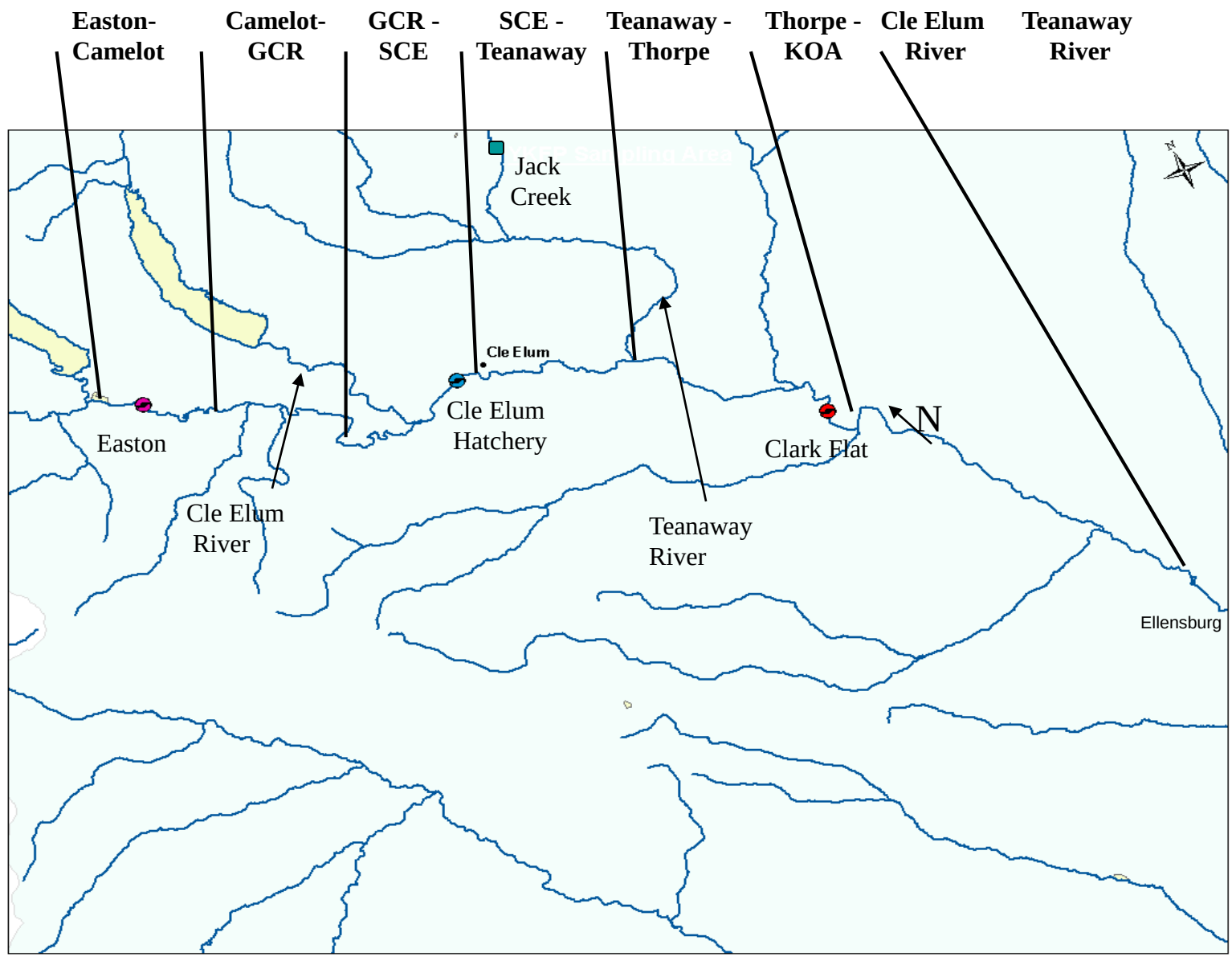
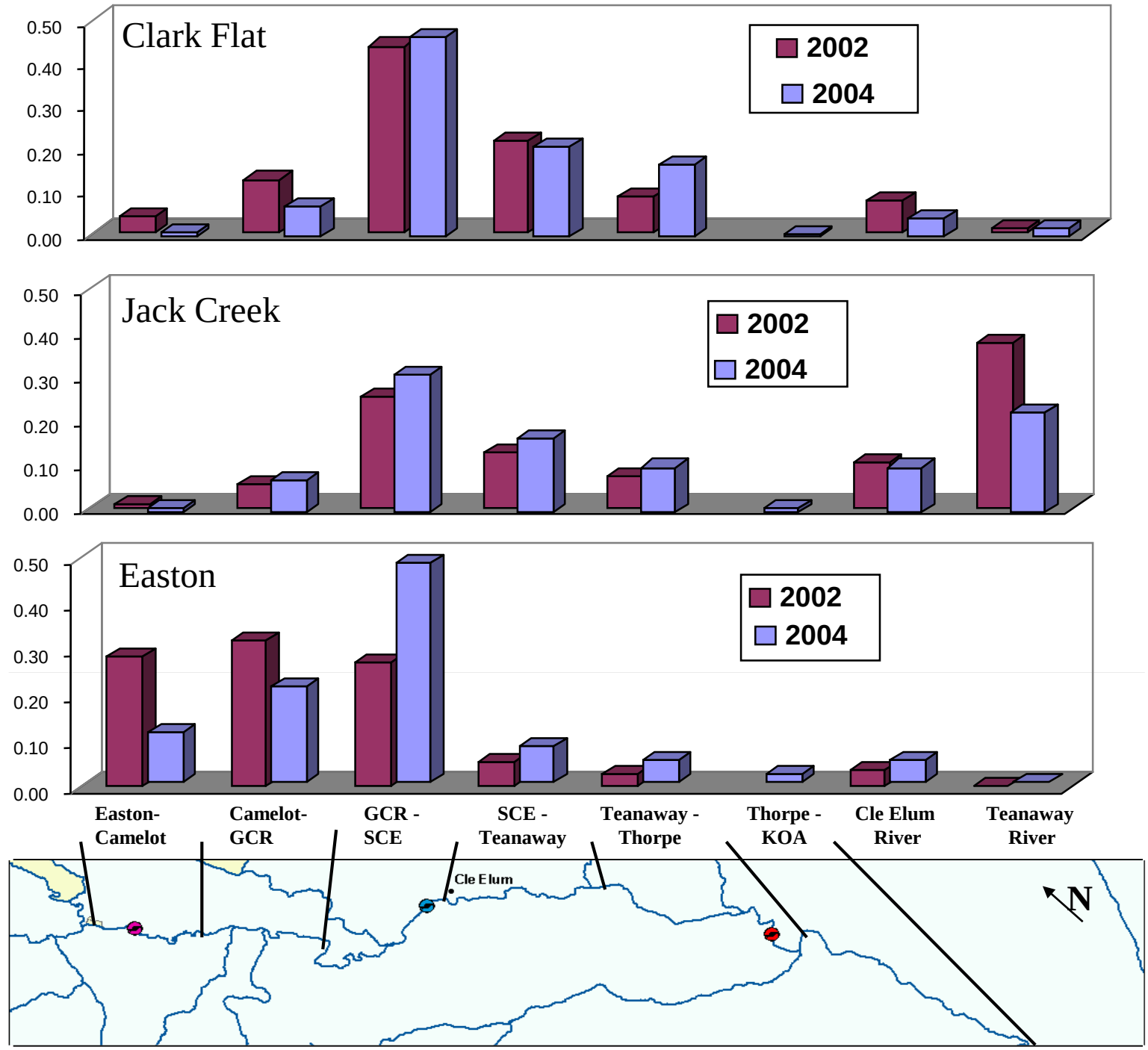


Clark Flat 2004



Upper Yakima River Spring Chinook Distribution




Clark Flat
2002
2004
0.50
0.40
0.30
0.20
0.10
0.00
Jack Creek
2002
2004
0.50
0.40
0.30
0.20
0.10
0.00
Easton
2002
2004
0.50
0.40
0.30
0.20
0.10
0.00
Easton-Camelot
Camelot-GCR
GCR - SCE
SCE - Teanaway
Teanaway - Thorpe
Thorpe - KOA
Cle Elum River
Teanaway River
Cle Elum
N

Conclusions

-Salmon can/do imprint and home to release sites (although spatial scales vary); relaxed home site fidelity

-Tradeoffs between home site and habitat quality

-Even moderate hatchery "straying" could impact wild fish (Cle Elum R.)

-Hatchery-reared fish do not (yet) "colonize" all reaches utilized by wild fish

Acclimation does increase number of spawners in underutilized habitat

Future studies

1) **Continue mapping of homing and spawning locations of wild and YKFP supplementation salmon (e.g. interannual variation; density dependence, habitat changes)**

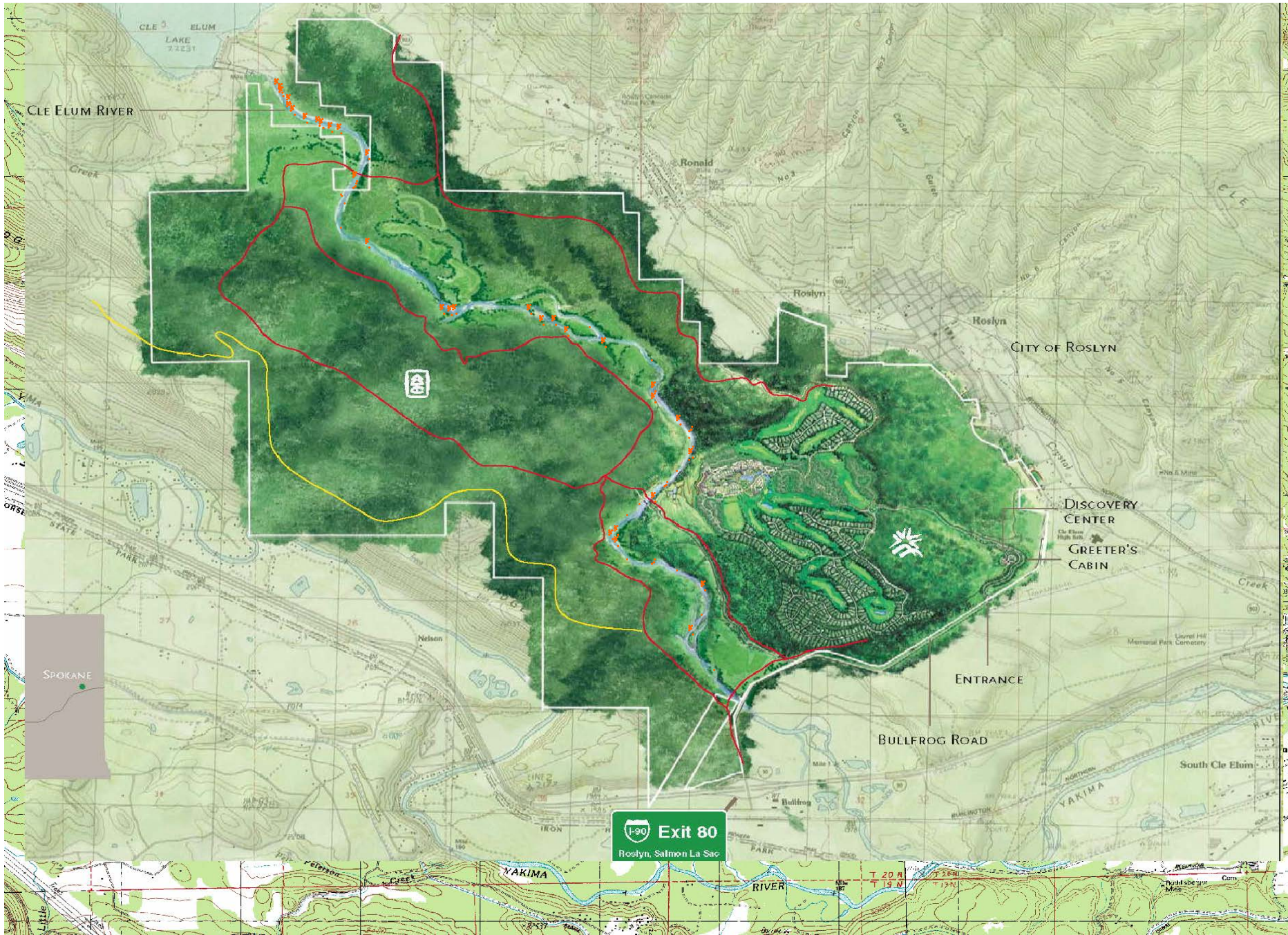
2) **Linkages between homing and habitat in spawning site selection**

3) **Assess efficacy of acclimation/off site release in recolonization of underutilized habitat (Experimental manipulations - e.g. direct release, time of acclimation; reproductive success of Teanaway fish)**

4) **Physiological and behavioral (radiotelemetry) assessments of imprinting and homing**


Mile 5
ELUM
RIVER
Bullfrog
Cem
Cem
OPEN PIT MINE
OPEN PIT MINE
BURLINGTON
BM 2218
2400
2200
2200
2165
2135
2400
2200
19
20
20
29
29
30
× 2310T
Borrow Pit
Spring
No 9 Mine
Borrow Pit
Trans
lines
BULLFROG
ROAD
Transmis


Braided River
Battista's Meadow
Roslyn
Suncadia Village
TUMBLE CREEK
SUNCADIA
RESORT, COMMUNITY, LEGACY
THE NEXT
SUNCADIA COMMUNITY - 2005
GOLF COURSE
DESIGNED BY JACOBSEN HARDY
PETER JACOBSEN, WINNER 2004
PGA SENIORS TOURNAMENT
Future Development
WISHBONE
Big Hill
Rocking Chair
Mountainster
FUTURE
TUMBLE CREEK
COMMUNITY
Cle Elum River
Mile 5
Cem
Trans
Bullfrog


Cle Elum River
City of Roslyn
Discovery Center
Greeter's Cabin
Entrance
Bullfrog Road
Spokane
I-90 Exit 80
Roslyn, Salmon La Sac
Yakima River
Ronald
Roslyn
Nelson
South Cle Elum

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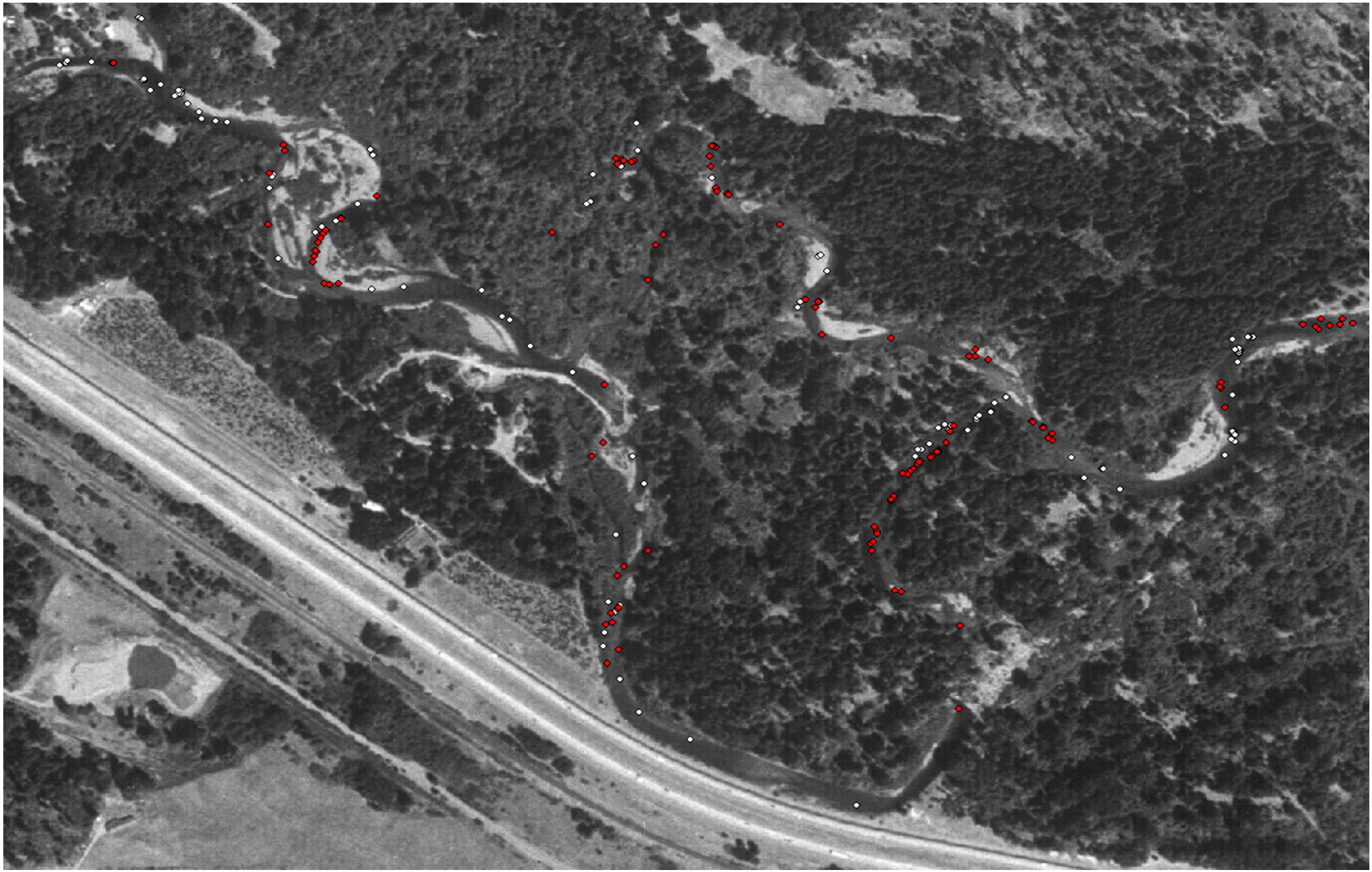

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Acknowledgements

Field help
Jaime Athos
Brian Burke
Walt Dickhoff
Mike Hayes
Michelle Havey
Becky Kihslinger
Eric Kummerow
Andy Pierce
Linda Rhodes
Julie Scheurer

Yakama Nation
Dave Fast
Mark Johnston
Bill Bosch
Yakama biologists

NMFS
Blake Feist
Michelle Rub