Oral Report to the Alaska Board of Fisheries

Review of Salmon Escapement Goals in Upper Cook Inlet

By

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and

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RC-4

Oral Report:
Tab 3

Written Report:
RC-4, Tab 1

Presentation Objectives

- Policies
- Key terms
- Methods, including the new & old percentile approaches
- Recent escapement performance
- 2017 Recommendations

Escapement Goal Policies

- **Policy for the Management of Sustainable Salmon Fisheries (SSFP; 5 AAC 39.222)**

- **Policy for Statewide Salmon Escapement Goals (5 AAC 39.223)**

- **Adopted to ensure salmon stocks are conserved, managed, and developed using the sustained yield principle**

Two important terms defined in the SSFP:

***biological escapement goal* (BEG):**

- "***escapement that provides the greatest potential for maximum sustained yield***"

- "***expressed as a range based on factors such as salmon stock productivity and data uncertainty***"

And sustainable escapement goal (SEG):

- “***a level of escapement, indicated by an index or an escapement estimate, that is known to provide for sustained yield over a 5 to 10 year period, used in situations where a BEG cannot be estimated or managed for***”

- “***will take into account data uncertainty and be stated as either a "SEG range" or "lower bound SEG***”

* **Percentile: a value below which, the percentage of escapements for a stock have occurred**

Contrast: the ratio between the highest and lowest observed escapement for a stock

* **4-Tier Percentile Approach (Bue andHasbrouck)**
  * Tier 1: 25^{th}–75^{th} percentiles for stocks with high escapement contrast (>8) and moderate harvest rates
  * Tier 2: 15^{th}–75^{th} percentiles for stocks with medium escapement contrast (4-8) and low harvest rates
  * Tier 3: 15^{th}–85^{th} percentiles for stocks with medium escapement contrast (4-8) and unknown harvest
  * Tier 4: 15^{th}–100^{th} percentiles for stocks with low escapement contrast and unknown harvest

4-Tier Percentile Approach: used to develop half of the SEGs currently in use in Alaska

A Review of the 4-Tier Percentile Approach used:

- Theoretical Analysis: range of productivities, harvest rates, and process and measurement errors
- Simulation Analysis: Monte Carlo simulation model
- Empirical Meta-Analysis: compared percentile-based SEGs with MSY-based SEGs for 76 stocks around AK

Findings from Clark 2014 Review:

* Each of the 4 tiers were sub-optimal as proxies for an SEG range that captures MSY

* The upper bound percentiles for each tier were too high, likely exceeding carrying capacity

* The lower bound percentile (25%) of tier 1 was too high

* Escapements in the lower 60 to 65th percentiles are optimal across a wide range of stocks

Two percentile approaches for setting an SEG: 4-tier(old) vs. 3-Tier (new)

	Percentiles Used				Measurement
Tier	**4-Tier**	**3-Tier**	**Contrast**	**Harvest**	**Error**
Tier 1	25th–75th	**20th–60th**	>8	<0.4	**High**
Tier 2	15th–75th	**15th–65th**	>8	<0.4	**Low**
Tier 3	15th–85th	**5th–65th**	≤8	<0.4	**NA**
Tier 4	15th–100th	**NA**	<4	<0.4	**NA**

The new 3-Tier approach also considers measurement error

-acknowledged that all stocks do not fit within one of the 3 tiers

-this approach is to be *considered* on a stock by stock basis

Current UCI Escapement Goals

King salmon: 21 stocks

Alexander, Campbell, Clear, Crooked, Goose, Lake, Little Willow, Montana, Peters, Prairie, Sheep, and Willow creeks; and Chuitna, Chulitna, Deshka, Kenai (early and late run), Lewis, Little Susitna, Talachulitna, and Theodore rivers

Coho salmon: 3 stocks

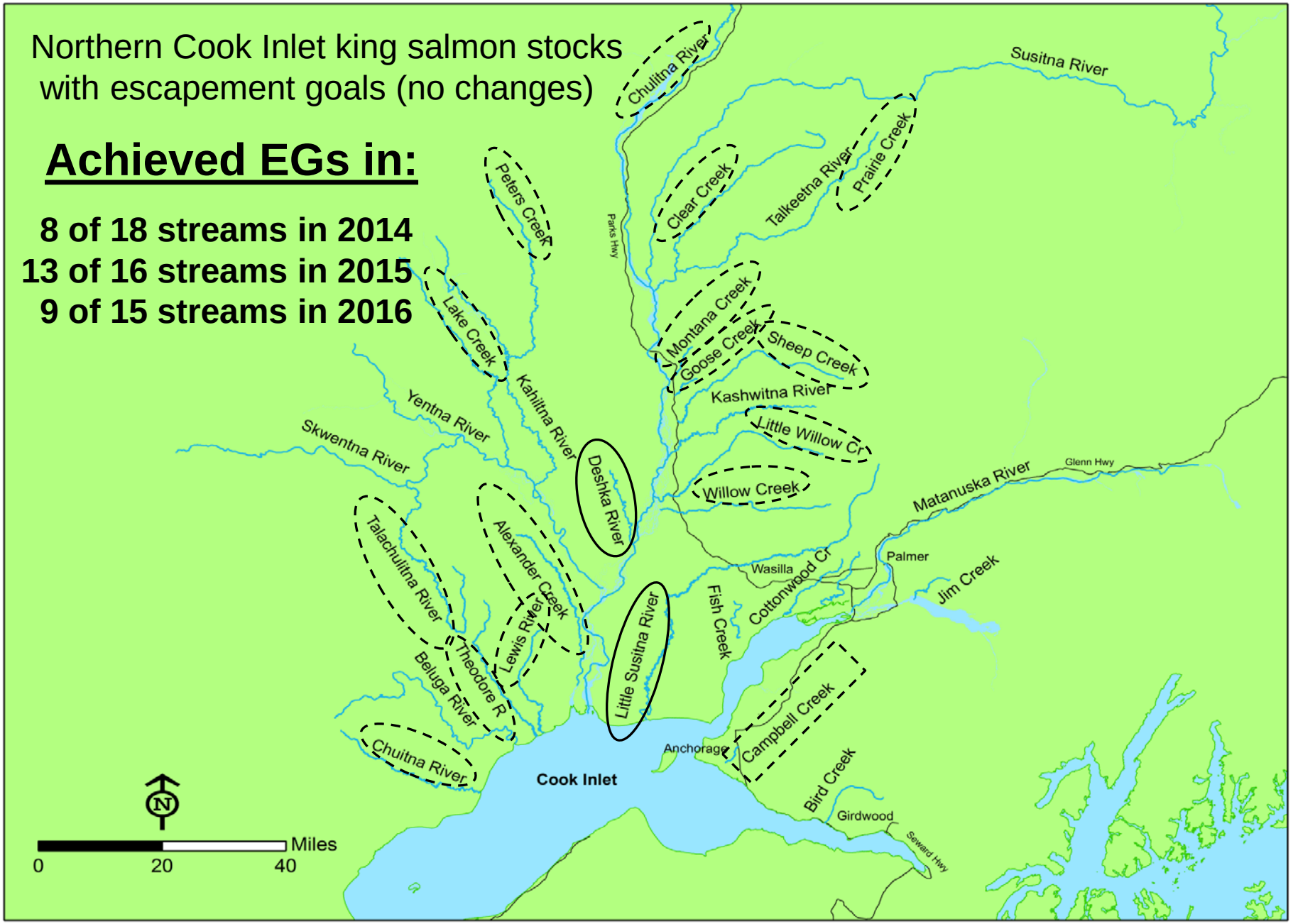
Fish and Jim creeks; and Little Susitna River

Sockeye salmon: 9 stocks

Fish and Packers creeks; Chelatna, Judd, and Larson lakes; and Kasilof, Kenai, and Russian (early and late run) rivers

Chum salmon: 1 stock

Clearwater Creek


Northern Cook Inlet king salmon stocks with escapement goals (no changes)
Achieved EGs in:
8 of 18 streams in 2014
13 of 16 streams in 2015
9 of 15 streams in 2016
Chulitna River
Susitna River
Peters Creek
Clear Creek
Talkeetna River
Prairie Creek
Parks Hwy
Lake Creek
Montana Creek
Goose Creek
Sheep Creek
Kashwitna River
Yentna River
Skwentna River
Kahiltna River
Little Willow Cr
Deshka River
Willow Creek
Glenn Hwy
Matanuska River
Talachulitna River
Alexander Creek
Lewis River
Theodore R
Beluga River
Little Susitna River
Fish Creek
Wasilla
Cottonwood Cr
Palmer
Jim Creek
Chuitna River
Anchorage
Campbell Creek
Bird Creek
Girdwood
Seward Hwy
Cook Inlet
N
Miles
0
20
40

Since the initial stock of concern designations in 2011, only two of the king salmon systems, Chuitna River and Willow Creek, have consistently achieved their goals

Recent escapements for king salmon stocks of concern in Upper Cook Inlet

Stock	SEG	2011	2012	2013	2014	2015	2016
Theodore R	500 – 1,700	327	179	476	312	426	68
Lewis R	250 – 800	92	107	61	61	5	0
Chuitna R	1,200 – 2,900	719	502	1,690	1,398	1,965	1,372
Alexander Cr	2,100 – 2,900	343	181	588	911	1,117	754
Willow Cr	1,600 – 2,800	1,061	756	1,752	1,335	2,046	1,814
Goose Cr	250 – 650	80	57	62	232	NS	NS
Sheep Cr	600 – 1,200	350	363	NS	262	NS	NS

NS = was Not able to Survey

Northern Kenai Peninsula king salmon

Kenai River – early run

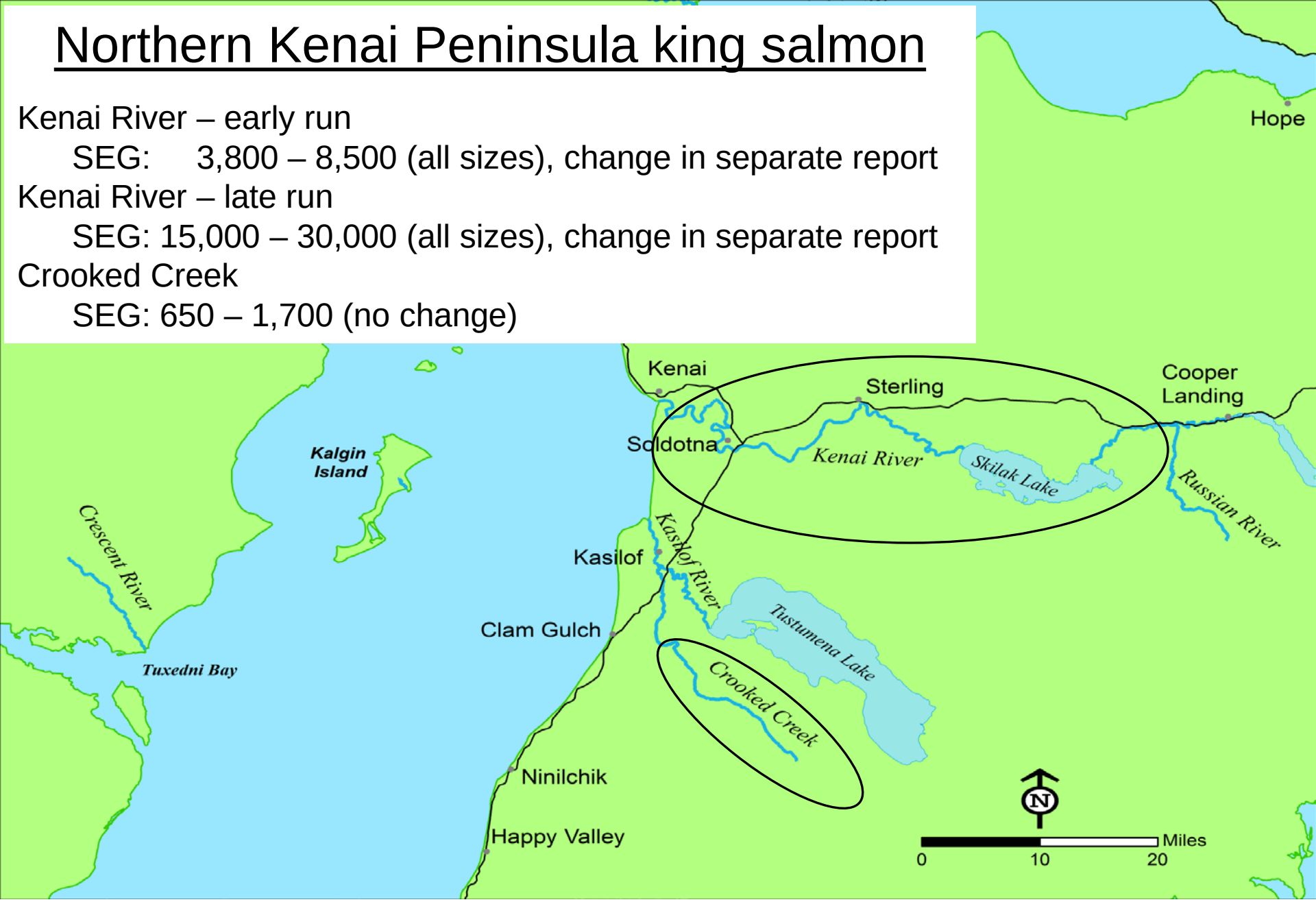
SEG: 3,800 – 8,500 (all sizes), change in separate report

Kenai River – late run

SEG: 15,000 – 30,000 (all sizes), change in separate report

Crooked Creek

SEG: 650 – 1,700 (no change)



ADDITION: A new weir-based SEG for Little Susitna R King salmon (2,100 - 4,300)

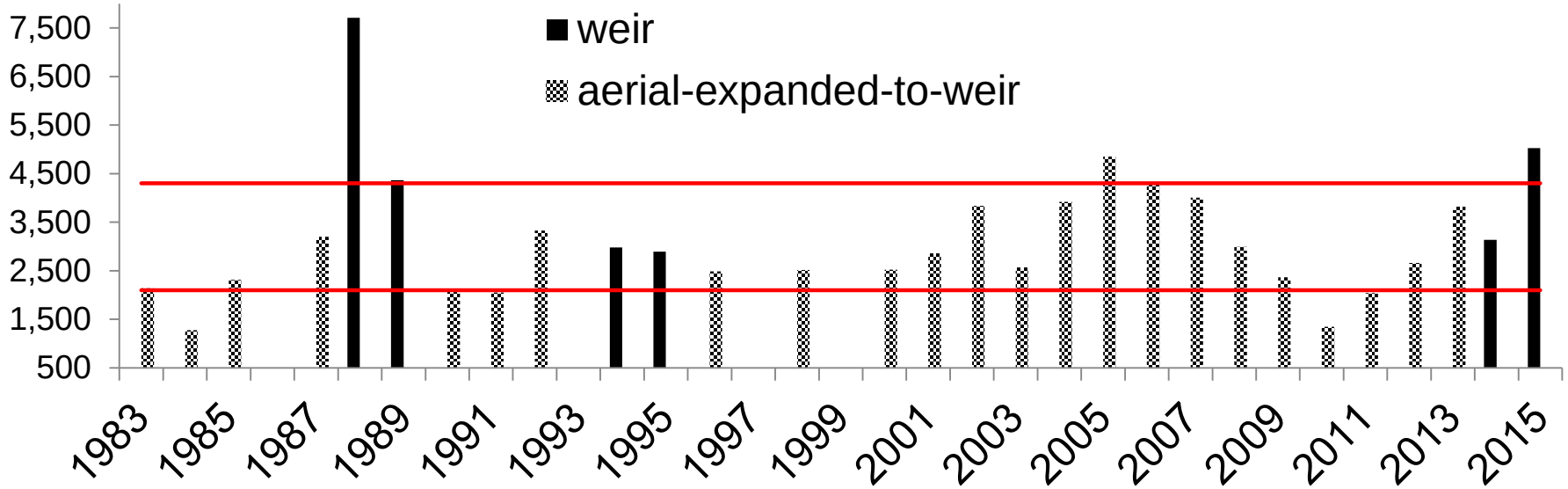
-that compliments the existing aerial survey based SEG (900 – 1,800)

HOW: Applied ratio of weir-to-aerial survey (2.3) in 5 paired years
to 23 aerial survey-only years

DATA: 5 weir years, 23 aerial-expanded-to-weir years, 1 weir-only year (= 29 years)

GOAL METHOD: Stock characteristics do not fit the new 3-Tier Approach
(Harvest rate >.40, contrast 6)

-Applied same method as previously used for aerial SEG (15^{th} – 85^{th} percentile)

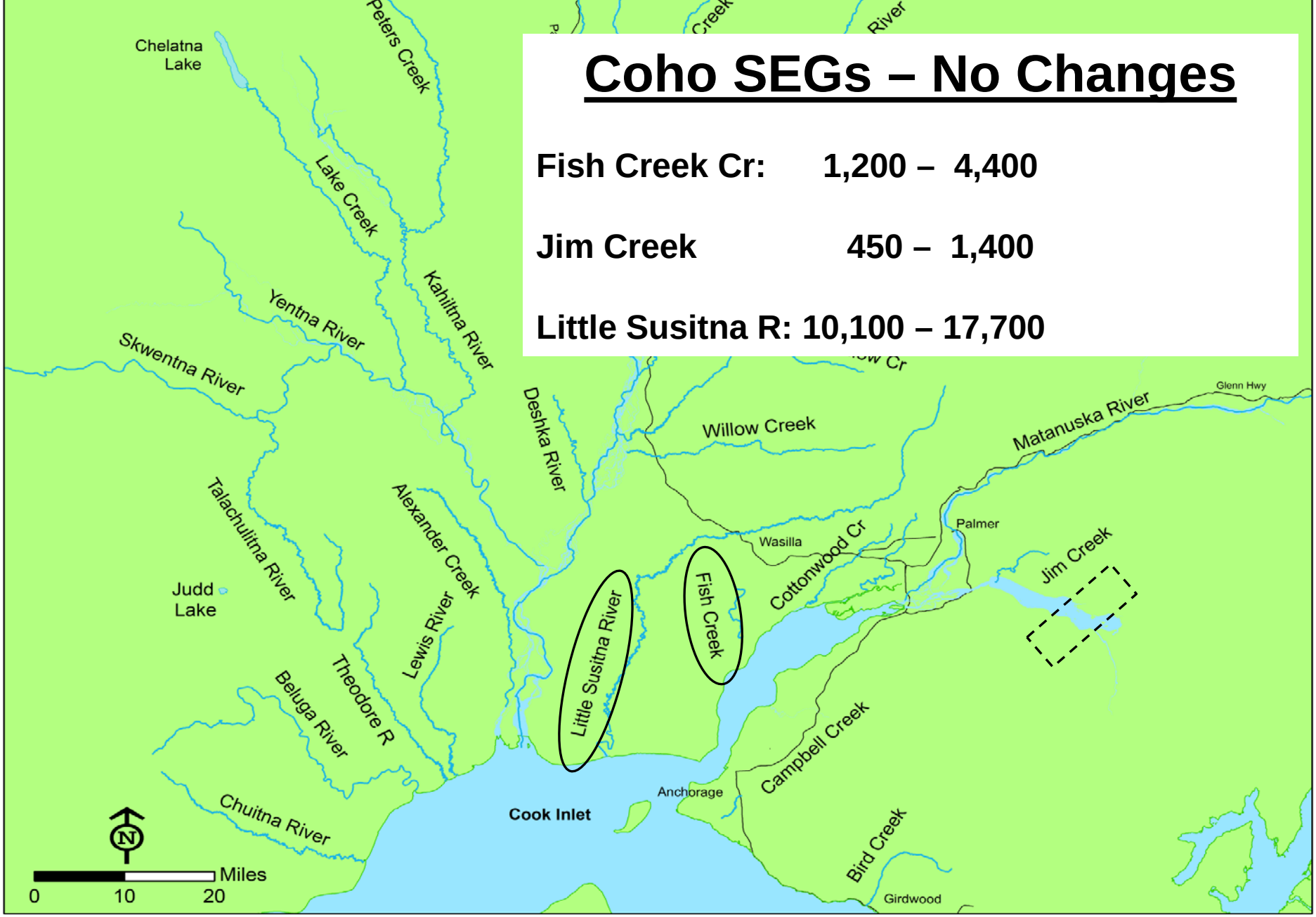


Coho SEGs – No Changes

Fish Creek Cr: 1,200 – 4,400

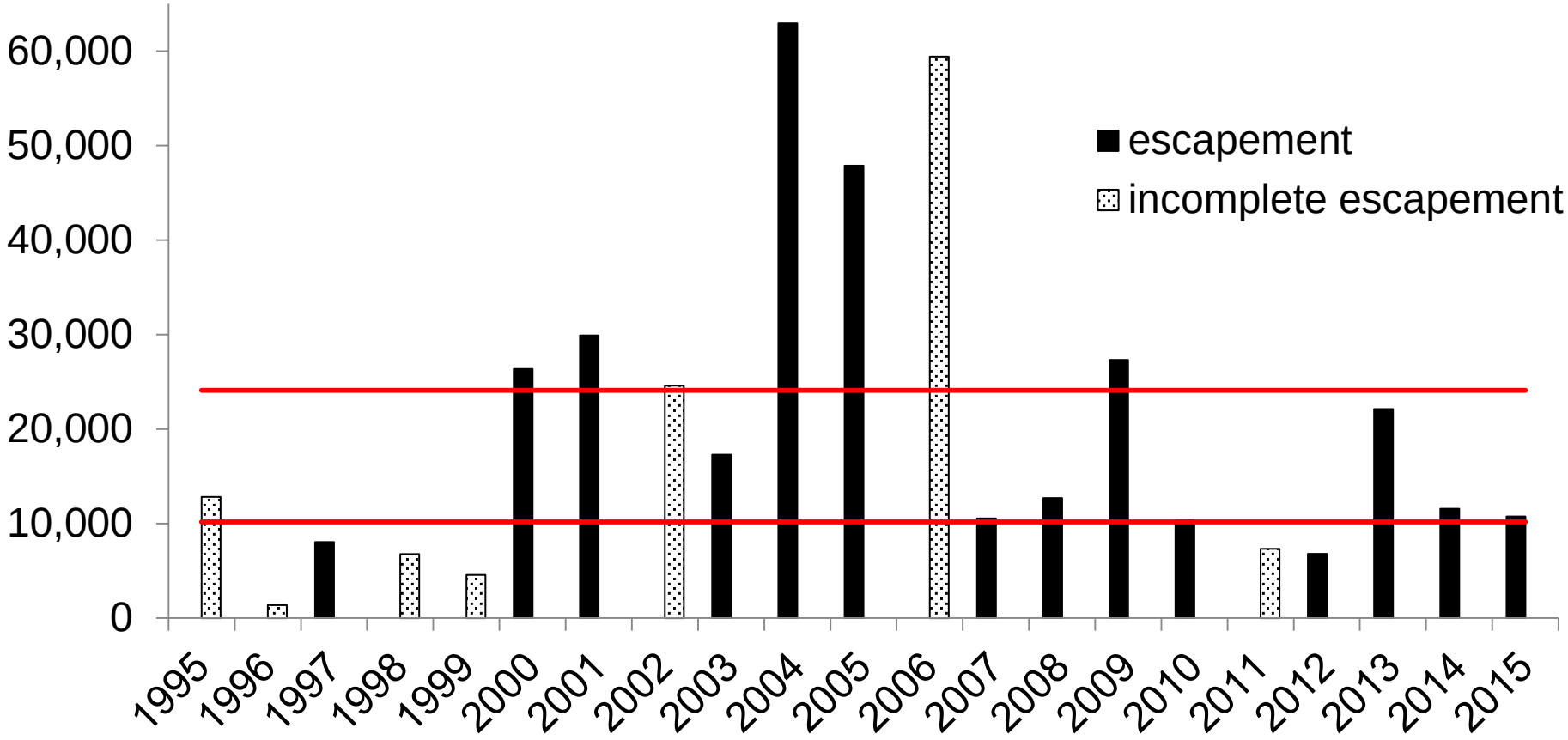
Jim Creek 450 – 1,400

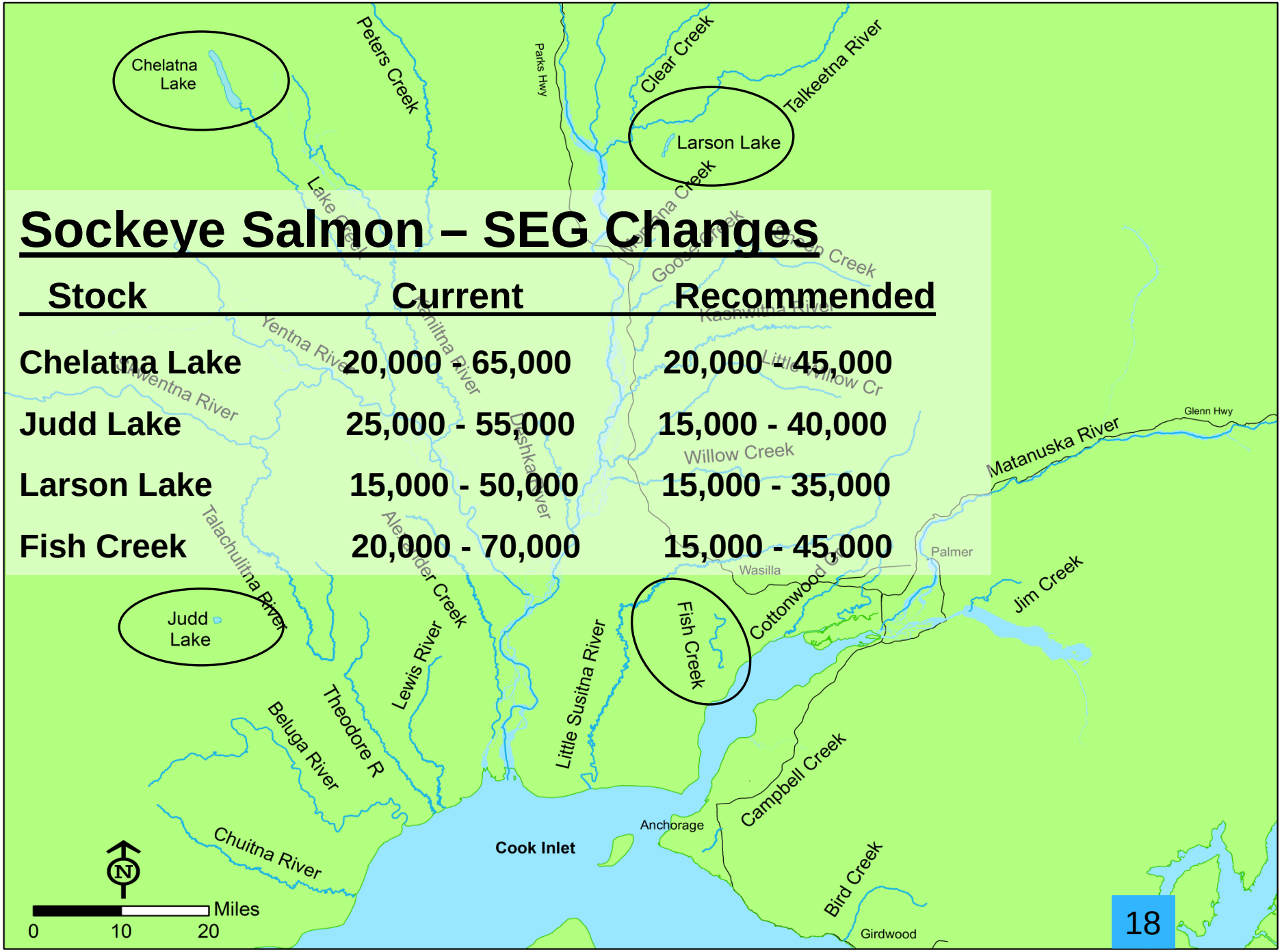
Little Susitna R: 10,100 – 17,700



ADDITION: A new weir-based SEG for Deshka R coho salmon (10,200 - 24,100)

DATA: 14 complete weir years, harvest rate <.40, contrast 9
GOAL METHOD: 3-Tier Approach, tier-2 (15th – 65th percentiles)



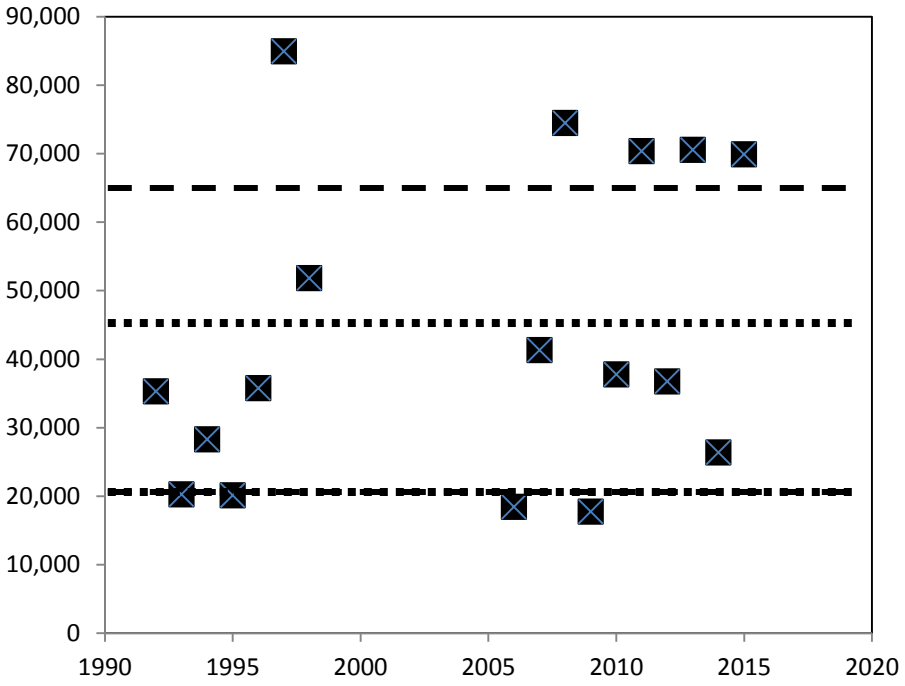


Sockeye Salmon – SEG Changes

Stock	Current	Recommended
Chelatna Lake	20,000 - 65,000	20,000 - 45,000
Judd Lake	25,000 - 55,000	15,000 - 40,000
Larson Lake	15,000 - 50,000	15,000 - 35,000
Fish Creek	20,000 - 70,000	15,000 - 45,000

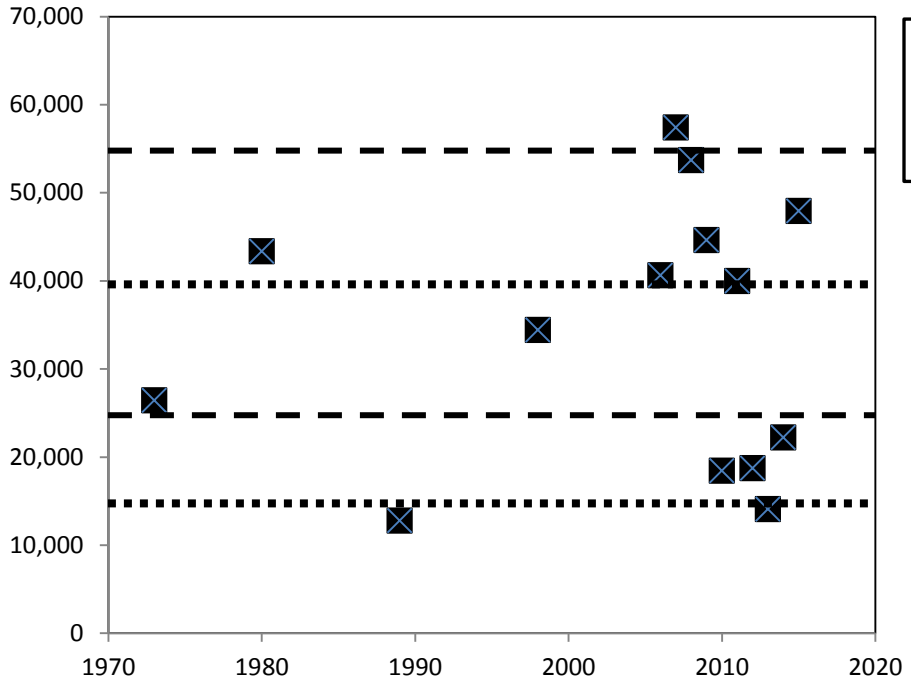
Chelatna Lake Sockeye Salmon

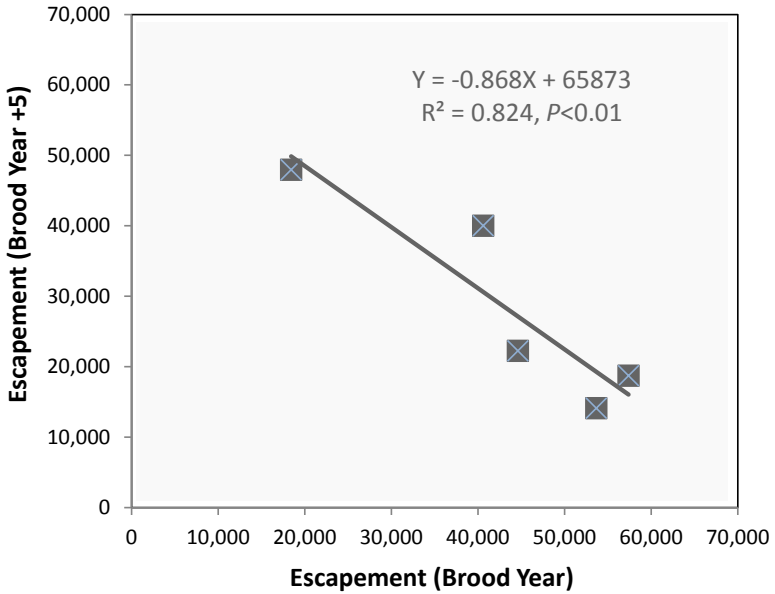
Current SEG:	20,000 - 65,000	- - - -
Recommended SEG:	20,000 - 45,000	.....



- Current SEG established in 2009 using 4-Tier Percentile Approach applied to 10 years of data
- SEG achieved in all but one year since 2009
- 17 years of data were used to develop the recommended SEG
- Contrast low (4.8)
- Measurement error low (weirs and mark-recapture)
- Harvest rate low-moderate (40.7%)
- 3rd tier of the 3-Tier Percentile Approach, rounded up to nearest 5,000 fish for lower end of range

Judd Lake Sockeye Salmon





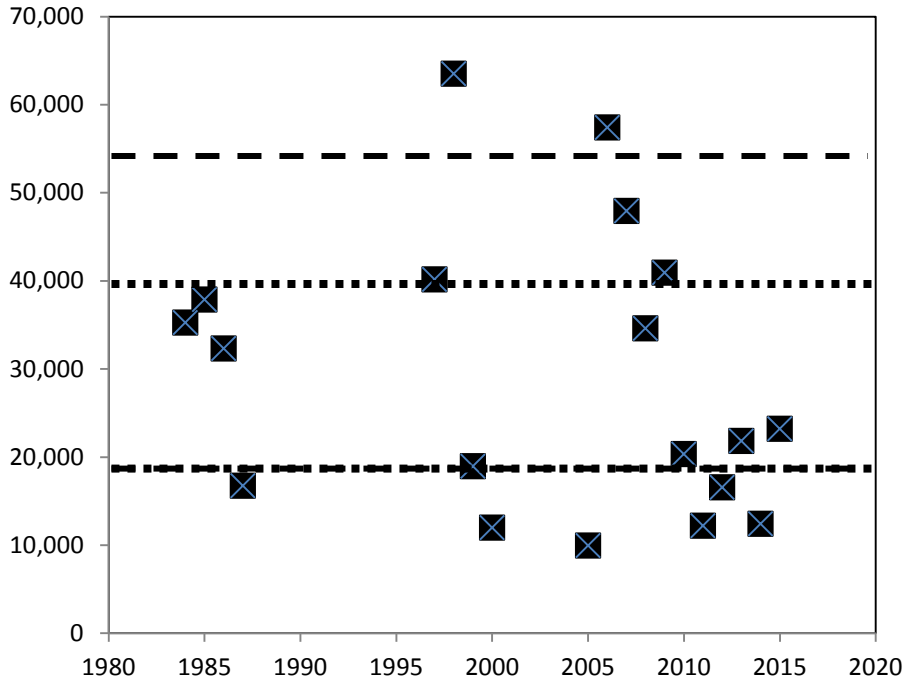
Current SEG: 25,000 - 55,000

Recommended SEG: 15,000 - 40,000

- Current SEG established in 2009 using 4-Tier Percentile Approach applied to 7 years of data
- SEG not achieved in 4 years since 2009
- 14 years of data were used to develop the recommended SEG
- Contrast low (4.5)
- Measurement error low-moderate (12 yrs-weirs, 2 yrs-peak aerial)
- Harvest rate low-moderate (40.7%)
- 3rd tier of 3-Tier Percentile Approach rounded up to the nearest 5,000 fish for lower end of range
- Brood year escapements are negatively related to escapements 5 years later
- No assessment in 2016

Larson Lake Sockeye Salmon

Current SEG: 15,000 - 50,000
Recommended SEG: 15,000 - 35,000

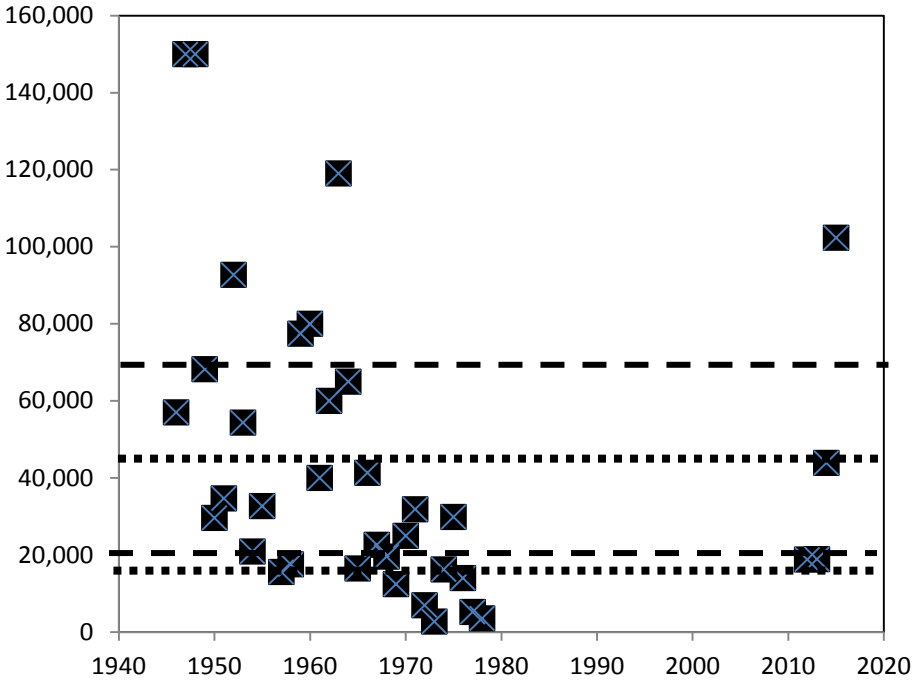


- Current SEG established in 2009 using 4-Tier Percentile Approach applied to 12 years of data
- SEG not achieved in 2 years since 2009
- 19 years of data were used to develop the recommended SEG
- Contrast low (6.4)
- Measurement error low (weirs)
- Harvest rate low-moderate (40.7%)
- 3rd tier of 3-Tier Percentile Approach rounded up to the nearest 5,000 fish for lower end of range

Fish Creek Sockeye Salmon

Current SEG: 20,000 - 70,000

Recommended SEG: 15,000 - 45,000



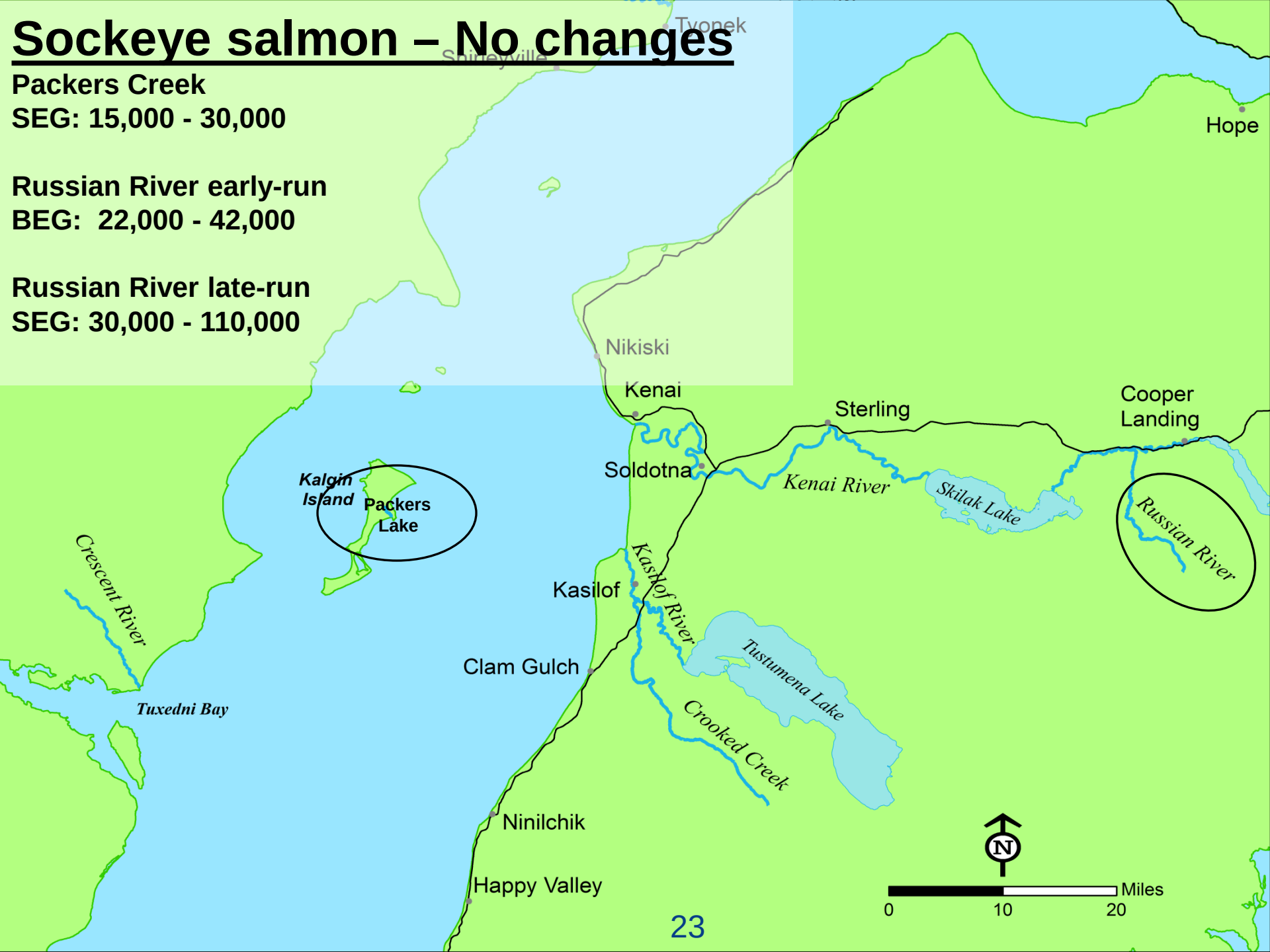
- Current SEG established in 2001 using 4-Tier Percentile Approach applied to 26 years of data
- SEG not achieved in 4 years since 2001
- 36 years of data were used to develop the recommended SEG
- Years with fry stocking were not used
- Contrast high (55.5)
- Measurement error low-moderate: 23 yrs weir, 10 yrs counting screen, 3 yrs ground surveys
- Harvest rate low (37%)
- 2nd tier of 3-Tier Percentile Approach rounded up to the nearest 5,000 fish for lower end of range

Sockeye salmon – No changes

Packers Creek
SEG: 15,000 - 30,000

Russian River early-run
BEG: 22,000 - 42,000

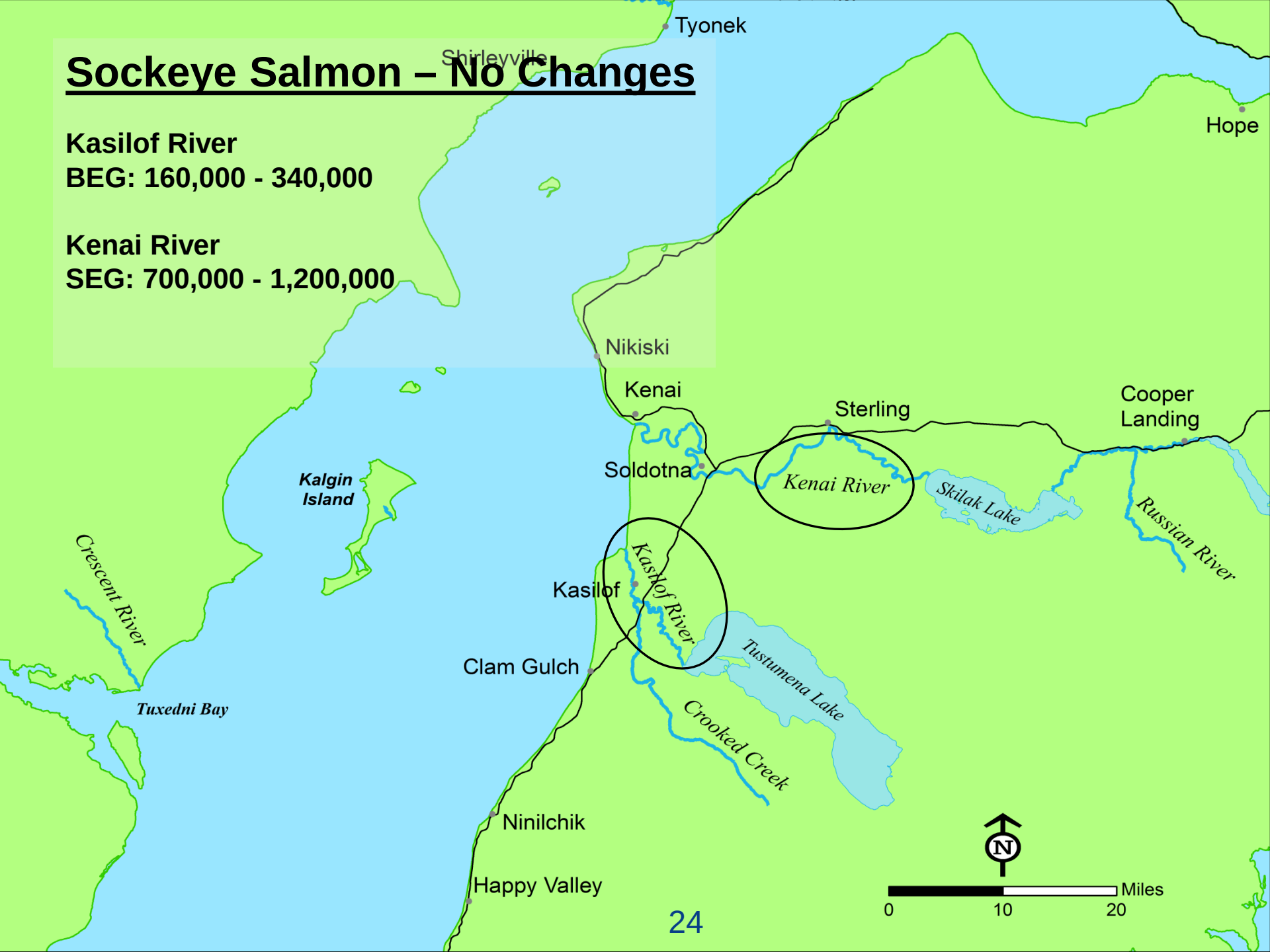
Russian River late-run
SEG: 30,000 - 110,000



Sockeye Salmon – No Changes

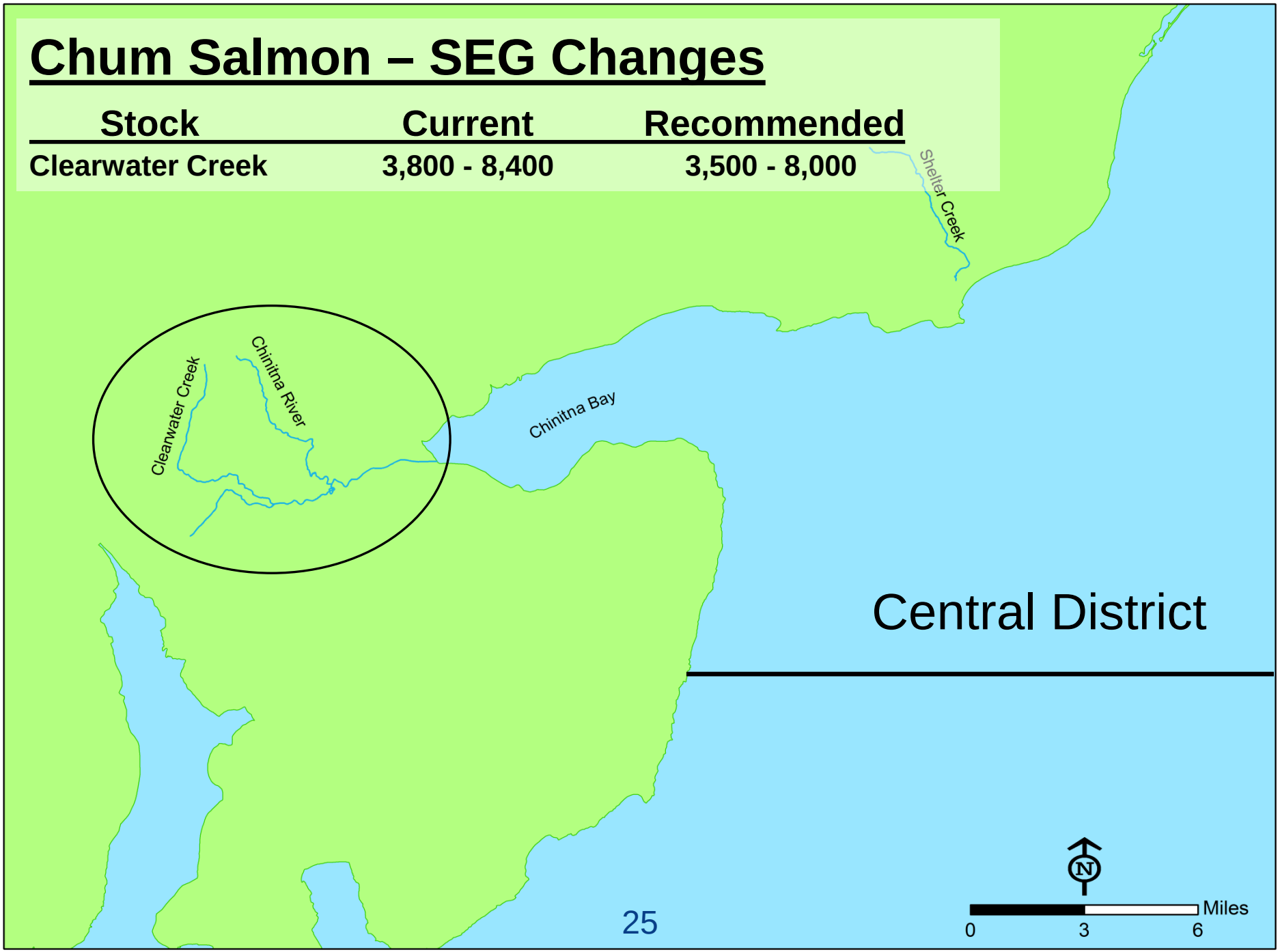
Kasilof River
BEG: 160,000 - 340,000

Kenai River
SEG: 700,000 - 1,200,000



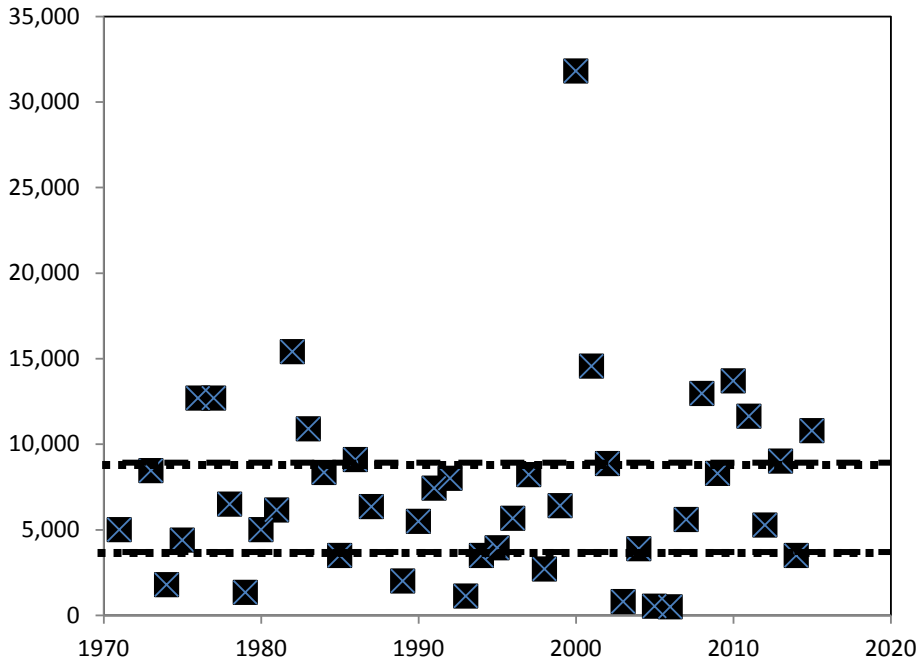
Chum Salmon – SEG Changes

Stock	Current	Recommended
Clearwater Creek	3,800 - 8,400	3,500 - 8,000



Clearwater Creek Chum Salmon

Current SEG: 3,800 - 8,400
Recommended SEG: 3,500 - 8,000



- Current SEG established in 2001 using 4-Tier Percentile Approach applied to 28 years of data
- SEG not achieved in 4 years since 2001
- 43 years of data used to develop the recommended SEG
- Contrast high (64)
- Measurement error high, peak aerial survey
- Harvest rate low (26%)
- 1st tier of 3-Tier Percentile Approach

Review Summary

No changes to 27 Goals

* Fish Creek coho
* Little Susitna River coho
* Jim Creek coho
* Kasilof River sockeye
* Kenai River sockeye
* Packers Creek sockeye
* Russian River early-run sockeye
* Russian River late-run sockeye
* Alexander Creek king
* Campbell Creek king
* Chuitna River king
* Chulitna River king
* Clear Creek king
* Crooked Creek king
* Deshka River king
* Goose Creek king
* Lake Creek king
* Lewis River king
* Little Susitna River king
* Little Willow Creek king
* Montana Creek king
* Peters Creek king
* Prairie Creek king
* Sheep Creek king
* Talachulitna River king
* Theodore River king
* Willow Creek king

Changes to 7 Goals

* Clearwater Creek chum
* Chelatna Lake sockeye
* Judd Lake sockeye
* Larson Lake sockeye
* Fish Creek sockeye
* Kenai River Early-run king
* Kenai River Late-run King

2 New Goals

- Little Susitna River king (weir based)
- Deshka River coho

Questions?