

Reintroduction of Spring Chinook Salmon in Lookingglass Creek: analysis of three stocks over time

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Funded by the Lower Snake River Compensation Plan

Management Goal

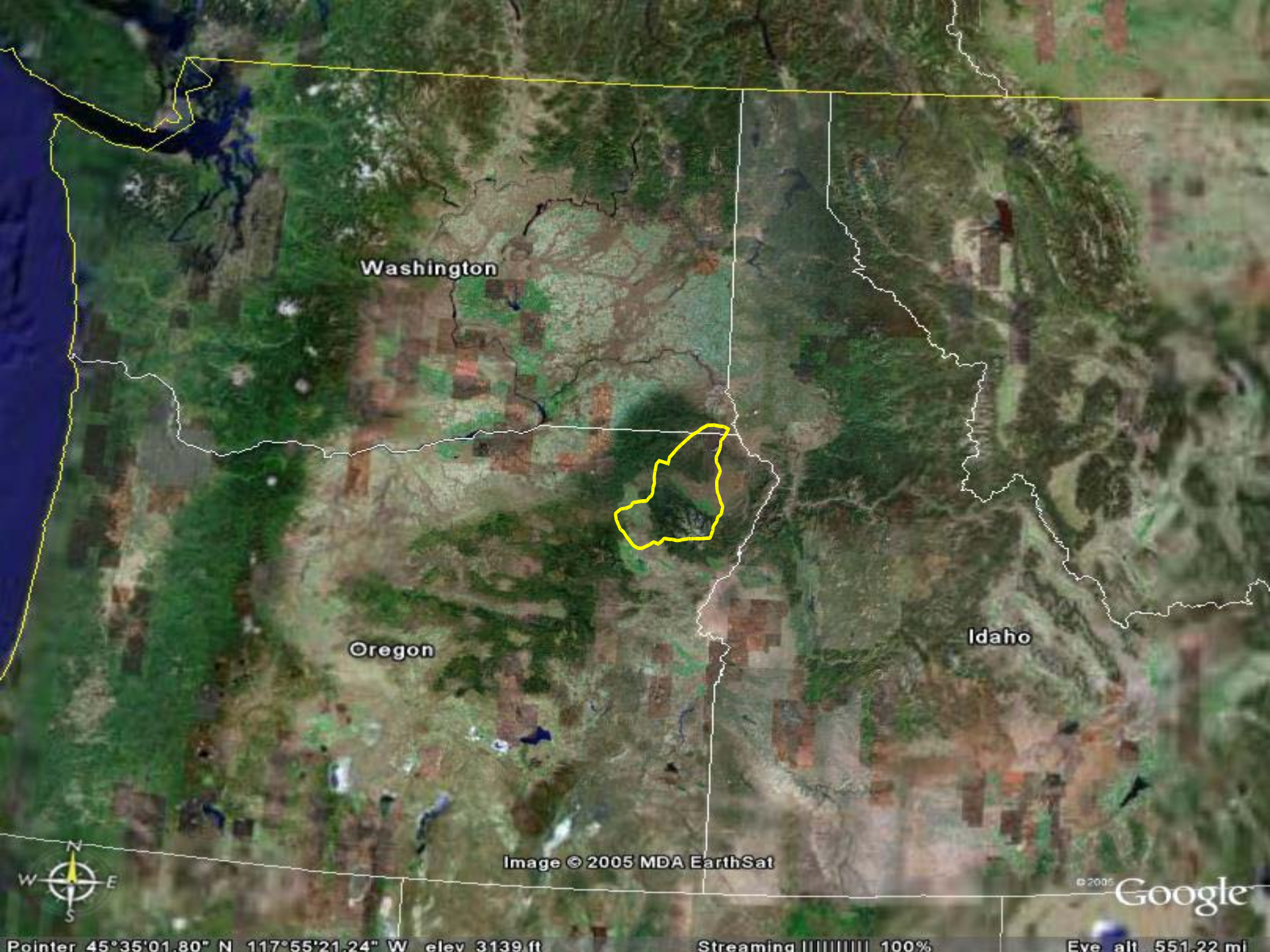
The goal of the Lookingglass Creek Spring Chinook Hatchery Program is to reintroduce spring Chinook salmon into Lookingglass Creek using the Catherine Creek (captive brood) stock to support natural population restoration, tributary harvest, and maintenance of a gene bank for for the Catherine Creek stock.

RM&E Goal

Conduct studies to inform managers concerning use of a local spring Chinook salmon broodstock (Catherine Creek) for reintroduction into Lookingglass Creek

RM&E Objectives

- Compare performance across three time periods of two reintroduced stocks (Rapid River, Catherine Creek) with the extirpated endemic stock of spring Chinook salmon in Lookingglass Creek
- Evaluate use of Catherine Creek F_1 captive broodstock progeny for natural spawning and hatchery production



Washington

Oregon

Idaho

Image © 2005 MDA EarthSat

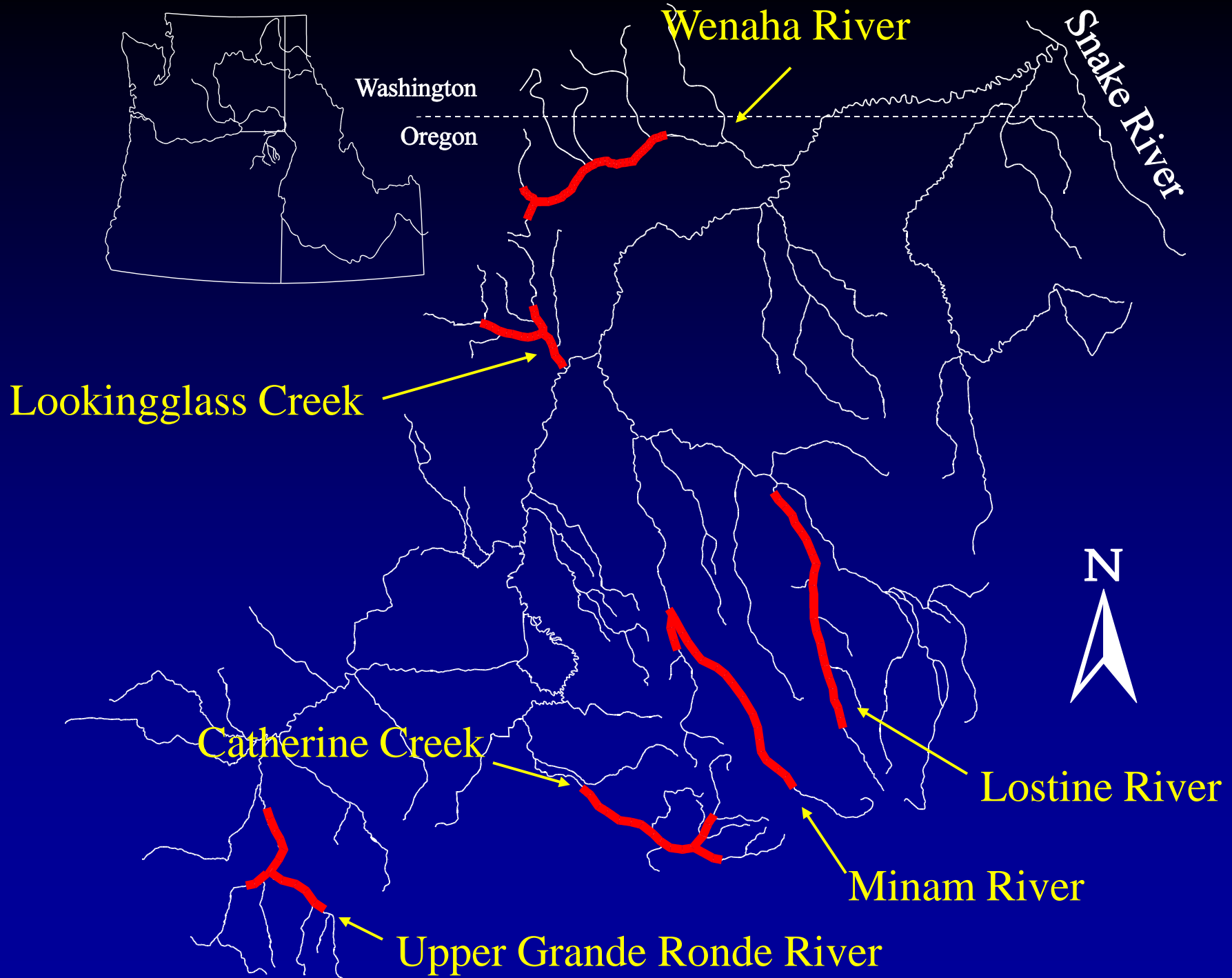
© 2005 Google



Pointer 45°35'01.80" N 117°55'21.24" W elev 3139 ft

Streaming ||||| 100%

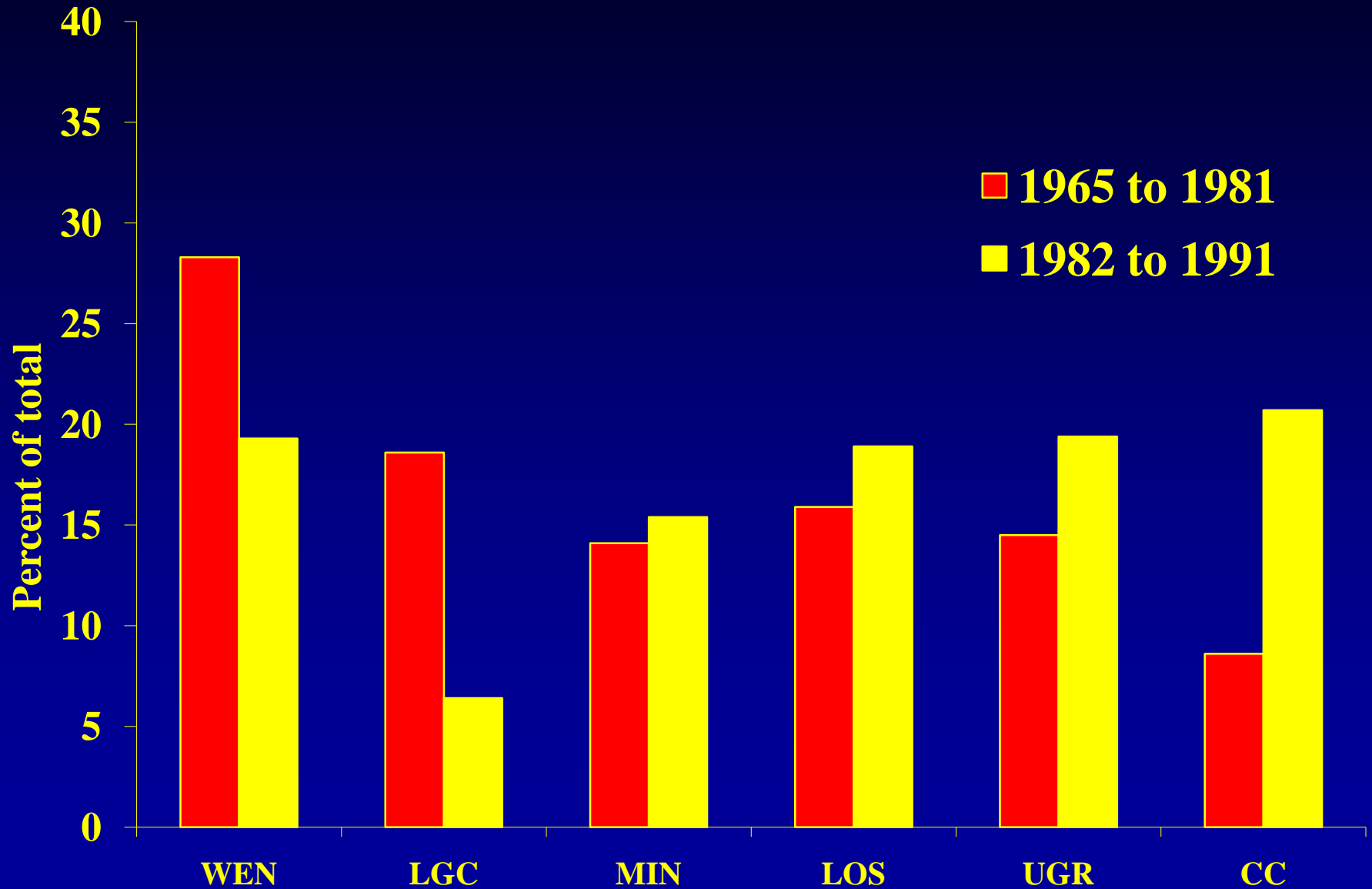
Eve alt 551.22 mi



Lookingglass Hatchery established in 1982



Grande Ronde Subbasin Total Redds



Background

- Formerly abundant spring Chinook salmon supported significant tribal and sport fisheries
- Endemic stock extirpated (no natural production above the hatchery)
- Unique study opportunity for evaluation endemic production (control) vs two different supplementation treatments
- Control and two treatments all in same stream over different time periods

Background

- Relatively healthy watershed
 - compared to other non-wilderness areas in the basin
 - relatively unaltered through period of three study eras



Background

- Lookingglass Fish Hatchery located there
 - Weir allows control of fish passage above hatchery



Study Era #1- (1964-1974)



Previous study on endemic spring chinook
(Burck 1993)

Study Era #2 - (1992-2000)



Previous study on use of non-endemic hatchery spring Chinook (Rapid River) to re-establish population

Study Era #3 - (2001–present)

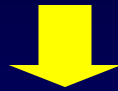
- Local GR Basin stock and surplus available
- Supplemented Catherine Creek most similar to Lookingglass Creek
- Good opportunity to study captive broodstock in the natural environment
- Chapter 3 of Lookingglass Creek study
 1. Endemic – control
 2. Non-endemic (Rapid River) supplementation treatment #1
 3. Local (Catherine Creek) supplementation treatment #2

Current Management

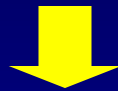
- Sliding scale for disposition of hatchery/natural adults collected at the Lookingglass Hatchery trap
- Returns held for outplant above the hatchery weir or use as conventional broodstock
- Both hatchery- and natural-origin adults used for outplanting and conventional broodstock

Catherine Creek Captive Broodstock Supplementation Sequence

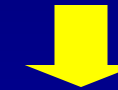
Juveniles released in LGC starting in fall 2001



Adult returns to Lookingglass Hatchery 2004-2007



First Generation Natural Production (F_1) – BY 2004 -



Unmarked returns

Second Generation Natural Production (F_2) – BY 2008

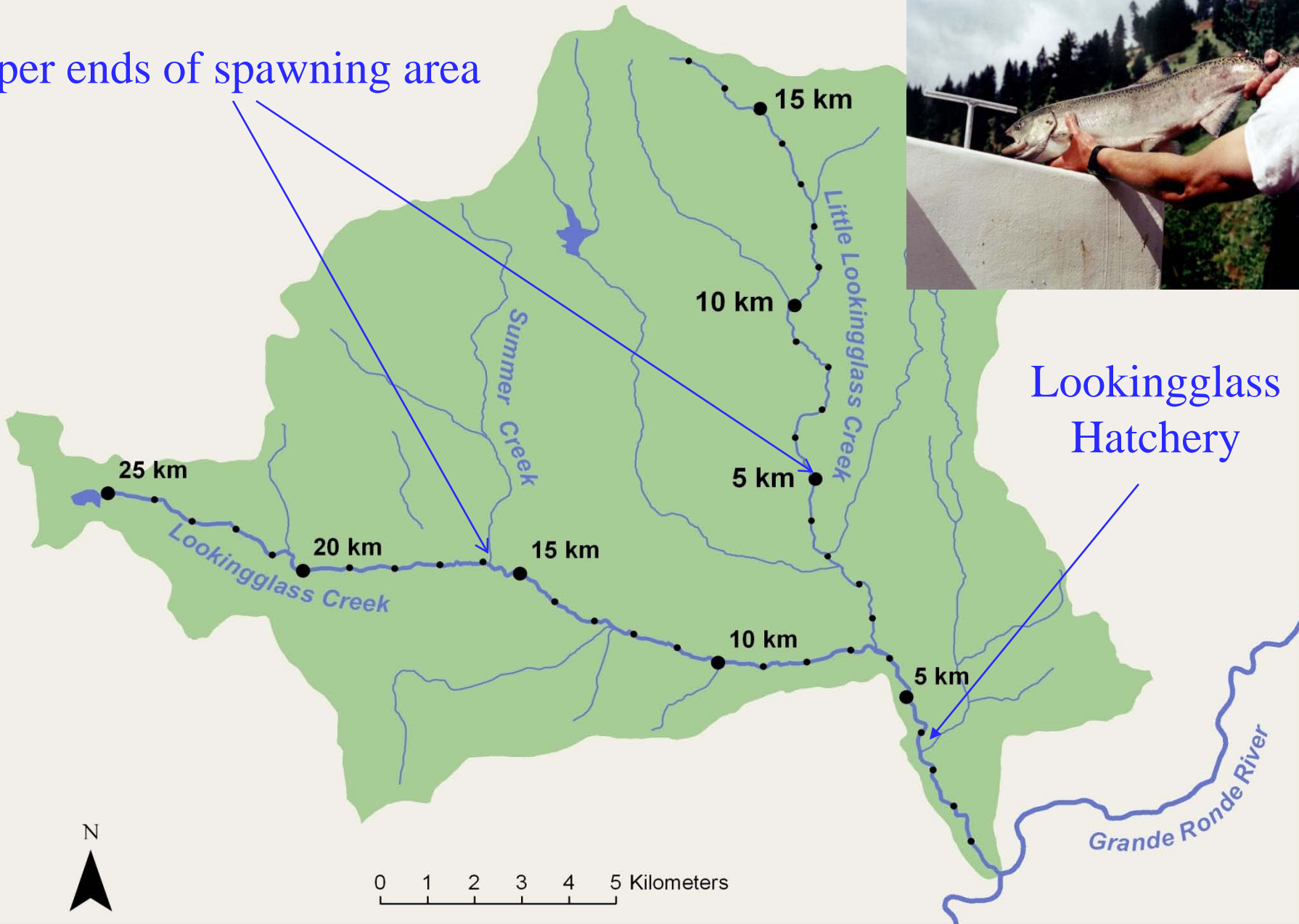
Methods

- Adults collected at Lookingglass Hatchery trap, 2004-2010
 - FL, marks, sex, age
 - Holding pond at Lookingglass Hatchery
- Selected for outplant, transported, released
 - FL, sex, marks, opercle punch for mark/recapture and relative reproductive success (CRITFC)
 - July-August-large group, stragglers later

LOOKINGGLASS CREEK WATERSHED



Upper ends of spawning area



Lookingglass Hatchery



0 1 2 3 4 5 Kilometers

Methods

- Spawning ground surveys
 - Weekly after outplanting
 - Counted new redds
 - Sampled carcasses for marks (pop estimate), FL, sex, % spawned, scales, tags, genetics, BKD, snouts
 - Mainstem and Little Lookingglass



Methods

- Snorkel/seining at rkm 9 on 20th of each month
 - Measure, weigh 50 parr

Methods

• Juvenile outmigration

- 1.5 m rotary screw trap
- PIT-tagged ~ 500 per season (fall, winter, spring) during MY
 - July-September, October-December, January-June
- Outmigrant estimate using DARR 2.0
- Genetics tissues



Methods

• Summer parr

- 1,000 fish from upper reaches of stream PIT-tagged (late July-August), BY 2004-2008
- Arrival timing and survival to Lower Granite Dam
- Comparison to other natural populations
 - Lookingglass Creek 1992-4, 1996-7
 - ODFW Early Life History study





Columbia River

Washington

Lower Granite Dam rm 432

Columbia River Mouth rm 0

Lower Mon. rm 366

Little Goose rm 395

324

Ice Harbor rm 334

Bonneville rm 145

John Day rm 216

McNary rm 292

The Dalles rm 191

128

Idaho

153

WEN
LGC
UGR

184

LOS
MIN
CC

175

228

228

Oregon

Snake River

Performance Measures

- Adult life history
 - *Spawner abundance*
 - *Percent hatchery/natural-origin spawners*
 - *Redd distribution*
 - *Adults-per-redd*
 - *Prespawning mortality*

Performance Measures

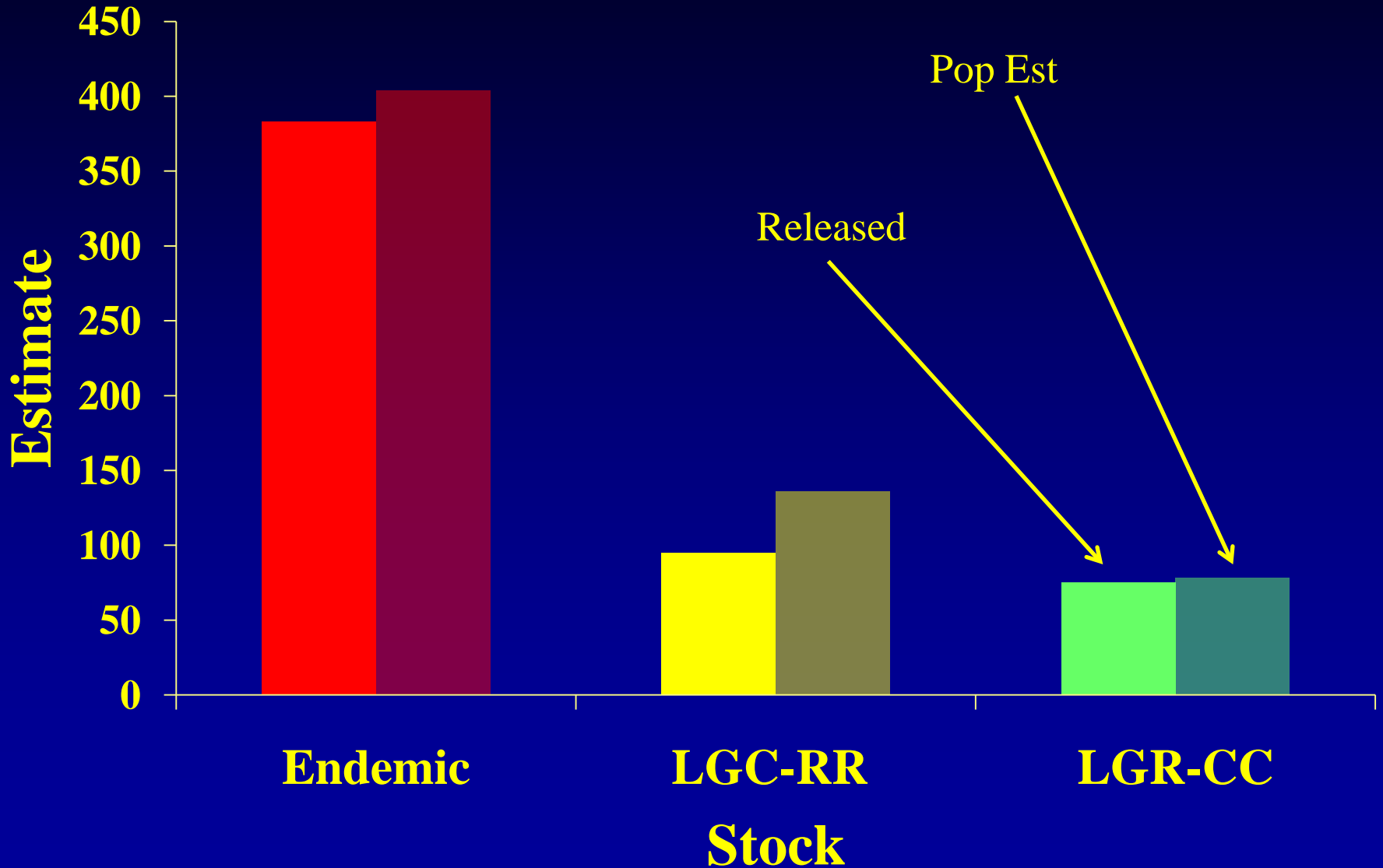
- Natural production
 - *Total outmigrants*
 - *Outmigrants-per-redd*
 - *Outmigration by season*
- Juvenile growth, survival, migration timing
 - *Juvenile first year growth*
 - *Parr survival to Lower Granite Dam*
 - *Arrival timing at McNary Dam*

Performance Measures

- Progeny-per-parent (P/P) ratios, natural spawners
 - Natural spawners in 2004, 2005 and returns in 2007-2008-2009 and 2008-2009-2010 (use ages 4 and 5 only)
- Smolt/adult ratios (SAR) natural spawners
 - Natural smolt equivalents (total outmigrants x survival to Lower Granite Dam) for MY 2006 and 2007 and natural returns in 2007-2008-2009 and 2008-2009-2010 (use ages 4 and 5 only)

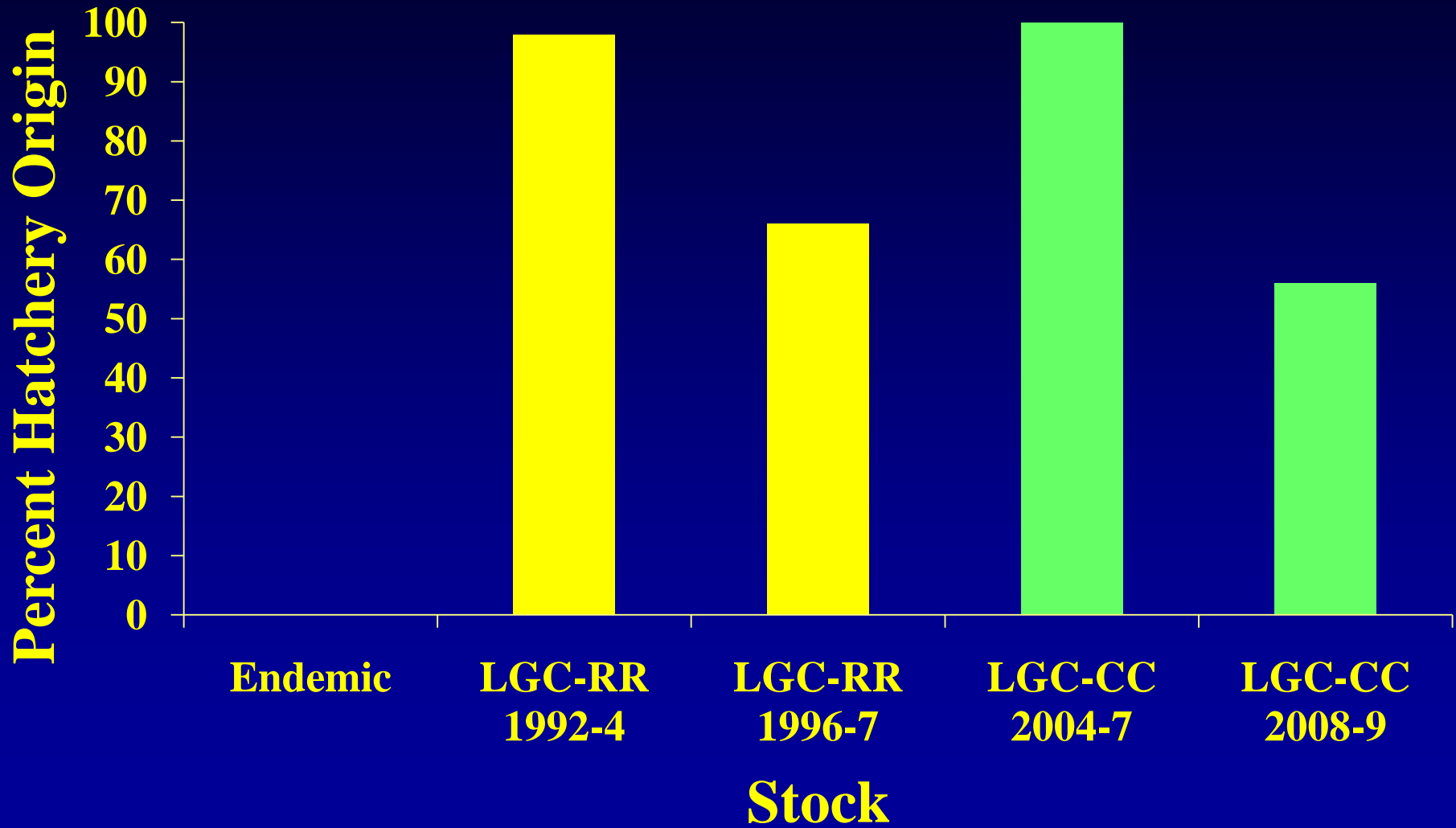
- Adult life history
 - *Spawner abundance*

Average Spawners Above the Weir



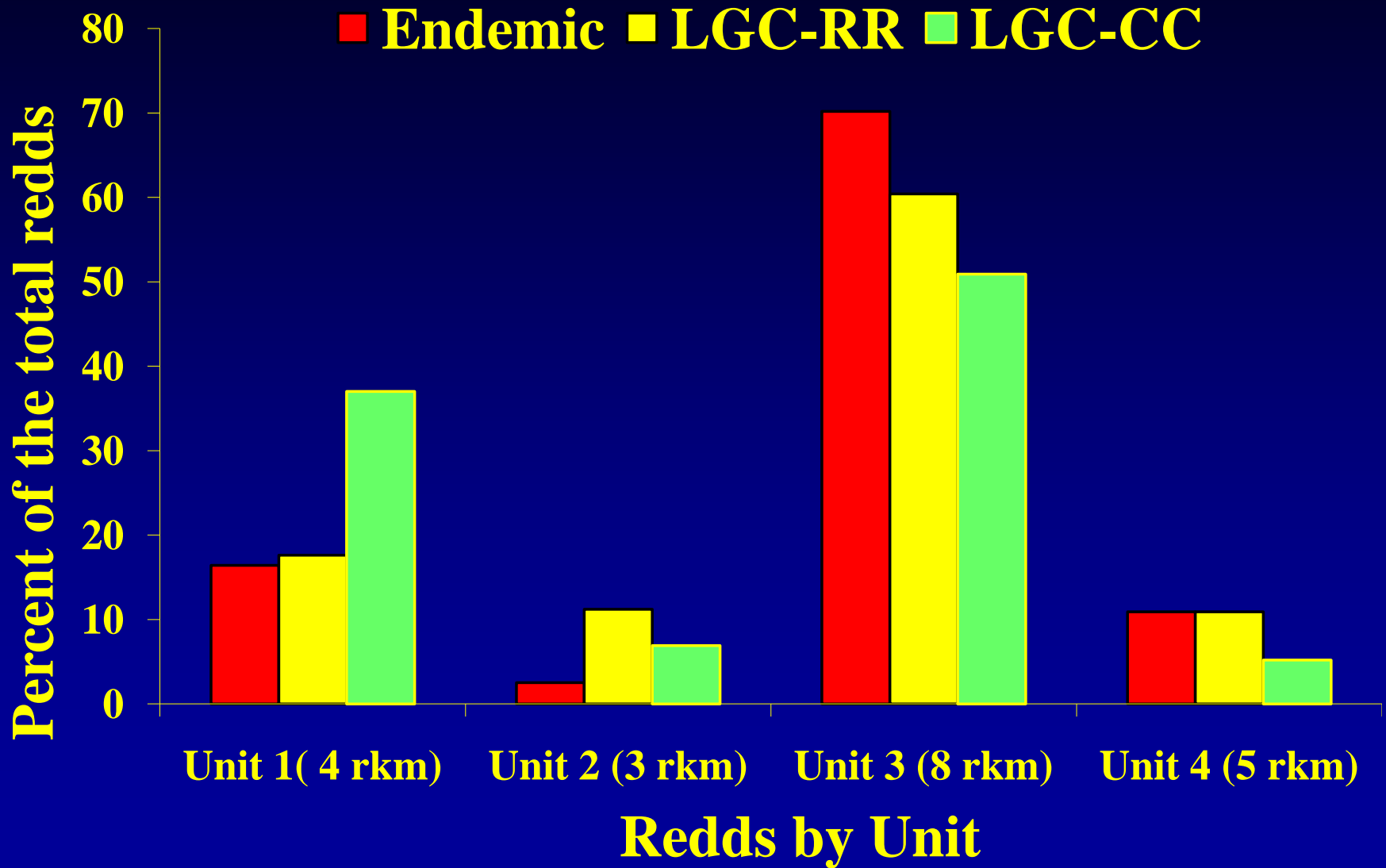
- Adult life history
 - *Percent hatchery/natural-origin spawners*

Percent Hatchery-origin Spawners Above the Weir



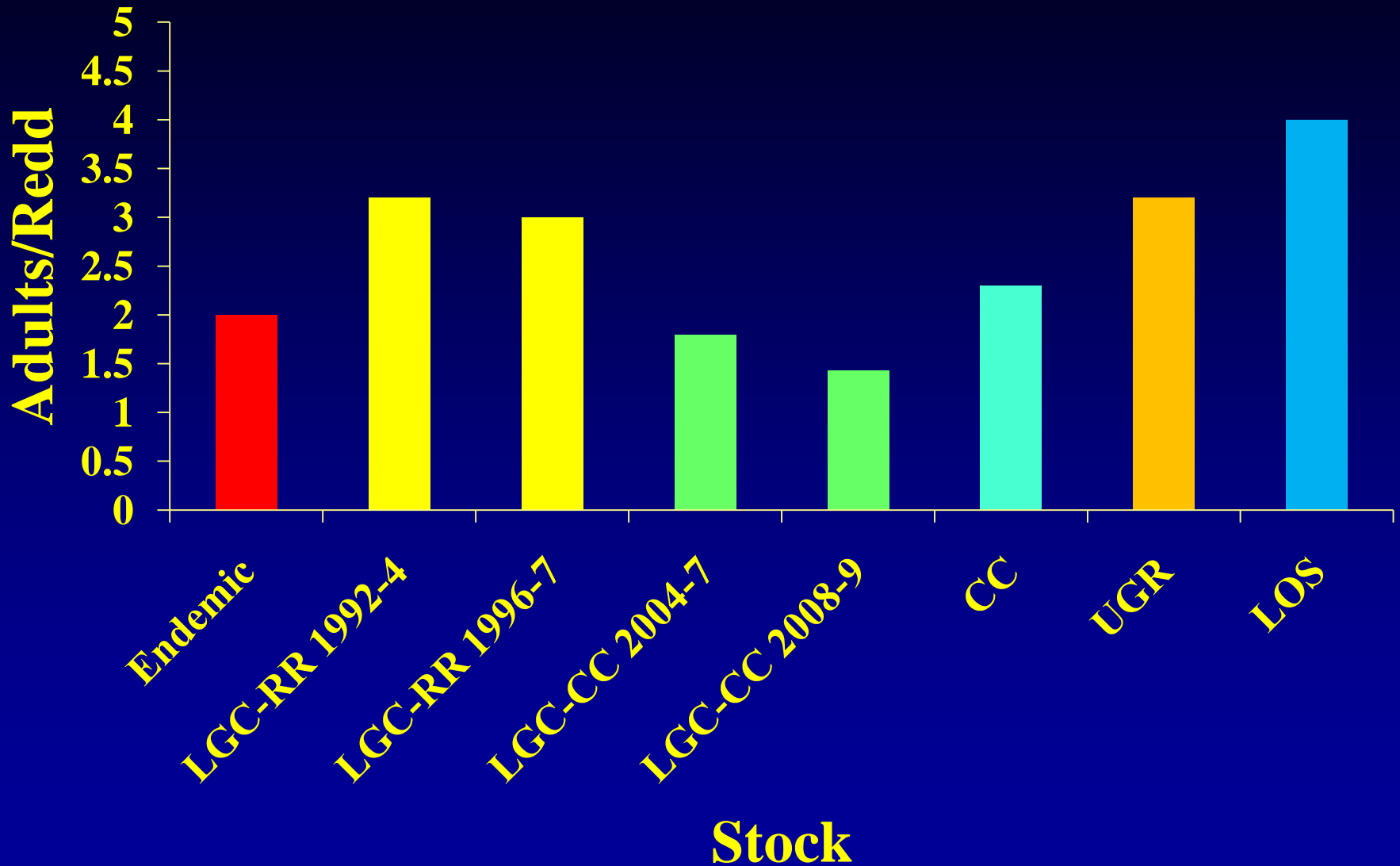
- Adult life history
 - *Redd distribution*

Redd Distribution



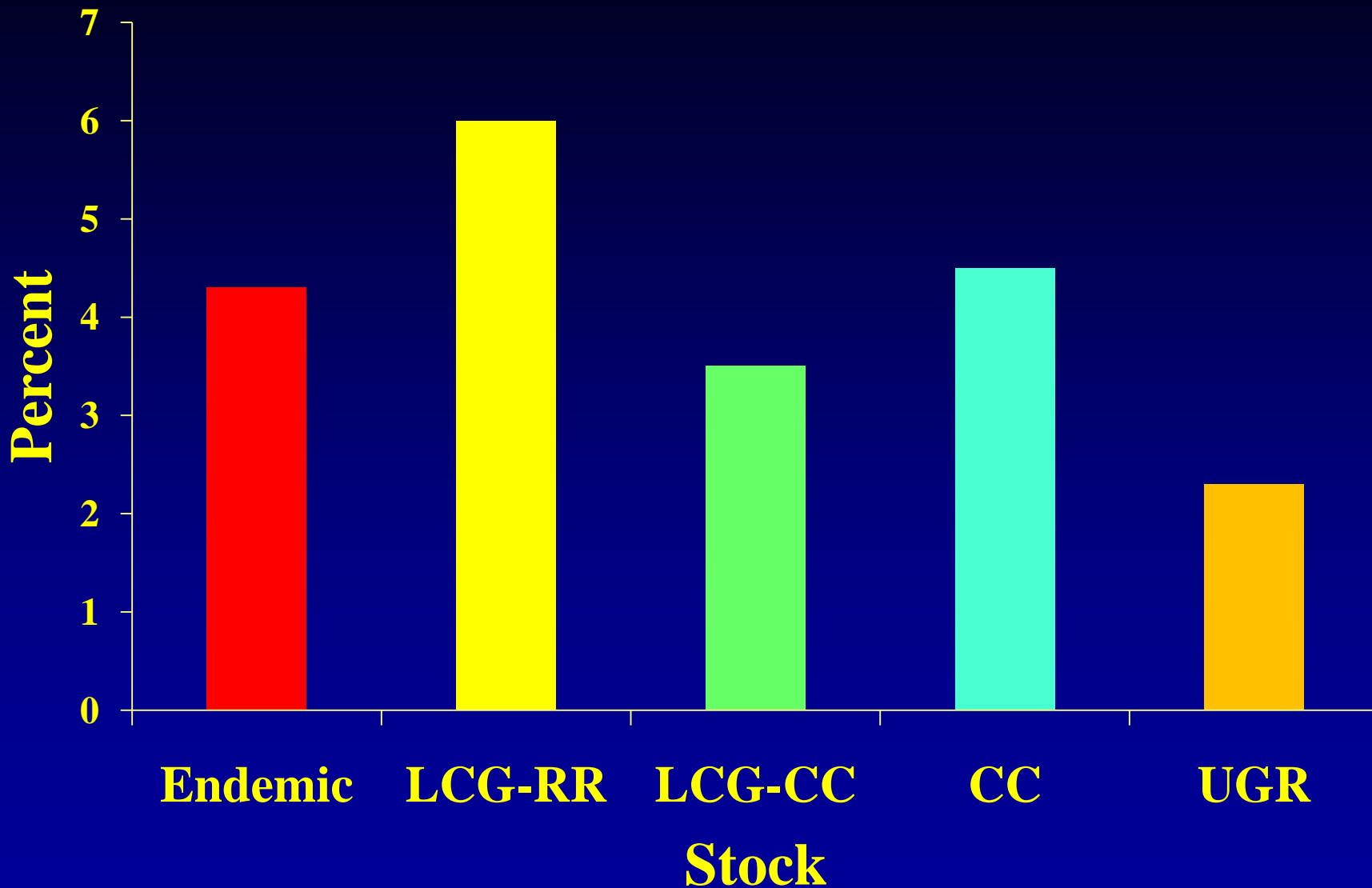
- Adult life history
 - *Adults-per-redd*

Adults-per-Redd



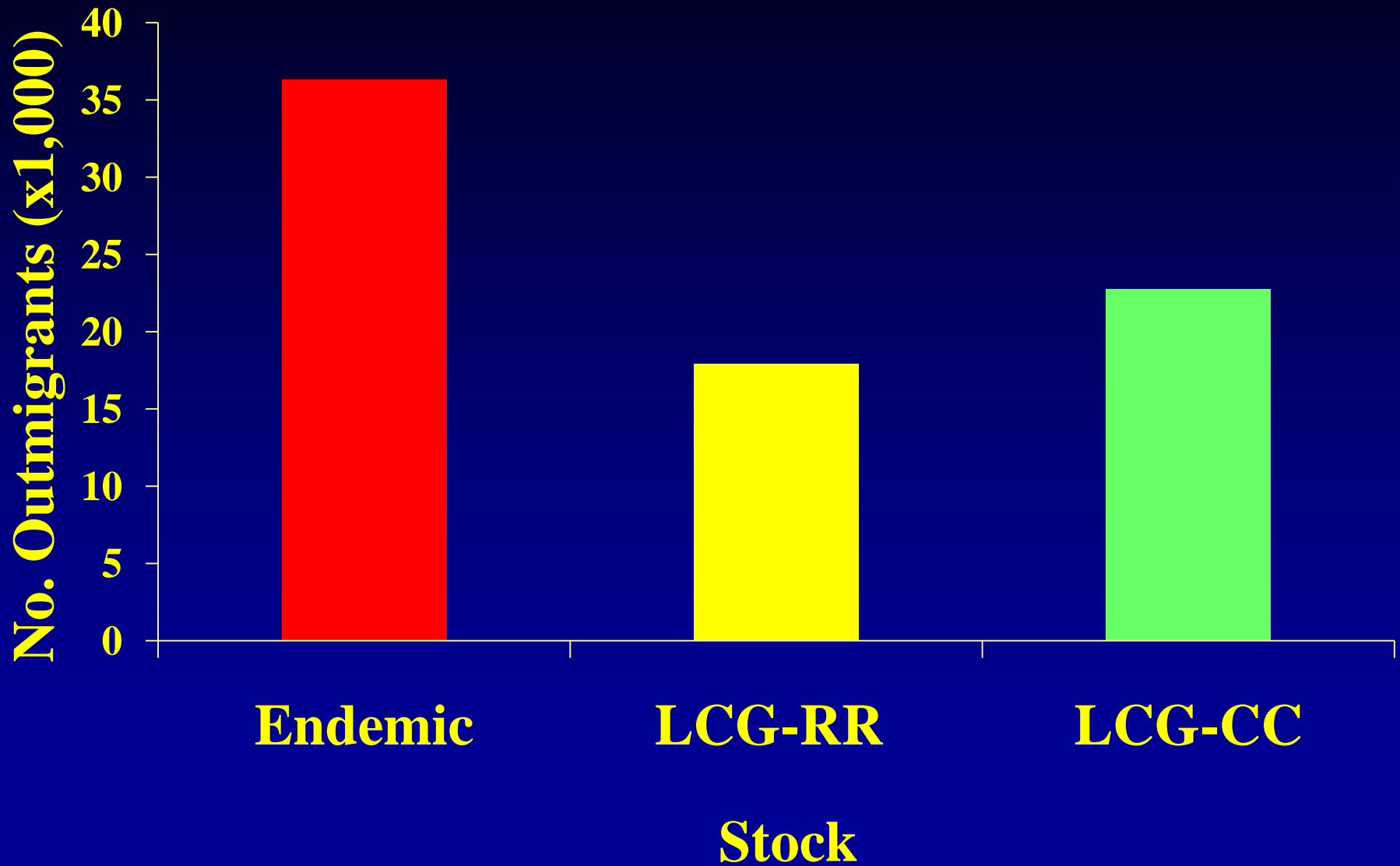
- Adult life history
 - *Prespawning mortality*

Prespawning Mortality (0% spawned)



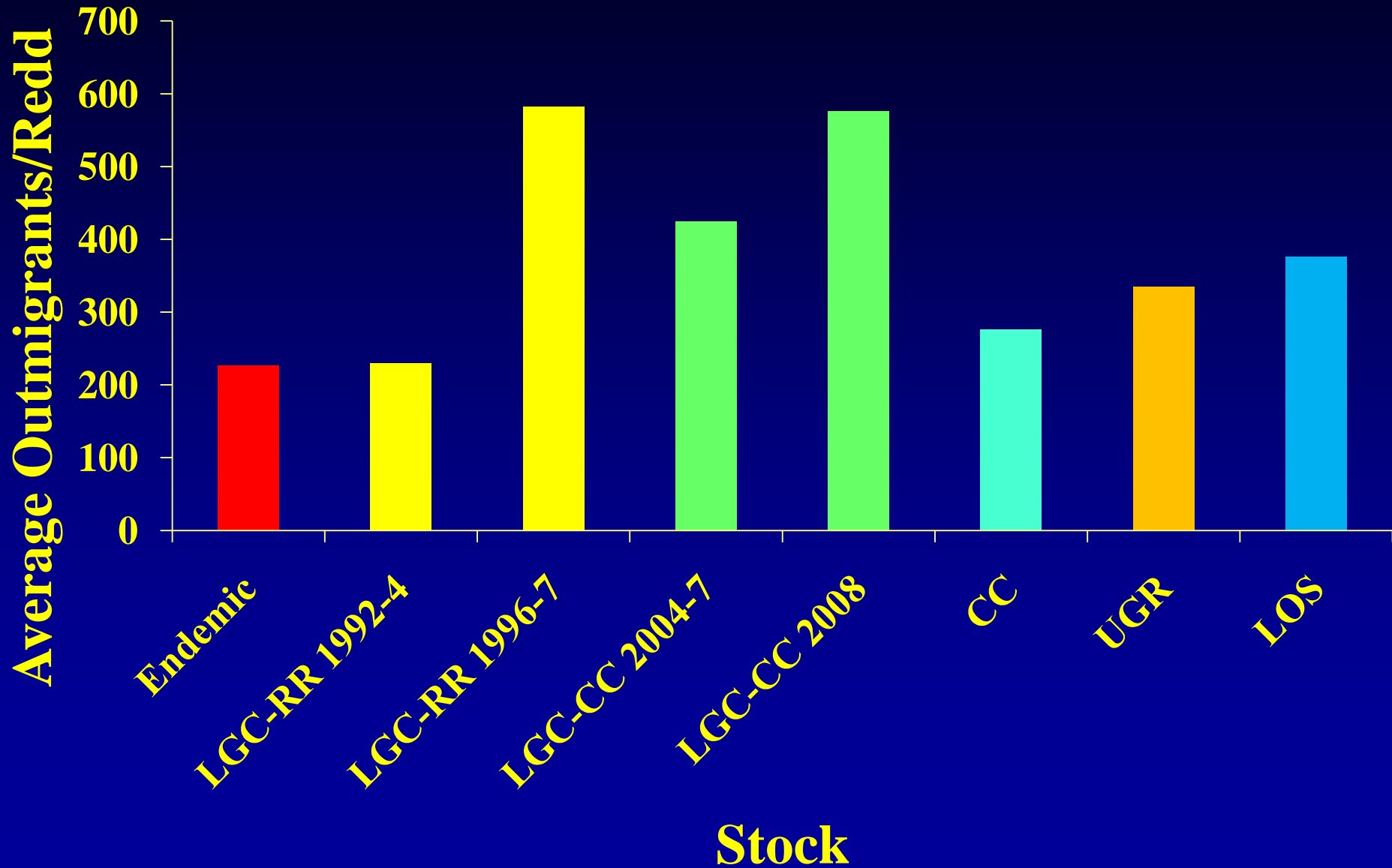
- Natural production
 - *Total outmigrants*

Total Outmigrants



- Natural production
 - *Outmigrants-per-redd*

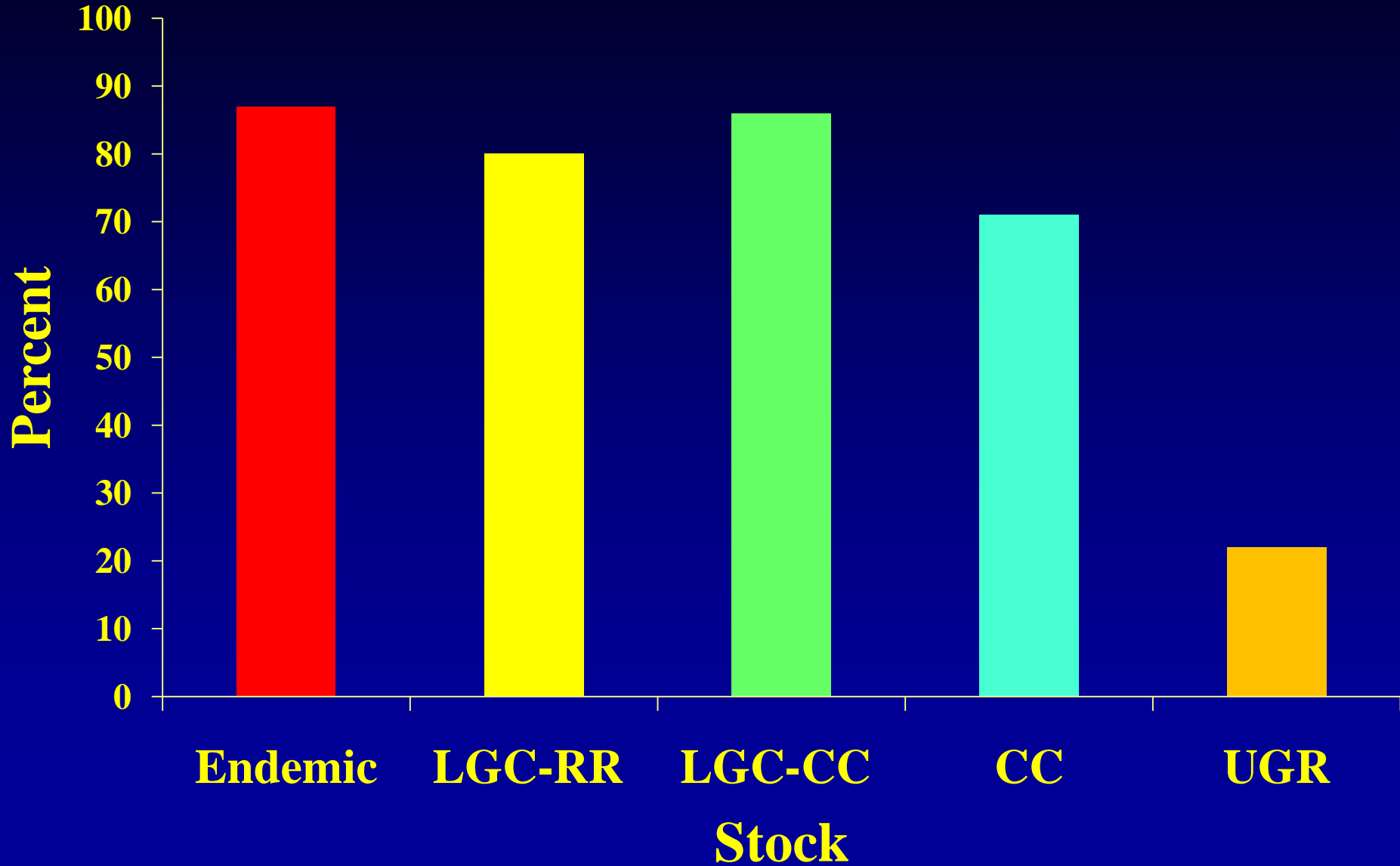
Average Outmigrants-per-Redd



- Natural production
 - *Outmigration by season*

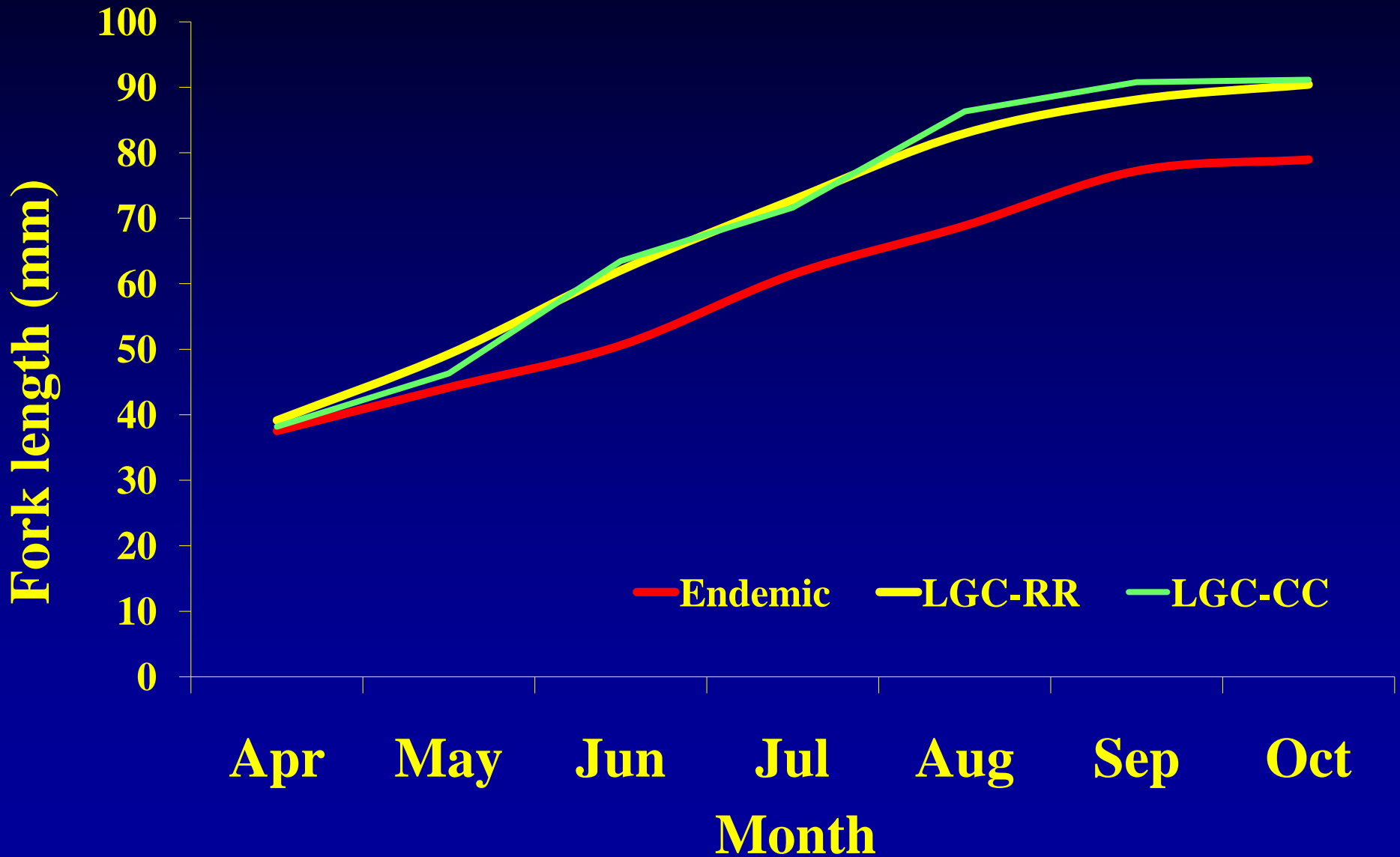
Outmigration by Season Past the Screw Trap

Early (Fall)

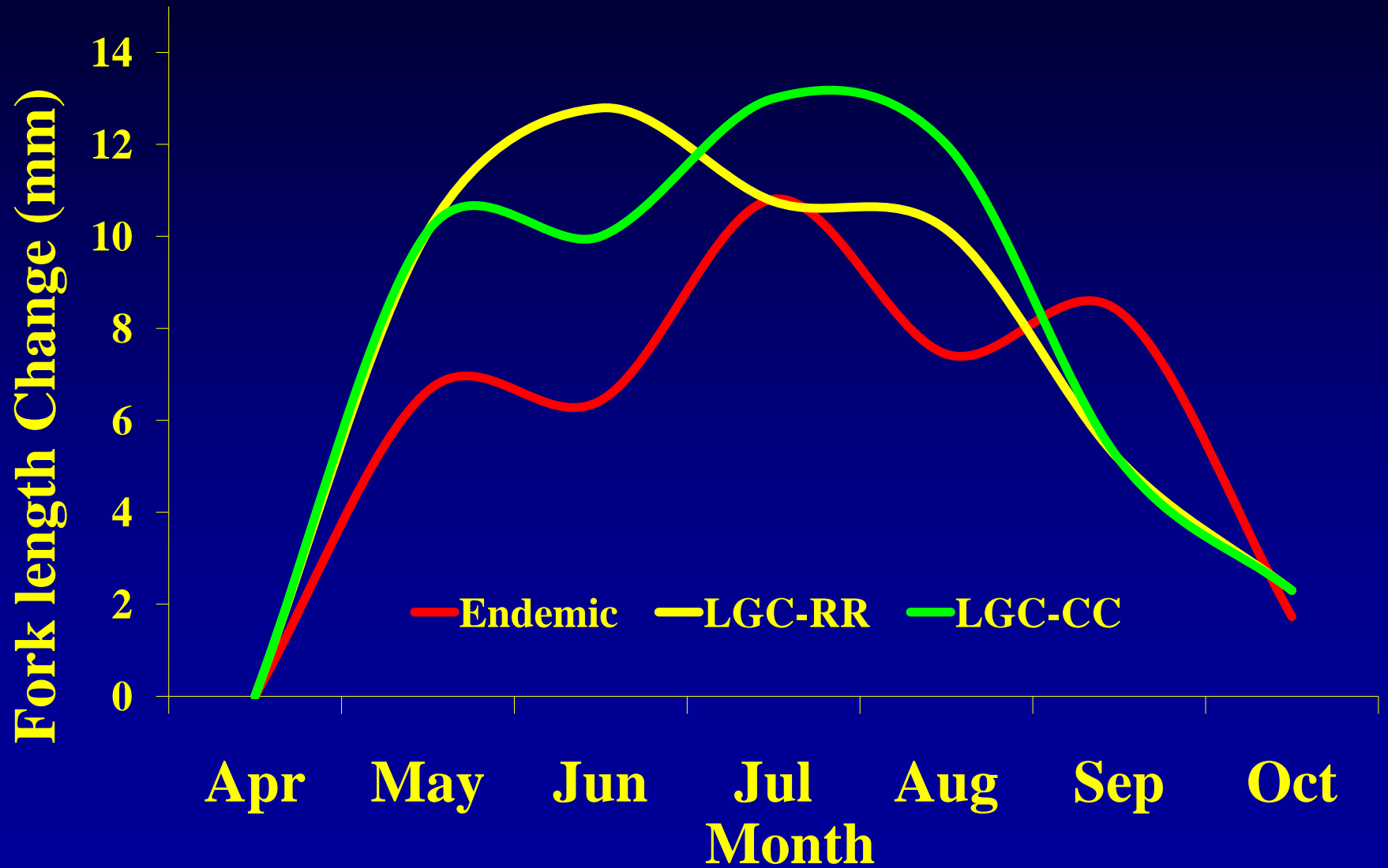


- Juvenile growth, survival, migration timing
 - *Juvenile first year growth*

Juvenile Growth

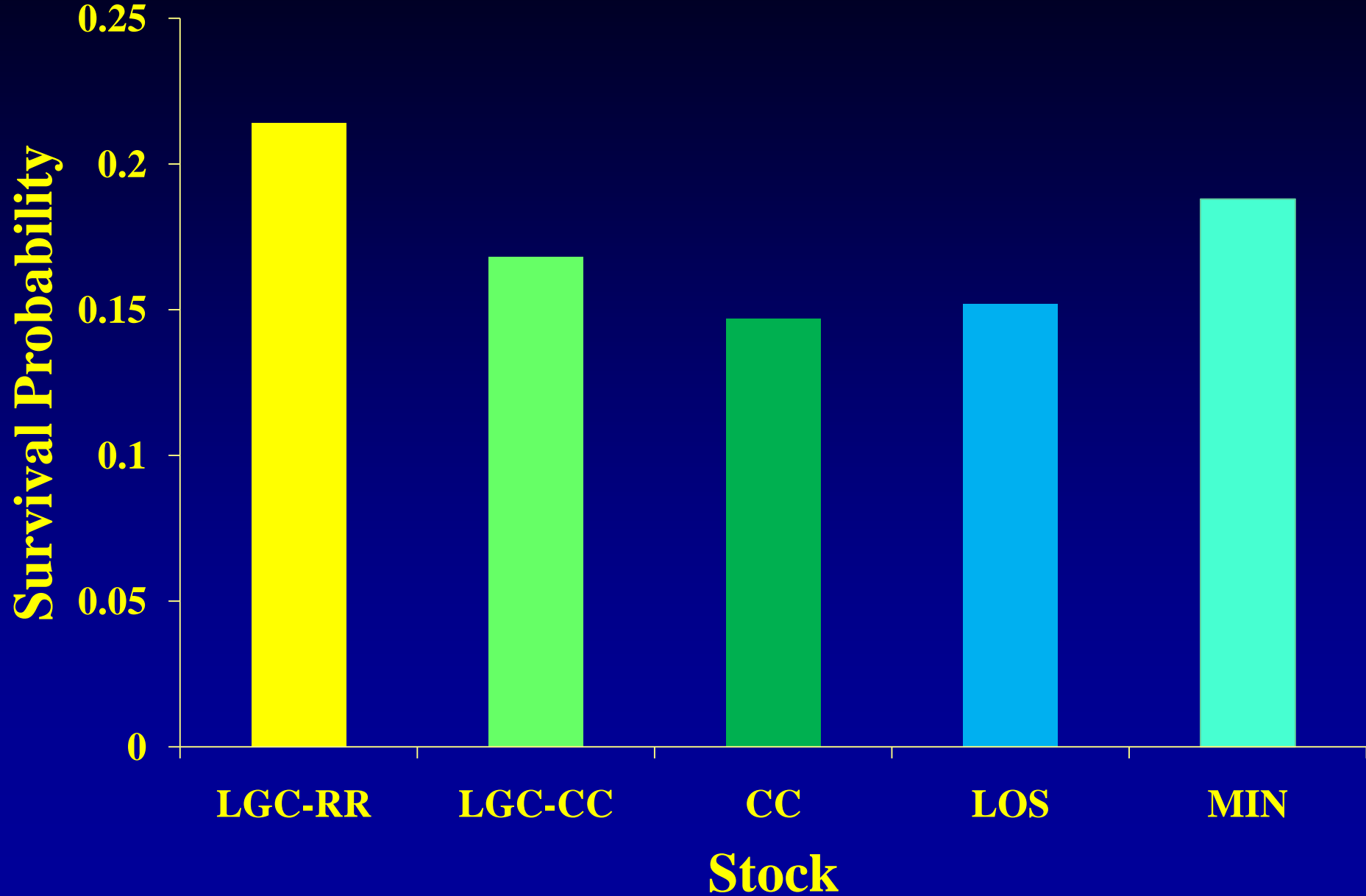


Juvenile Growth Patterns



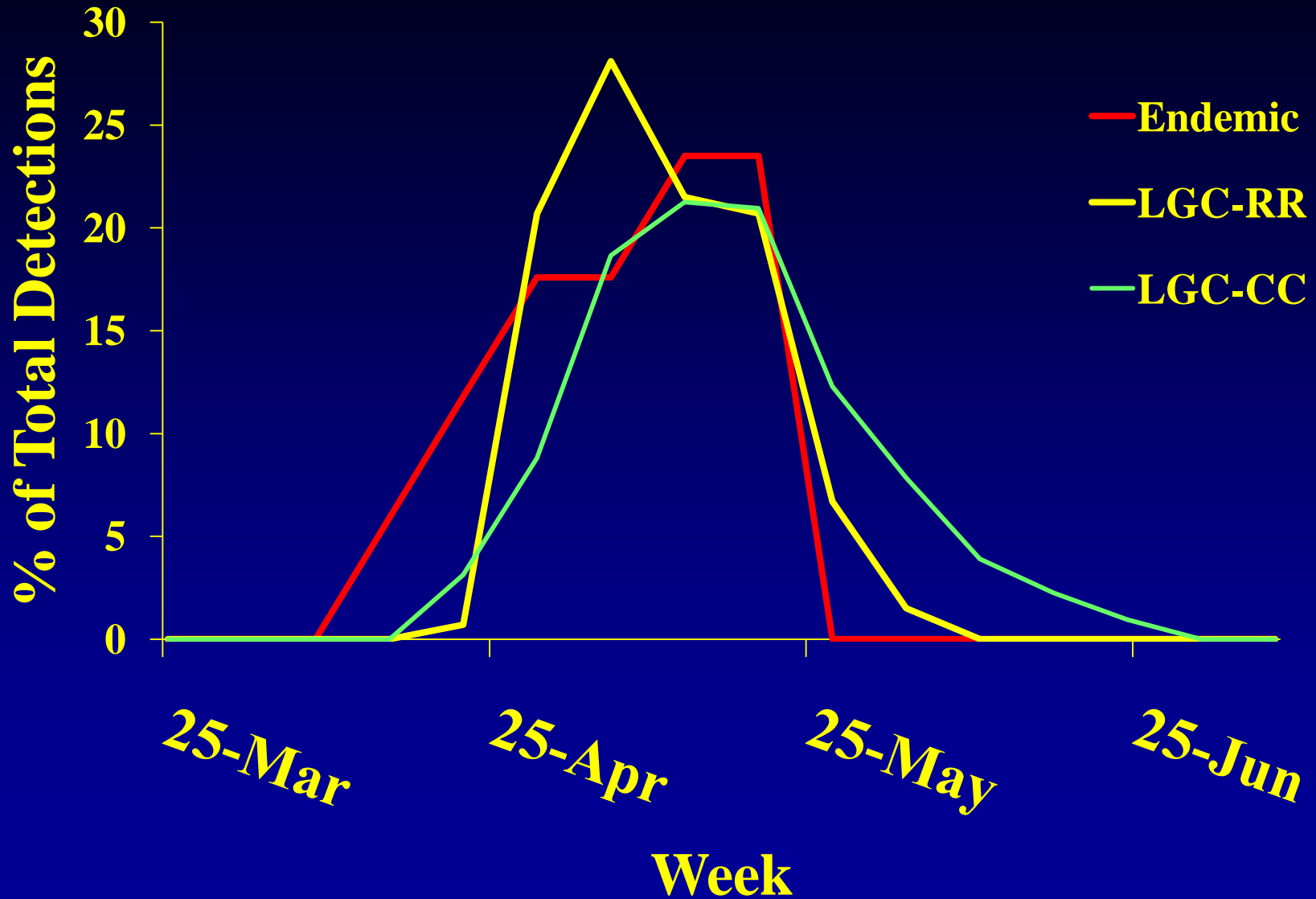
- Juvenile growth, survival, migration timing
 - *Parr survival to Lower Granite Dam*

Survival to Lower Granite Dam



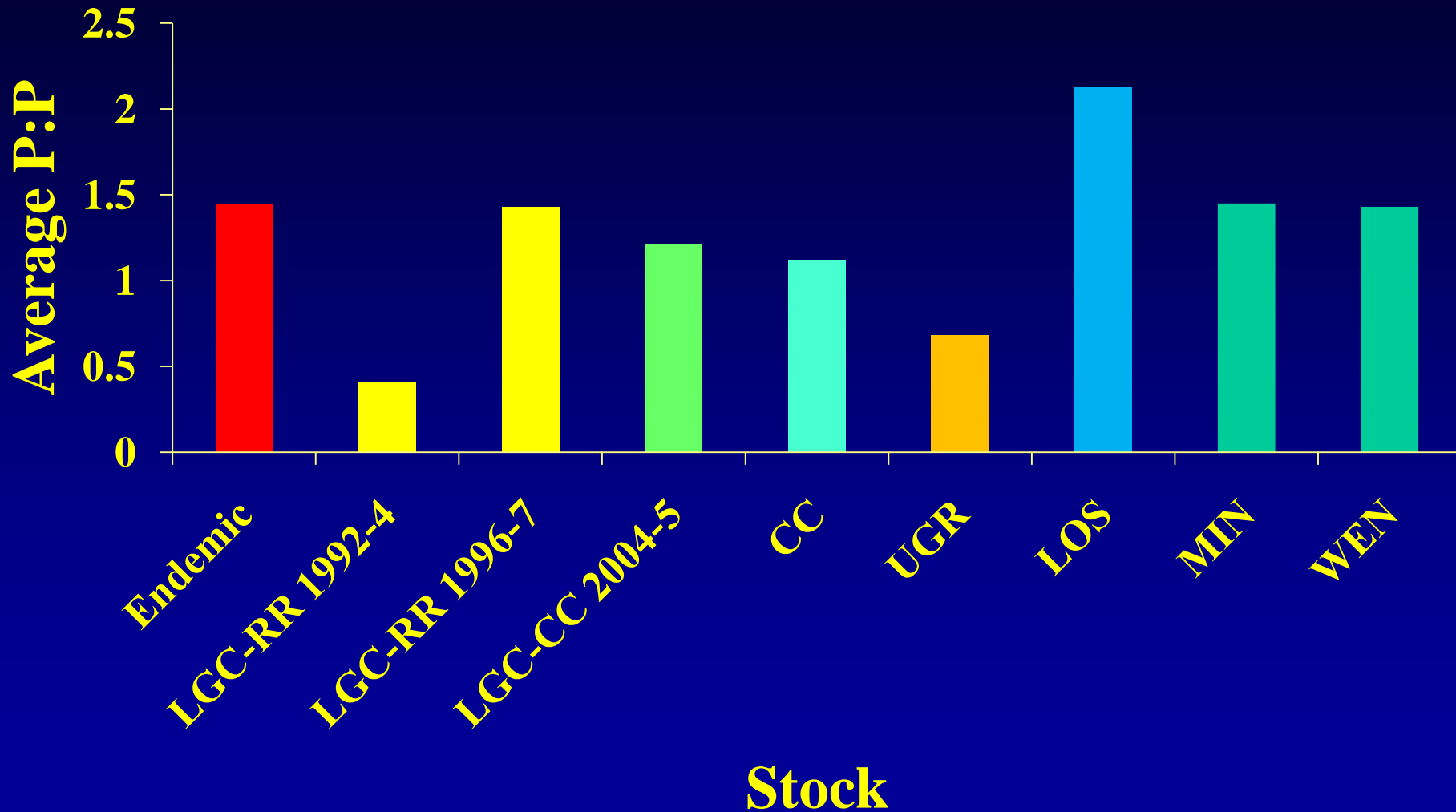
- Parr growth, survival, migration timing
 - *Arrival timing at McNary Dam*

Arrival Timing at McNary Dam

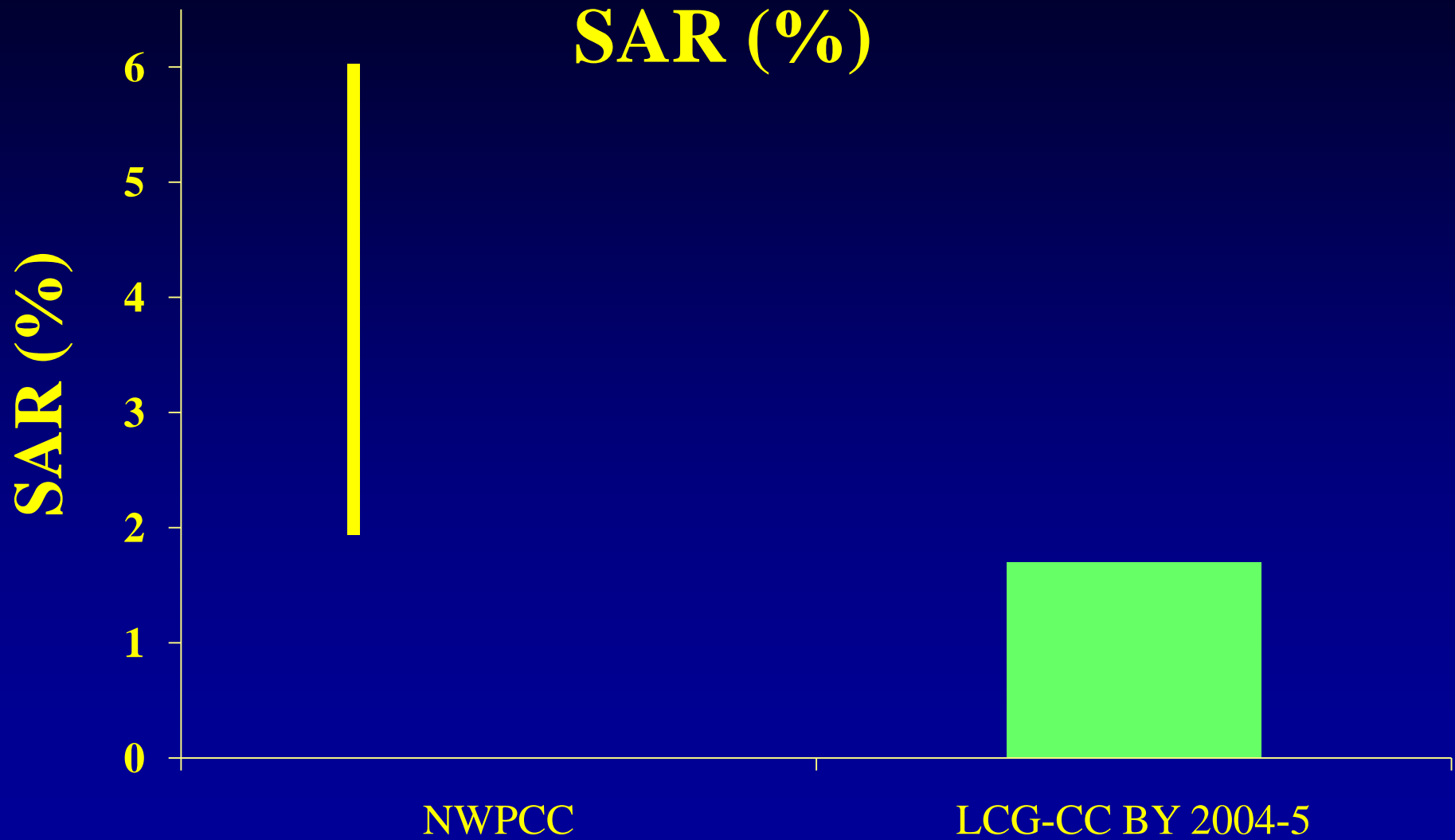


Progeny-per-parent (P:P) ratios, natural spawners

Average P:P ratios



Smolt/adult ratios (SAR) natural spawners



Summary

Three era comparison study (Obj. 1)

- Captive brood progeny spawned successfully, produced outmigrants and adult returns
- Spawners dominated by hatchery-origin
- Redd distributions similar
- Adults/redd lower for LGC-CC era, highly variable
- Prespawning mortality 2-6%, can approach 50%
- Total outmigrant production $\frac{1}{2}$ of endemic
- Outmigrants/redd higher than endemic
- Little variation in % early outmigrants

Summary

- Summer growth similar for LGC-RR and LGC-CC eras
- Growth patterns similar for endemic and LGC-CC
- Peak arrival timing at McNary Dam similar for endemic and LGC-CC
- P:P 1-1.5 except for Rapid River 1992-1994; only 2 BY for LCG-CC

(LGC-RR and LGC-CC only comparison)

- Survival to Lower Granite Dam higher for LGC-RR than LGC-CC
- (LGC-CC only)
- SAR below NWPCC recovery goal-only 2 BY

Summary

Natural production (LGC-CC vs CC) Comparison (Obj. 2a)

- Adults/redd and prespawn mortality lower for LGC-CC
- Outmigrants/redd LGC-CC>CC
- % early outmigrants LGC-CC>CC
- Survival to Lower Granite Dam LGC-CC>CC
- Average P:P LGC-CC>CC

Hatchery production (LGC-CC vs CC) Comparison (Obj. 2b)

- (Future) Evaluate the performance metrics for LGC-CC vs CC hatchery production

Acknowledgments

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Private landowners

Forest Capital, LLC

Umatilla National Forest

