

A school of Chinook salmon swimming in clear water over a rocky riverbed. The fish are silvery with dark spots and are moving in a coordinated pattern. The background shows the rocky riverbed and the water's surface.

Spring Chinook Salmon Interactions Indices - Competition

Todd Pearsons

Christopher Johnson

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and

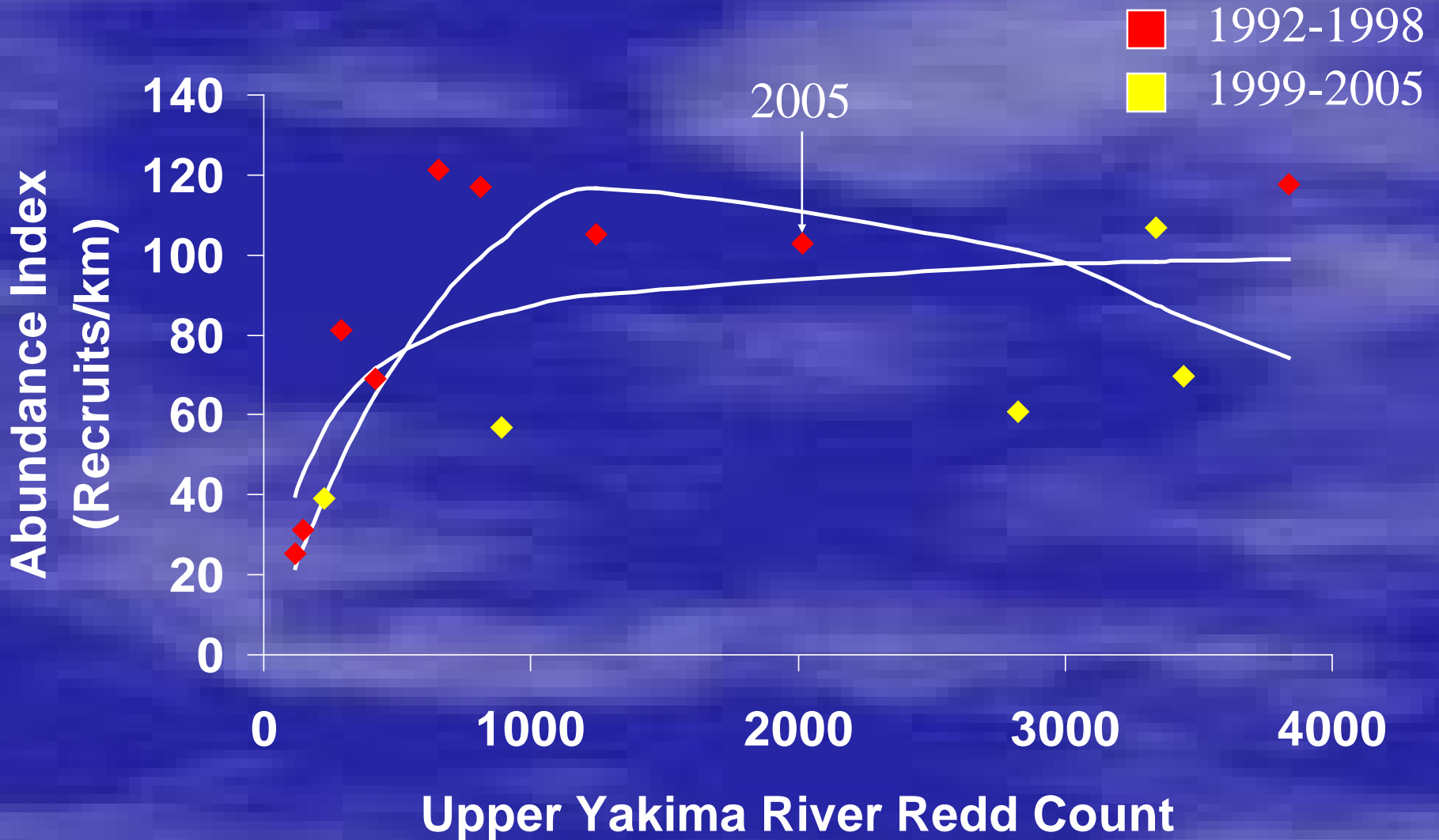
Gabriel Temple

A group of juvenile Chinook salmon swimming in a river. The fish are silvery with dark spots and are swimming towards the right. A large log is visible in the background, partially submerged in the water. The water is clear and the scene is brightly lit.

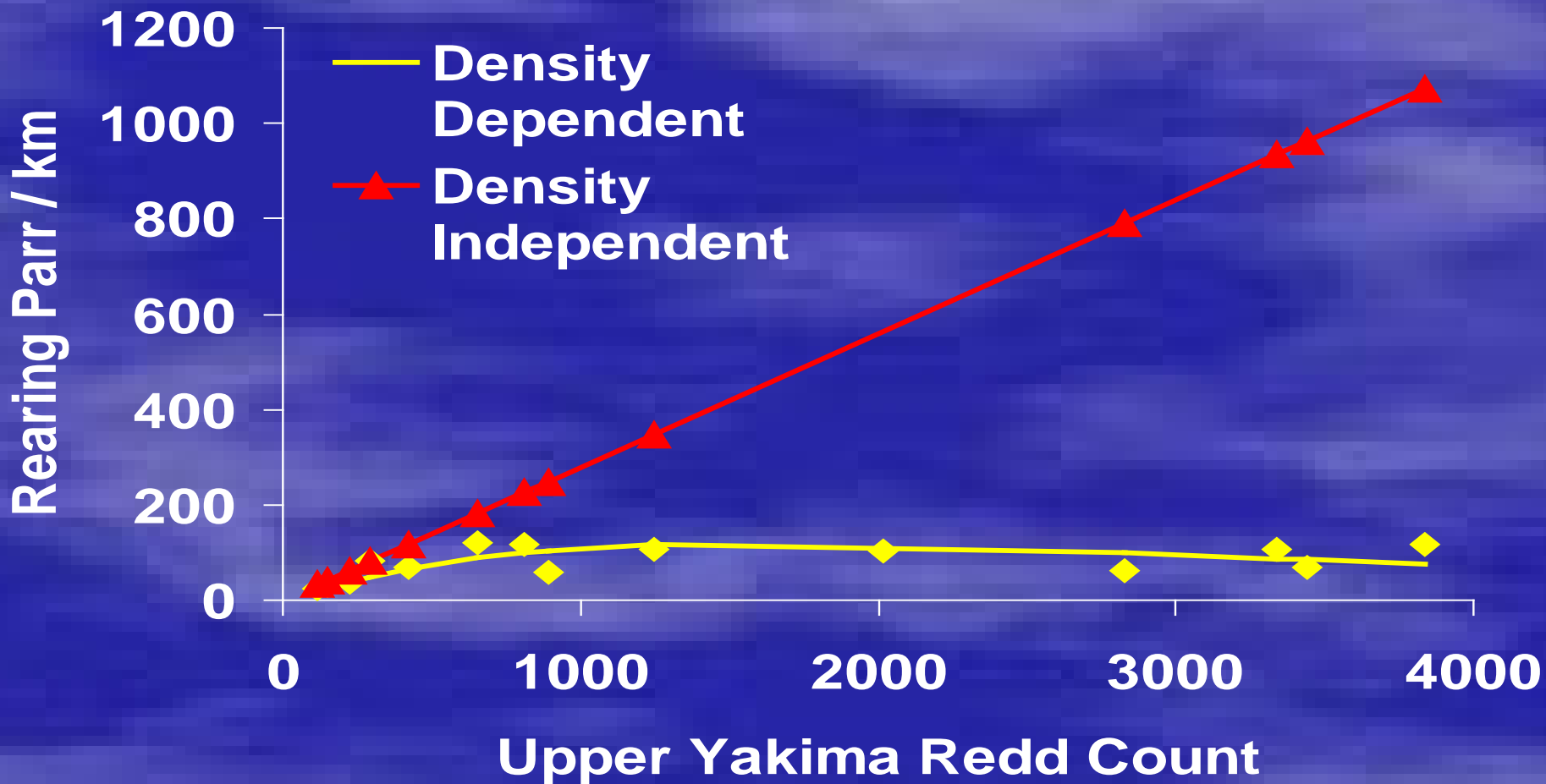
Purpose

- Historical estimate of 120,000 adult spring Chinook returning to upper Yakima
- What are the factors that limit carrying capacity of juvenile spring Chinook salmon in the upper Yakima River?

Beverton/Holt and Ricker

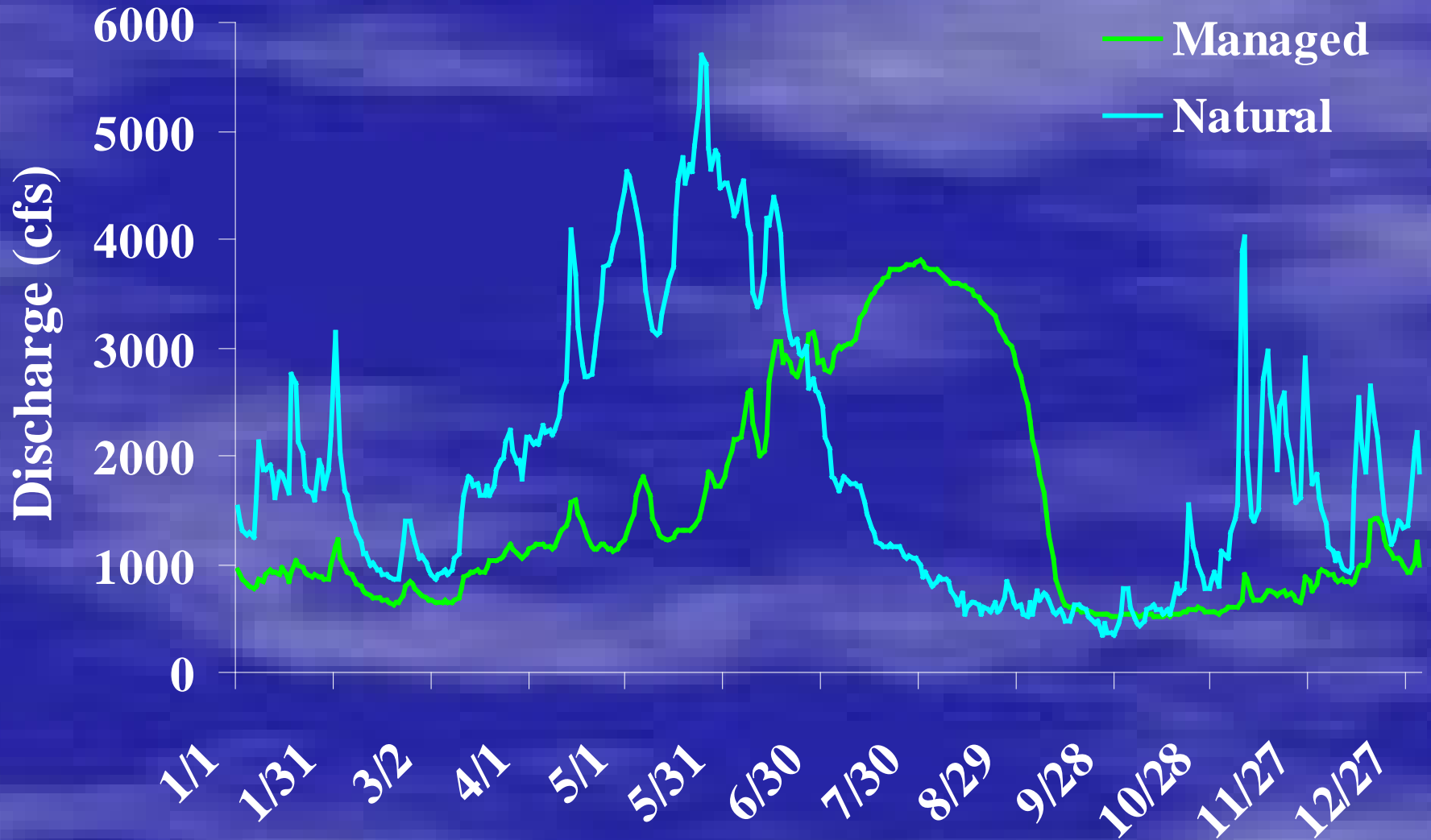


Importance of Density Dependence

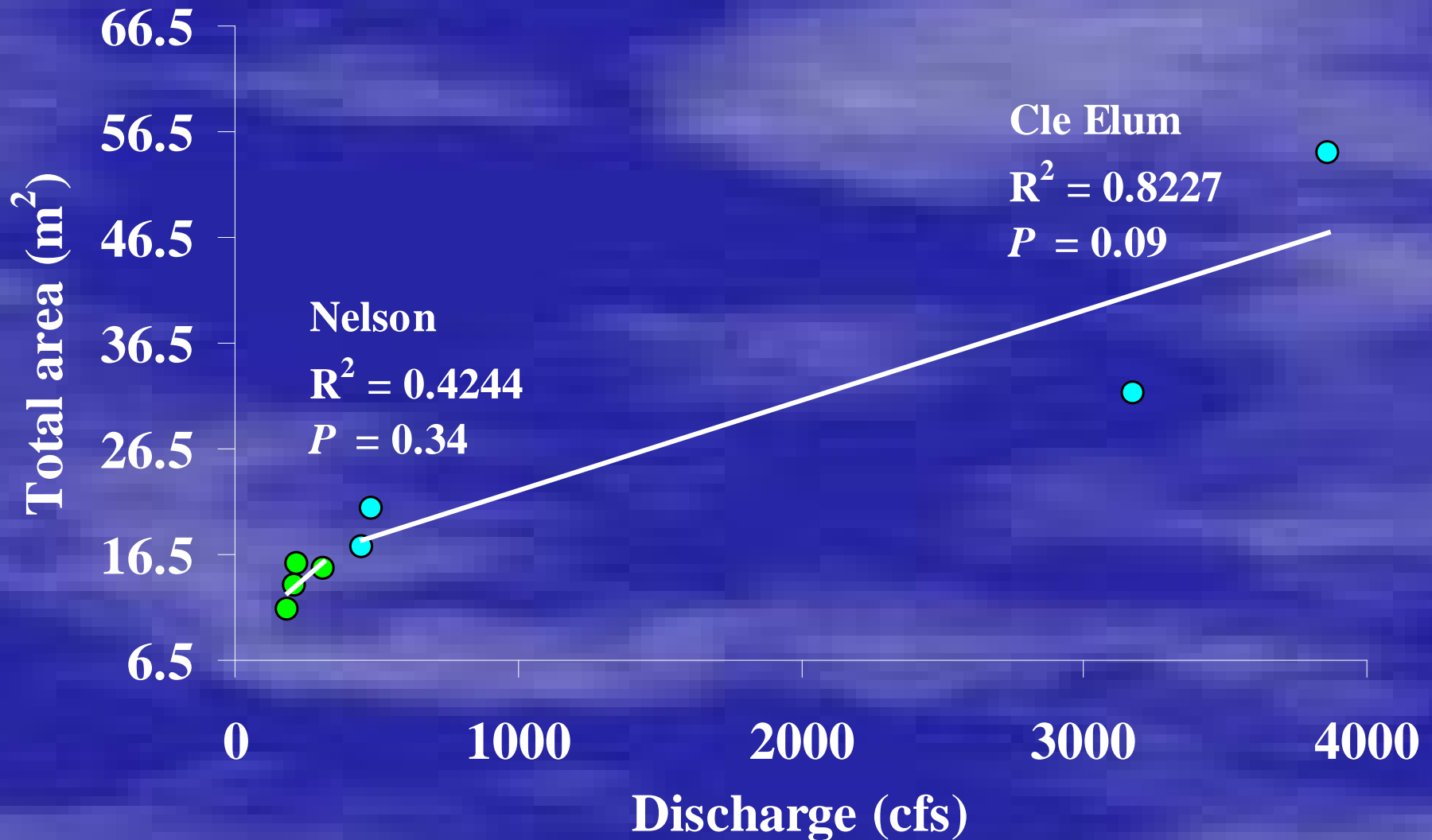


Capacity changes

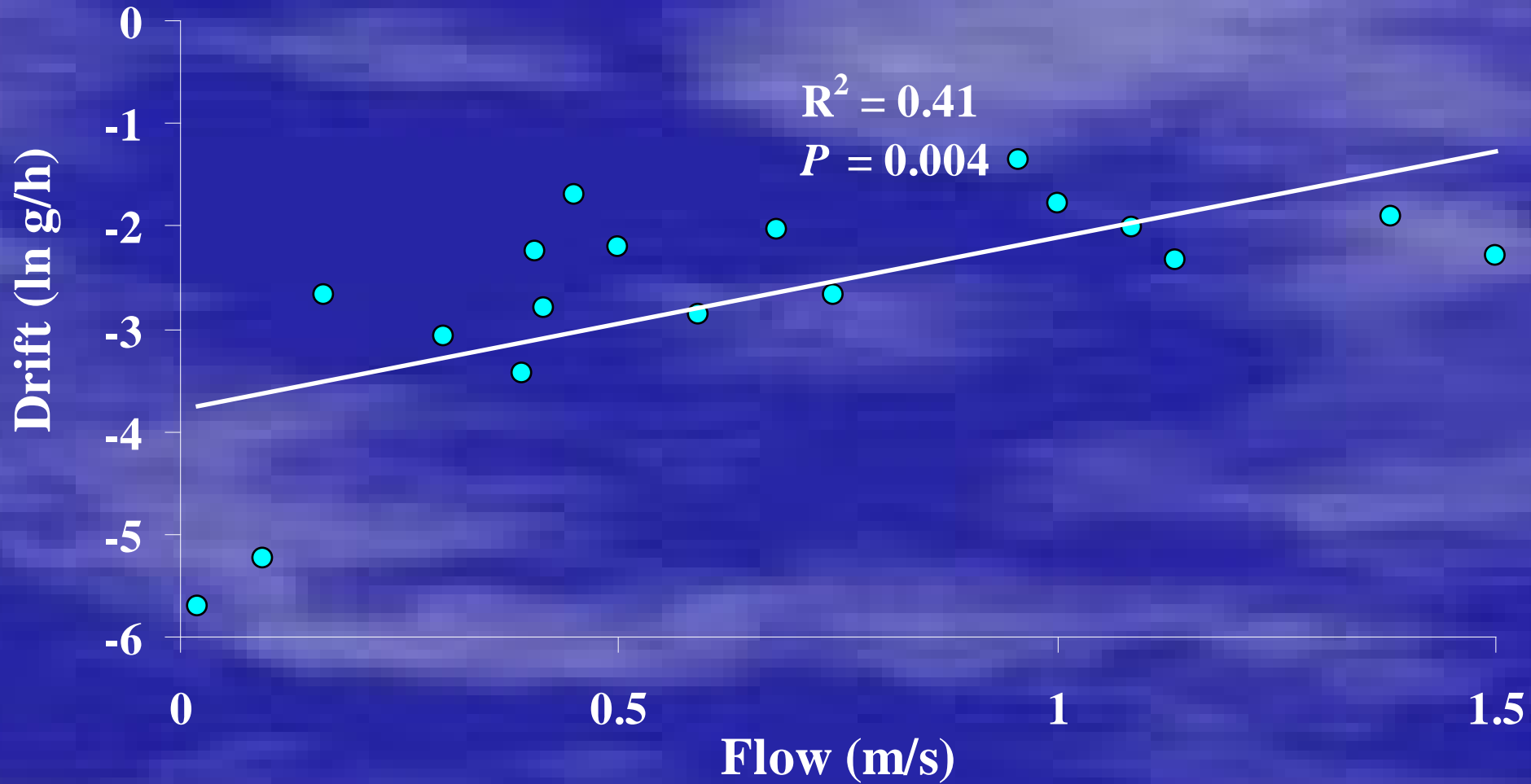
Yakima River at Cle Elum 98-06



Discharge vs. Cross Sectional Area

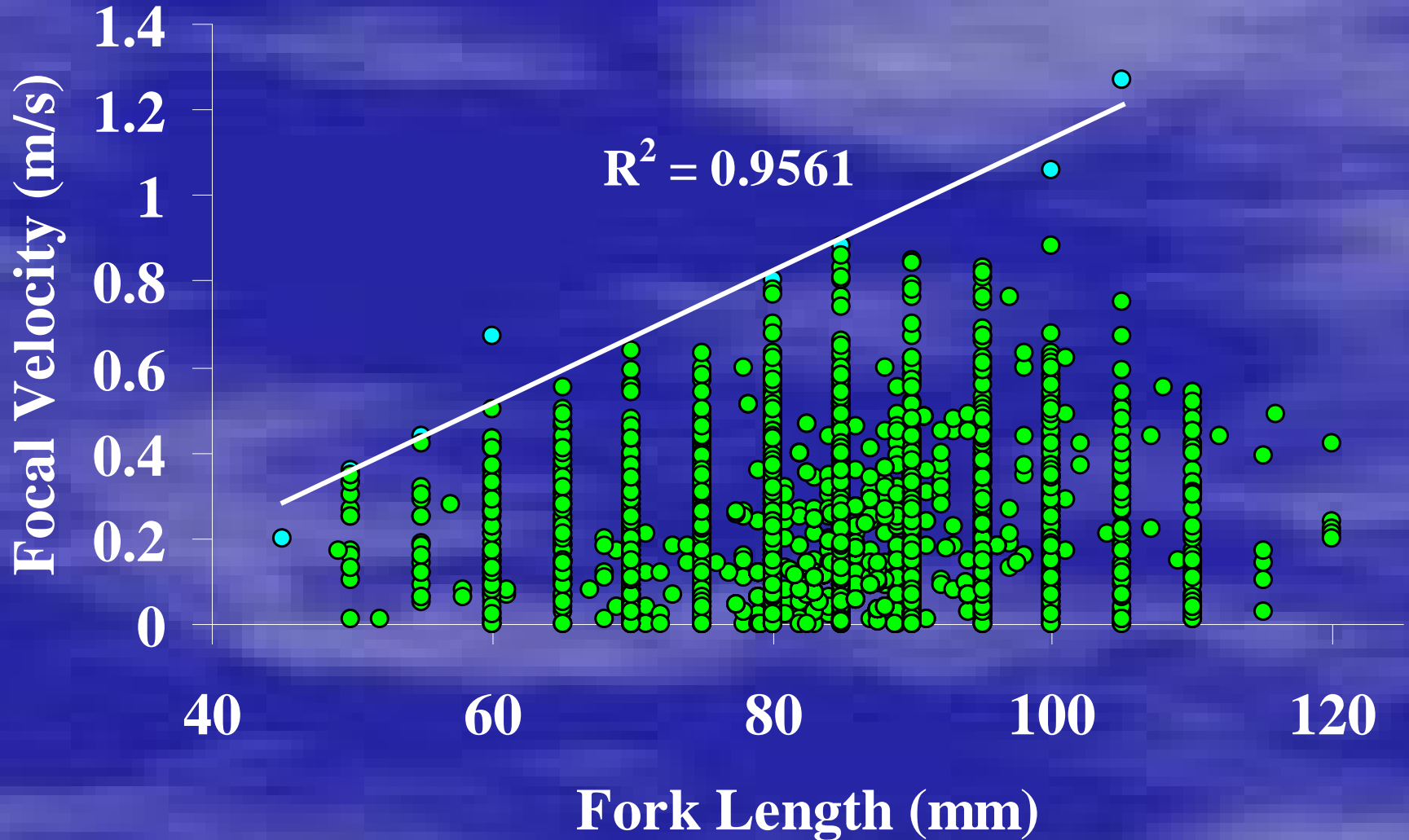


Food vs. Flow (2006)



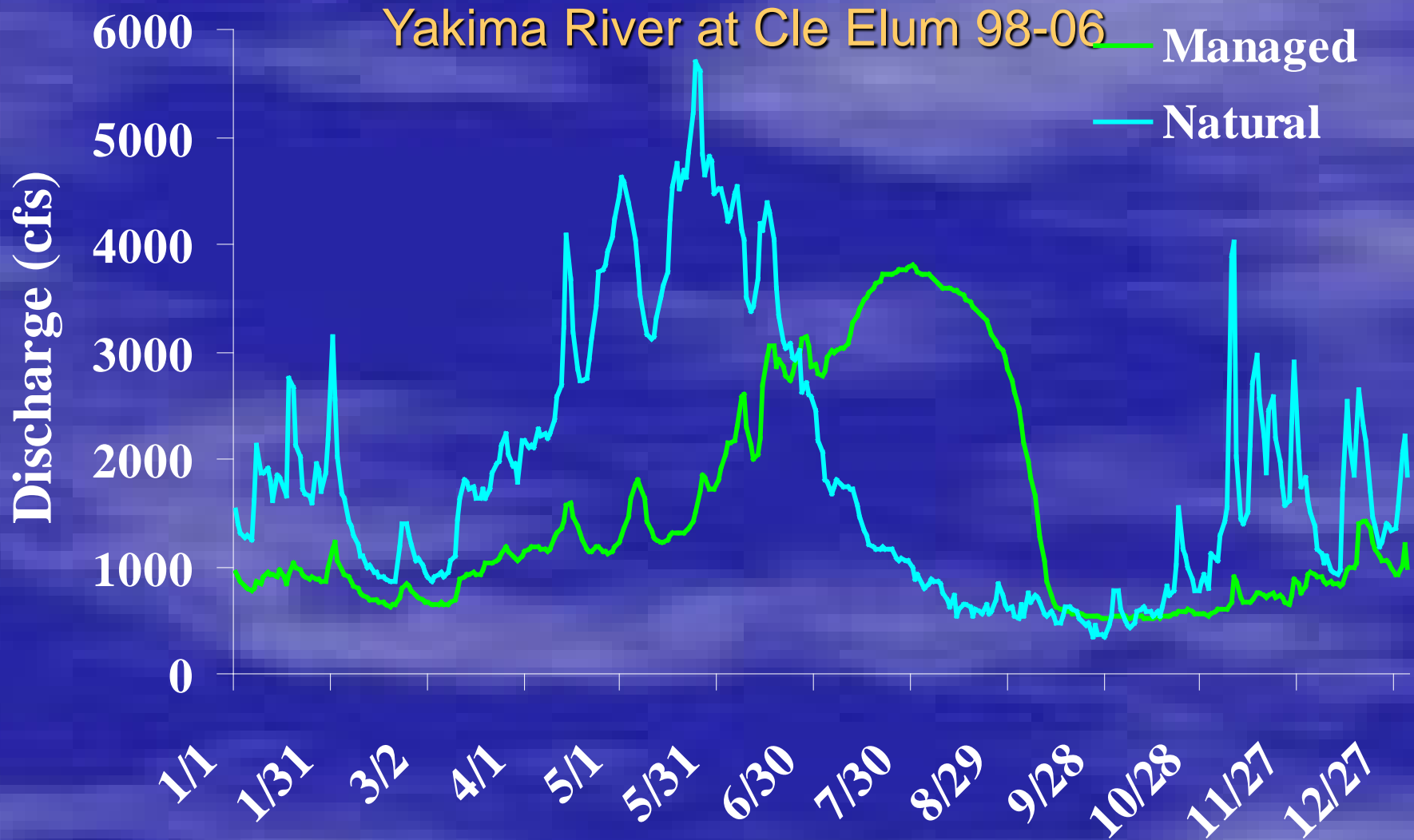
Length vs. Focal Velocity

98-06



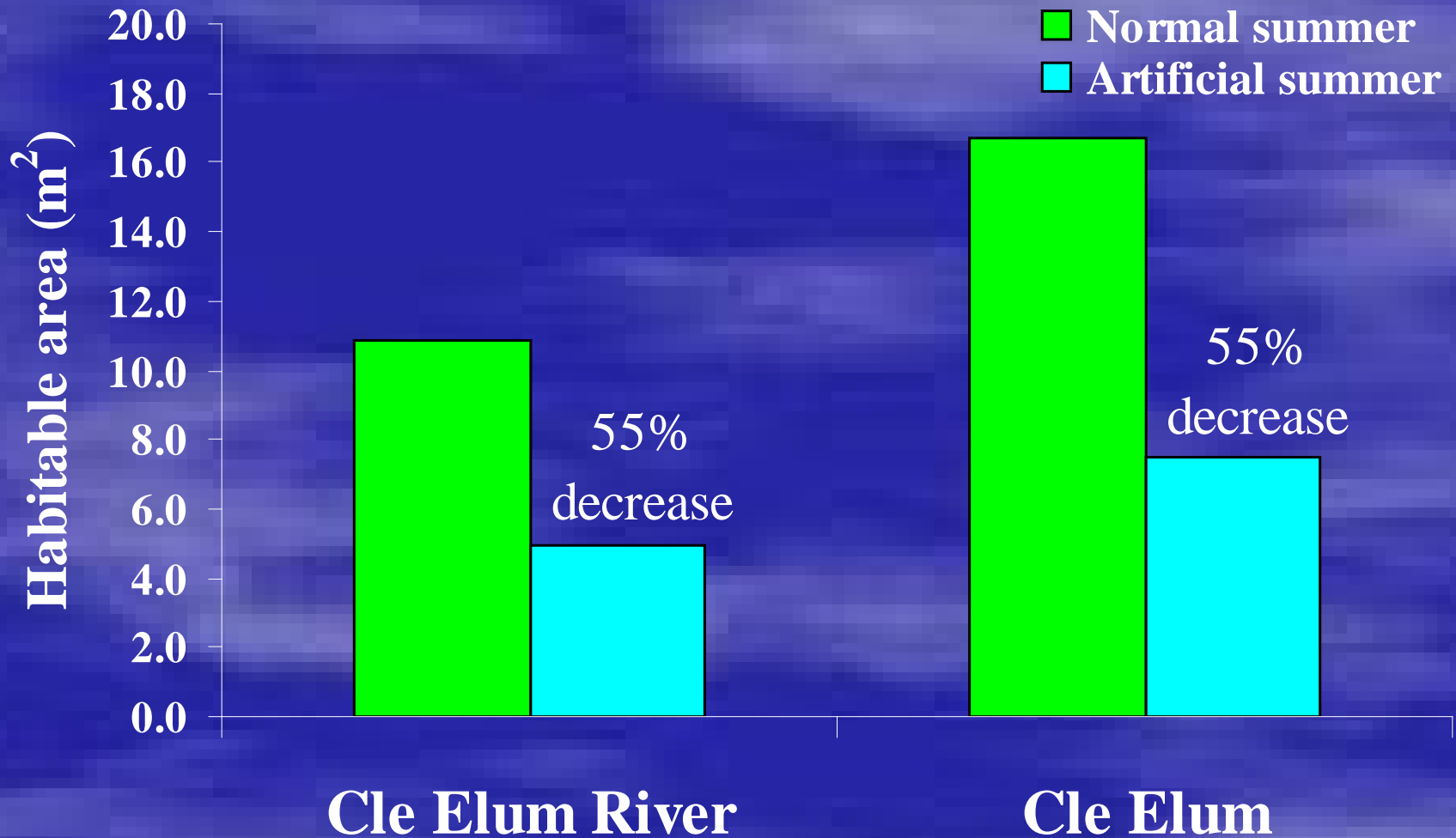
What happens to habitable
area of juvenile Chinook when
discharge increases
dramatically relative to
normal?

Normal vs. Managed Measures

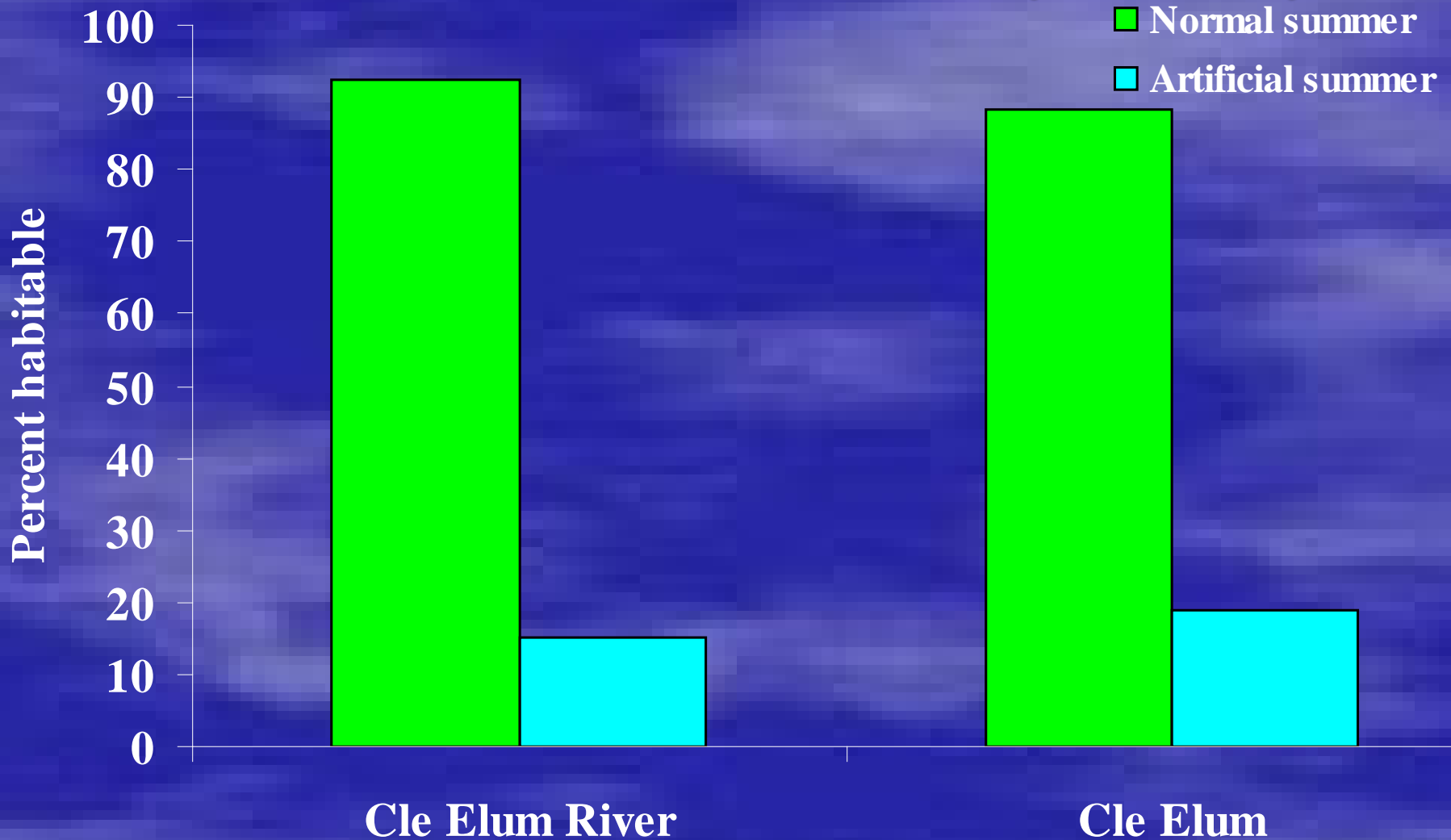


Habitat area goes down

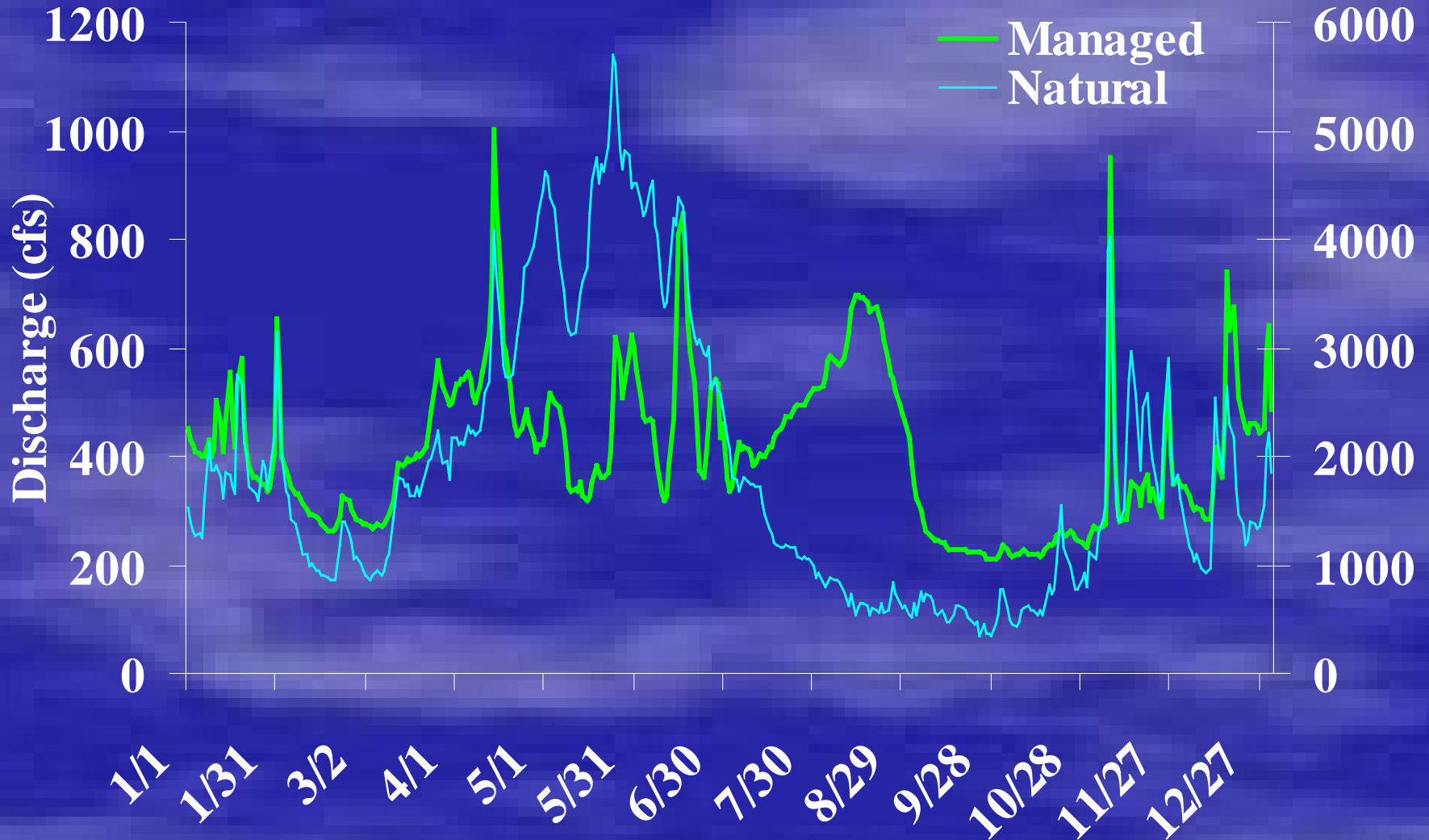
(2005-2006)



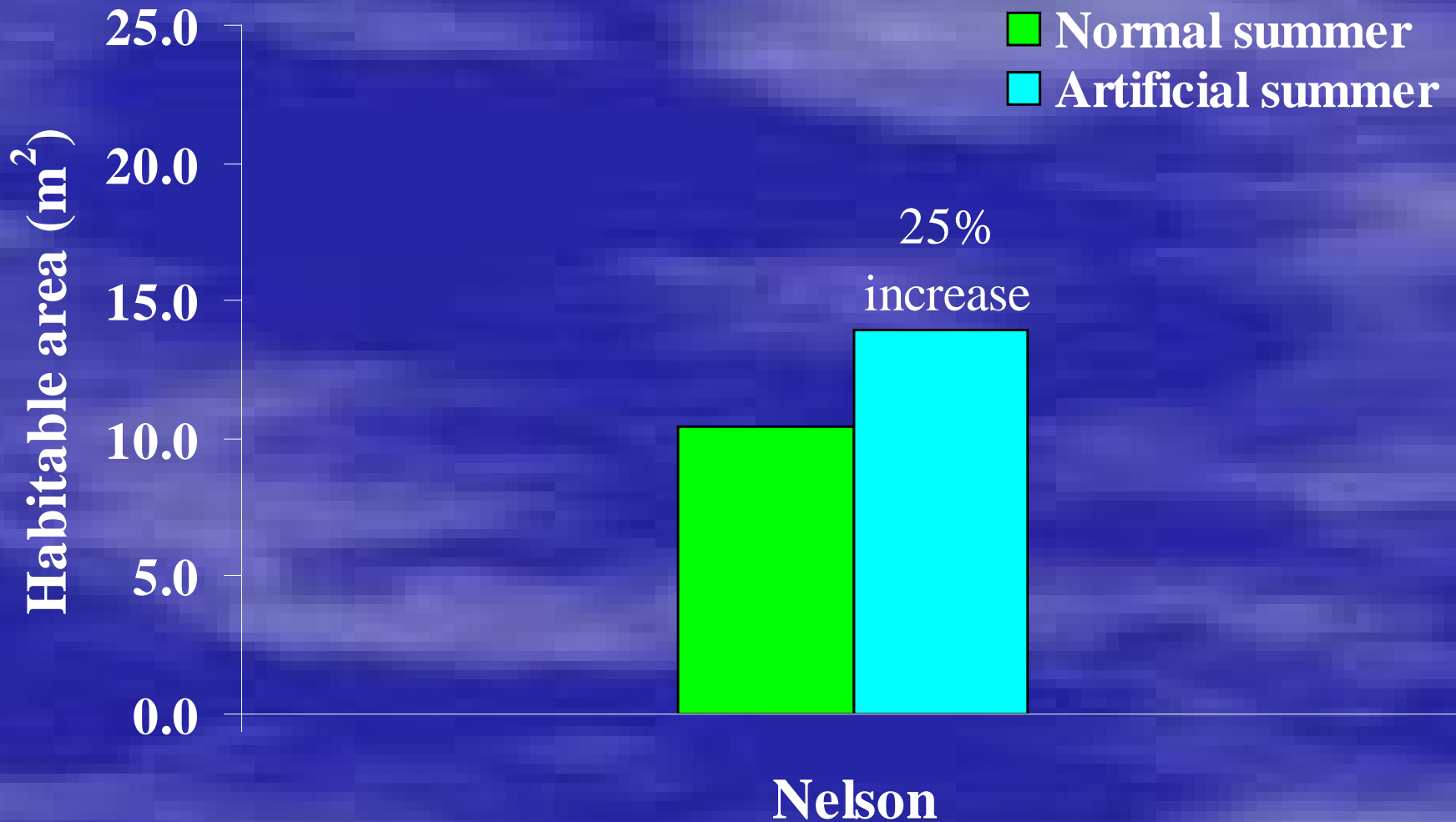
% of habitable area (05-06)



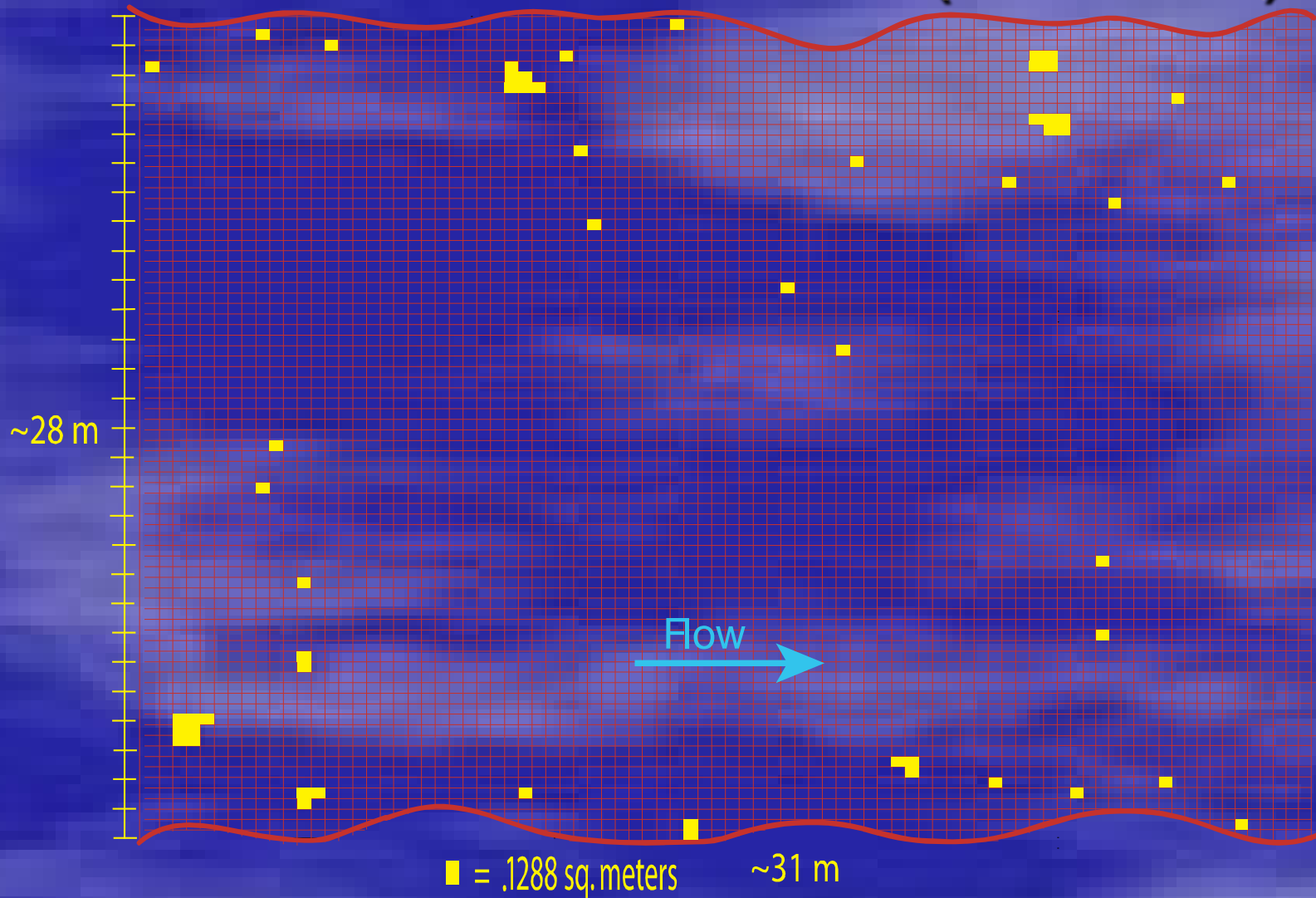
Nelson Hydrograph

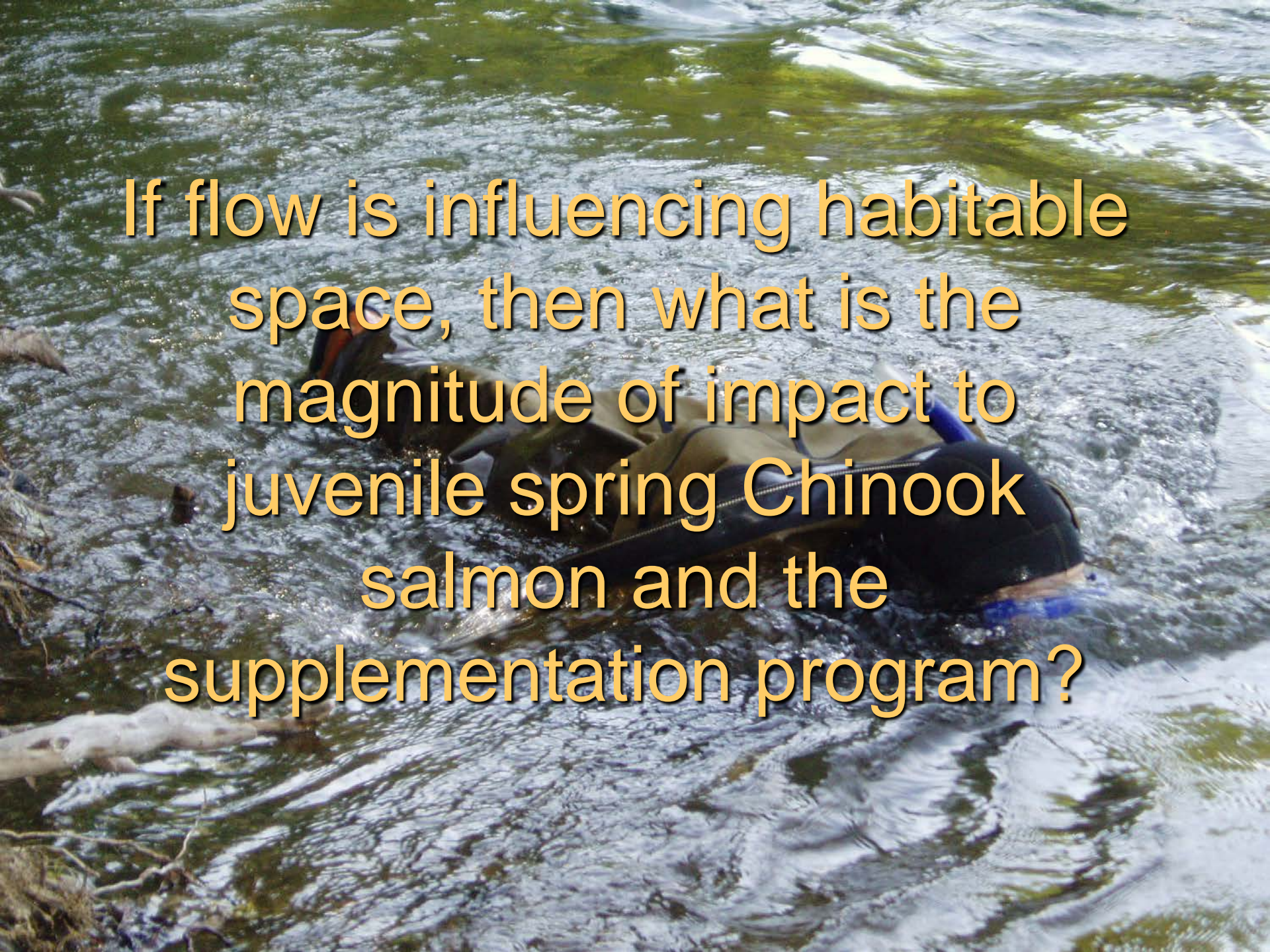


Increase in habitable area (05-06)



Distribution of SPC (Nelson)



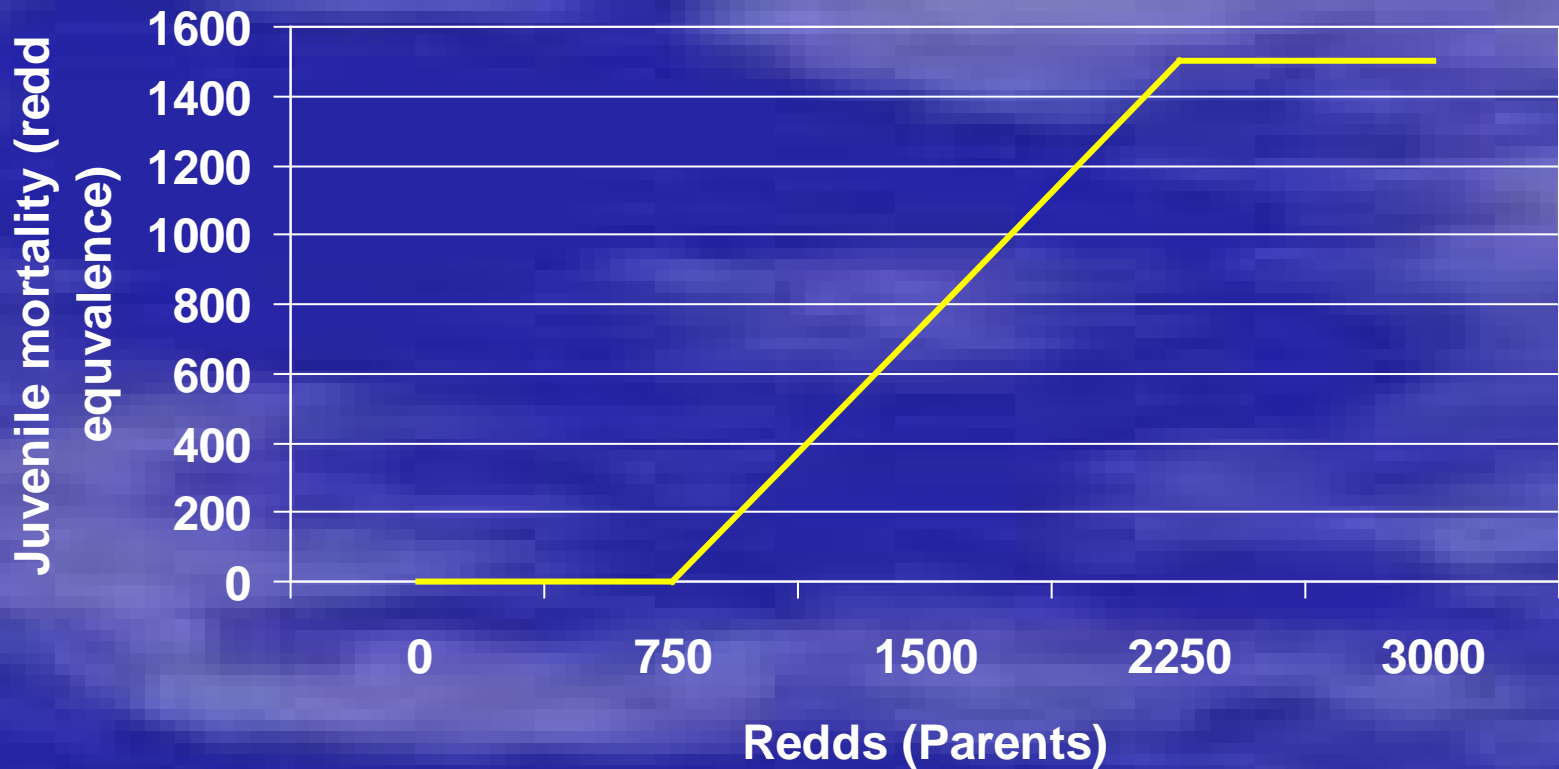
A photograph of a stream with a juvenile Chinook salmon in the foreground. The water is clear and flowing, with some rocks and debris visible. In the background, a person wearing a wetsuit and a blue cap is partially visible, possibly a diver or researcher. The text is overlaid on the image in a yellow, bold font.

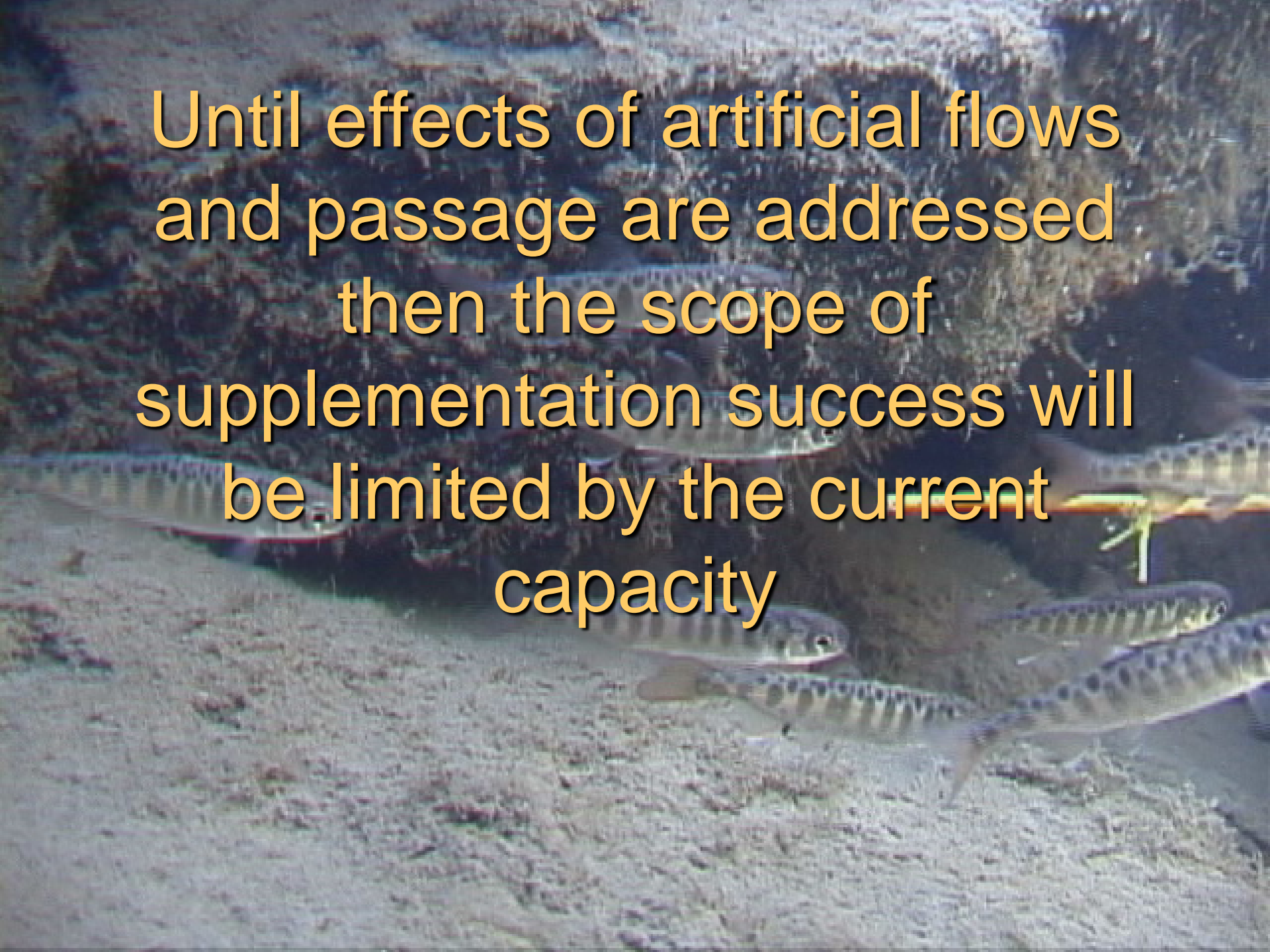
If flow is influencing habitable space, then what is the magnitude of impact to juvenile spring Chinook salmon and the supplementation program?

Assumptions

- Ksp (minimum number of spawners to produce asymptotic number of juvenile progeny) is limited to 750 redds because of artificially high discharge during the summer
- Artificially high discharge limits availability of food and space to juvenile Chinook (below natural levels)
- Normal capacity without artificial discharge is 2,250 redds

Hypothetical Flow Mortality



A group of salmon swimming in a stream over a rocky riverbed. The fish are silvery with dark spots and are moving towards the right. The water is clear, and the rocks are visible at the bottom.

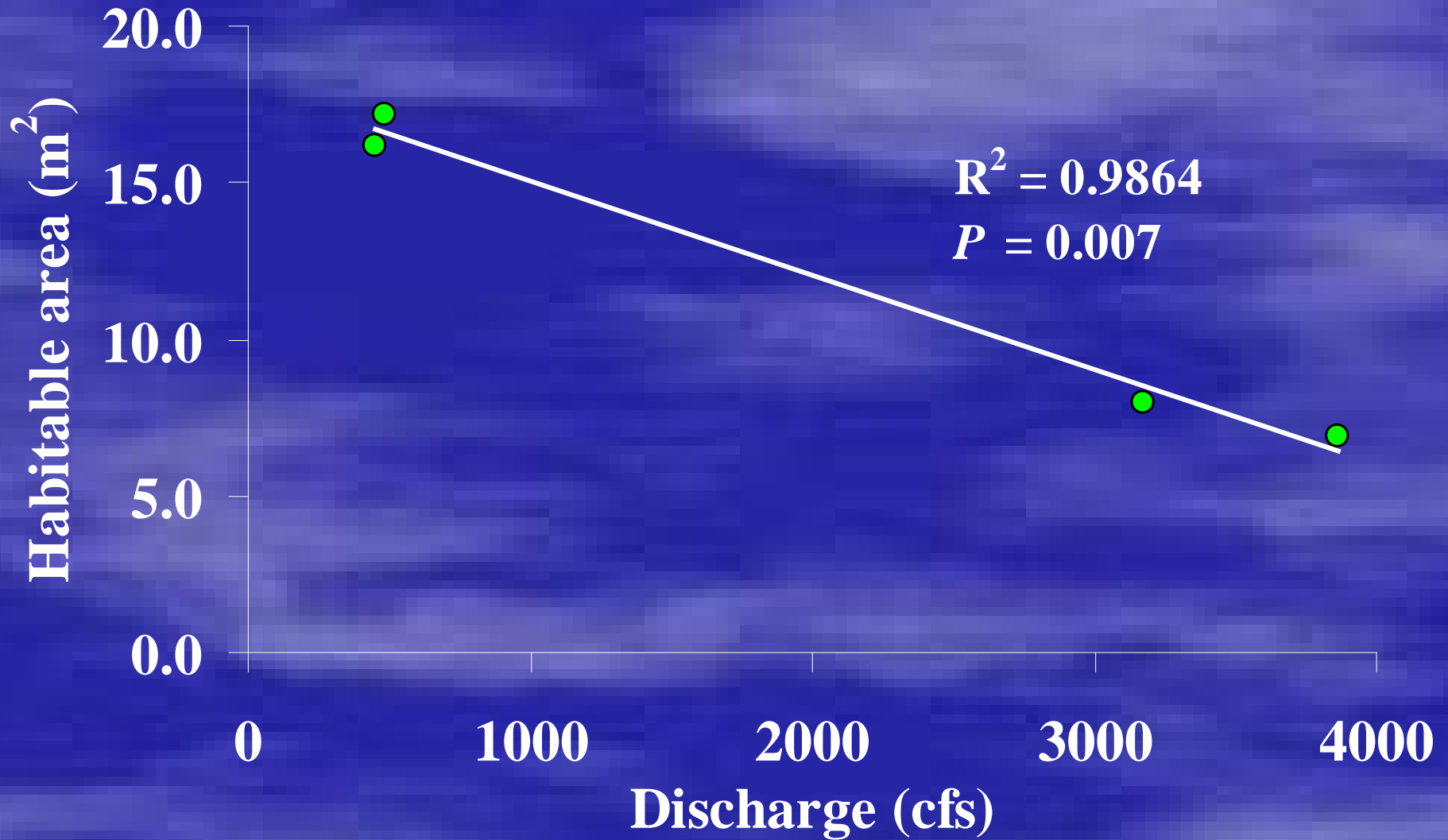
Until effects of artificial flows
and passage are addressed
then the scope of
supplementation success will
be limited by the current
capacity

A person wearing a green cap and an olive-green jacket is kneeling in a stream. They are holding a long, thin stick or branch and measuring it with a white ruler. The water is clear, and the stream bed is covered with rocks and fallen leaves. The person's face is partially visible, looking down at the ruler.

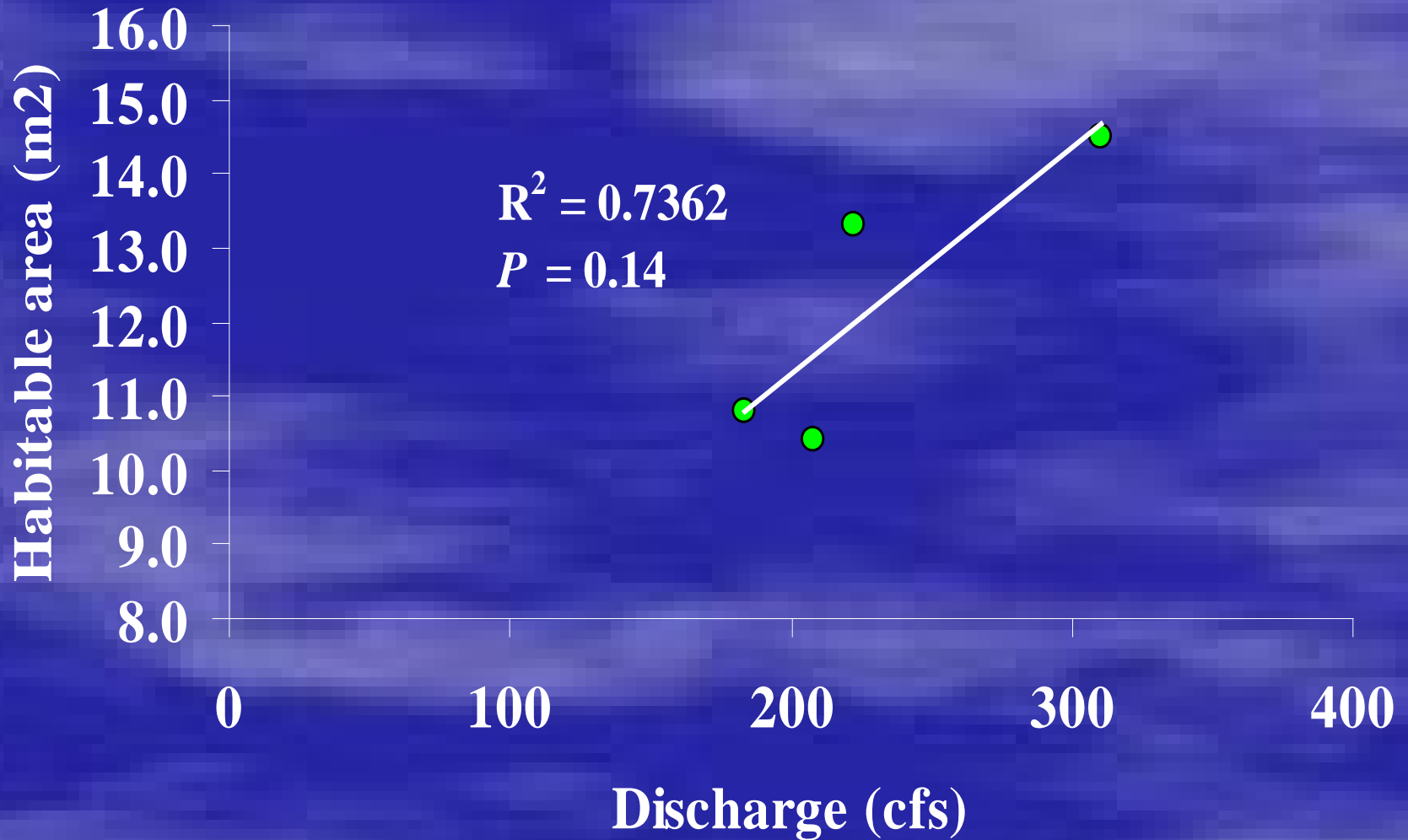
Acknowledgments

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- Cascade Aquatics – Paul James and field staff

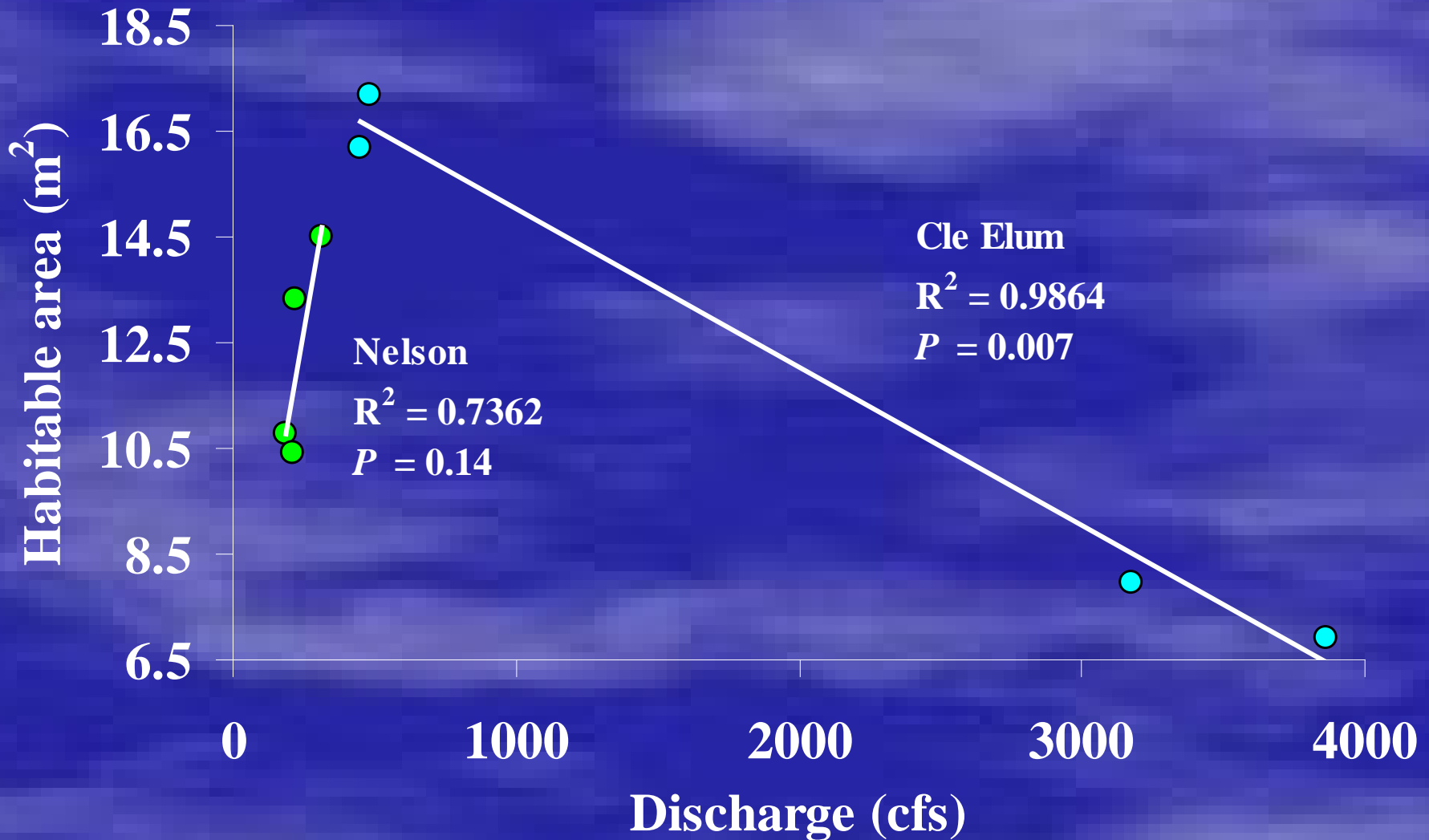
Cle Elum



Nelson

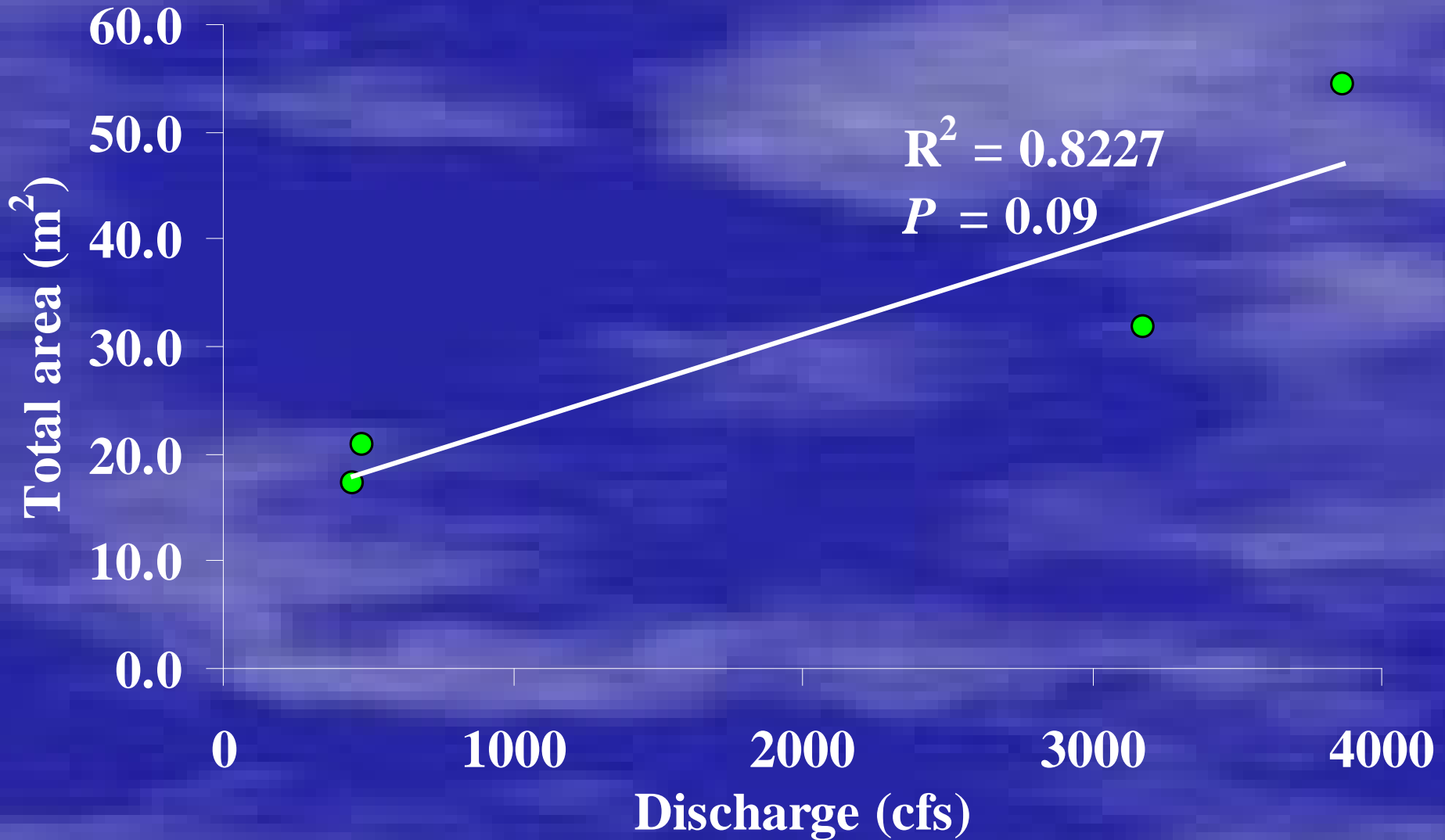


Discharge vs. Habitable Area

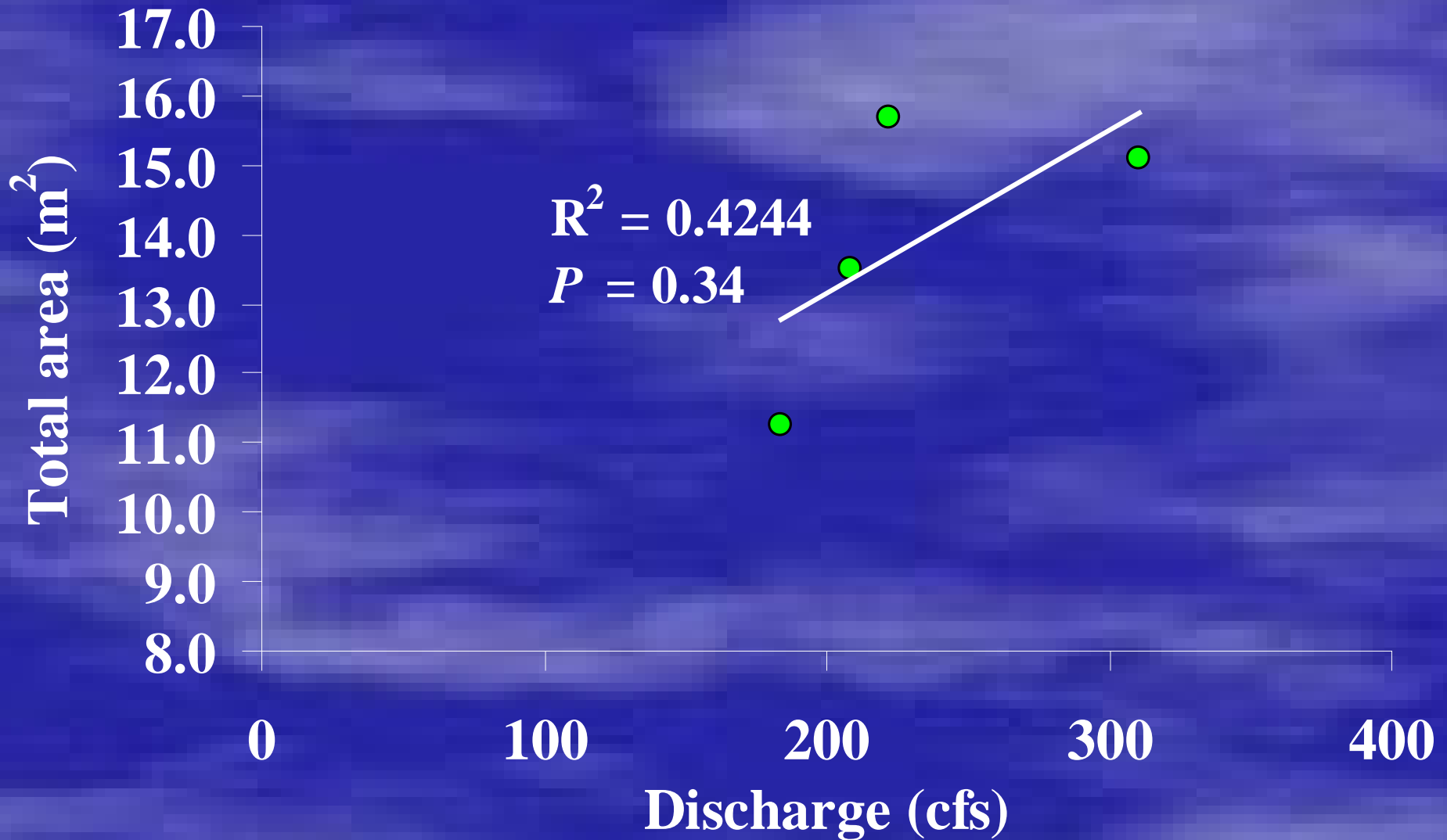


Cle Elum

cross-sectional area



Nelson



Genetic and Environ. Capacity

