Northwest Power and Conservation Council

August 31, 2004

MEMORANDUM

TO: Council Members

FROM: Bruce Suzumoto

SUBJECT: Avian predation in the Mid-Columbia region

Dr. Julia Parrish of the University of Washington will present her findings on the abundance, habitat needs and food habits of several species of birds (gulls, mergansers, cormorants and terns) found in the Mid-Columbia region. In particular she will focus on the consumption of salmonids by avian predators and discuss impacts and possible implications. Dr. Parish's study was sponsored and funded by Chelan County PUD.

Abstract for Dr. Parrish's presentation:

The Avian Predation Project on the mid-Columbia is a three-year effort to determine the risk posed to out-migrating salmon smolts by bird predators. Limitations on total allowable mortality to listed salmon species, as well as the potential for negative publicity associated with lethal control of avian predators, were the main factors driving the need for this study. Five species of piscivorous birds are found in Chelan County: California and ring-billed gulls, Caspian terns, double-crested cormorants, and common mergansers.

There are four components that make a predator species a threat to salmon: (1) preys on or prefers salmon, (2) always present in the system, (3) has a large population, and (4) has a high energy demand. Our approach was to use a combination of observation, satellite telemetry, diet analyses, and bio-energetic modeling to: (1) determine which birds consume salmon, (2) determine which birds are abundant in the system, (3) help managers and policy makers determine which birds are an actual threat, and (4) design adaptive management tools to manage predation.

Our data show that although cormorants and terns are salmon specialists, their numbers are low, and they are not present in the system during the peak of salmon smolt out-migration.

851 S.W. Sixth Avenue, Suite 1100
Portland, Oregon 97204-1348

Telephone: 503-222-5161
Toll free: 800-452-5161

Fax: 503-820-2370
Web site: www.nwcouncil.org

By contrast, gulls target salmon, are present in high numbers and maintain a fair presence in the system throughout the summer. Common mergansers do not target salmon, but are the only bird species always present in the system, and these birds have a high energy demand. Bio-energetic modeling reveals that mergansers currently pose the highest threat to salmon in Chelan County. The degree to which this result is transferable is a function of relative species presence. The data collection and modeling approach is directly transferable.

Solving the "avian predator problem" is possible using a "tool-box" approach. We recommend a combination of habitat modification (including attention to riprap habitat preferred by foraging mergansers, and park habitat preferred by gulls as resting sites), "smart" lethal control (using the bio-energetics model in conjunction with in-season predator population assessment to determine total estimated smolt mortality), and integrated predator management (utilizing the bio-energetics approach in conjunction with an ecosystem modeling approach to manage all salmonid predators, including northern pikeminnow, simultaneously).

Avian Predation on the Mid-Columbia

Dr. Julia K Parrish
School of Aquatic and Fishery Sciences
University of Washington

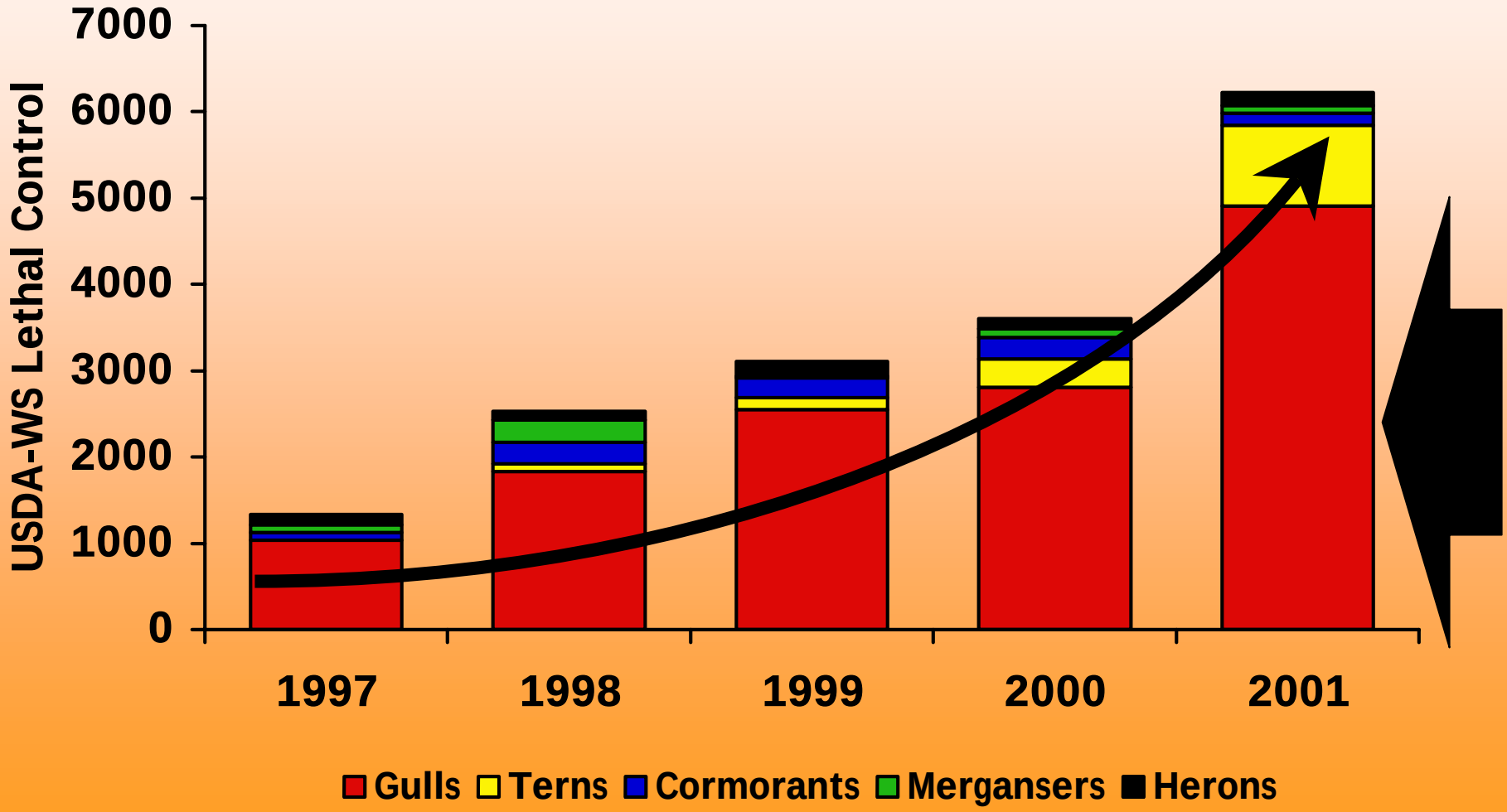
The Players

Caspian Terns

California and Ring-billed Gulls

Double-crested Cormorants

Avian Predators taken from Mid-Columbia Dams & Hatcheries



Bird Predators in the Media

Caspian terns eating millions of salmon heading to ocean

THE ASSOCIATED PRESS

CORVALLIS, Ore. – Young salmon that survive their journey down the Columbia River to the Pacific are being eaten by the millions just a few miles short of their goal, Oregon State University researchers say.

The smolts are the favorite food of a growing population of Caspian terns on Rice Island, a two-mile stretch of dredged sand eight miles upstream from Astoria.

The colony of birds, established 11 years ago, has grown to about 8,000 pairs, making it the largest colony of Caspian terns in North America and perhaps the world, wildlife biologist Daniel Roby says.

University researchers Carl Schreck and Larry Davis discovered the birds' salmon-feeding habit in 1996 as part of a three-year research project into factors causing stress for salmon migrating to the Pacific.

In 1996 and 1997, the researchers released radio-tagged salmon below Bonneville Dam and found that terns on Rice Island ate as many as 15 to 20 percent of the smolts – perhaps up to 20 million a season – that reached the Columbia River estuary. Roby studied the tern colony's diet last summer and found that it was about 85 percent salmon smolts.

MARK HARRISON / THE SEATTLE TIMES

A Caspian tern *flies over a nesting ground in Everett in 1994.*

The terns are protected by federal law, but researchers say they could be encouraged to move elsewhere by building another sand island from dredge material. Planting vegetation on the island would discourage the terns, which prefer bare sand.

Research is planned to determine if other birds, such as cormorants in the estuary or gulls nesting upriver, also pose a threat to the salmon.

Salmon predators

Researchers say a large colony of terns on a Columbia River sand island eat millions of juvenile salmon as they try to reach the sea.

THE SEATTLE TIMES

There are some signs that nature is solving the tern problem. Very few nesting pairs of terns produced offspring during the last breeding season, possibly because of the high river levels, ocean conditions and raids on nests by predators.

Army Corps of Engineers Plan to Kill Birds

by Herb Curl, Science Committee member

In March of this year, the US Army Corps of Engineers issued an Environmental Assessment (EA) stating, "The (Corps) is experiencing losses of Federally listed juvenile salmonid fish to piscivorous (fish-eating) birds at the eight hydroelectric dams (projects) operated by the Corps on the Lower Columbia and Lower Snake Rivers in the States of Oregon and Washington." The EA stated that fish-eating birds were a major cause of salmonid mortality, along with the direct effects of the dams, including passage through turbines. They selected Alternative 1 (of 5)—No Action, The Current Program. "No Action" means they are not going to choose one of the other alternative programs. The current program consists of non-lethal and lethal (shooting) deterrents.

Stating that non-lethal methods are inefficient and ineffective, the Corps has earlier resorted to shooting birds. According to the EA, Wildlife Services of the US Department of Agriculture killed over 11,500 birds from 1997 to 2002, including 10,404 gulls (Ringed-billed, Herring, California, and unidentified gulls), 835 Double-crested Cormorants, 273 grebes (nearly all Western Grebes), seven Great Blue Herons, and one Common Merganser. Data for other past years are similar or worse.

Although the Corps' EA justifies the program on the basis of losses of "Federally listed juvenile salmonid fish," the Corps has been unable to determine whether the fish are already dead from passage through the dams, or even if the fish eaten are actually Federally listed salmonids.

For more information, or to get involved, please contact Alex Morgan, 206-985-6581, or alexm@seattleaudubon.org.

Purpose of the Avian Predation Study

- Determine which birds consume salmon
- Determine which birds are abundant
- Help managers and policy makers determine which birds are an actual threat
- Design adaptive management tools to manage predation

Why Do This Study?

- Un-necessary lethal control is wasteful, may be damaging to predator populations, and can arouse the ire of environmental groups
- Unknown predator populations can be damaging to salmon
- Certainty as to which predators are important will maximize future choices - no surprises

What We Do

- Identify, count, and collect activity information on birds at dams, and along the reaches
- Satellite-tag birds to determine residency
- Dissect lethal control carcasses - assess diet
- Calculate total salmon consumption

Fish-Eating Birds in the Mid-Columbia

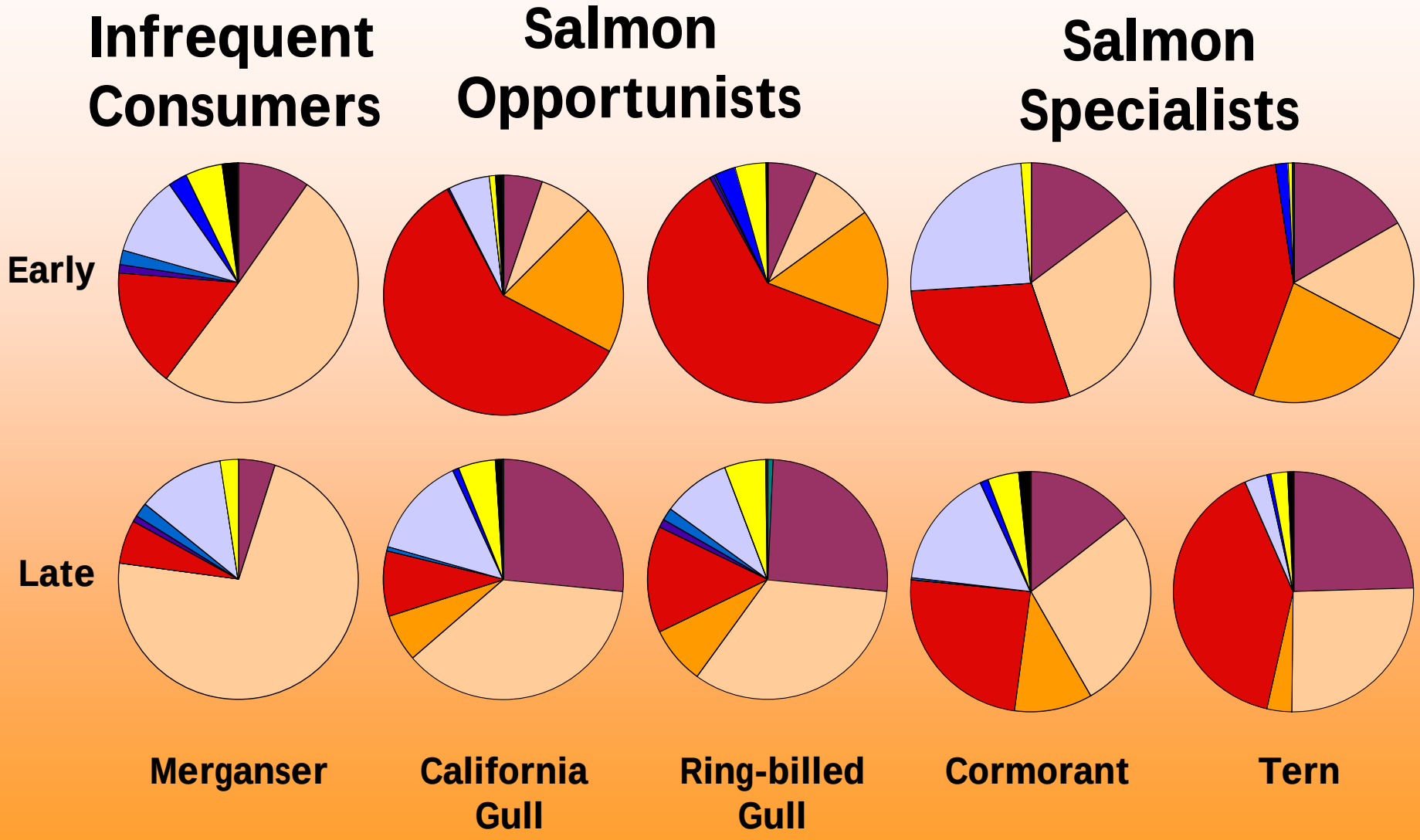
What Makes a Predator Species a Threat?

- Preys on salmon; prefers salmon
- Always present in the system
- Large population
- High energy demand (eats a lot)

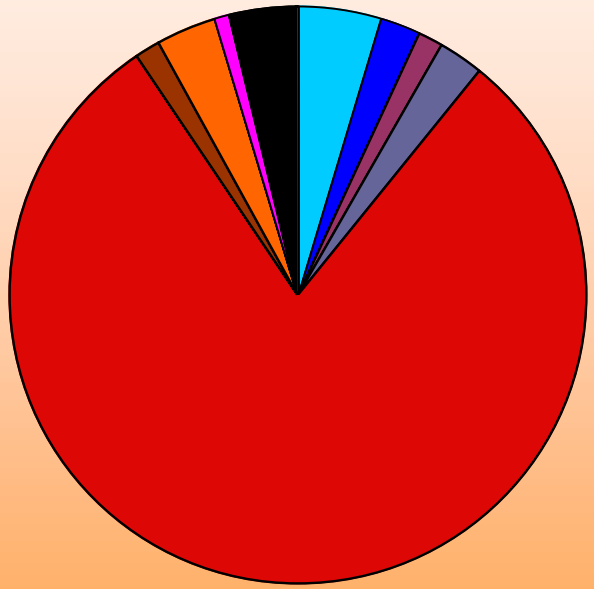
What Makes a Predator Species a Threat?

- **Preys on salmon; prefers salmon**
- Always present in the system
- Large population
- High energy demand (eats a lot)

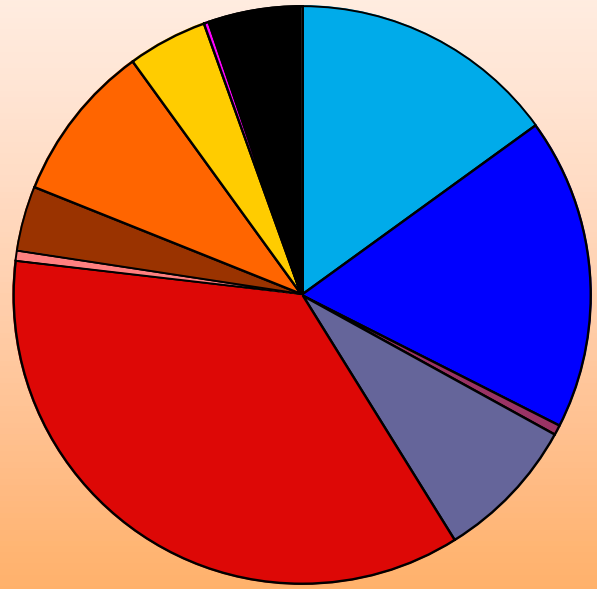
Not All Birds Eat Salmon



Caspian Tern Diet in the Lower Columbia



Rice Island *(1997-2000)*



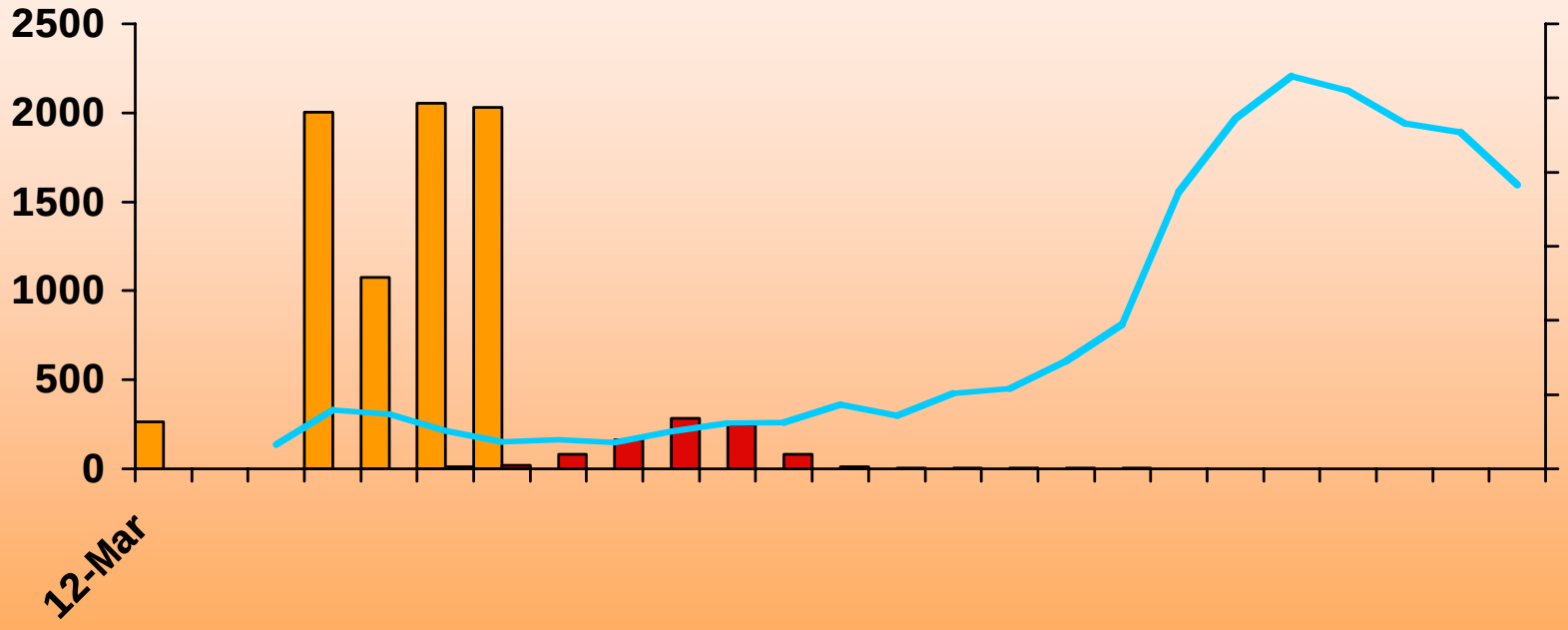
East Sand Island *(1999-2003)*

data from several sources, all derived from D. Roby et al.

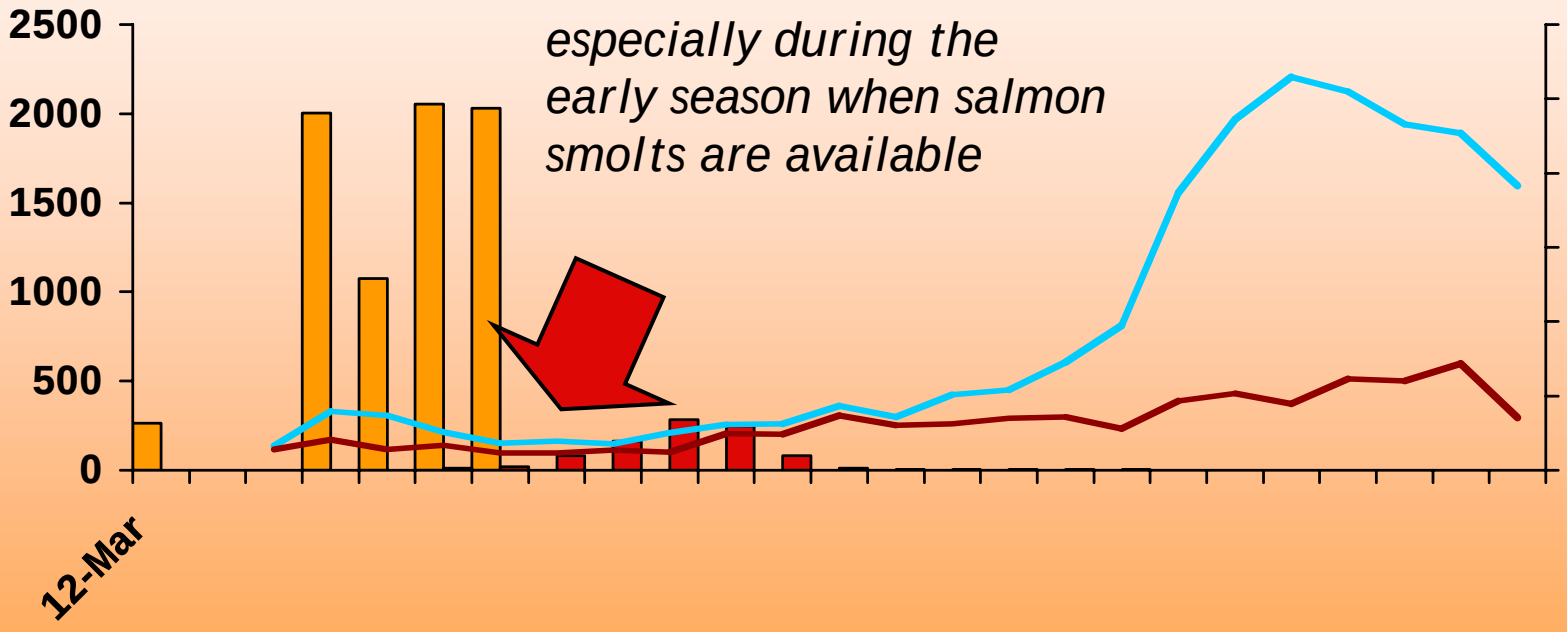
What Makes a Predator Species a Threat?

- Preys on salmon; prefers salmon
- **Always present in the system**
- Large population
- High energy demand (eats a lot)

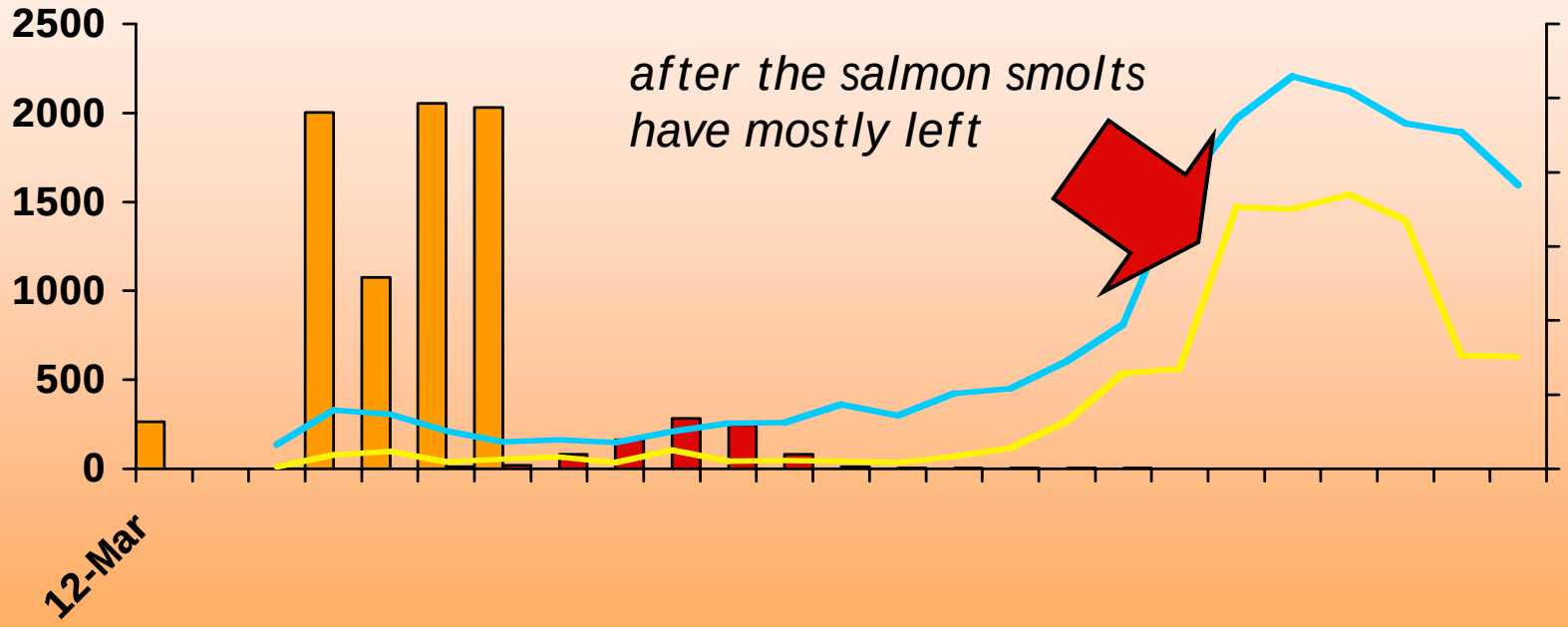
Timing is Critical

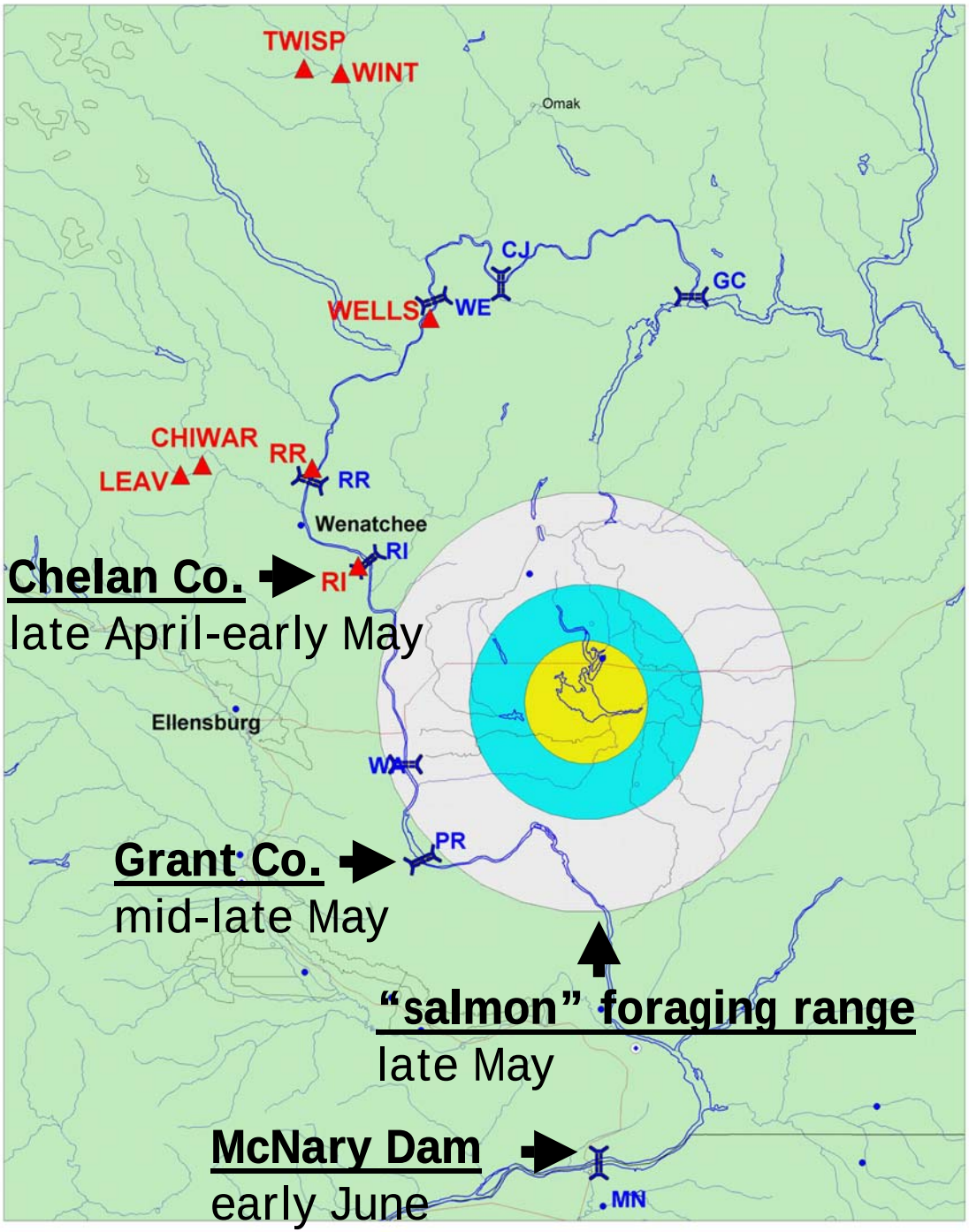


Mergansers are ALWAYS Present



Gulls Come Later

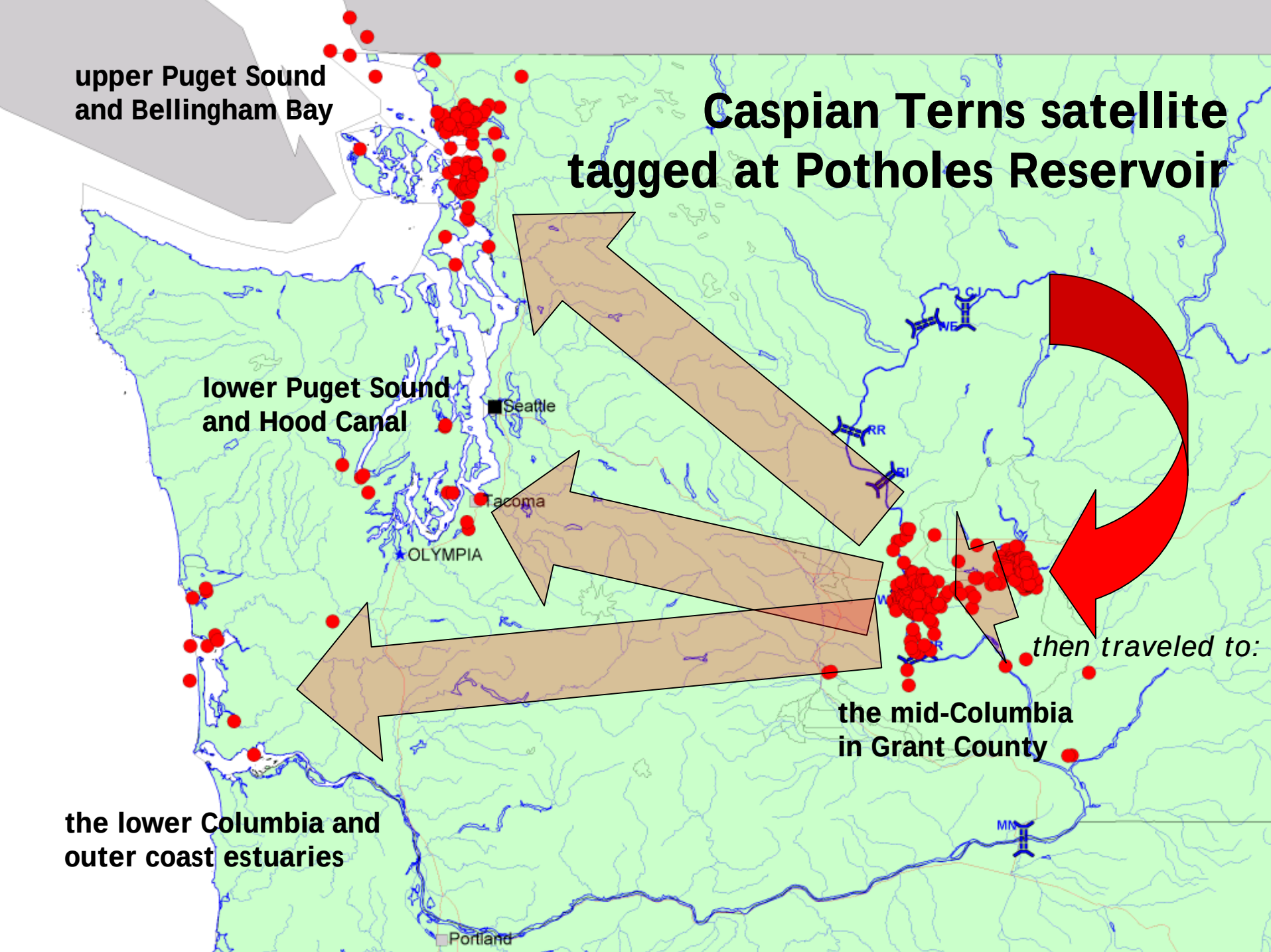




Origin of salmonids:
red = hatchery origin of PIT tags found at Potholes

Foraging range:
yellow = average gull
blue = average tern
white = tern w/ salmon

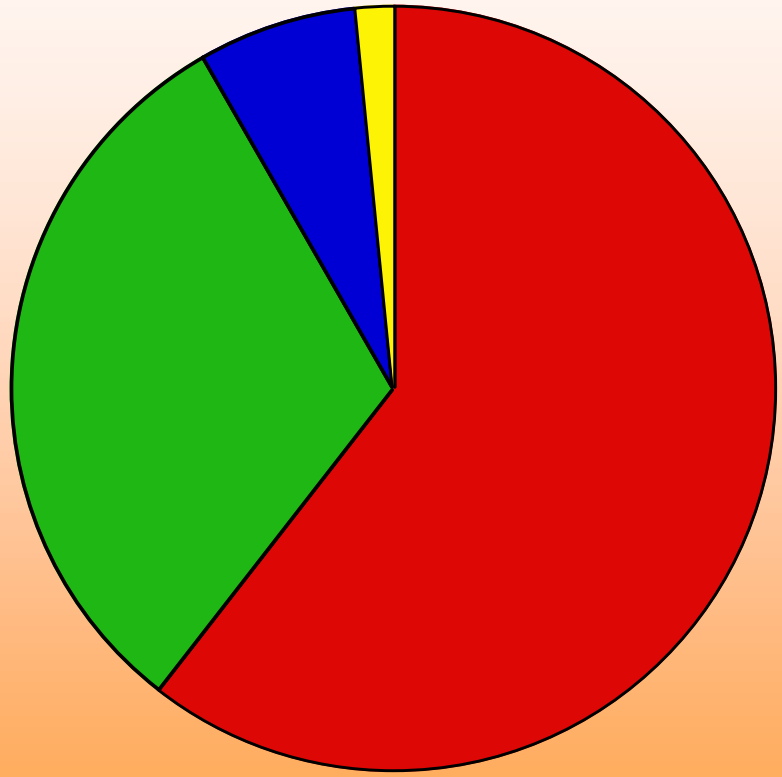
Timing:
black = month by which 75% of all relevant releases have passed through


upper Puget Sound
and Bellingham Bay
Caspian Terns satellite
tagged at Potholes Reservoir
lower Puget Sound
and Hood Canal
Seattle
Tacoma
OLYMPIA
then traveled to:
the mid-Columbia
in Grant County
the lower Columbia and
outer coast estuaries
Portland

What Makes a Predator Species a Threat?

- Preys on salmon; prefers salmon
- Always present in the system
- **Large population**
- High energy demand (eats a lot)

Overall, Gulls are Most Abundant



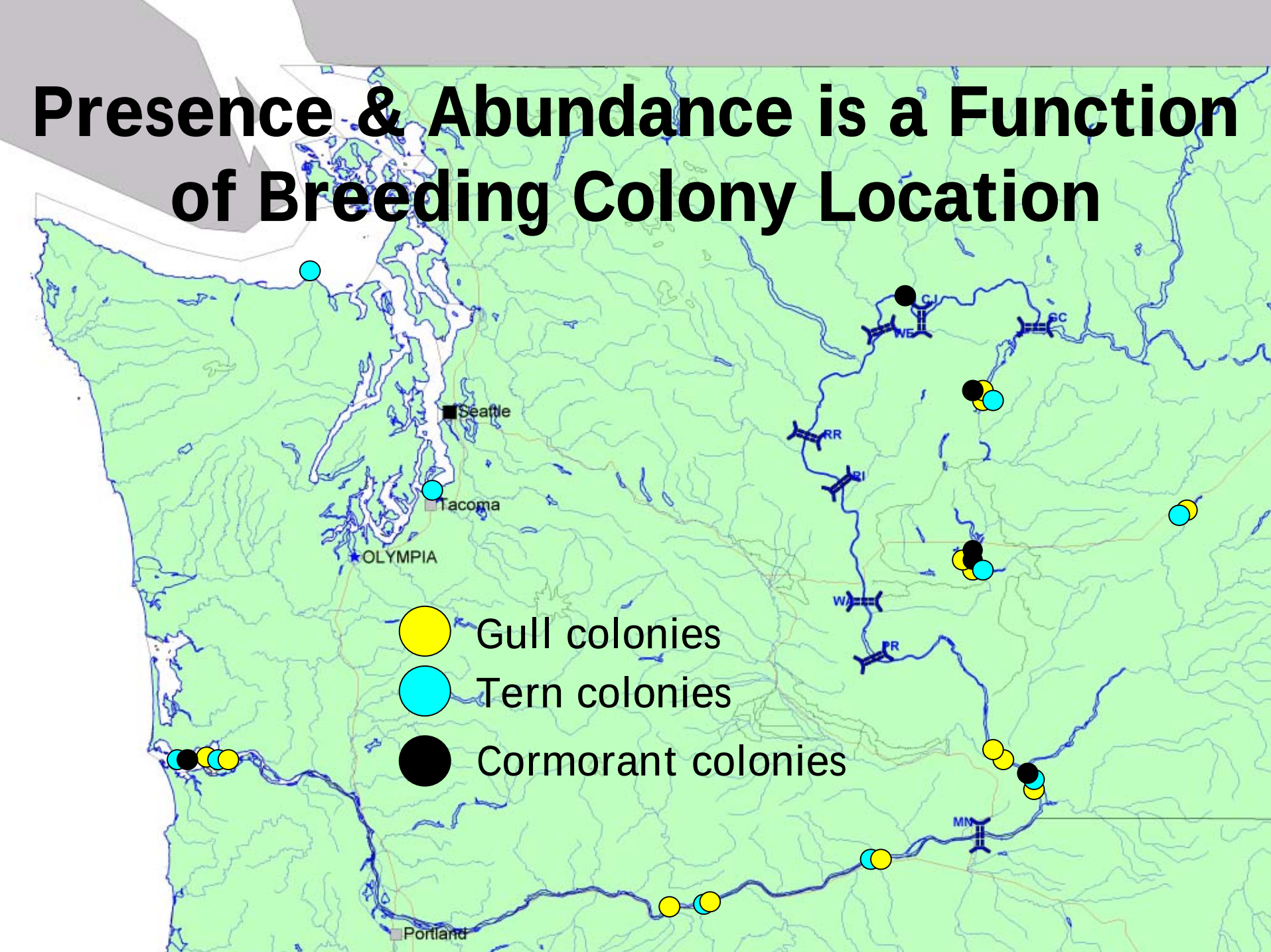
Gulls

Common mergansers

Double-crested cormorants

Caspian terns

Presence & Abundance is a Function of Breeding Colony Location



What Makes a Predator Species a Threat?

- Preys on salmon; prefers salmon
- Always present in the system
- Large population
- **High energy demand (eats a lot)**

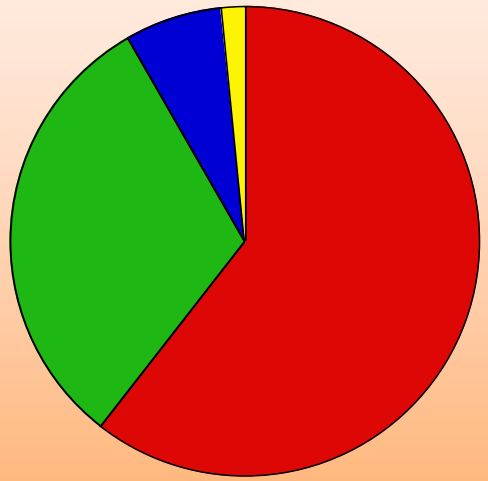
Big Birds Eat More

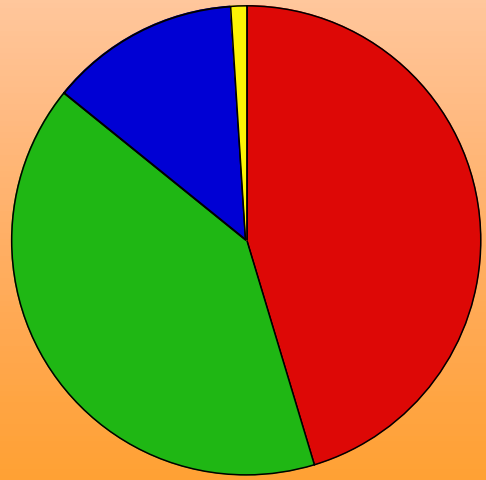
1 Cormorant eats as much as =

1.5 Mergansers

2.4 Terns

2.6 Gulls

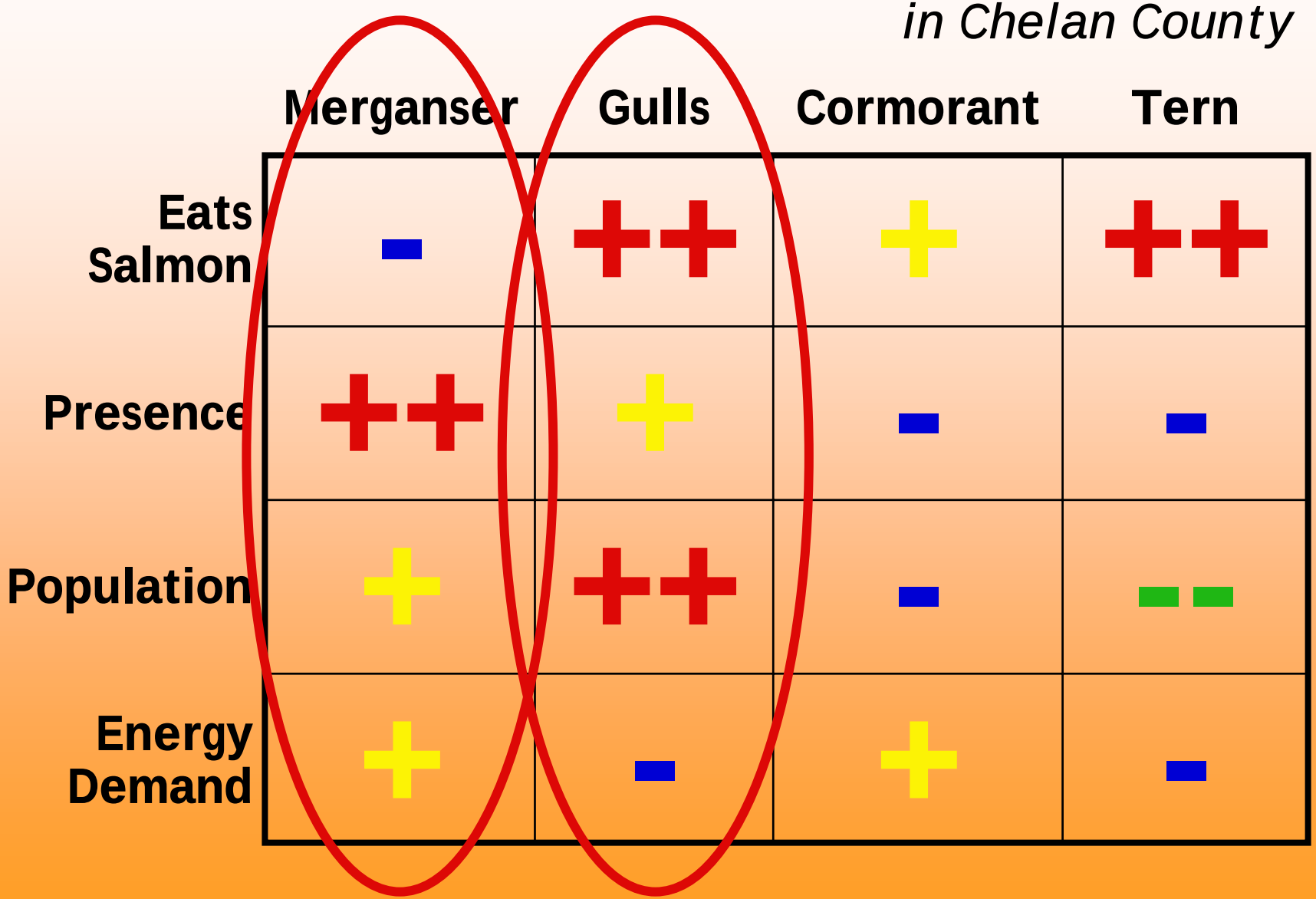




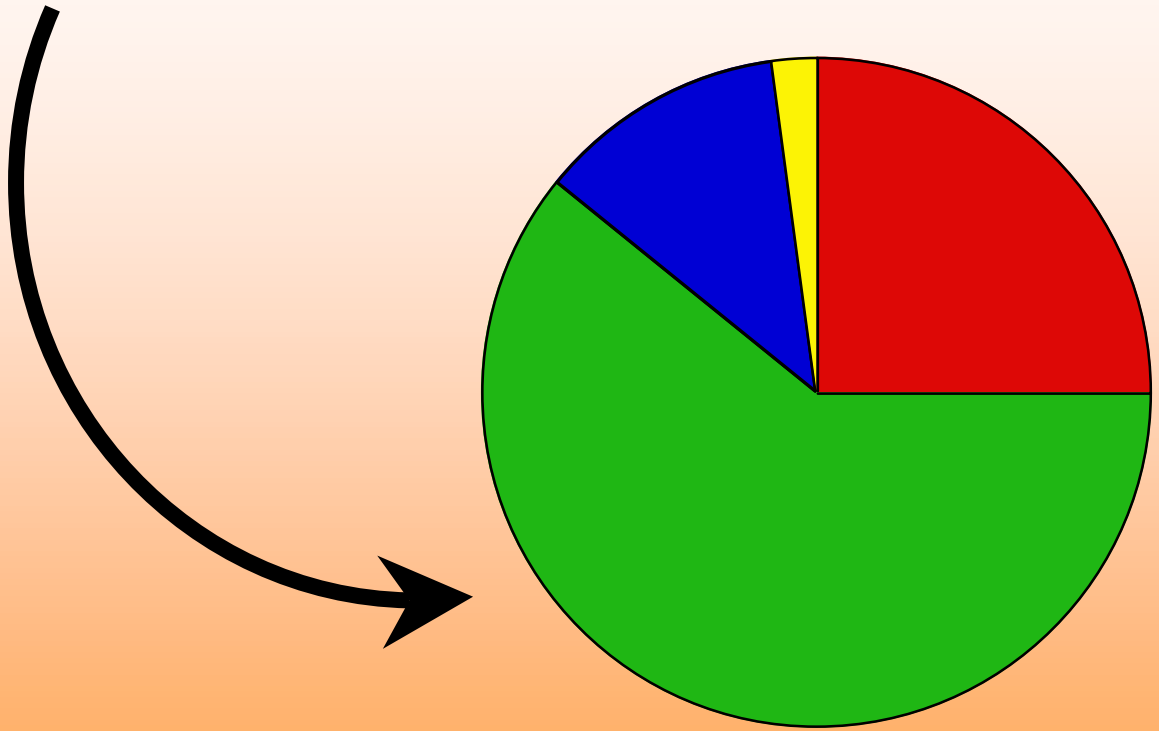
changing abundance so that mergansers are even more influential, and gulls and terns lose influence

Mergansers and Gulls are a Threat

in Chelan County



Mergansers Eat the Most Salmon



Gulls

Double-crested cormorants

Common mergansers

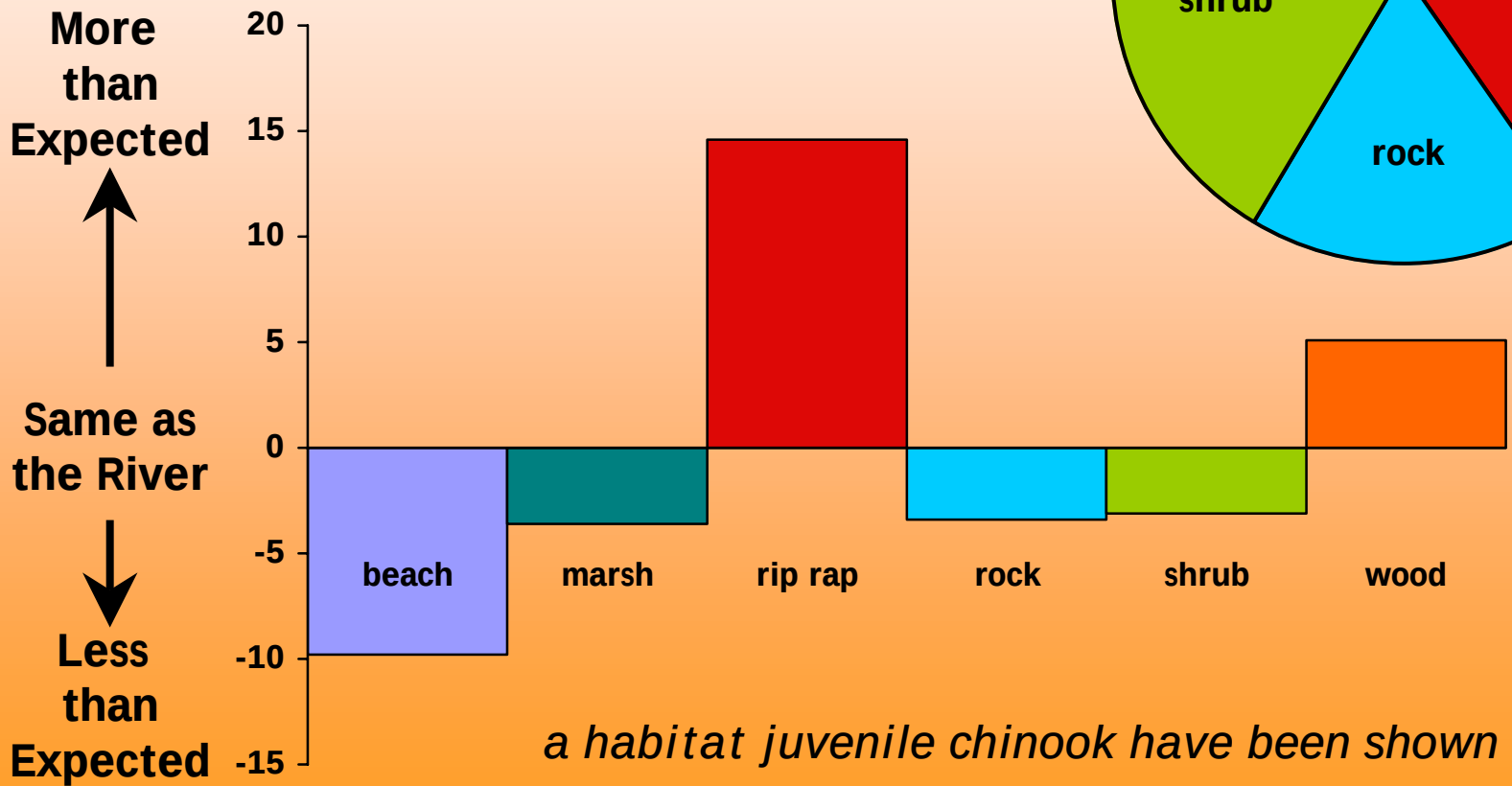
Caspian terns

Solving the Problem

- Habitat is a key
  - 80% of fish consumed off dam, along the reaches
- Smart lethal control
  - minimize waste, maximize effect
- Integrated predator management
  - some birds can help

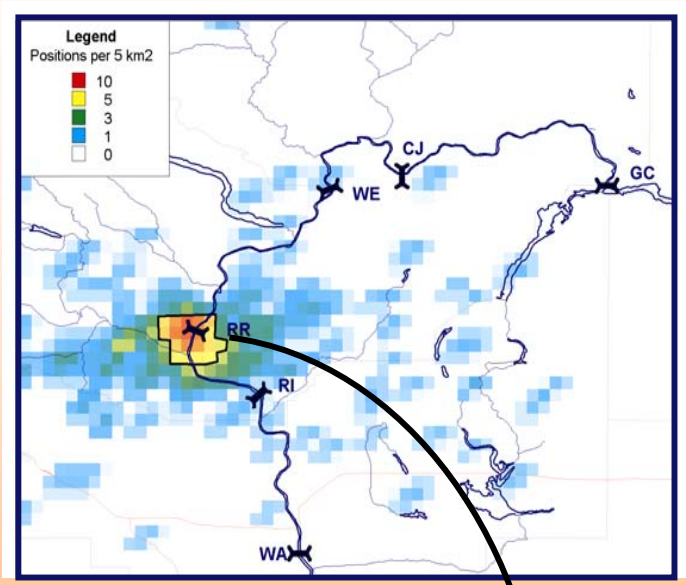
Hot Habitat

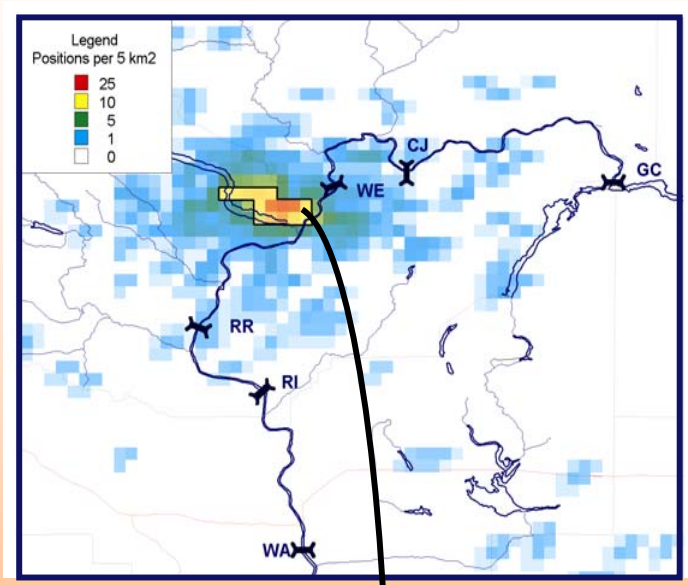
River mapping and activity data show that mergansers prefer to forage in rip rap



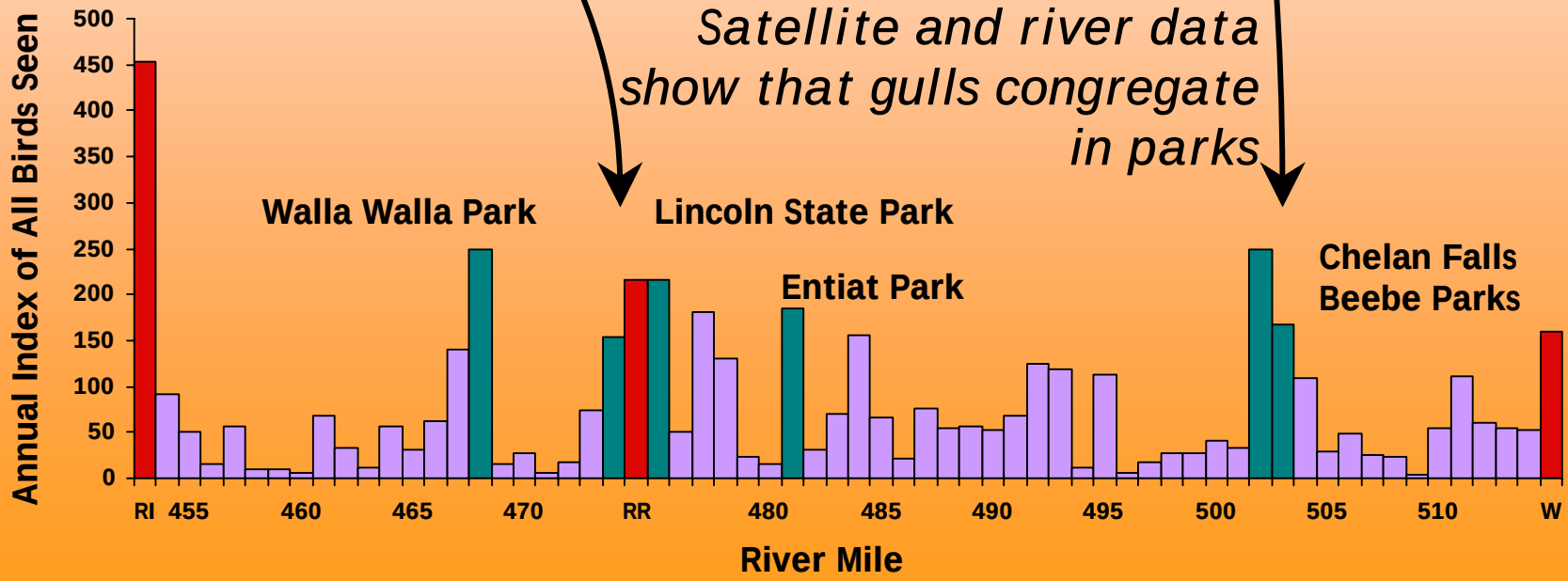
a habitat juvenile chinook have been shown to prefer

Hotspots



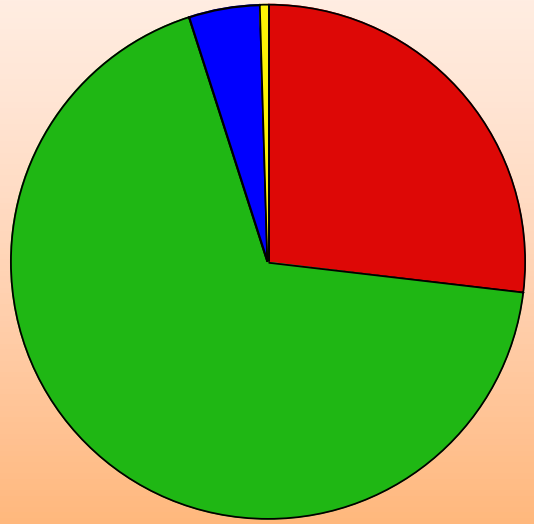


Satellite and river data show that gulls congregate in parks



Adaptive Management Choices

Early

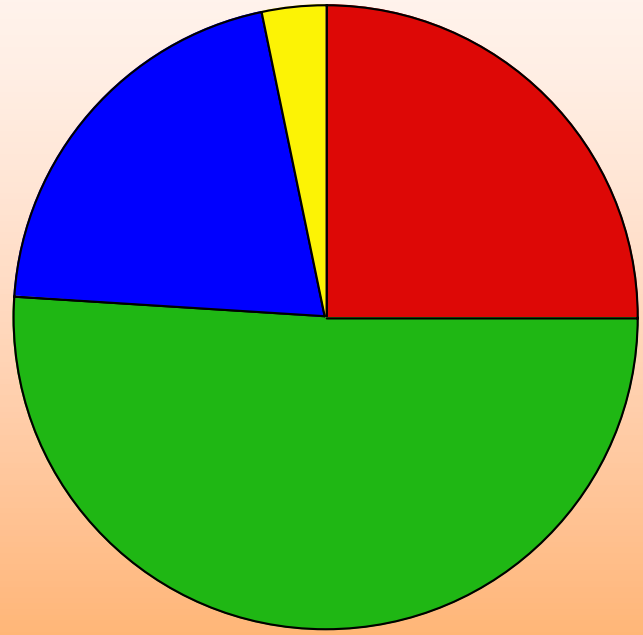


40 % of salmon consumed

90% of steelhead

90% of coho

Late



60 % of salmon consumed

67% of chinook

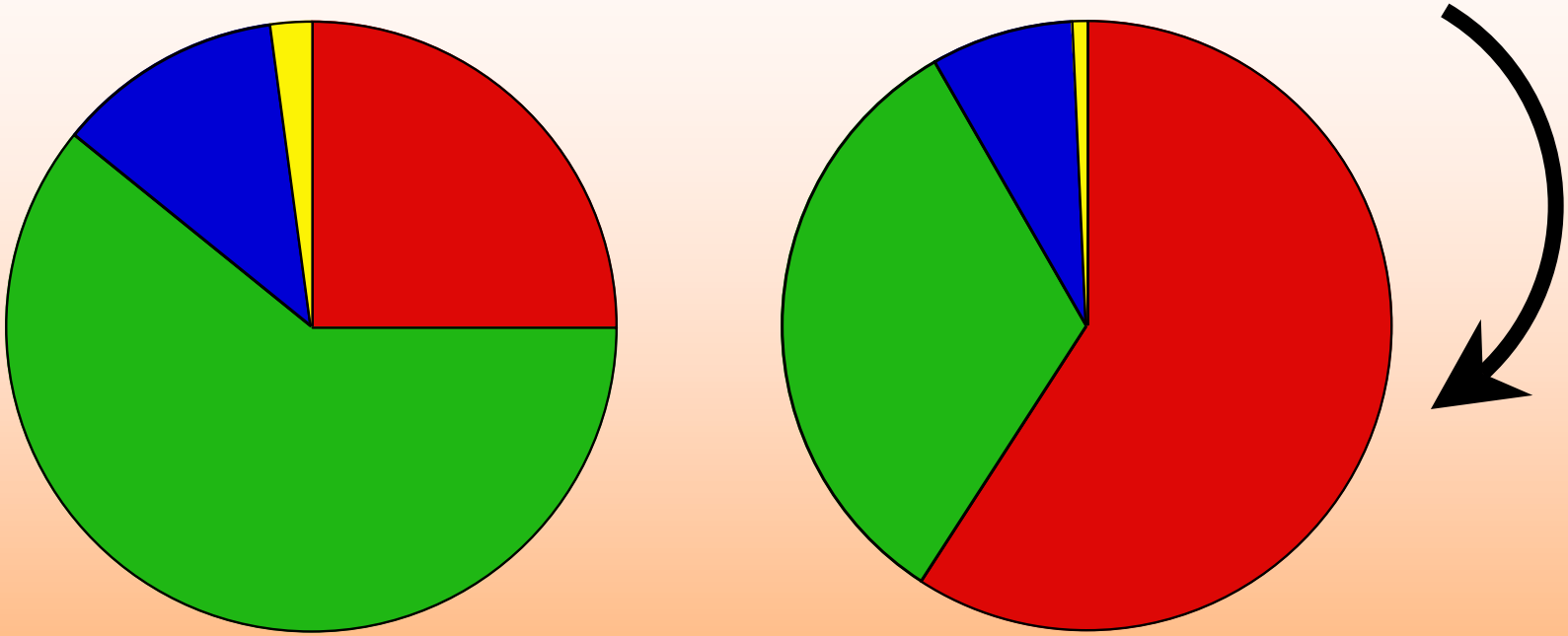
Gulls

Double-crested cormorants

Common mergansers

Caspian terns

Gulls Eat the Most Pikeminnow



Salmon **Pikeminnow**

and pikeminnow are major consumers of juvenile salmon

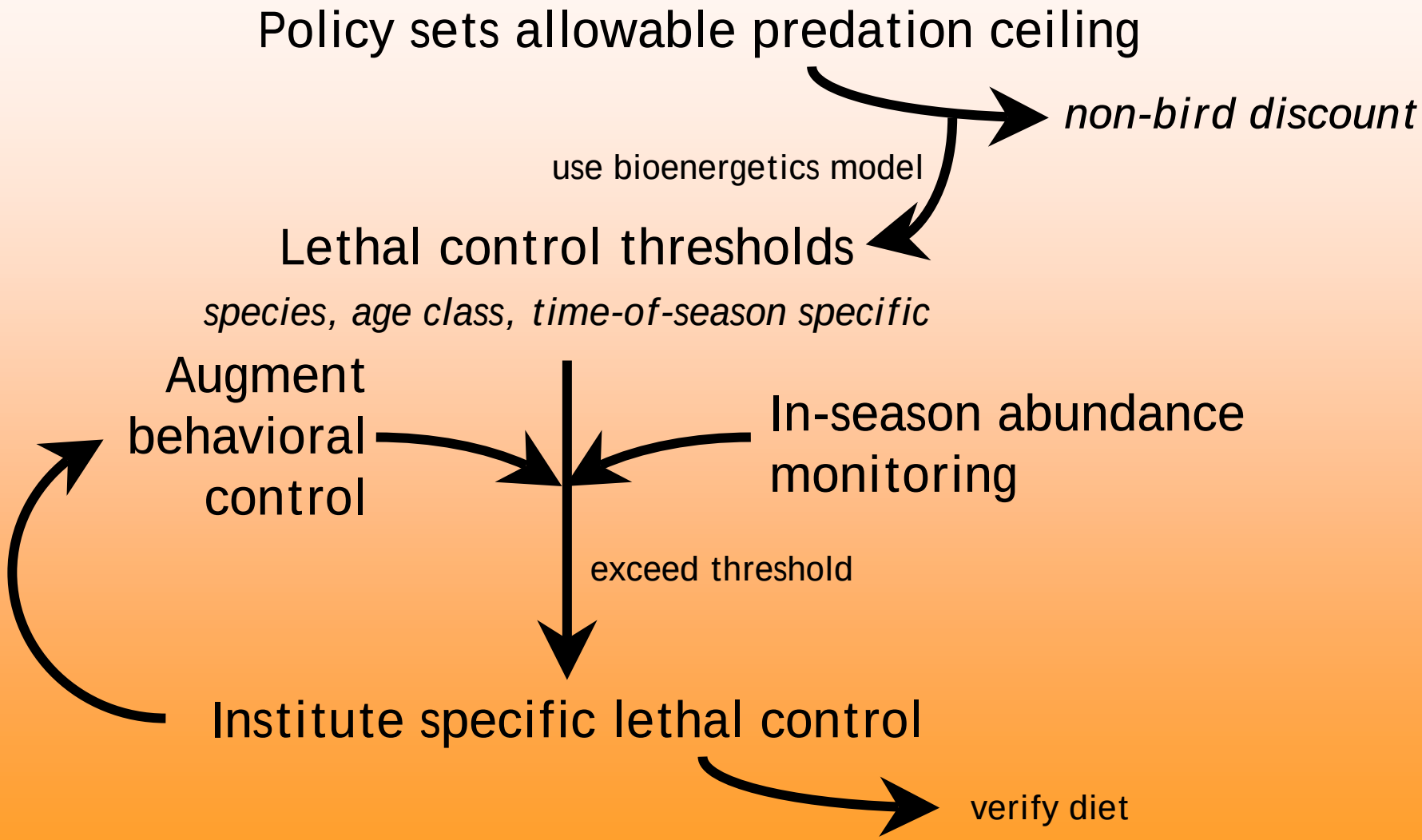
Gulls

Common mergansers

Double-crested cormorants

Caspian terns

Smart Control



Recommendations & Next Steps

Chelan County

- Adopt habitat-based measures to deter bird presence or foraging (dams, parks, rip rap)
- If lethal control is necessary, adopt adaptive management practices
  - On river abundance assessment
  - Limited diet analysis
- Examine all major predators simultaneously
  - Mergansers, gulls
  - Pikeminnow

Larger Scale Recommendations

Region-wide Smart Control Program

- Increase non-lethal control toolbox
- Regional approach to predator diet
  - birds and NPM
  - location-specific differences
  - standardized methods
- Regional assessment of bird distribution and abundance *on the river*
- Refine windows of salmon predation opportunity
- Adaptive management using bioenergetics-population dynamic predator threshold model