November 7, 2017

MEMORANDUM

TO: **Council Members**

FROM: **Jeff Allen**

SUBJECT: **Upper Salmon Integrated Rehabilitation Assessment (IRA) process**

BACKGROUND:

Presenters: Mike Edmondson, Idaho Office of Species Conservation; Jude Trapani, Bureau of Reclamation; Chris Beasley, GCINC; and Mark Davidson, The Nature Conservancy

Summary: Salmon recovery in the Columbia River Basin is often framed in the context of the "Four-H's" – Hatcheries, Harvest, Hydrosystem, and Habitat. The metric most often used to evaluate the relative value of the "Four-H's" is Smolt to Adult Return Rate (SAR). This metric encompasses adult escapement and juvenile production, resulting from those adults. Of the Four H's only tributary habitat sustainably increases the number of juveniles entering the hydrosystem in a manner that supports regional goals (e.g. ESA de-listing goals).

Freshwater habitat capacity has been degraded. This has decreased the number of juveniles produced by escaping adults (e.g., ISAB density-dependence report).

Unfortunately, there are few examples of freshwater habitat improvements that are accompanied by quantitative evidence that allow their value to be placed in the context of the SAR equation.

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The Upper Salmon Basin Integrated Rehabilitation Assessment (IRA) presents a new metric, habitat “capacity,” that speaks directly to a change in the SAR metric – namely the conversion of adults to smolts entering the hydrosytem. This approach uses regional goals that provide a target for freshwater capacity requirements meaningfully supporting adaptive management across the Four H’s. Furthermore, it better defines actions to achieve increases in habitat capacity and an efficient means to quantitatively document progress towards meeting those goals.

Project funders and policymakers have been frustrated over a lack of connection between habitat improvement actions and increases in adult salmon returns. The IRA uses previous Monitoring and Evaluation efforts, namely ISEMP and CHaMP, to effectively and efficiently estimate existing habitat capacity, identifies habitat improvement actions to address capacity deficiencies, and evaluate progress to achieve regional goals.

This approach can now be consistently applied across the Interior Columbia River Basin with no (or very limited) data collection, providing a pathway to define goals and chart progress across MPG’s and ESUs.

Upper Salmon Integrated Rehabilitation Assessment

IDAHO GOVERNOR'S OFFICE OF SPECIES CONSERVATION

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

QCI
Quantitative Consultants Inc.

Rio
Applied Science & Engineering

TROUT UNLIMITED

The Nature Conservancy

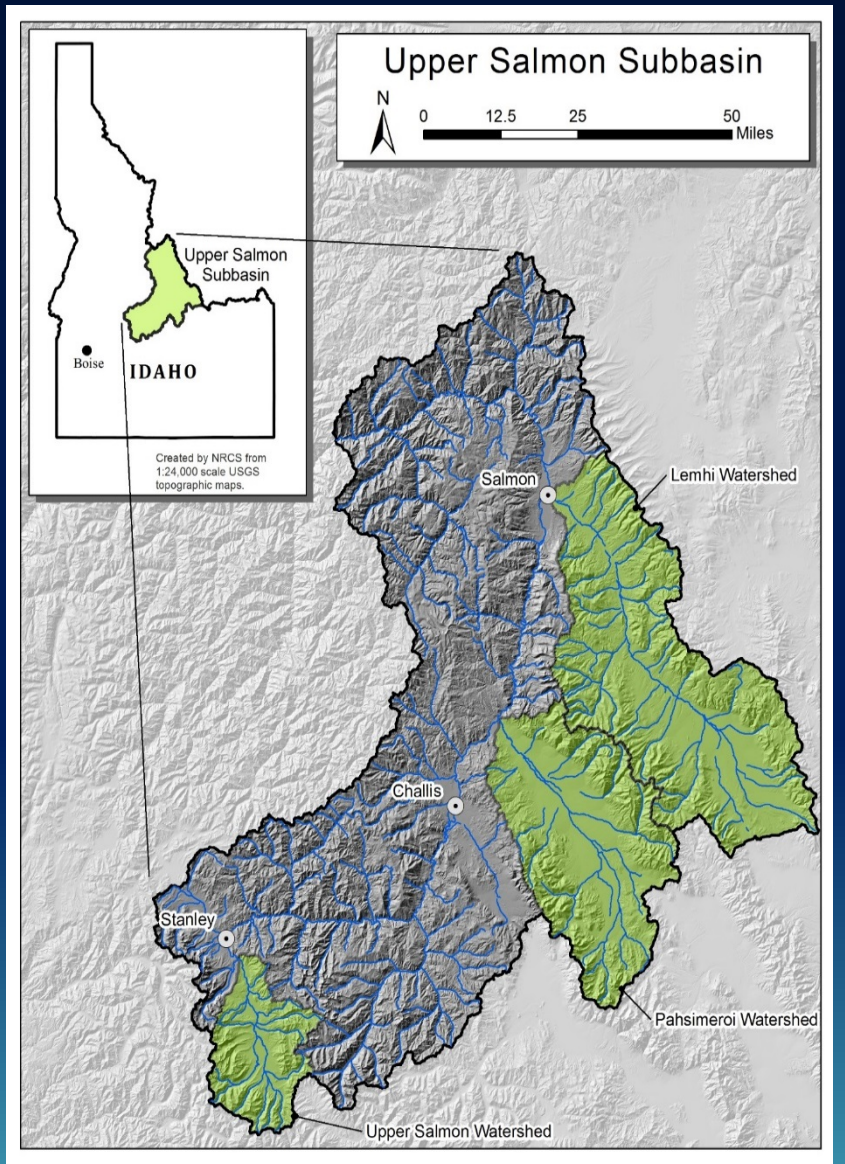
Upper Salmon Integrated Rehabilitation Assessment

Background Information – a rich history of work

- Model Watershed Plan, 1995
- NPCC, Salmon Subbasin Plan 2002
- Screening and Habitat Improvement Prioritization for the USB (SHIPUS 2012)
- project ranking forms and criteria
- Donato (USGS, 1998)
- Work Windows and Fish Periodicity (USBWP 2005)
- PHABSIM studies (USGS, 2004-'07)
- Pahsimeroi River hydrology study (Whittier 2006)
- Lemhi MIKE-Basin model (2016)
- Lemhi Bridge to Bridge Reach Assessment (BOR 2011)
- 2002 completed projects report (Loukes 2002)
- TA/RA in other basins (UC, GR, YF)
- Individual Tributary Fisheries Investigations (Warren and others 1997-present)
- ISEMP, IMW, CHaMP investigations (2003-present)

Habitat Rehabilitation Challenges

- Despite this work, something was missing:
  - Single habitat limiting factors had no direct relationship to fish
  - Spatial scale not consistent with regional goals.
- Team chose to evolve from using traditional physical assessment – IRA goal to incorporate fish information and let that drive the process
- Despite previous efforts, the following questions remain:
  - What types of rehabilitation?
  - Where?
  - How much is necessary?



Habitat Rehabilitation

Tributary habitat rehabilitation is the only means to sustainably improve freshwater productivity

To date, it has been difficult to identify and prioritize tributary habitat improvements

Locally driven process

Upper Salmon Integrated Rehabilitation Assessment

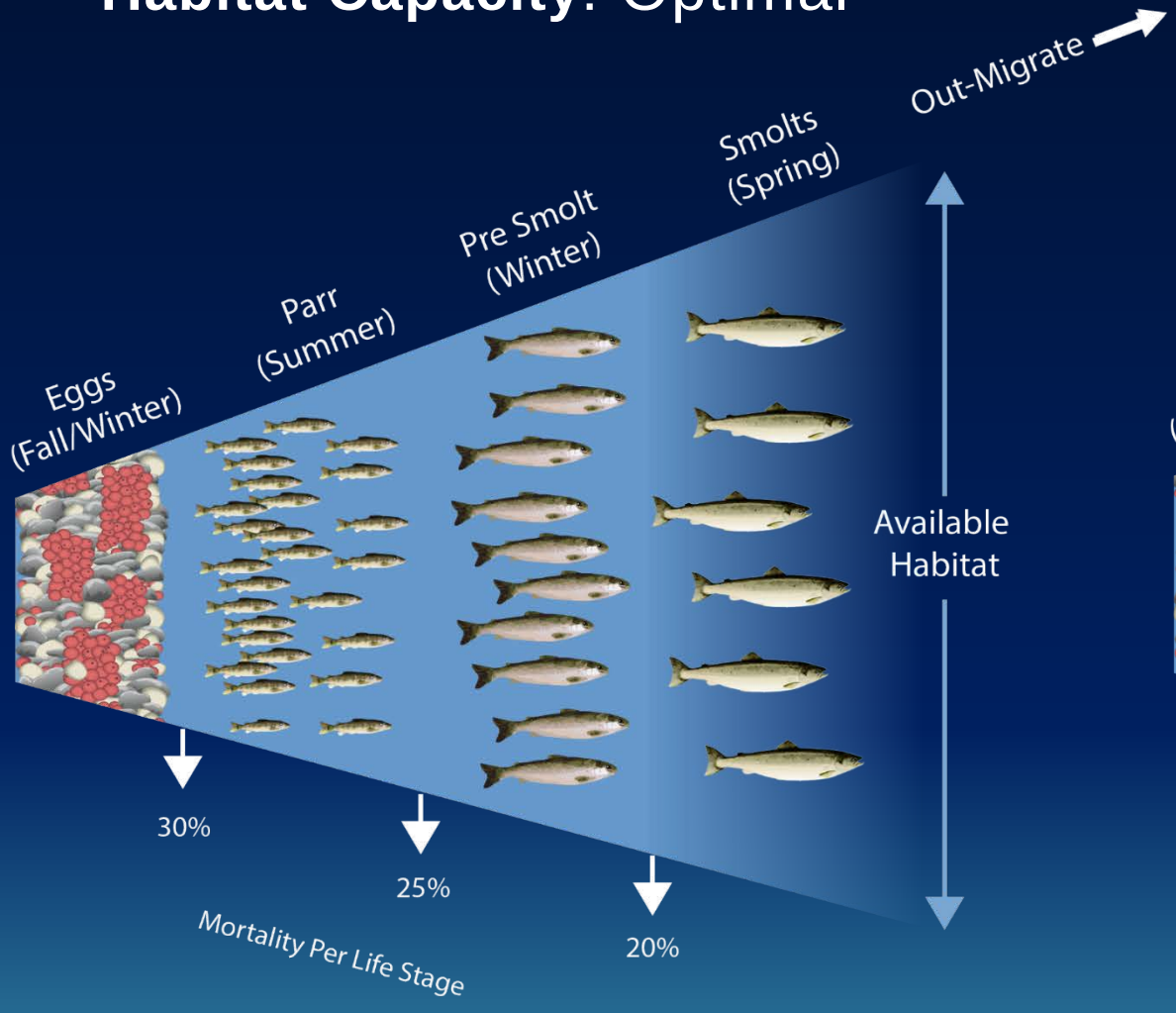
IRA Approach:

- Target most limiting life stage, then serial limiting life stage(s).

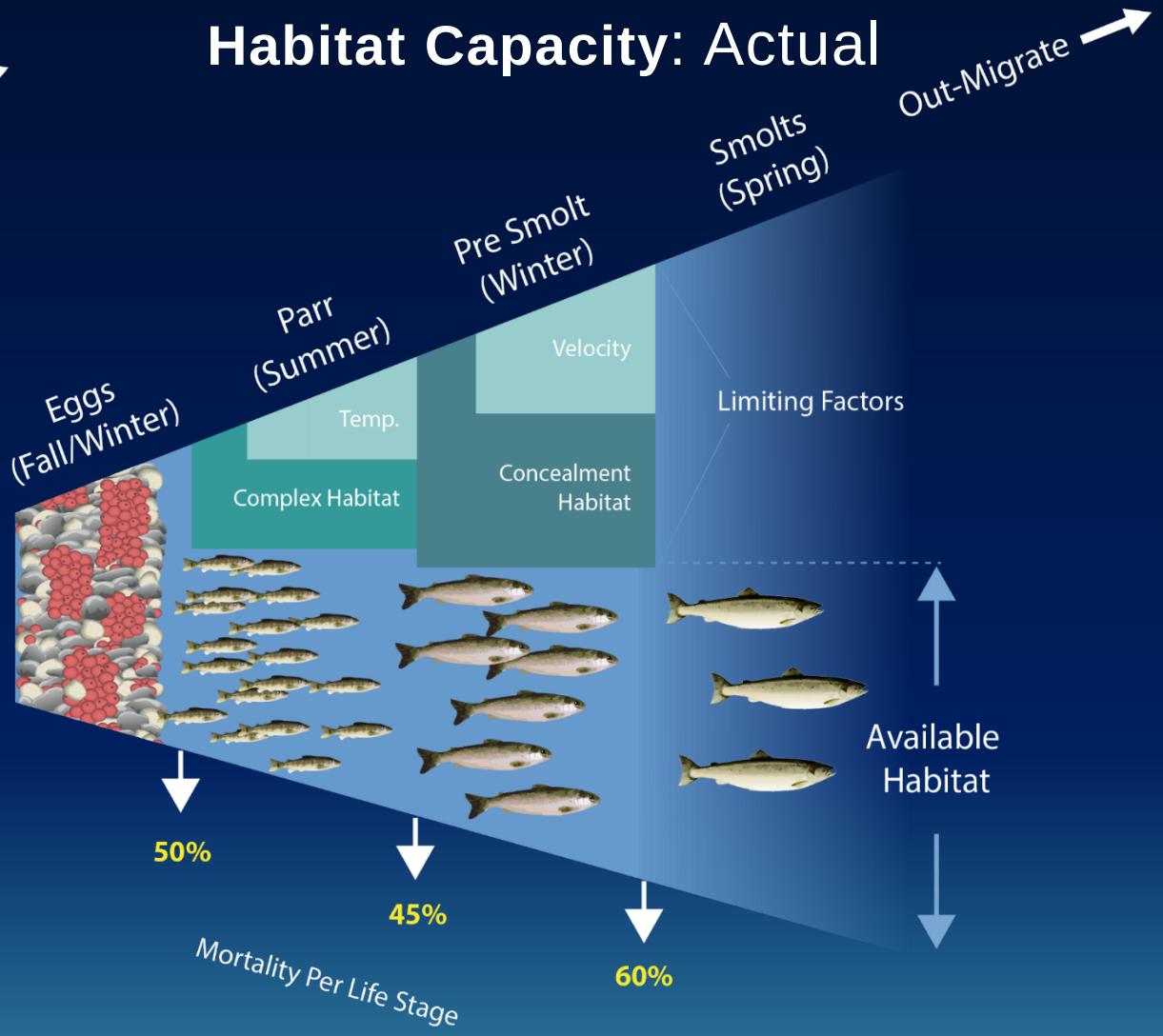
- Evaluate via estimated change in capacity for implemented actions.

Using Capacity as a Metric

Habitat Capacity: Optimal



Habitat Capacity: Actual



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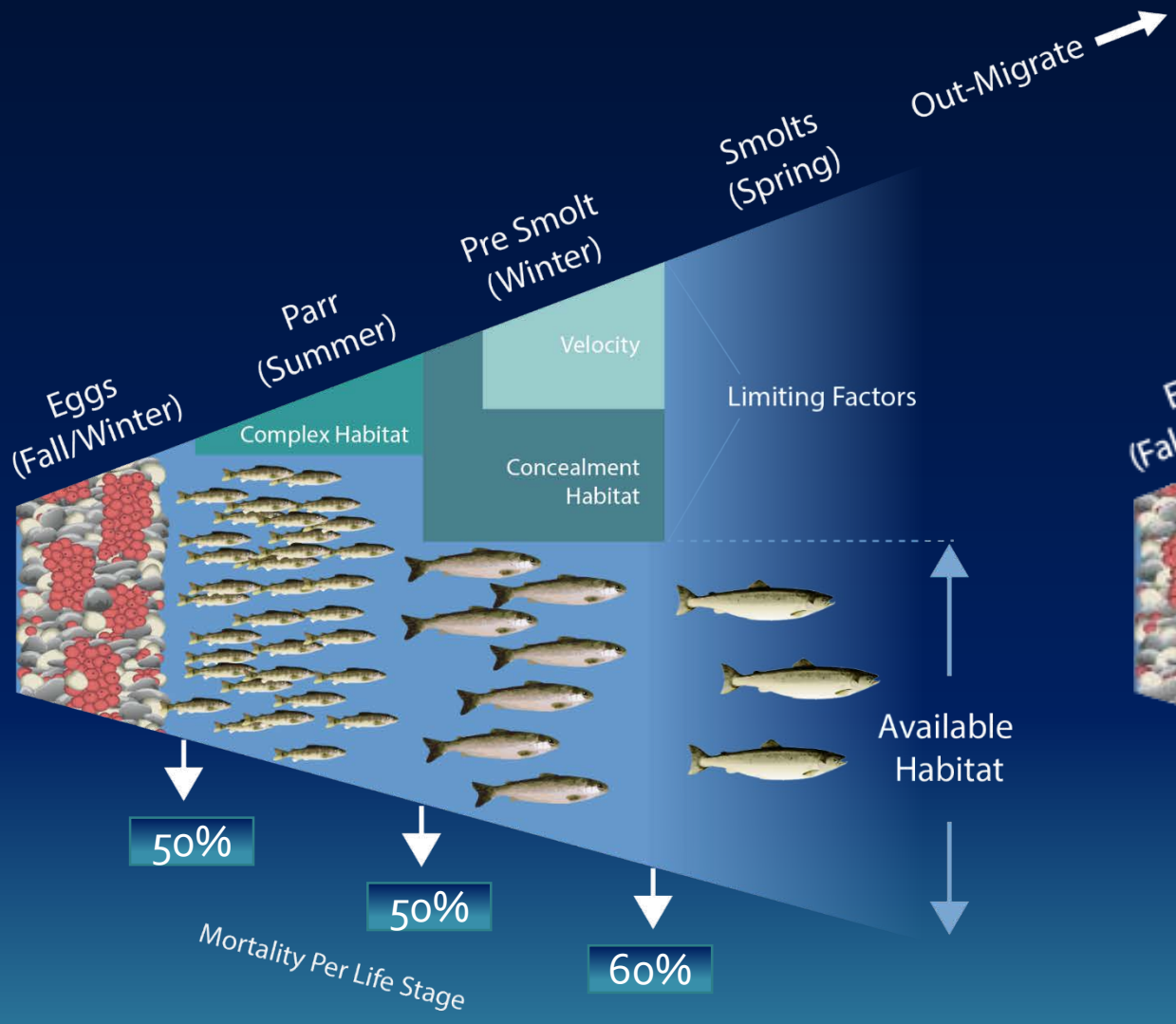
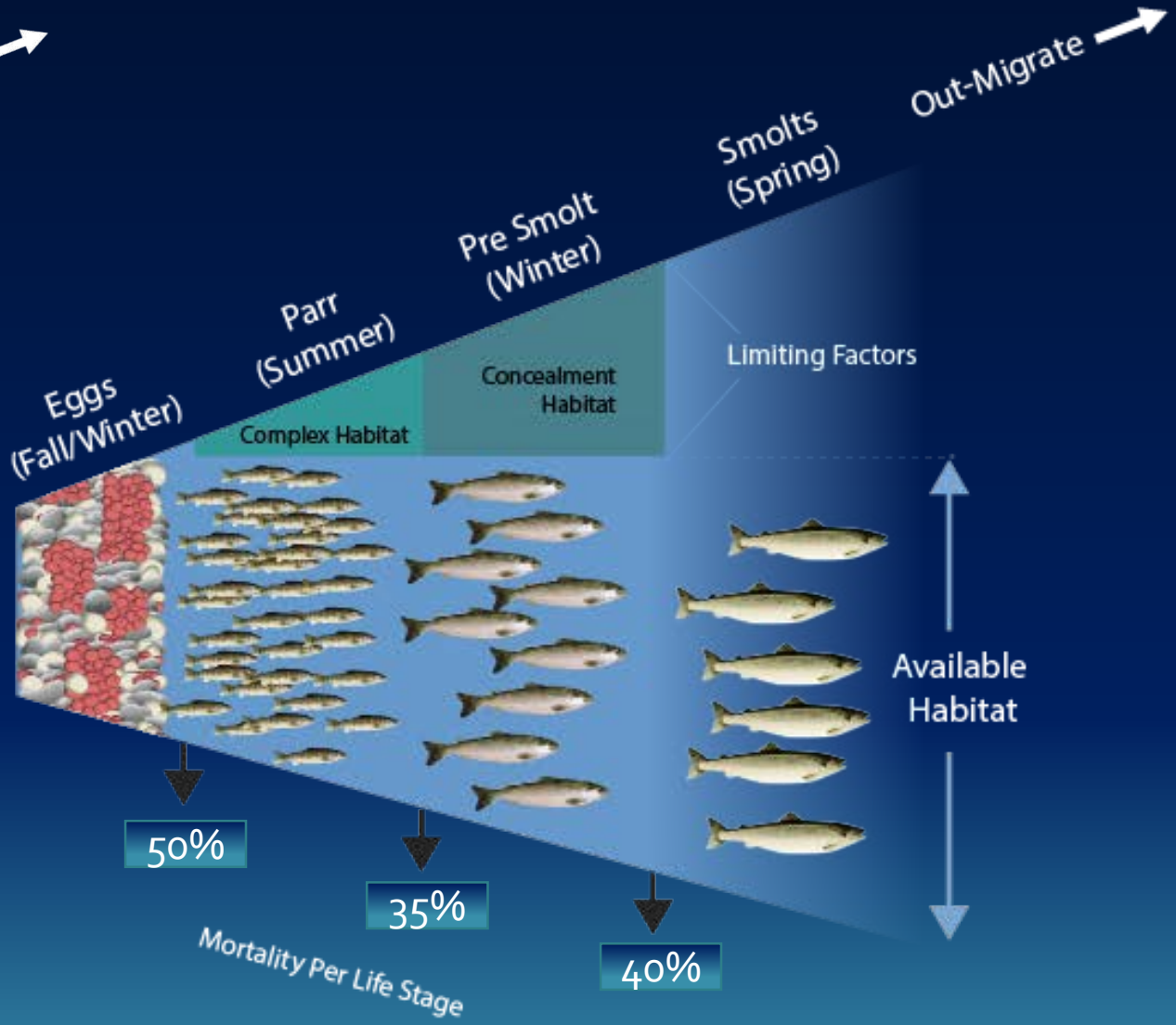




Upper Salmon Integrated Rehabilitation Assessment

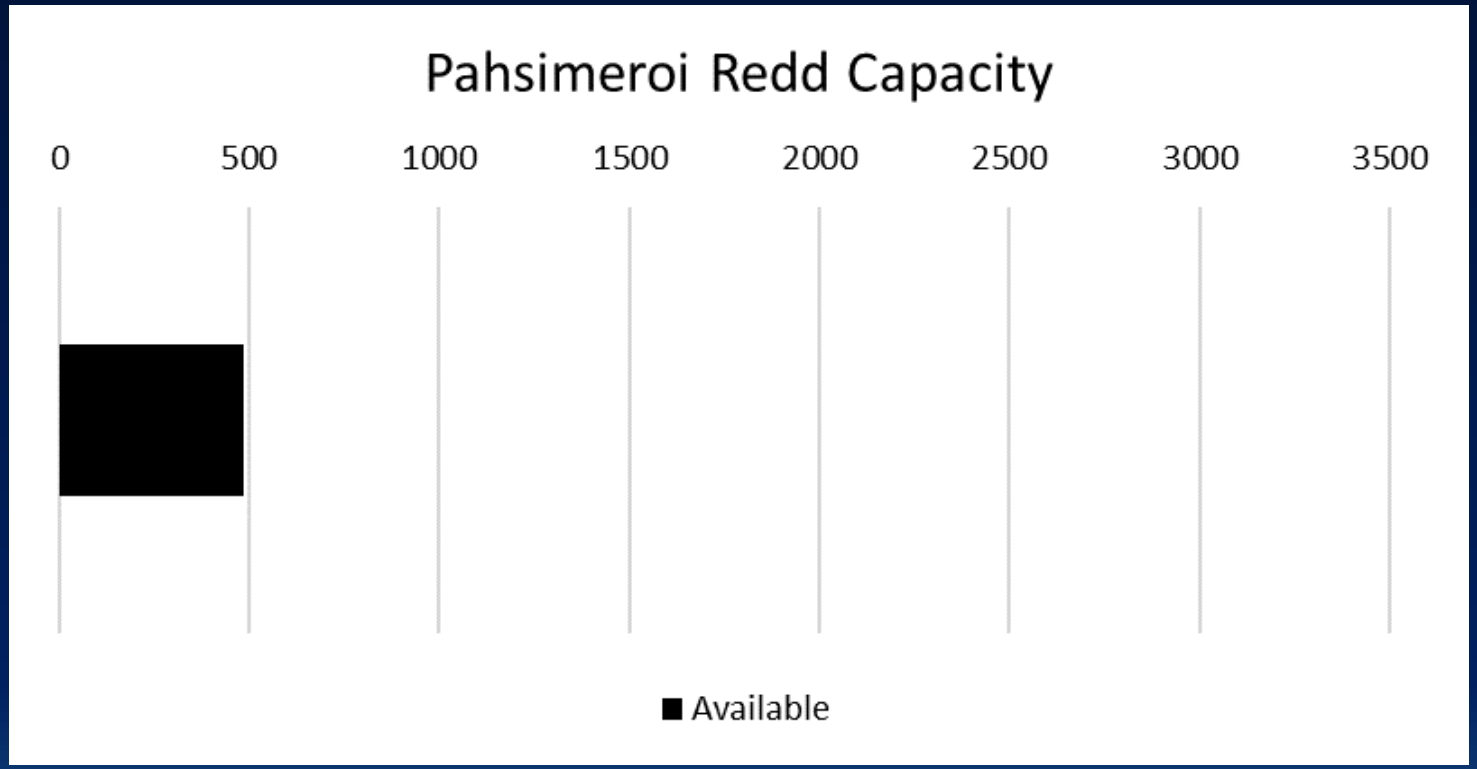
IRA Approach:

- Adopt life-stage-specific capacity as the primary metric:
  - multi-dimensional metric based on fish/habitat relationship using ISEMP / CHaMP data and analysis

- Regional goal example defined by capacity requirements:
  - 2,000 adults ≈ 980 redds ≈ 1.5 million parr ≈ 700k presmolt
  - simple conversions based on empirical data

- Use Quantile Random Forest model to estimate available capacity:
  - Redd (spawning), summer rearing, and winter period

Biology – Capacity Deficits (Redd)



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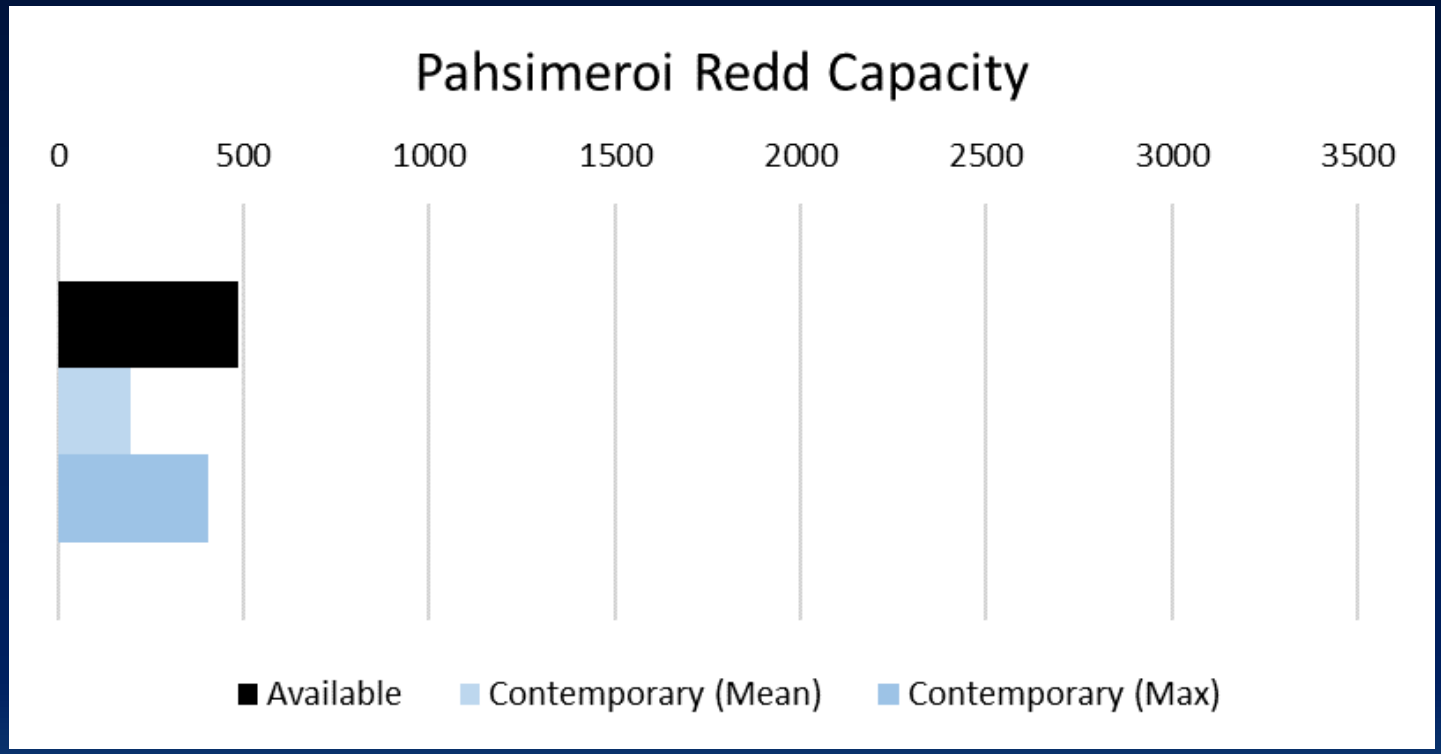

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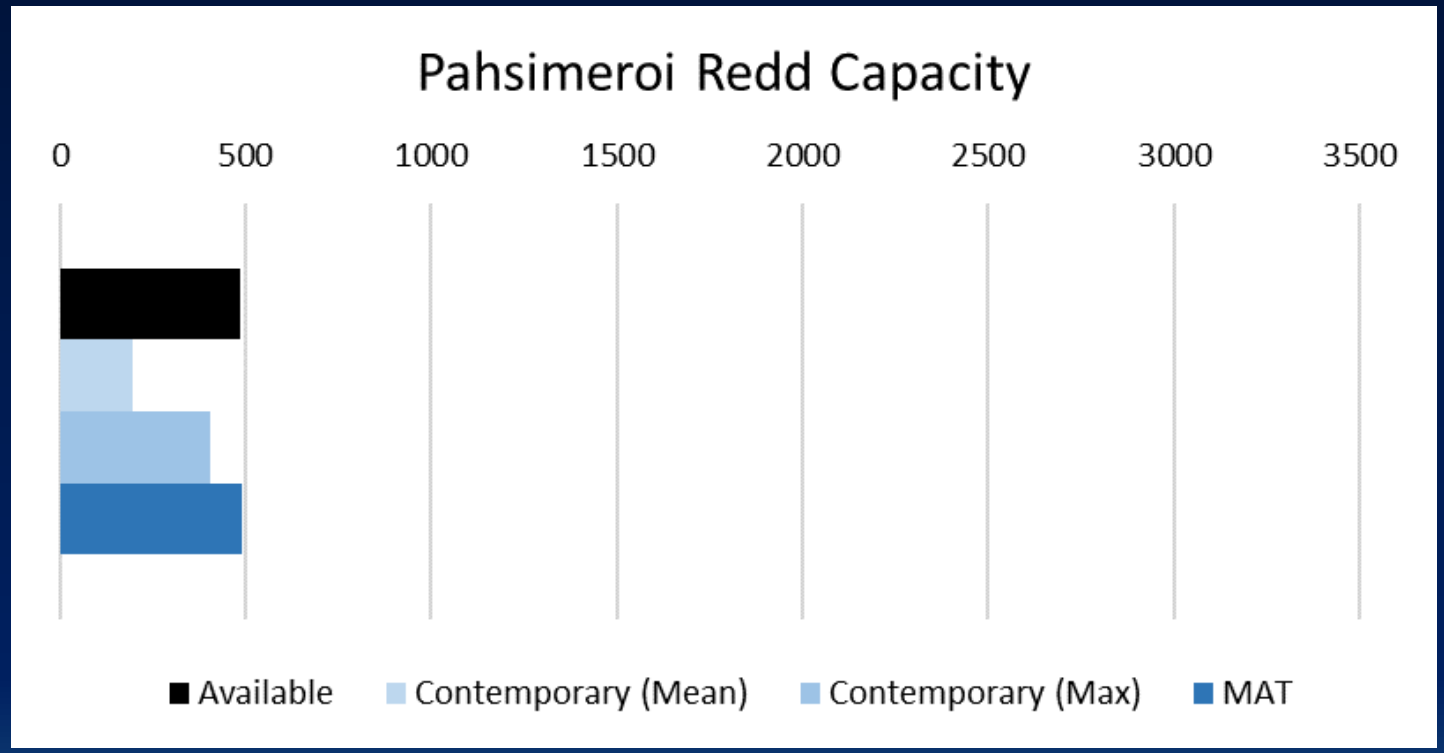

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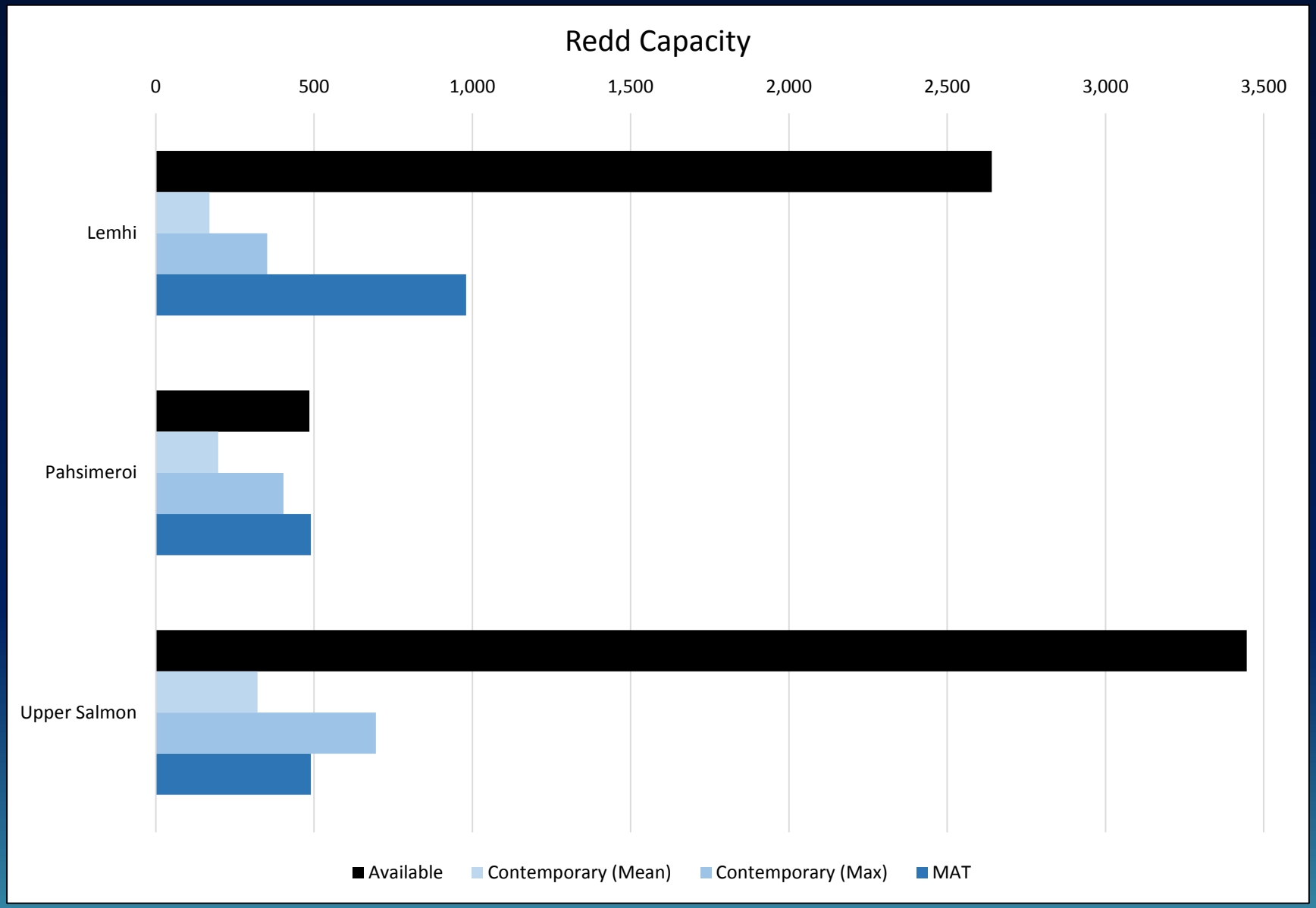
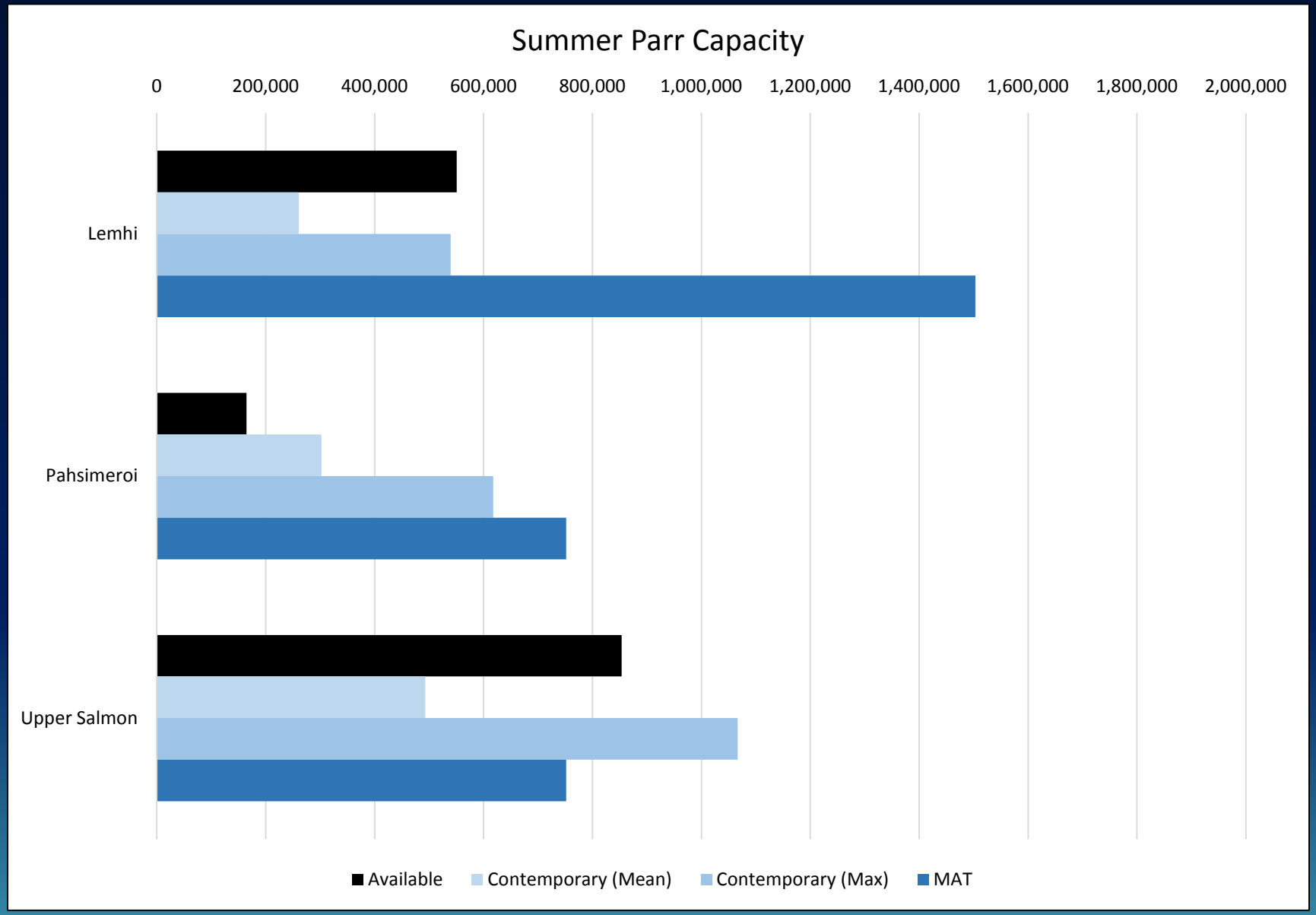
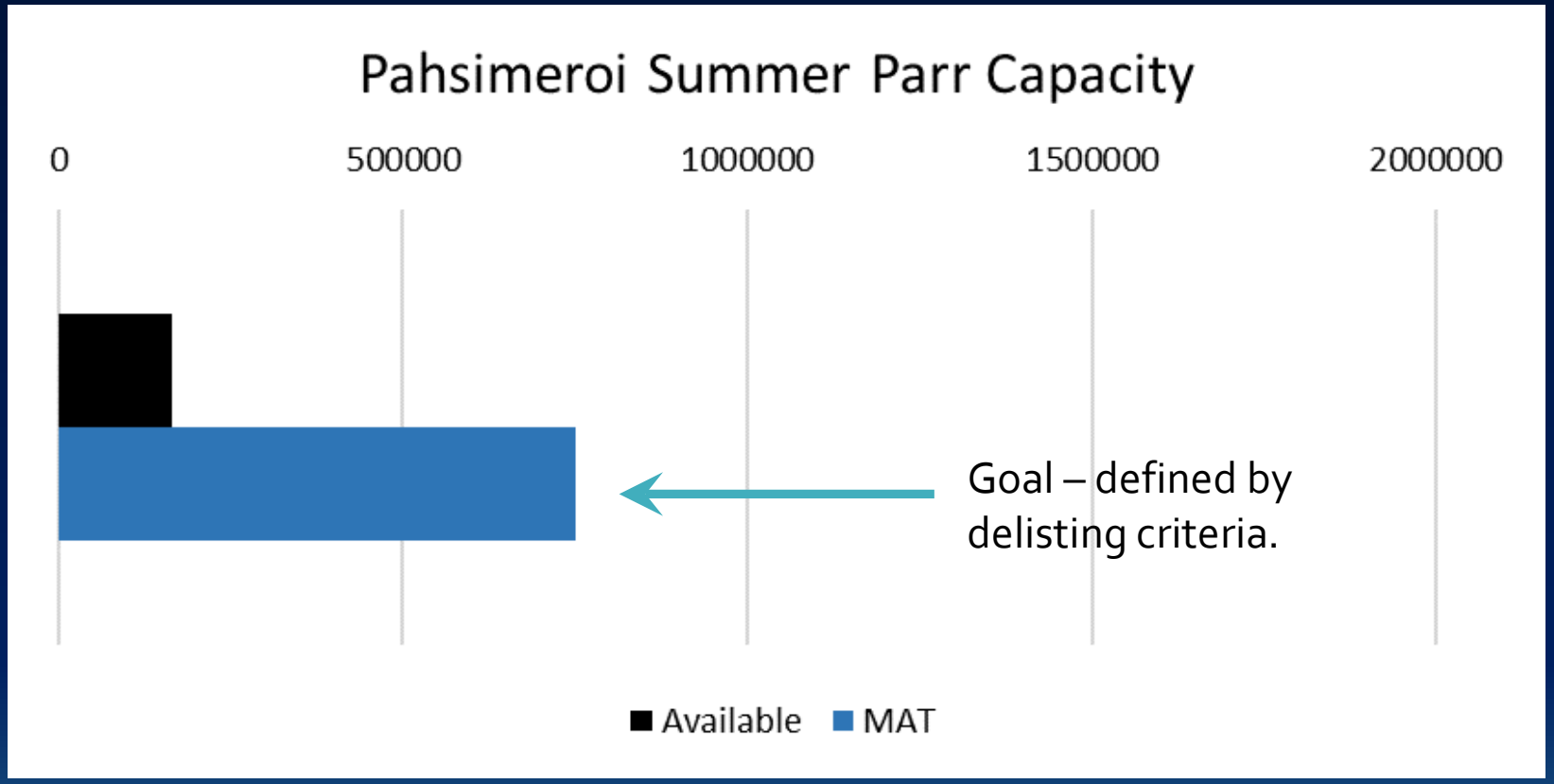


Biology – Capacity Deficits (Summer Parr)



Prioritizing Projects using Capacity Improvement



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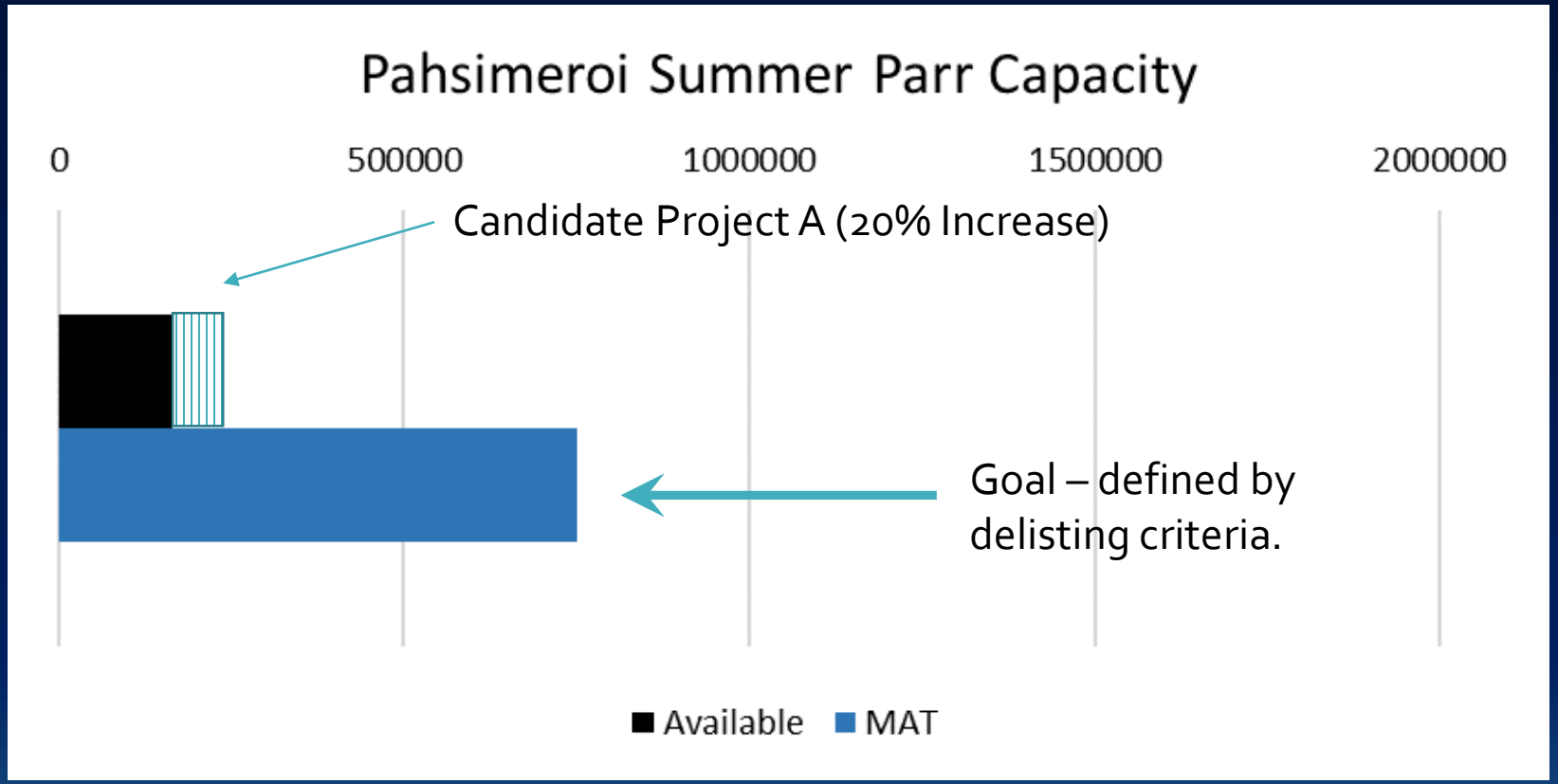

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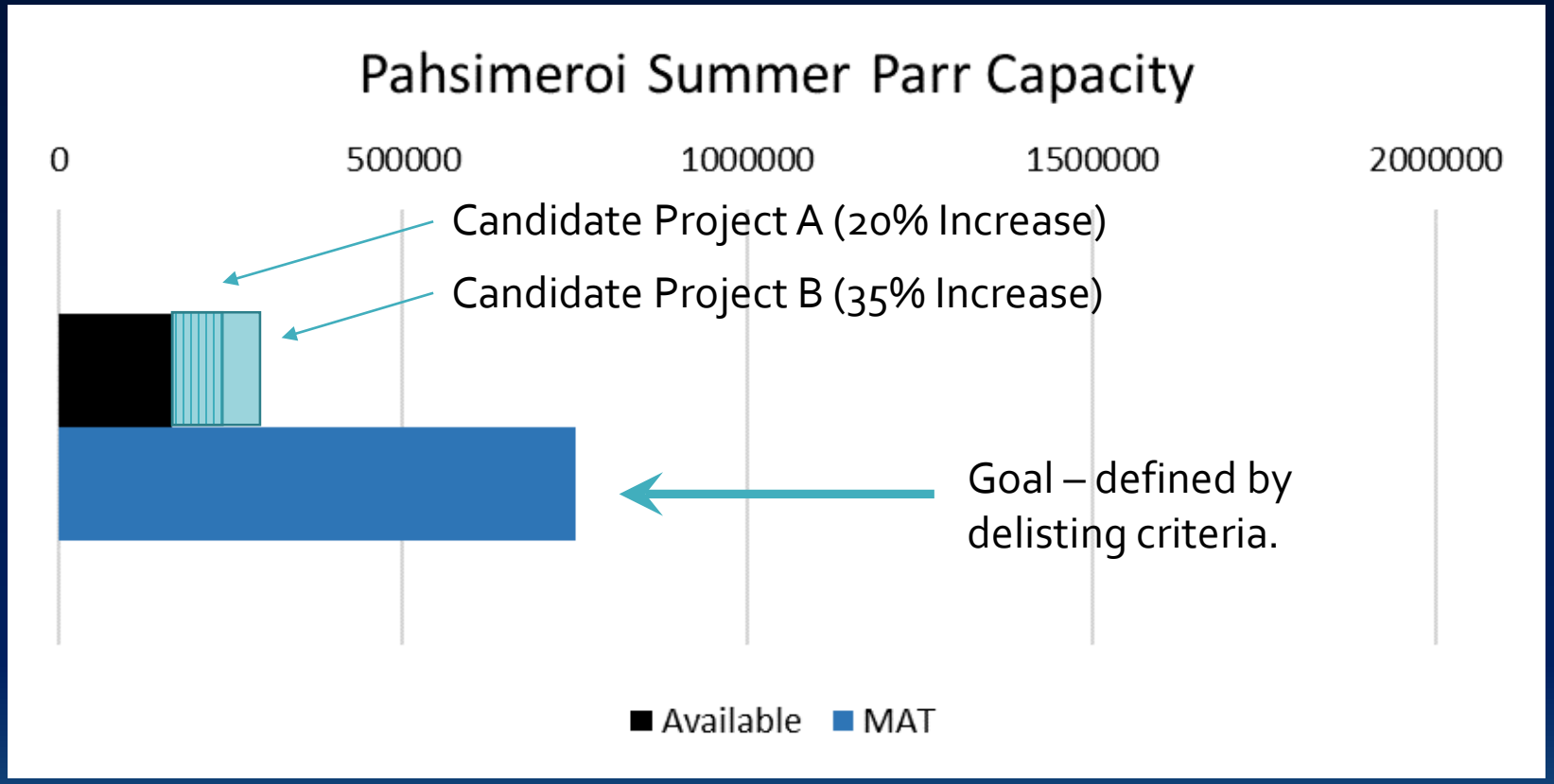
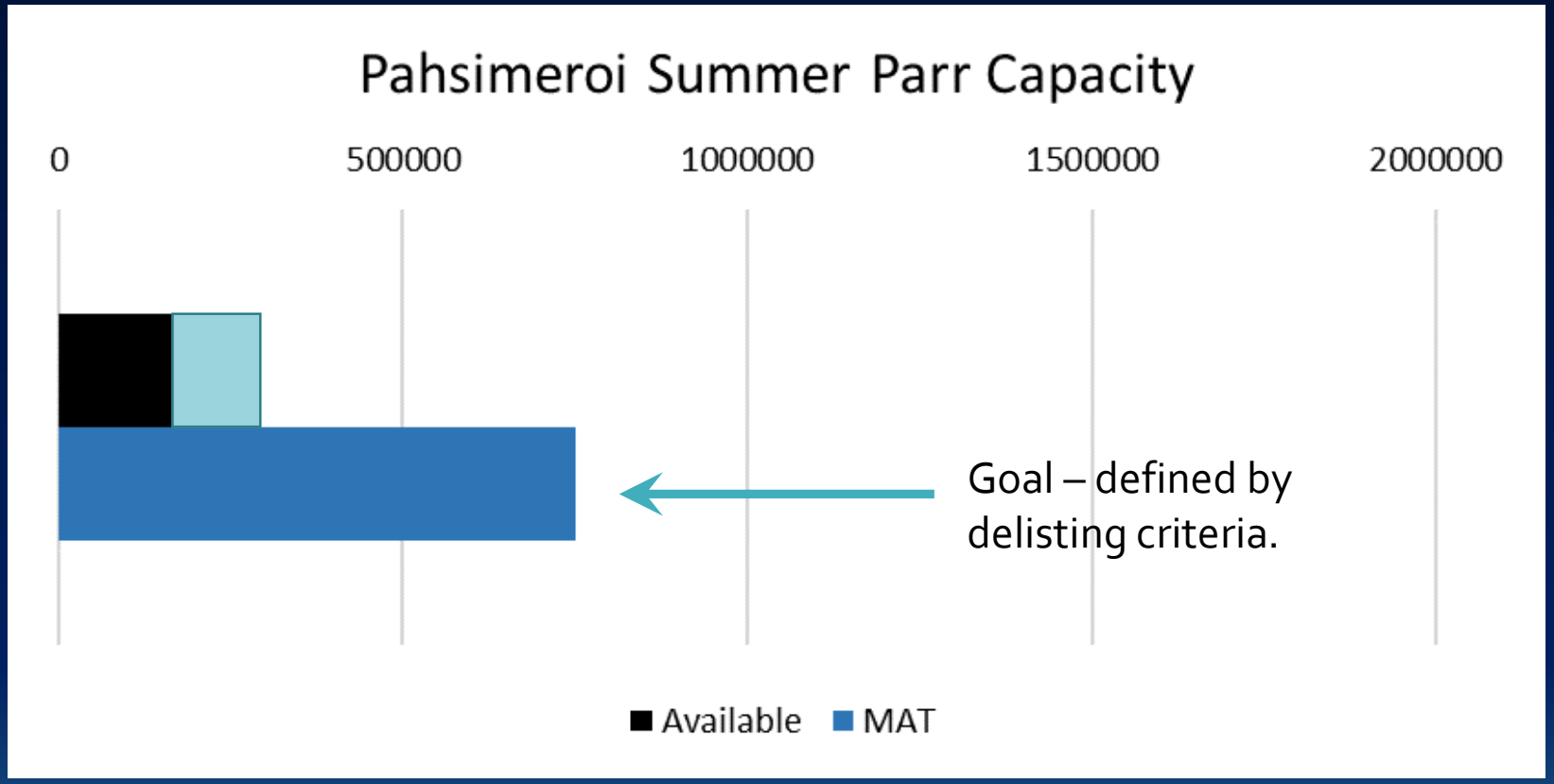


Evaluating Progress using Capacity Improvement



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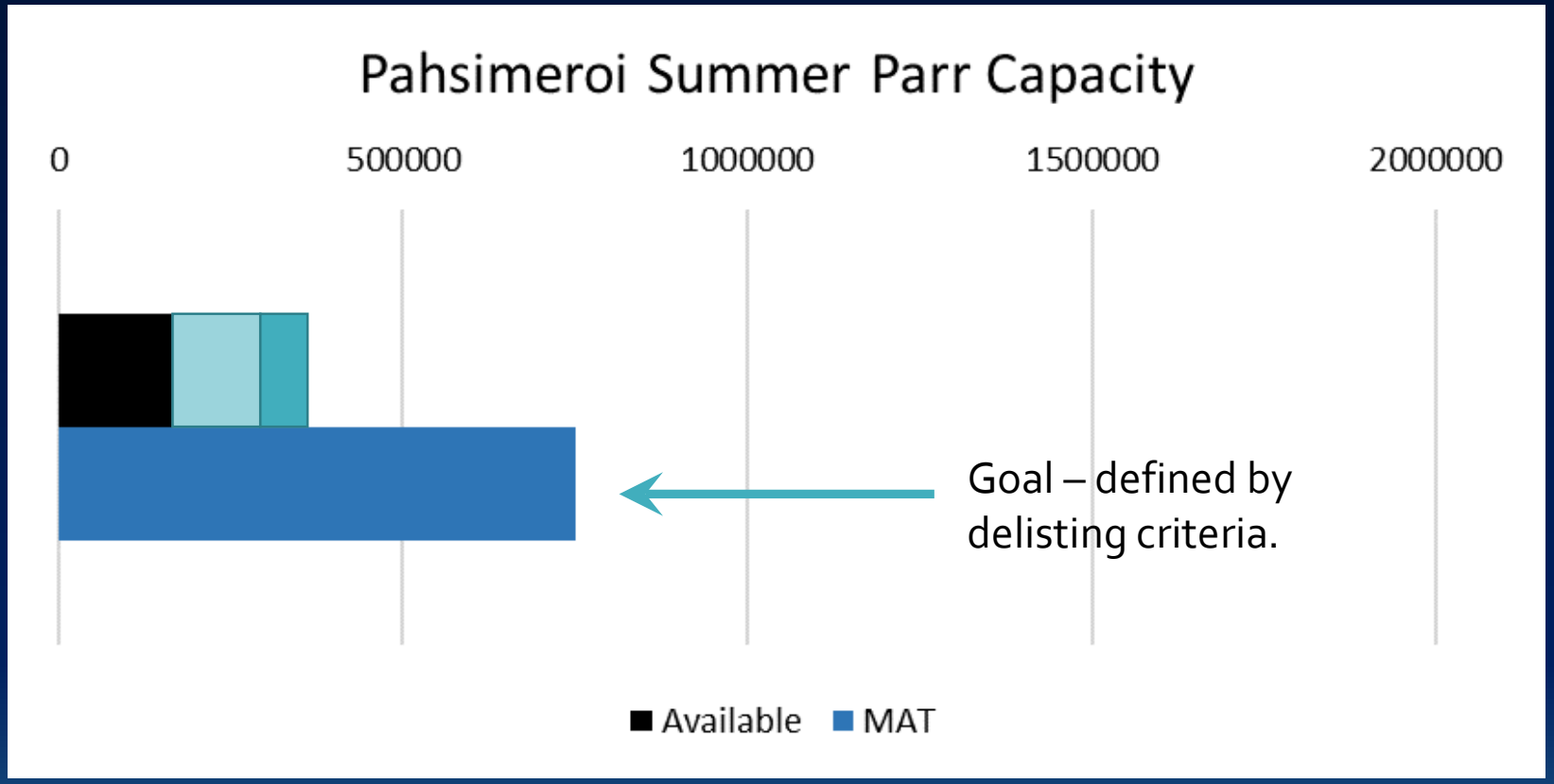

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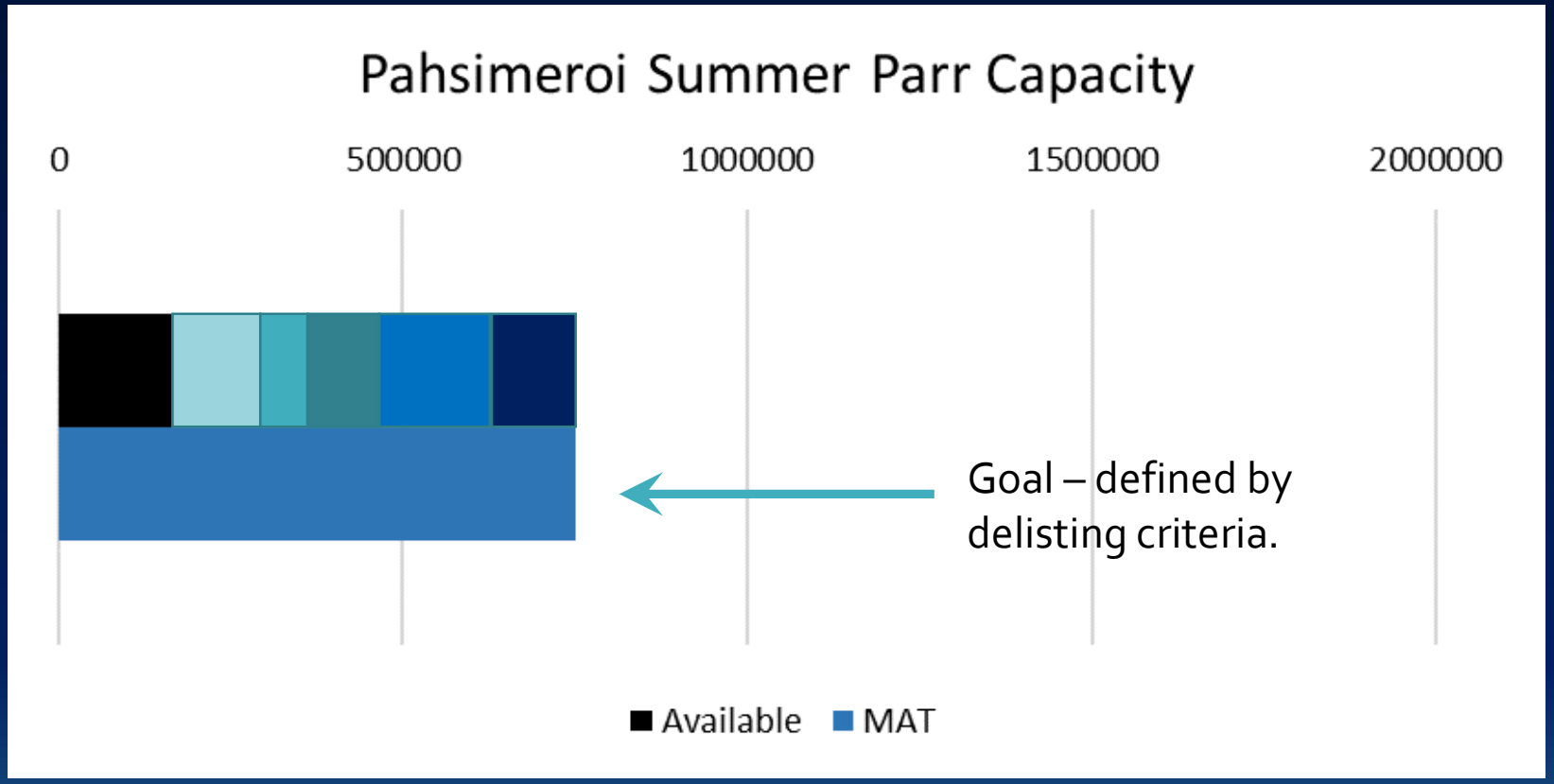

Expanding on IRA concept

- Past work has built foundation for today's tools that are more efficient and effective at providing understanding of fish habitat needs

- This process can be replicated in any other interior Columbia watershed with the existing data
  - (No new data necessary, with potential exception of Clearwater Subbasin)
  - Providing a consistent and streamlined approach thru out the region

- Future: QRF Existing vs Proposed modeling to inform project engineering design

Upper Salmon Conclusions

- IRA Phase 1:
  - Quantitative capacity estimates
  - Known rehabilitation goals
  - Quantitative evaluation of whether goals have been achieved (can be completed faster and more cost-effectively that standard M&E (often held captive by variation in escapement)

- IRA Phase 2:
  - Identify opportunities based on biological needs and geomorphological potential
  - use QRF to evaluate alternatives
  - identify most cost-effective reliable actions to address capacity deficits

Regional Considerations

- IRA an effective and cost sensible method to help implement habitat improvement actions
- Consistent manner benefitting fish
- Consider using in other areas of the region
- Assist other subbasins with planning and prioritizing tool
- Spend less $ on M&E and more on habitat benefitting actions
- Adding this to other processes such as ATLAS, EDT

- IRA found at modelwatershed.org

Upper Salmon Integrated Rehabilitation Assessment