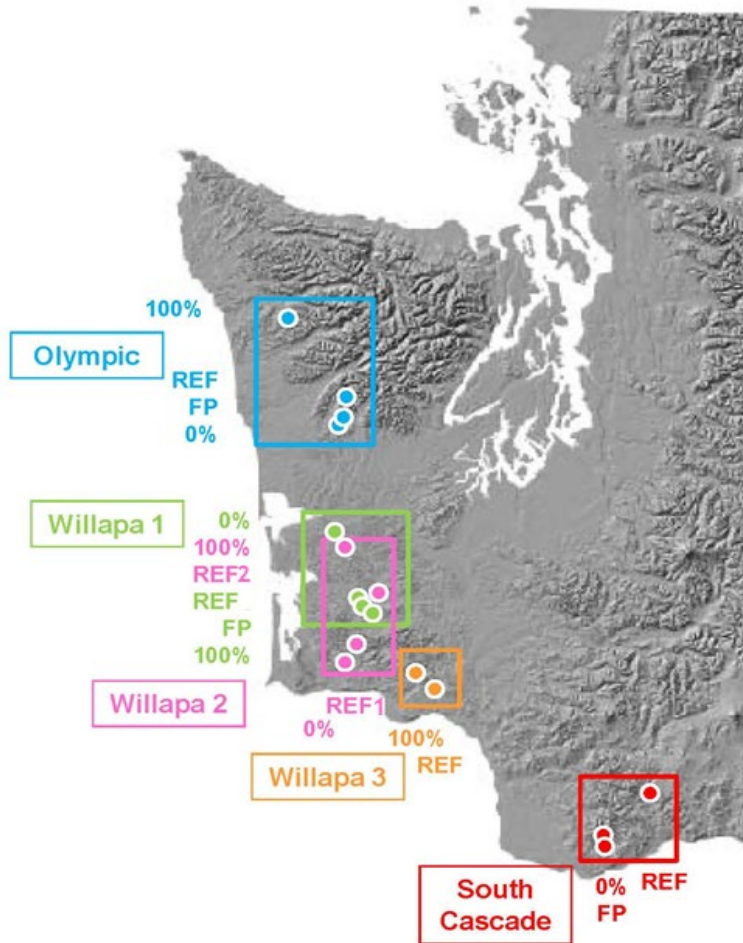


Extrapolating Type N Study Temperature Findings to the Broader Managed Forest Landscape



Criteria	2018 CMER Np Study
Geographic Range	Olympic Mountains
	Willapa Hills
	South Cascades
Elevation	Olympic Mountains: < 3,500ft
	Willapa Hills: No limit
	South Cascades: < 4,000ft
Stream Gradient	5-50% (3-27 deg)
Lithology	Competent (or any Lithology that could potentially be competent)
Type Np Basin Size	12-49 ha (30 - 120 ac)
Stream Order	Second order stream (Strahler, 1952)
Stream Network Geometry	Minimum of 75m (246ft) of stream between the F/N break and nearest downstream tributary intersection
Stand Age	>70% of stands between 30 and 80 yo during time of harvest
Harvest Timing	Apr 2008 - Mar 2009
Area Owned	>80% owned by single participating landowner

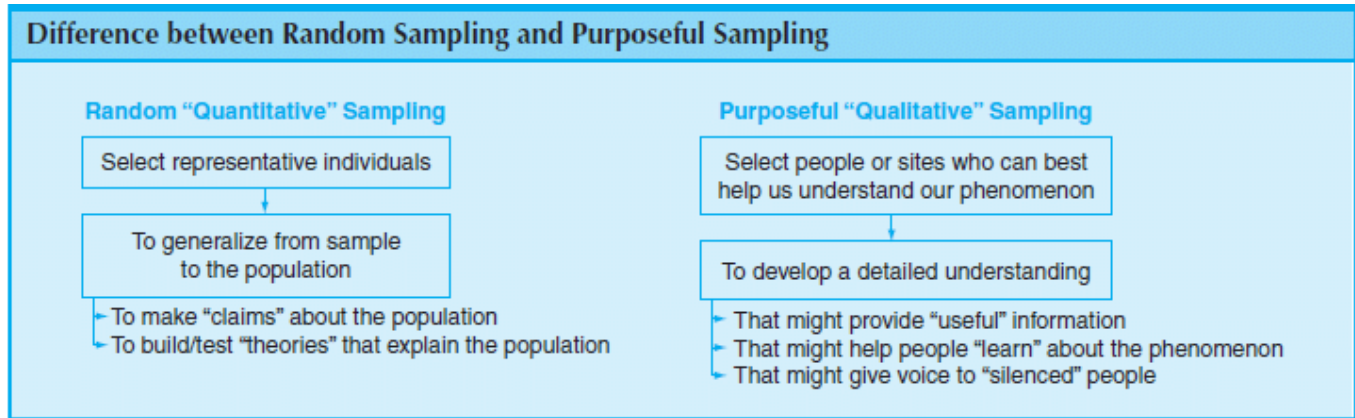
Statement of the Problem:

The Type N Study's treatment constraints limit application of study findings to the broader managed forest landscape.

- Study Constraint - Harvest treatments within the Type N Study were to be the size of the entire Type N basin where possible to maximize the likelihood of detecting a difference between treatments.
 - Harvests of more than 80% of a Np basin are rare operational prescriptions; average portion of individual Np basins harvested within a single FPA is 38% (WFPA preliminary data).
- Study Constraint - Harvest treatments in the Type N Study were limited to Np basins between 30 and 120 acres.
 - Although harvest FPA's often fall within the 30-120 acre basin area range, Np basins vary widely above and below the prescribed acreage thresholds.

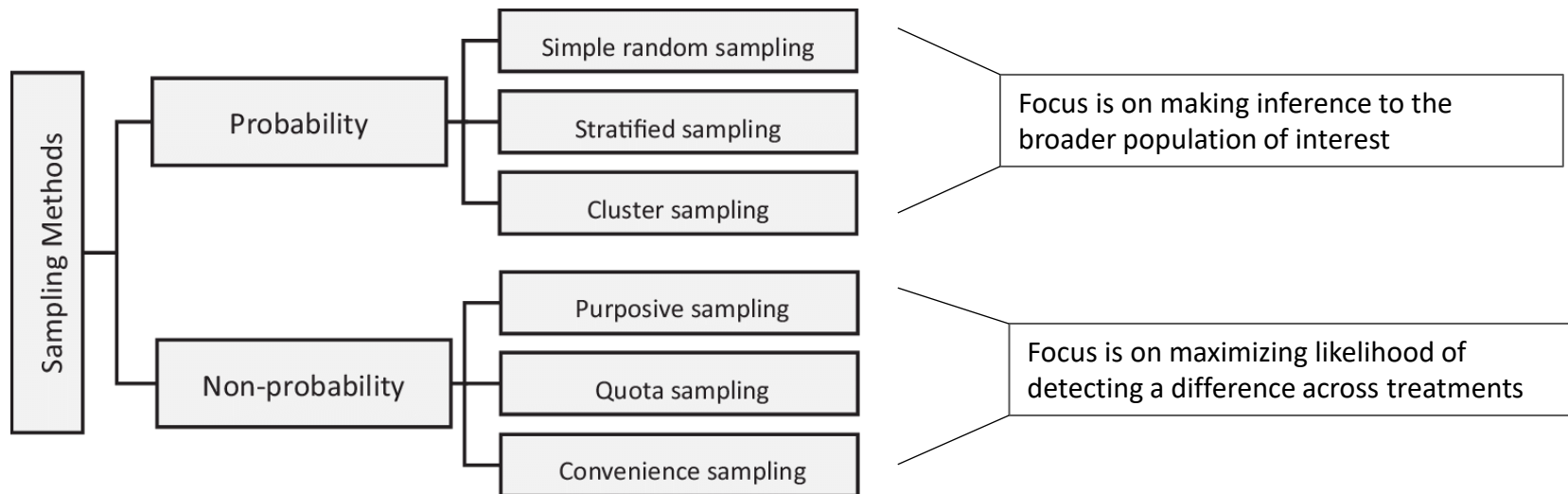
The Type N Study did not include an evaluation to determine how representative the selected study sites were of contemporary harvest practices, as well as Np watershed characteristics in general.

Sampling Design Determines Scope of Inference



Creswell, J.W. 2012. Research Design. Sage Publications, Inc.

Qualitative Non-Random Sampling Design in Type N Study: "To maximize the influence of the treatment on treated units and thus the potential of an effect resulting in differences among treatments, harvest unit size had to equal or approach the size of the non-fish-bearing study basin."
(Type N Feasibility Study p4)



Sarstedt, M, A. Shaltoni, P. Bengart,. 2017. The use of sampling methods in advertising research: A gap between theory and practice. International Journal of Advertising.

Scope of Inference Limitations Are Recognized

Study authors recognized scope of inference limitations for extrapolating study results to Type Np basins where the Type N site selection constraints are not met:

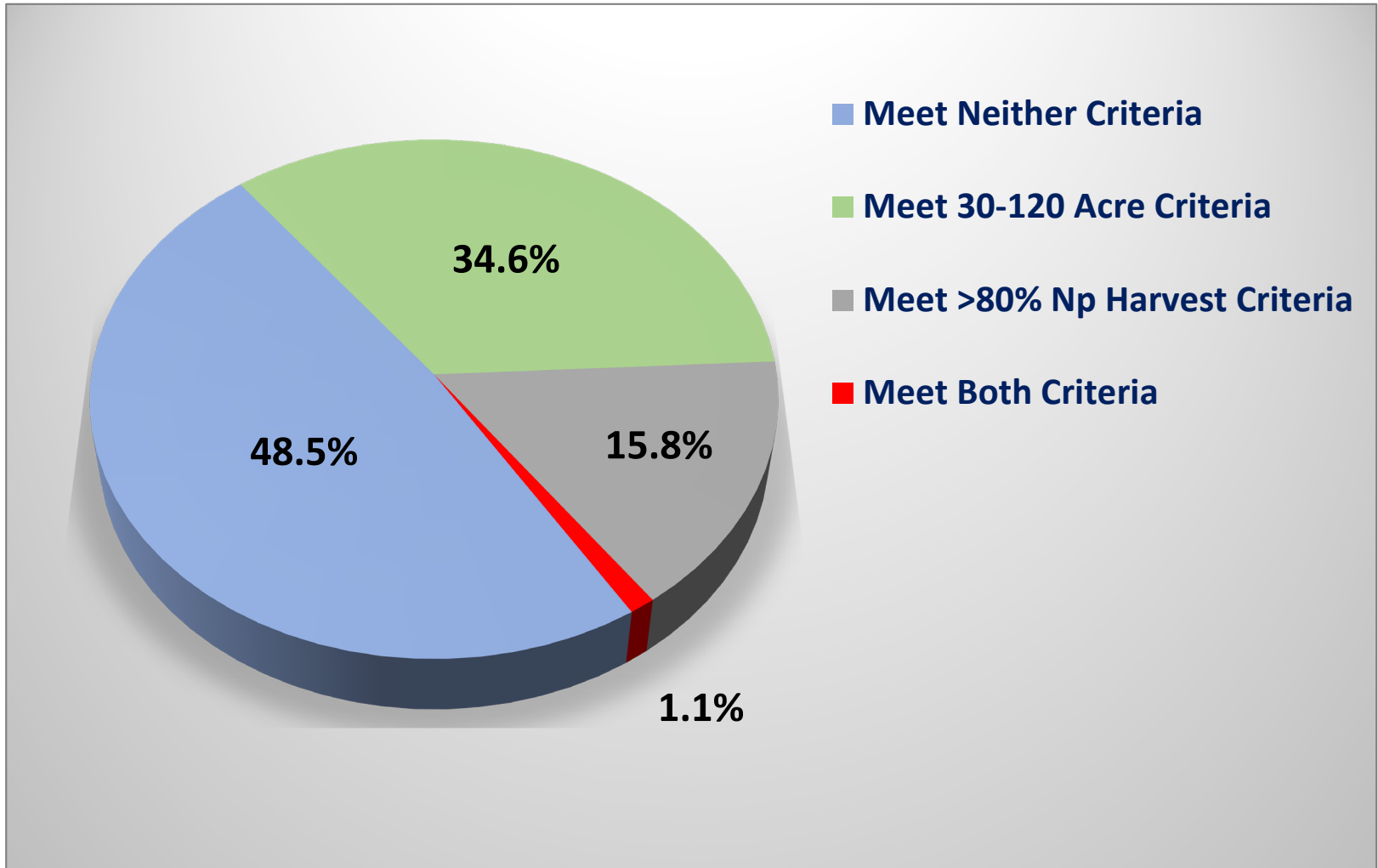
“Scope of inference is limited by the site selection criteria listed. Inference can only be made to Type N basins located in second-growth forests on lands managed for timber production, dominated by competent lithologies, located in western Washington (including the Olympic, Willapa Hills, and South Cascade (south of the Cowlitz River) physiographic regions), and consistent with our other selection criteria (size, gradient, etc.)”

The Type N Workgroup also recognized potential bias due to site selection constraints:

“In practice, harvest units rarely encompass entire watersheds, and streams and RMZs often form a harvest boundary. We are uncertain about the extent of these study biases; future examinations of the effects of more representative harvest layouts on aquatic resources rather than experimental treatments of entire watersheds could reduce this uncertainty and allow us to better understand the magnitude of this source of bias.”

Proportion of Np Basins in FPAs With >80% Np Harvested and 30-120 ac Basin Size

n=532, preliminary WFA FPA analysis



Conclusions

Operational harvest configurations rarely meet the Type N Study's basin size and full Np basin harvest criteria.

- Full Np basin harvest was intended to maximize the likelihood of detecting a difference across treatments, but is uncommon as an operational practice.
- The 30-120 acre size constraint precluded sampling of the full range of Np basin sizes likely to be encountered operationally.

In aggregate, the Type N site selection constraints resulted in a non-random sample of the broader population of contemporary operational harvest practices, severely limiting the Type N Study's scope of inference.

Therefore, it is unknown if the frequency or magnitude of temperature responses observed in the Type N Study are representative of temperature responses likely to occur in the majority of operational harvest units.

The proposed PI is intended to provide operational context to support reliable interpretation of Type N Study results and uncertainties.