# Reducing bias in pHOS in a world with hatchery hot spots

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When hatchery releases of winter steelhead are well managed, a clustered pattern of hatchery origin spawning is common.  These clusters are known as hot spots. Hot spots are desirable because they can reduce introgression between wild and hatchery stocks; however, for large-scale monitoring they can create potential biases in calculations of the percent of hatchery origin (pHOS) fish on the spawning grounds.  In cases like western Oregon where Generalized Random Tessellation Stratified (GRTS) based monitoring is used, the common solution to this problem is to spatially stratify site selections.  Grouping sites into hotspot versus non-hotspot areas can help to reduce pHOS bias. While stratification can be effective when appropriately applied, it can also result in inaccurate pHOS calculations if used without a clear protocol.  State management plans have prescribed how pHOS should be monitored within populations of winter steelhead in western Oregon, and these plans clarify the times and places where stratification should take place. These prescriptions significantly aid in the reliability of wild winter steelhead population estimates, but are not able to address several issues with pHOS as a metric for introgression. Some potential solutions to these problems will be discussed.