

Choice of Potential Problem Areas

The picking of Potential Problem Areas (PPAs) is key to the success of the Slow the Spread (STS) project by the US Forest Service. The goal of the STS project is to slow down the spread of gypsy moths. The most important way that the gypsy moths spread is by establishing isolated colonies in the generally non-infested area. Then as these isolated colonies begin to grow, they coalesce into the new population front. Catching these isolated colonies early and treating them is the goal of STS and what the design of the Decision Algorithm (DA) is based on. The places that the DA determines might be an isolated colony are labeled as a PPA.

To find a PPA, three methods are used, and if any of the methods determines that an area is a PPA, then it is assigned a PPA ID. The PPA ID is used to help track places that were determined to be a PPA and what actions were performed in the given area. There are two sets of data that are used to find all these locations. First of all there is the raw catch data. Second there is the kriged surface that is a smoothed interpolated surface of the raw catch data.

The first method involves looking at the raw point catch data. To start, a point is picked to be examined and all the points in the surrounding 40x40 km area. For each point, the value of $\log_e(\text{Catch Count} + 1)$ is used to determine the local mean and standard deviation of the area. This data is used to find the threshold of the 98th percentile for the local distribution of catch data. If the actual catch value is greater than this threshold, then the point, and all points ± 1 km in any direction, is added as a PPA. This process is repeated for all the points in the catch data.

The second method involves finding peaks in the kriged moth catch surface for the given year. The same process as the first method is used for determining the mean and standard deviation for a given 40x40 km area. This data is then used to find the threshold of the 92nd percentile. If the kriged surface data for any point is greater than the calculated threshold, then the point is added as a PPA. This process is repeated over all the data points in the kriged surface.

A similar approach to the last method is used in method three. For this test the data that is used is the value of $\log_e((C_1 * C_2) + 1)$ where C_1 is the data point on the kriged surface of the current year and C_2 is the data point on the kriged surface for the previous year. Once again this data is used to find the 92nd percentile and compare the product of C_1 and C_2 to determine if it is above the threshold. This test is designed to help find isolated colonies that might not have been found because of high male dispersion in a particular year.

These three methods work together to help find all the potential places that isolated colonies may be formed. This is just the beginning in determining what needs to be done in order to slow the spread of the gypsy moth population. The next step is to assign priorities to all the PPA's that were found using any one of these three methods but that will be covered in another document.

