HOOD CANAL REGIONAL POLLUTION IDENTIFICATION AND CORRECTION PROGRAM - PHASE 1 GIS OSS MAPPING COMPONENT

METHODS REPORT

[click here to see the accompanying maps]

For the Hood Canal Coordinating Council

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By PetersonGIS

Gretchen Peterson, Principal

INPUT DATA

JEFFERSON COUNTY Jefferson OSS data were received from Jefferson County on October 8, 2012 in spreadsheet format. The septic ID was parsed to obtain OSS age. There are duplicate records where there is a single OSS for multiple parcels. A “remove duplicates” function was applied to the septic ID field since the goal was to have a single OSS record for each OSS. This assigns the OSS arbitrarily to one of the parcels, where it may not actually be, though in many cases it will at least be located on a neighboring parcel. When all data for all fields were the same except for the septic ID, the duplicates were removed. There were 211 cases of these duplicates.

When duplicate parcel numbers have different septic IDs and different type IDs, then if type=REP, the REP record was kept and if type=TNK the non-tank record was kept. In all, 2,299 records fit those criteria. If the REP record has a Violation (V) code, then that code was moved to the record with the NEW system. In this way the original year of the system was retained, but also the fact that it was determined to be in violation. One record of type=RED was assumed to be type=REP. Type=EES and type=EXP took precedence over older dates when duplicates were present. In most cases type=SEPTIC TANK was deleted when duplicated. One record is listed as “abandoned” and this was kept as an “unknown”.

After this extensive data clean-up was performed the spreadsheet was joined to the Jefferson County parcel data. Approximately 300 of the OSS records did not join to the parcel data and were dropped. The reason for this drop may be that the parcel numbers for those records do not match with the GIS parcel database numbers.

MASON COUNTY Mason parcels with OSS information were received from Mason County on September 4, 2012. An update to the data was received on 1/17/2013. The fields *Date_Insta*, *_100ft_to*, and *Component_* were used to derive system age, shore proximity, and system category, respectively. All records with *Date_Instal* = 12/31/1991 were categorized as Conventional.[1] All records with *Date_Insta_* = 1/1/1940 were assigned an age of “0” in the HCCC OSS database to indicate that the age is unknown.[2] However, note that the OSS by Age map in the maps report includes these records in the “30-73” category as dark red dots and that the density and clustering maps include these systems in the Age > 20 and Age > 30

[1] Amy Georgeson, email, 9/4/2012, “Any site with an install date of "12/31/91" means we assumed that the site has an OSS, but we have no record of service to the system and we have not verified the OSS with the parcel record. These sites are assumed to be conventional non-pressure (gravity).”
1

[2] Amy Georgeson, email, 9/4/2012, “Any site with an install date of "1/1/1940" means we have record of service at the system, but we do not know the install date.”
2

categories. All records with *_100ft_to* = yes were included in the counts of OSS within 100' of the shoreline for the analysis reported on here.[3]

Also received on 1/17/2013 was a point file of locations of OSS where there are multiple OSS per parcel. The data represent OSS points at the actual OSS locations--within a parcel--where there are multiple OSS within a single parcel. Supplemental data were received from Mason County on 2/8/2013 in the form of a spreadsheet with a *Tracking* # field. The *Tracking* # field was used to join this table to the point file to obtain system age and type information. In some cases one or more points from this database duplicate a point from the parcel database. These were not numerous. Where this spreadsheet had *system_type* = null, we assigned a category of "unknown". Metadata for this dataset, written by Mason County, is available here.

A spreadsheet of approximately 200 Belfair-area parcels to be removed from the OSS database due to their transfer to sewer was received on 4/3/2013. This spreadsheet was joined to the OSS database and those OSS were removed.

KITSAP COUNTY Kitsap parcels with OSS information were received from Kitsap County on September 19, 2012. The fields *decSystemA* and *txtSystemT* were used to derive system age and system category, respectively. The Kitsap Public Health District stated in an email dated November 14, 2012 that the Kitsap OSS database is updated on an ongoing basis. Therefore, database changes and additions may have been made to the Kitsap OSS data since September 19, 2012 that are not reflected in the results of this analysis and mapping effort.

WASHINGTON STATE DEPARTMENT OF HEALTH Shellfish data were received from DOH on February 21, 2013. In all, five datasets were received: threatened area points with place names; recreational shellfish beaches lines with status (e.g., "closed") and reason; commercial shellfish growing areas polygons with reason (e.g., "nonpoint pollution"); biotoxin closure zones polygons with status (e.g., "closed for butter clams only"); and polluted areas polygons with no additional information.

SYSTEM CATEGORY

The county OSS data contains many system types that were categorized in a more granular scheme for this project. The categories used in this project are: alternative, community system, conventional, holding tank, seepage pits, sewer, and unknown. In all three counties a join-table was produced and agreed upon by the group to make these category assignments for the final database.

[3] Amy Georgeson, email, 9/4/2012, "If in the 'Records_Av' (Records available) field is "N/A" and the '_100ft_to' (Drainfield is within 100' of surface water) field is also "N/A". That means we have not actually looked at that parcel file yet. If Records available field has a "yes" or a "no" and the distance to surface water field is "N/A", then that means we could not tell from the parcel file if the drainfield was within 100' of surface water."
3

SYSTEM AGE

Originally, systems with unknown age were coded with an age of "0" in the data and recorded in the statistics as having unknown age. However, it was agreed during a discussion at the HCCC PIC meeting on 3/21/2013 that systems with unknown age should be coded with an age signifying that the system is most likely greater than 30 years old. The systems with an age of "0" were thus changed to an age of "999" so that the systems can be included in the analyses and maps of older systems but also be separated out at a later date if needed. Note that not all systems with an unknown category type have an unknown age according to the data received.

OSS STATISTICS

Number of OSS records, total: 29,521

Age	Number of OSS Records
1 - 9	3,874
10 - 19	5,875
20 - 29	6,290
30 plus	13,482

OSS WITHIN 100’ OF THE SHORELINE

To determine which OSS are within 100’ of the shoreline two different methods were used. The first was to select the points that intersected with the 100’ shoreline buffer. This method was used on the parcel centroid data for Jefferson and Kitsap County. The second method was to select OSS with *_100ft_to* = yes for Mason County. Jefferson and Kitsap County data did not have this field.

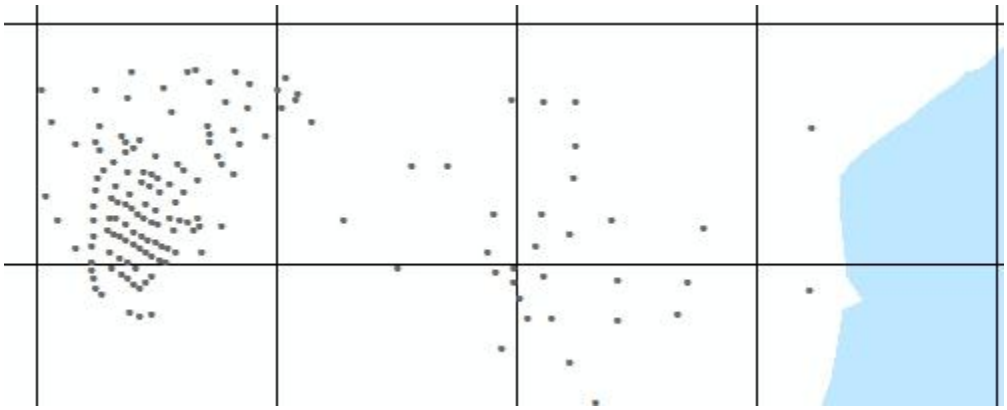
Category	Jefferson	Kitsap	Mason	Total
Alternative	99	14	100	214
Community System			15	15
Conventional	87	25	498	612
Holding Tank	3		1	4
LOSS		1		1
Seepage Pits	1		41	42
Unknown	6	40		46
Total	196	80	655	934

Note that the 2011 OSS report had a similar table that used very different methods. In the 2011 OSS analysis all **parcels** that touched the 100’ shoreline buffer were included, whereas in this analysis only parcels with centroids inside the 100’ shoreline buffer are included for Kitsap and Jefferson Counties. For Mason County the accuracy of this table is assumed to be even better considering that the new *_100ft_to* field is individually verified.

DENSITY

Kernel density maps are useful for visualizing dense areas in data. Kernel density maps were produced for the original 2011 OSS analysis and were also produced for this updated analysis. See the maps document to view these maps. Note that when the Belfair sewer parcels were included in the draft version of this document, the kernel density map for all OSS looked exactly the same as the map in the final version of the maps document except that the final version shows very slightly less pink in the Belfair sewer area.

A second type of density analysis was also produced for this updated analysis in order to determine the statistical significance, if any, of the clustering. A Getis-Ord GI* hot spot analysis was performed to obtain this additional level of rigor. The analysis works best with input data structured as a regular grid with point counts. Several grids of varying sizes were created and tested. The 2,500 foot grid--seen below at 1:24,000 scale with OSS represented as gray dots--was chosen as the best size for the data. The OSS locations were summed for each grid cell and this data was fed into the Getis-Ord GI* algorithm. Two Getis-Ord GI* maps were produced from this, one for all OSS and one for older OSS.



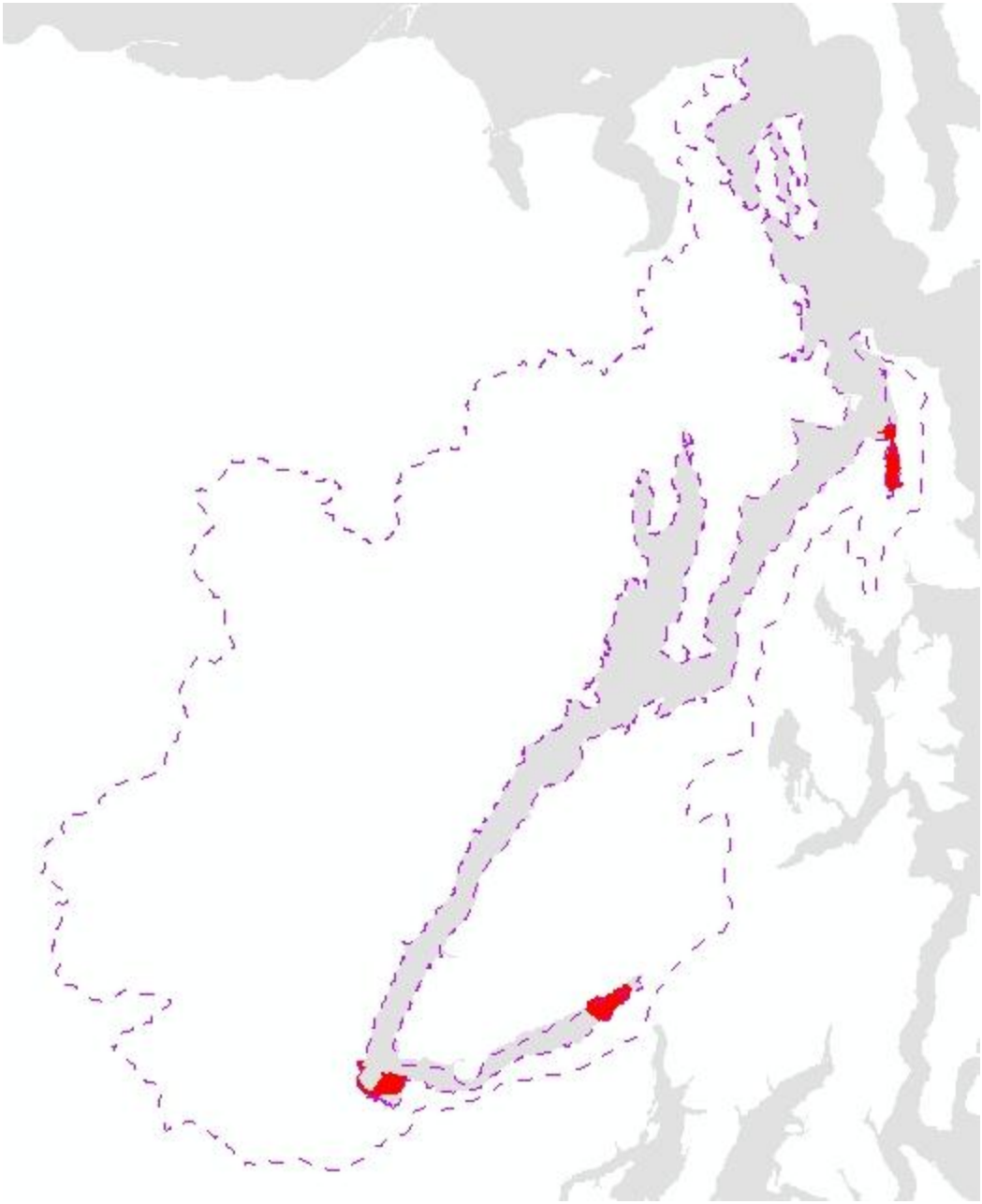
The Getis-Ord GI* maps show where the data is likely to be clustered (not likely to be random) at the 95% and 99% confidence intervals. A caveat is that, because OSS are correlated with higher population, the map may be similar to a population density map. See the maps document to view these maps.

THREATENED AREAS OVERLAY ANALYSIS

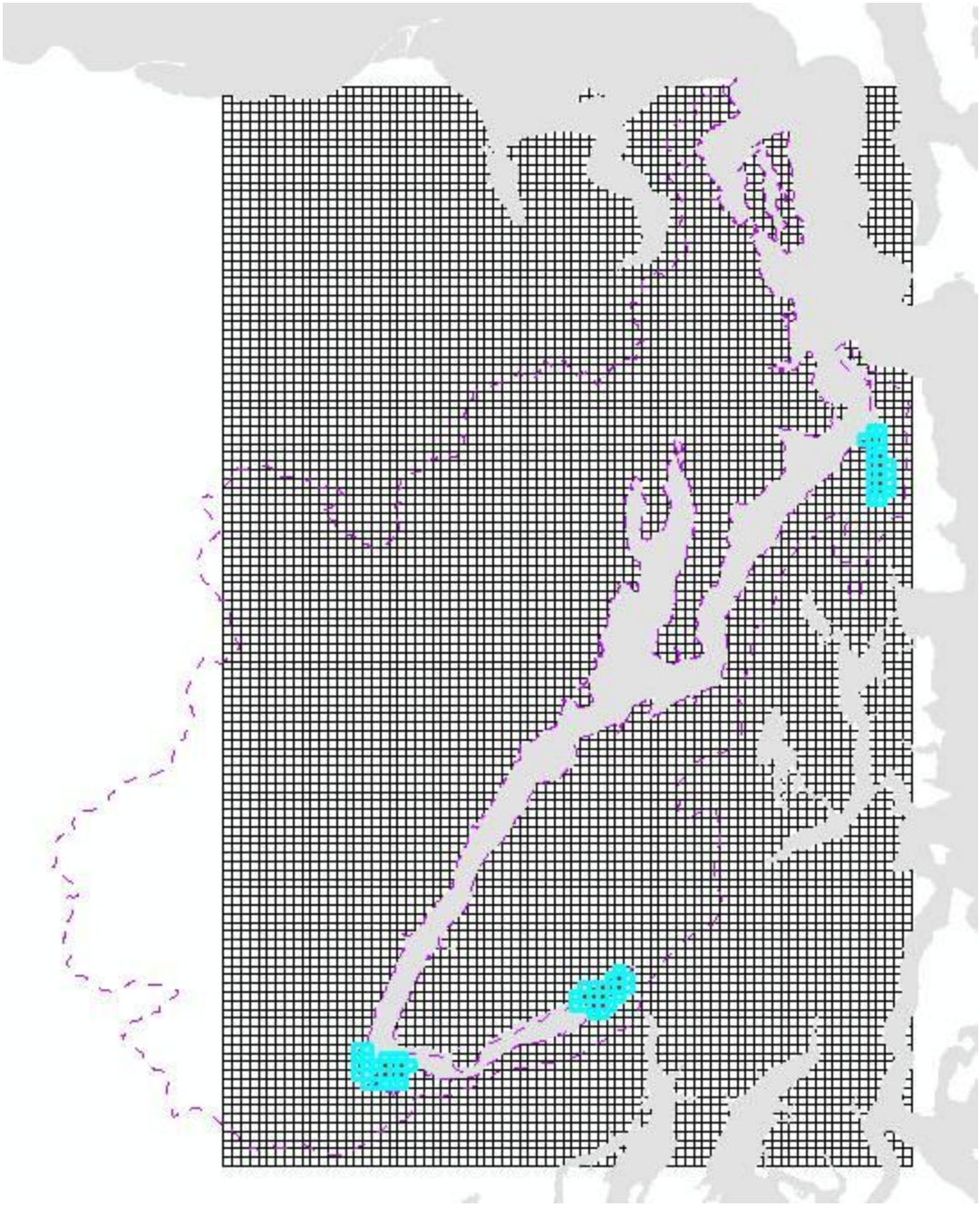
The DOH threatened areas points in the study area were used to select the commercial growing areas polygons that they represented.[4] There were three threatened areas. These are shown in red in the map below. Note that not all threatened areas are due to OSS issues.

[4] From Scott Kellogg, email dated 2/21/2013, "Threatened Areas is point data and you can compare it with Growing Areas to get acreages."

4

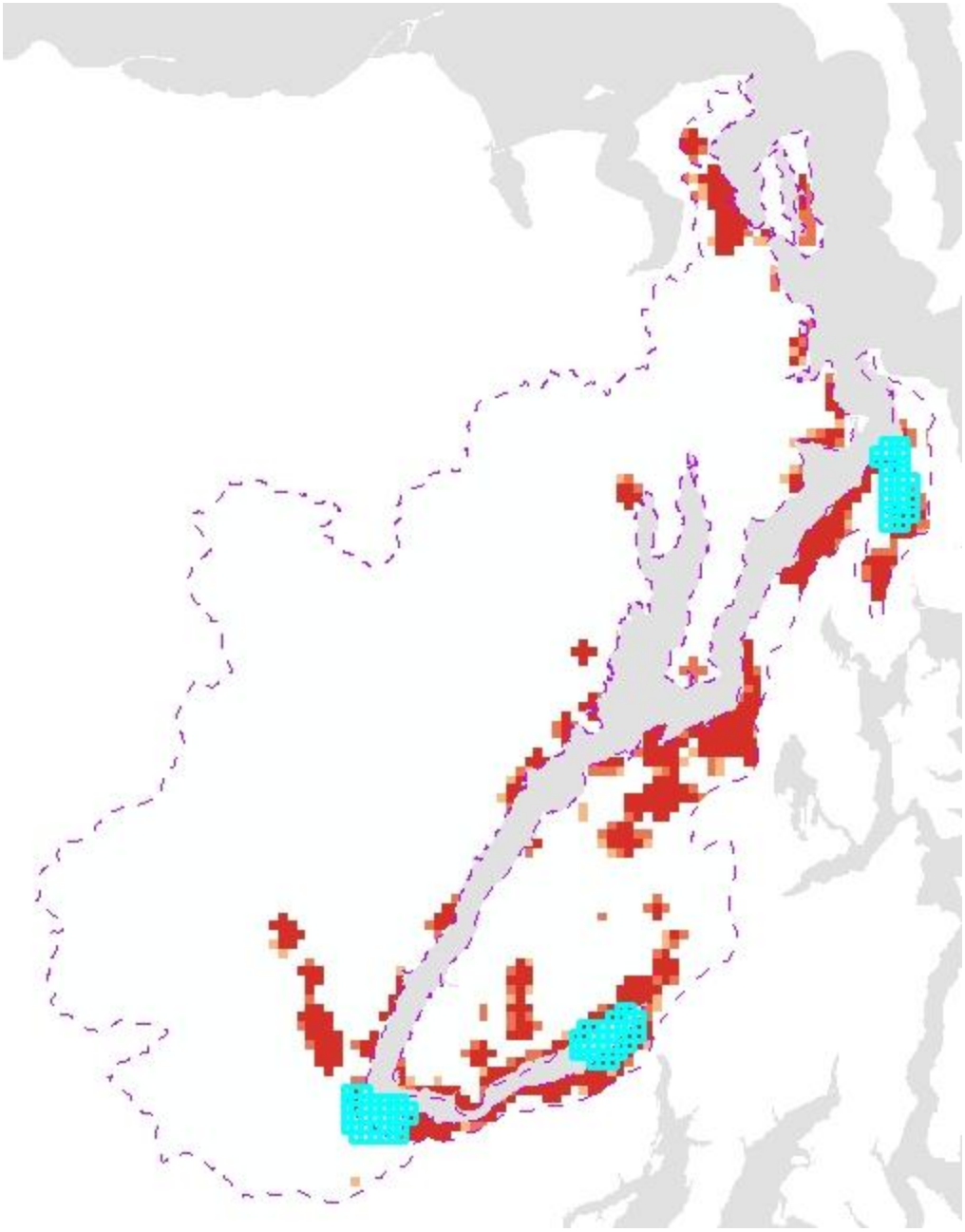


The 2,500 foot grid was overlaid with the threatened areas that fall in the PSP Action Area and the grid cells that intersected with the threatened areas were selected. The selected grid cells are shown in blue, below.



71 of the 1,796 cells were selected, representing an area of 16 square miles out of the 2,196 square mile grid (the grid itself encompasses the minimum bounding box around the OSS data points, not the study area per se).

The Getis-Ord GI* for all OSS points was selected from the grid selection set, shown below.



Analyzing the selected data for spatially significant clustering that overlaps with the threatened areas gives us the following information: Where the GiZ score is greater than 2.58 (99% confidence interval indicating clustering), 11 square miles (of the grid) are associated with threatened shellfish growing areas. For comparison, for all areas of the grid, 122 square miles have a GiZ score greater than 2.58.

Note that the clustering was measured as direct overlap with the threatened areas, even though much of the clustering may affect those water quality indicators from upstream contiguity.

RISK MODEL

A visual risk model was developed with input from the HCCC PIC team. The model is a kernel density analysis of OSS within 100’ of the shoreline of age greater than 20 or 30 (both densities were computed). See the maps report for the results.