

# Endangered Species Aquatic Exposure Area of Interest Tool

## AquaXpos

### Background:

AquaXpos conducts a geospatial analysis of the stream network to identify potential pesticide use impacts. Based on an initial area of concern and a method for estimating pesticide “Impact”, AquaXpos analyzes the stream network to find places, downstream from potential pesticide use sites, where chemical “Impact”’s may exceed a specific level of concern.

AquaXpos starts with the initial area of concern (AOC) on the NHDPlus stream network and searches upstream and downstream to identify stream segments where the pesticide “Impact” exceeds a threshold “dilution factor”. The user provides the initial AOC, the method for computing the “Impact”, and the “dilution factor”. The initial AOC is expressed as a list of NHDPlus Flowlines (stream segments). The method for computing the “Impact” is expressed as a function of the upstream land cover. When the “Impact” for an NHDPlus Flowline exceeds the “dilution factor”, the Flowline is placed on an Impact List which is the output from AquaXpos. The Impact List can easily be used in a GIS to map the impacted NHDPlus Flowlines.

### Navigating the AquaXpos User Interface:

The main screen of AquaXpos presents five functions:

- **About** – contains version and other basic information about AquaXpos. This information is displayed when AquaXpos is first started and each time the “About” button is clicked.
- **Run AquaXpos** – which starts the user interface for entering inputs to AquaXpos and for performing the geospatial analysis.
- **Delete Log** – which deletes the cumulative log that AquaXpos builds whenever it is run. The log is stored in the directory where AquaXpos is installed and contains important information in the event that AquaXpos fails.
- **Help** – displays this help document.
- **Quit** – terminates AquaXpos.

### Running AquaXpos:

After clicking the “Run AquaXpos” button, the user input form is displayed (see Figure 1).

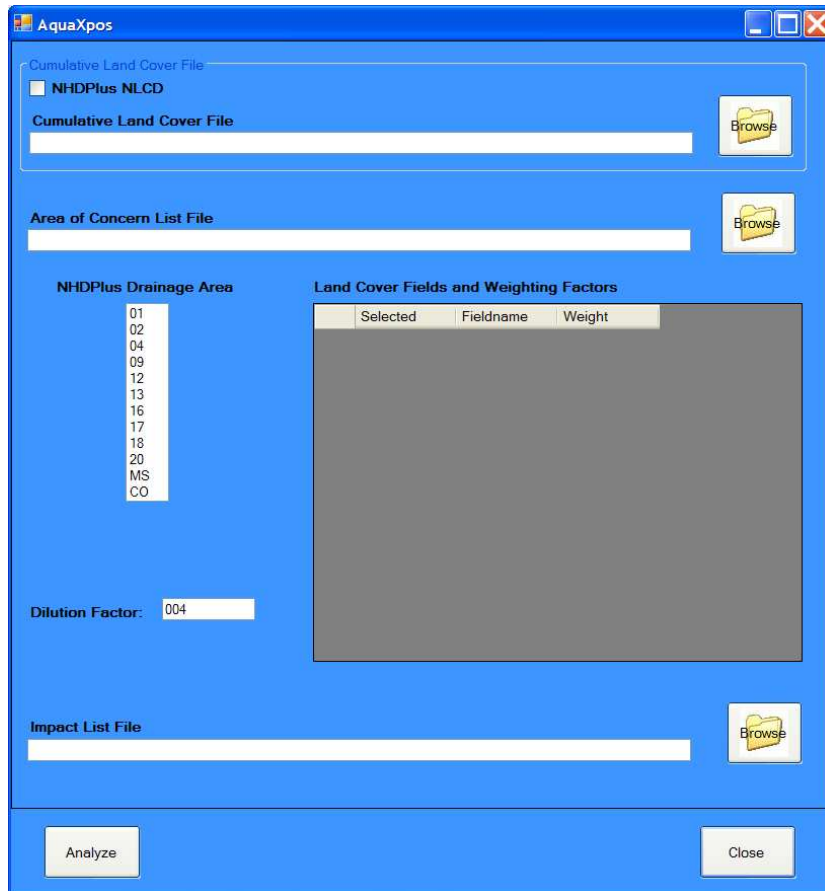


Figure 1

The user must enter six pieces of information:

- **Cumulative Land Cover File:** NHDPlus contains the cumulative land Cover attributes derived from the National Land Cover Dataset (NLCD). To use the NHDPlus NLCD data, simply check the box. Otherwise, specify the location and name of a different land cover file. If the land cover file supplied does not contain data for the entire NHDPlus drainage area, it is possible that the output Impact List will be incomplete. For that reason, it is recommended that the land cover attributes cover the entire drainage area specified. Accumulated attribute files of land cover created by the NHDPlus CA<sup>3</sup>T tool are properly formatted for AquaXpos.

More information about NHDPlus NLCD attributes is available in the “NHDPlus User Guide”.

- **Area of Concern List File:** Specify the location and name of the AOC text file. This file must contain a list of NHDPlus Flowlines (stream segments). Each flowline is identified by its unique identifier called ComID. Each ComID is on a separate line in the AOC file. The user must build an AOC file outside of and before executing AquaXpos. All NHD Flowlines in the AOC file must be in a single NHDPlus drainage area. The

AOC file must have a header line at the top of the file containing the word “comid”. A sample AOC file is:

```
Comid
102030412
95340020
120786345
...
```

- **NHDPlus Drainage Area:** Specify the NHDPlus drainage area that contains the AOC. NHDPlus drainage areas are hydrologic regions except for the Mississippi River and Colorado River drainage areas which contain more than one hydrologic region. Valid NHDPlus drainage areas are:
  - 01 – New England
  - 02 – Mid-Atlantic
  - 04 – Great Lakes
  - 09 – Souris-Red-Rainy
  - 12 – Texas
  - 13 – Rio Grande
  - 16 – Great Basin
  - 17 – Pacific Northwest
  - 18 – California
  - 20 – Hawaii
  - CO – Colorado River which is regions 14 and 15
  - MS – Mississippi River Basin which is regions 05, 06, 07, 08, 10 (Lower and Upper), 11 and 03. Note that the South Atlantic (region 03) is included in the Mississippi drainage area because the sub-region 0318 in region 03 is hydrologically connected to region 08.

More information about NHDPlus drainage areas is available in the “NHDPlus User Guide”.

- **Land Cover Fields and Weighting Factors:** The “Impact” of a pesticide in an NHDPlus Flowline is estimated from the land cover upstream of the Flowline. In AquaXpos, the “Impact” is expressed as a function of land cover categories and weighting factors. To define the function, specify the weighting factor for individual land cover categories displayed in the table. Using the cumulative land cover attributes upstream of a Flowline (LC1, LC2,...), AquaXpos computes the “Impact” for each Flowline as follows:

$$\text{Impact} = \text{LC1} * \text{WF1} + \text{LC2} * \text{WF2} + \dots + \text{LCn} * \text{WFn}$$

- **Dilution Factor:** Enter a Dilution Factor that represents the toxic threshold for the “Impact” formula computed above. The Dilution Factor is a function of the fate properties of the pesticide being studied and must be derived prior to the execution of AquaXpos. The dilution factor is the “Impact” threshold that determines when an

NHDPlus Flowline may experience a toxic impact. If an NHDPlus Flowline has an “Impact” that is greater than or equal to the Dilution Factor, the Flowline is considered to be “impacted”.

- **Impact List File:** Specify a location and filename for where AquaXpos is to place the list of impacted NHD Flowlines. When AquaXpos completes its work, this file will contain a list of NHD Flowline ComIDs where the “Impact” exceeds the Dilution Factor.

**“Analyze” Button:** When all the inputs have been specified, click this button and the AquaXpos analysis will be executed. Various messages will be displayed as the analysis is performed and completed.

### **Methodology of AquaXpos:**

The AquaXpos methodology contains the following steps:

1. Compute “Impact” for each NHDPlus flowline from the Land Cover Cumulative Attributes File. Using the land cover (LC) category and its weighting factor (WF), the “Impact” for each Flowline is
$$= LC1 * WF1 + LC2 * WF2 + \dots + LCn * WFn$$
2. Remove from AOC all Flowlines where the “Impact” computed for the Flowline is less than the Dilution Factor.
3. Navigate downstream from each AOC Flowline continuing on each downstream path until a Flowline is reached where the “Impact” is less than the Dilution Factor. Place all navigated Flowlines where the “Impact” is greater than or equal to the Dilution Factor into the Impact List.
4. Navigate upstream from each AOC Flowline continuing on each upstream path until a Flowline is reached where the “Impact” is less than the Dilution Factor. Place all navigated flowlines where the “Impact” is greater than or equal to the Dilution Factor into the Impact List.
5. Store Impact List in a file at the location and with the filename specified by the user.