NOAA's Coastal Assessment and Data Synthesis System

Physical and Hydrologic Characteristics of Coastal Watersheds

Dataset Description

An estuary's physical and hydrologic characteristics help define the ecological processes and habitats that can occur within that estuary, and these same characteristics also determine how human activities affect an estuary's overall condition. The Physical and Hydrologic Estuary Characteristics (P&H) dataset contains baseline information pertaining to estuarine and fluvial drainage areas, water surface area, freshwater inflow (USGS streamflow gages), and tidal range and tidal prism volume (NOS tide stations). Freshwater inflow estimates are provided for river long-term average flow discharging to coastal waters. Representative average tide level, prevailing tide, salinity zone areas (seawater, mixing, and tidal fresh), average tidal prism volume, and stratification characteristics are also included.

The estuary and fluvial drainage areas and the estuarine water surface areas (seawater, mixing and tidal fresh areas) were obtained from NOAA's Coastal Assessment Framework (CAF). An estuarine drainage area or EDA is comprised of the land and water component of a watershed that drains directly into estuarine waters. An EDA includes all or part of the USGS 8-digit cataloging unit containing the most upstream extent of tidal influence. Depending on the complexity of coastal drainage patterns, certain cataloging units were modified to eliminate the portion of the drainage area not draining directly to estuarine waters. A Fluvial Drainage Area (FDA) contains the land and freshwater portions of watersheds upstream of EDAs. FDAs coincide with USGS 8-digit cataloging units and include a majority of the Nation's hinterland. A Coastal Drainage Area (CDA) is comprised of the land and water component of an entire watershed that: 1) drains directly to the ocean, a non-National Estuary Inventory (NEI) estuary, or the Great lakes; and 2) contains the downstream-most USGS cataloging unit that contains the head of tide. Estuarine water surface area is approximated at mean tide level. Estuarine volume of an estuary helps determine its ability to dilute pollutants. When volume is used in conjunction with freshwater inflow and the portion of total volume that is freshwater, the susceptibility of an estuary to concentrate pollutants can be assessed.

Freshwater inflow information in the P&H dataset has been obtained from USGS Gage stations data. Freshwater inflow is a major determinant of the physical, chemical, and biological characteristics of most estuaries. It affects the concentration and retention of pollutants, the distribution of salinity, and the stratification of fresh and salt water within an estuary. Long-term average flows are included in the P&H dataset.

Tidal differences and other constants in P&H have been obtained from tide stations long-term data. Height of tide information is obtained by means of the height differences or ratios. The mean range given is the difference in height between mean high water and mean low water. The spring range is the average semidiurnal range occurring semimonthly as a result of the Moon being new or full. It is larger than the mean range where the type of tide is either semidiurnal or mixed, and is not of practical significance where the type of tide is diurnal. Mean tide level (half-tide level) is defined as a plane midway between mean low water and mean high water.

The data are available for one distinct spatial aggregation identified below. To view the data dictionary of the dataset, click on the link below or refer to NOAA's Coastal Assessment and Data Synthesis System (http://cads.nos.noaa.gov).

1) Coastal Watersheds (from NOAA's Coastal Assessment Framework).
(http://spo.nos.noaa.gov/projects/cads/data_references/pandh/p_and_h_eda_h_dict.html)

Source(s) of Information

Coastal Assessment Framework (CAF) Data and Digital Geographic Files
Special Projects Office, National Ocean Service, NOAA
1305 East West Highway, SSMC4, 9th Floor
Silver Spring, Maryland 20910
310-713-3000

CD-ROM(s)
Data from Selected U.S. Geological Survey
National Stream Water Quality
Monitoring Networks (WQN)
USGS Digital Data Series DDS-37, 1996
R.B. Alexander, A.S. Ludtke, K.K. Fitzgerald and T.L. Schertz
1201 Sunrise valley Drive, Mail Stop 410
Reston, VA 22092
703-648-6869

CD-ROM NCDC Environmental Data
Hydrosphere Data Products, Inc.
1002 Walnut, Suite 200
Boulder, CO 80302
303-443-7839

Digital Tide Tables 1999 High and Low Water Predictions Data (Table 2)
National Ocean Service
Products and Services Division, N/OPS3
1305 East-West Highway
Silver Spring, MD 20910
301-713-2815

Data Processing

Freshwater Inflow Data:

To obtain a master list of USGS gage stations, the Hydrosphere's Hydrodata CD-ROM, the USGS National Stream Water Quality Monitoring Networks CDs, and an unpublished list obtained directly from the USGS Water Resources office was used. The use of these three sources made it possible to compile the best available list of USGS gage stations in the US along with the best location and drainage area information.

USGS gage station daily streamflow data were processed to obtain long-term monthly flow averages. Each station was tagged to NOAA's 1999 CAF. Monthly and annual long-term averages were obtained for all USGS gage stations in the US. Using Geographic Information Systems techniques, the most downstream-gage stations were selected and tagged by visual observation on a multi-layer digital map. In addition a SAS computer program was also used to select these most downstream-gage stations for all estuaries and to insure that the most significant stations were selected. The sum of all the gage station drainage areas was then divided by the CAF's total watershed drainage area in order to compute a proration factor to be used in computing monthly and annual long-term averages of ungaged stations. The sum of all gage and ungaged streamflow information was used as the representative flow discharging to coastal waters from each watershed in the US. Main station(s) were also selected in each watershed to compute freshwater inflow statistics.

There were few cases were visual estimates of gage station drainage areas were needed. These cases were:

St_id = 02291270, drainage area = 40 sqmi
St_id = 02171700, drainage area = 400 sqmi
St_id = 02292900, drainage area = 1000 sqmi (changed original value of 25 sqmi)
St_id = 02378185, drainage area = 5 sqmi
St_id = 301425087441601, drainage area = 5 sqmi

Before computing monthly averages, non-reasonable daily streamflow values (outliers) were changed to missing for the following cases:

St_id=0807400, year = 1975, month = 10, days = 01 to 17

And records prior to 1985 were not used for the following cases because they represent pre-diversion conditions:

St_id=02171560
St_id=02172002

Data for estuaries sharing two countries (e.g. N010x and P010x) are representative only for the U.S. portion of that estuary.

Tide Data:

Digital 1999 tide predictions data received by Tom Kendrick, from NOS, NOAA; were tagged to both NOAA's 1999 CAF and 1999 Salinity 3-Zone coverage using a GIS. All formatting of these data was done using a SAS program. Visual observation and best professional judgment were used to select a main tide station located near or at the entrance to the estuary.

P&H Data (in general):

To develop the basic P&H dataset a SAS program was used to compile data from different sources. Information on watershed land and water areas was obtained from NOAA's CAF geographic files. The station file was processed to obtain long-term monthly and annual statistics by watershed. The tide file was processed to obtain tide information by watershed for the selected main tide, tide average of all tides in the watershed, and tide average of all tides in each salinity zone (seawater, mixing, and tidal fresh). To compute tidal prism volume, the salinity zone mean-range value was used when available, if not, the salinity mean-tide value multiplied by two was used instead. This salinity zone tide value multiplied by the salinity zone area provided volume for each salinity zone. The sum of all salinity zone volumes provided the tidal prism volume representative for the estuary. If tide information was not available for all three-salinity zones, the estuary mean-range was used when available, if not, the estuary mean-tide value multiplied by two was used instead. This estuary tide-value times the estuary water area provided the tidal prism volume representative for the estuary.

Before computing volumes by salinity zones, it was necessary to arbitrarily assign tide mean-range values to salinity zones where no tide information was available, primarily for large salinity zone areas. These assignments were as follows:

Estuary Code	Salinity Zone(s)	Tide Mean-Range (feet)
G140x	S, M, T	0.5
G270x	S, M, T	0.5
G200x	T	0
G230x	T	0
G120x	M	0.5
G290x	M	0.5
G300x	M	0.5
G310x	M	0.5
G320w	S	0.5
M130i	S	2.0
M130p	M	1.0
N120x	S	8.0
N160x	M	8.0
M190x	S, M	1.0
P010x	S	4.0
P050b	S	3.0
P070x	S	3.5
P080a	M	3.0
P100x	S	3.0
P120x	T	1.0
P140x	M	5.0
P140x	T	1.0
P150x	S	5.0
P160x	M	5.0
P230x	S	5.0
S010x	T	0.5
S020a	M	0.5
S020b	M	0.5
S040x	M	0.5
S150x	S	7.0
S150x	T	5.0

NOAA's original National Estuary Inventory (NEI) was processed to obtain high- and low-stratification information by estuary.

There were three estuaries; P030x, S020w and S090x that did not have representative streamflow data.

Contact(s) for Data Processing

For expert assistance with the data processing techniques used in developing this data, please contact;

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Quality Control

Making use of digital maps, hard copy maps, and best professional judgment, assignment of tide stations to each estuary was determined. Re-assignments of tide stations in a few cases was needed when latitude/longitude information for the tide station was determined to be obviously wrong in the original source file. Tidal prism volumes, prevailing tide, and stratification information was reviewed very carefully. The estuary average streamflow gage information was also reviewed very carefully.

Data have been intensely reviewed by a professional team in NOAA's Special Project Office. Their comments and observations have been incorporated in the final 1999 P&H dataset.

Citation

Physical and Hydrologic Characteristics of Coastal Watersheds. Coastal Assessment and Data Synthesis (CA&DS) System, 1999. National Coastal Assessments (NCA) Branch, Special Projects Office (SPO), National Ocean Service (NOS), National Oceanic and Atmospheric Administration (NOAA). Silver Spring, Maryland.

Applicable Digital Geography

The data are associated to distinct spatial aggregations. Geographic Information System (GIS) digital geographies are available for associating these data to their appropriate spatial aggregations. The following GIS file applies to and should be used with these data during GIS processing. To download the data or an applicable digital geography, click on the links below.

Dataset Spatial Aggregation	Applicable GIS file(s)
Coastal Watersheds	ftp://sposerver.nos.noaa.gov/datasets/CADS/GIS_Files/ShapeFiles/caf/

For Additional Information:

For additional information, refer to NOAA's Coastal Assessment and Data Synthesis (CA&DS) System, or contact;

The CA&DS team.
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