Hydrology of the Beaver Creek Estuary at Ona Beach State Park near Newport, Oregon

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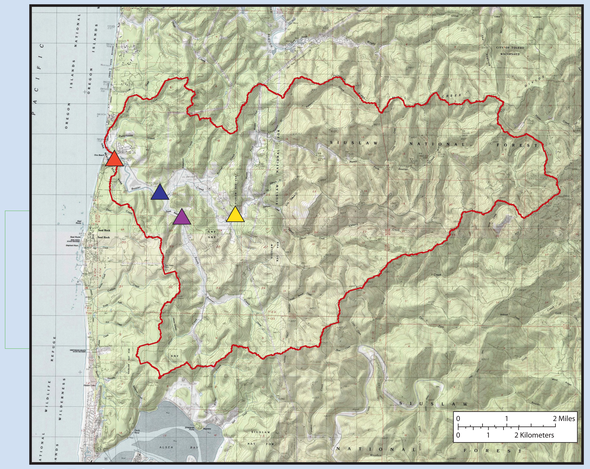
Study Objectives

1. Collect baseline hydrologic data in Beaver Creek and its estuary at several locations over time

2. Assess the extent of Pacific Ocean tidal influence by observing water level fluctuations and salinity in Beaver Creek. Measurements:

- Runoff from upland areas
- Tidal fluctuation and extent of influence, and salinity extent and duration.

Map showing Beaver Creek basin and monitoring sites



Explanation

- Beaver Creek drainage basin boundary
- Beaver Creek continuous monitor at Highway 101
- Beaver Creek continuous monitor just downstream of South Beaver Creek, 2 miles upstream from mouth.
- Beaver Creek near NW Beaver Valley Drive
- South Beaver Creek near mouth

Methods of Data Collection

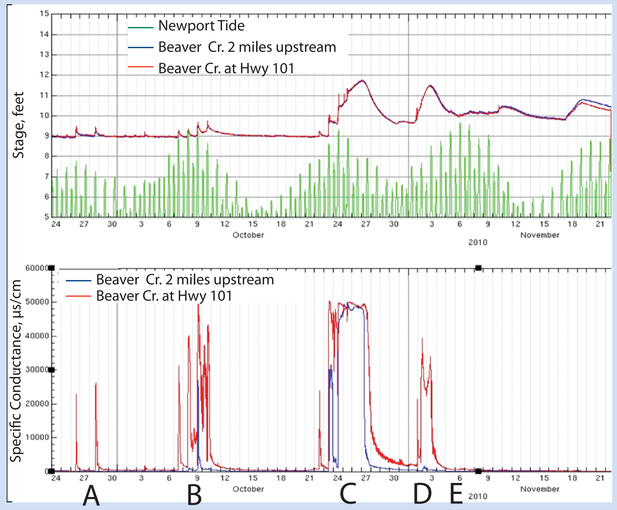
- Continuous stage, water temperature, and specific conductance (salinity) data are being collected at two sites – Beaver Creek at Highway 101 and 2 miles upstream, just downstream of South Beaver Creek.
- Integrated data loggers are used to store the data. Data are downloaded about every 8 weeks.
- In addition to continuous monitors, periodic streamflow measurements, water temperature, and specific conductance are collected at the continuous data monitoring sites and two upland Beaver Creek sites just upstream of the OPRD boundary at NW Beaver Valley Drive and near the mouth of South Beaver Creek.
- Tidal data is collected from the NOAA site Yaquina Bay at Newport (not shown on map).

View of Beaver Creek looking westward towards the Pacific Ocean south of Newport, Oregon. Photo Courtesy of Oregon Parks and Recreation Department

Study Area Description

- The Beaver Creek State Natural Area, at the terminus of a 34 square mile basin just south of Newport, in Lincoln County, is home to native flora and fauna, and is part of Ona Beach State Park, owned by the Oregon Parks and Recreation Department (OPRD).
- Beaver Creek lies between the Yaquina River to the north and the Alsea River to the south.
- The estuary extends from the mouth of Beaver Creek at the Pacific Ocean upstream approximately 3 river miles.
- OPRD has recently acquired property in the estuary and is developing plans for restoration to a more natural condition of a previously diked, channelized, and drained wetland area.
- Federal lands in the North Fork of Beaver Creek (upstream of the estuary area) are designated as a Key Watershed in the Northwest Forest Plan, making it a high priority for maintenance and restoration of aquatic habitat and species .
- The lower reaches of the Beaver Creek watershed are designated as critical habitat for coho salmon.

USGS scientist measures streamflow at Beaver Creek near NW Beaver Valley Drive during low water conditions in September 2010.



Effect of Tide and Stream Stage on Salinity in the Beaver Creek Estuary

The graph above shows Beaver Creek stage and specific conductance (salinity) data at two upstream measurment sites – Beaver Creek at Highway 101 and Beaver Creek 2 miles upstream fom the mouth – from mid-September to November 2010. The tidal stage at nearby Newport is shown as a reference to sea conditions.

A. In late September, during low Beaver Creek stage conditions and moderately high tide, short duration salinity spikes occur at Highway 101, but not 2 miles upstream. A sand riffle near the mouth of the creek (see photo, below), exposed during periods of low stage, impedes the upstream flow of denser, high salinity seawater, which flows along the bottom of the stream channel.

B. In mid-October, again during low Beaver Creek stage conditions, but during a higher tide, frequent and long-duration salinity spikes occurred at Highway 101; however, only a brief period of high salinity was detected 2 miles upstream because the riffle slowed the advance of the seawater wedge.

C. In later October, during high tide and moderate stage conditions (due to upland runoff of precipitation), a longer period of high salinity occured at both Highway 101 and at the measurement site 2 miles upstream. In this case, because of the higher stream stage, the riffle near the mouth of the creek was less able to impede the seawater wedge, which overtopped the riffle and traveled at least 2 miles up the creek channel before falling tide and flushing from upland runoff ended the seawater incursion.

D. In early November, high salinity occurred at Highway 101 during the early stages of a rising tide and moderate Beaver Creek stage conditions. This time, the seawater wedge was not able to reach the measurement site 2 miles upstream because flushing from upland precipitation runoff overcame the seawater incursion early in the tidal cycle.

E. Sustained upland flow from the earlier precipitation continued to prevent the seawater wedge from penetrating upstream, even though the tidal cycle was peaking.

View of Beaver Creek near its mouth, with low-water riffle in foreground.

Future Studies

Additional baseline data will be collected over several seasons to evaluate the results of ongoing restoration efforts. Knowldege of temperature and salinity characteristics within the basin will guide park managers in considering floral and faunal possibilities for future restoration efforts.

Resources

Oregon Parks and Recreation Department

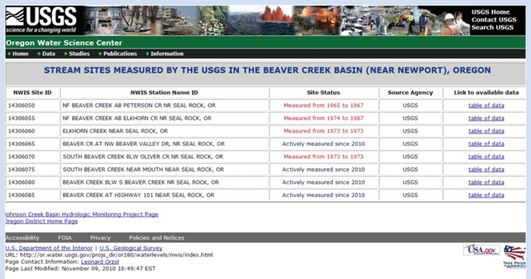
- *http://www.oregonstateparks.org/park_261.php*

USGS Beaver Creek Web page and data online

- *http://or.water.usgs.gov/beaver_creek/*

Real-time Monitors and Streamflow:

- *http://or.water.usgs.gov/beaver_ona/streams/index.html*



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