Flood Hazards - Part I

Lecture Objectives

-overview of the history and roles of the U.S. Army Corps of Engineers

-measurements of river discharge

Read for Wednesday:

Web page: http://www.coast2050.gov/2050reports.htm

-Project overview

-Executive Summary (use links to find this)

-what are the key problem areas?

-what solutions are proposed?

Quiz on Saffir-Simpson scale:

What factors are used to describe the magnitude of hurricanes?

Bonus: how many levels are there in the scale?

Quiz on Saffir-Simpson scale:

What factors are used to describe the magnitude of hurricanes?

Wind speed
Storm surge (+ flooding)

Added later: Atmospheric pressure, structural damage
No accounting for levels of damage

Bonus: how many levels are there in the scale?

5
No reason to go higher, until structures are engineered to withstand hurricanes with higher wind speeds and surges.

Fishcetti Paper: Drowning New Orleans

key threats

-land loss acceleration by sediment starvation

-storm surges: New Orleans rapidly inundated with no evacuation routes open

-subsidence

-intrusion of salt water

key solutions

levee cuts: allow some upstream removal of waters and sediments to wetlands

New Orleans: block Gulf access to Lake Ponchartrain with sea walls/gates

navigation: close eastern Gulf shipping outlets; open new channel to south and west; stop dredging of mouth to allow some migration and sediment accumulation

U.S. Army Corps of Engineers - Origins

-1775: Continental Congress authorized the first Chief Engineer whose first task was to build fortifications near Boston at Bunker Hill.

-1802: a team (corps) of engineers was stationed at West Point and constituted the nation's first military academy. The United States Military Academy was under the direction of the Corps of Engineers until 1866.

-New Orleans/Mississippi: provide protection of key harbor, from fears of future British invasions. It's additional responsibility was to ensure the navigability of the Mississippi (officially, in 1824).

USACE - Roles in Hazard Mitigation

-Planning, designing, building and operating water resources and other civil works projects (Navigation, Flood Control, Environmental Protection, Disaster Response, etc.)

-Designing and managing the construction of military facilities for the Army and Air Force. (Military Construction)

-Providing design and construction management support for other Defense and federal agencies. (Interagency and International Services)

Services for the Public

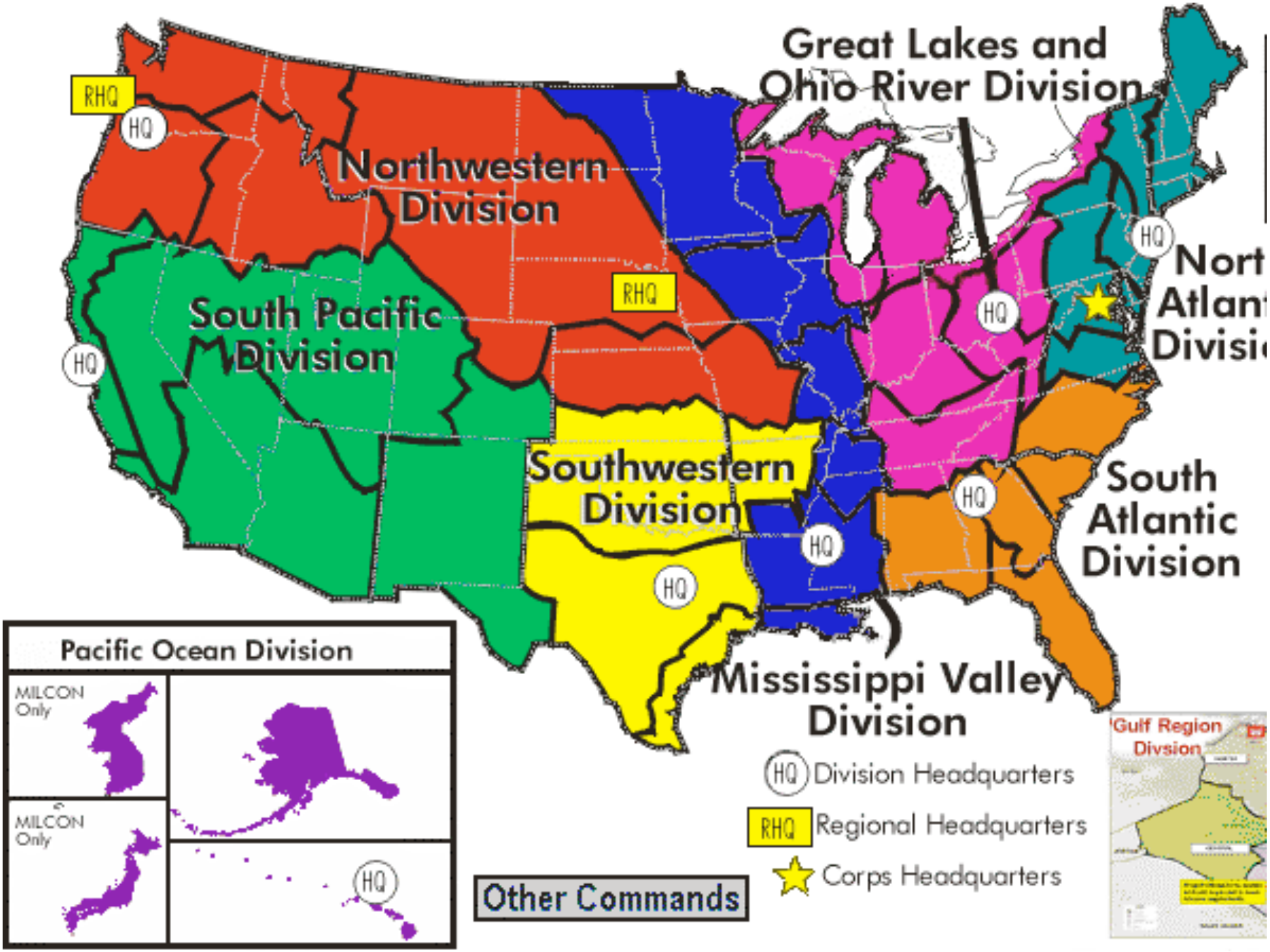
On This Page

USACE - size and location

-34,600 civilian and 650 military men and women, stationed across the country and internationally.

-Headquarters in Washington, D.C.

-Where are we? Great Lakes and Ohio River Division


Great Lakes and Ohio River Division
RHQ
HQ
Northwestern Division
RHQ
South Pacific Division
HQ
HQ
Nort
Atlan
Divisi
Southwestern Division
HQ
HQ
South Atlantic Division
HQ
Mississippi Valley Division
Pacific Ocean Division
MILCON Only
MILCON Only
HQ
Other Commands
HQ Division Headquarters
RHQ Regional Headquarters
Corps Headquarters
Gulf Region Divsion

USACE - funding/budget

2002 information

-Funding from Congress - current annual budget of over $12 billion. The "backlog" in unfunded construction approved by Congress is approximately $38 billion. Only about $2 billion a year is provided for new construction. On top of this, over the past several years, there has been a lot of deferred maintenance. This will grow from about $435 million to an $825 million "backlog" in FY2002.

-The Bush Administration proposed to “focus on the high use commercial harbors or main channels on the Mississippi River rather than a ‘salami slice’ budget”…

USACE - Head

-Lieutenant General Carl A. Strock, holds a Bachelor of Science degree in civil engineering from the Virginia Military Institute and a master's degree in civil engineering from Mississippi State University. He is a Registered Professional Engineer.

Prior to his selection as the Chief of Engineers and Commanding General of the U.S. Army Corps on Engineers, he served as Director of Civil Works, Headquarters, U.S. Army Corps of Engineers. In September 2003, he returned from a six-month tour of duty in Iraq as the Deputy Director of Operations for the Coalition Provisional Authority. His previous assignment was Director of Military Programs, Headquarters, U.S. Army Corps of Engineers.

Following the retirement of the previous head, in 2004 Strock was nominated by the President and confirmed by Congress.

USACE - Role in Latin America

-USACE maintains a “mobile” office, which has duties in the Gulf states, and parts of Central and South American. Missions include:

-military base support (e.g., utility services, construction, demolition, security)

-disaster assistance (repair of damaged infrastructure; cleanup, large equipment)

-planning (real estate assessment, property surveying)

-environmental issues (cleanup, waste treatment)

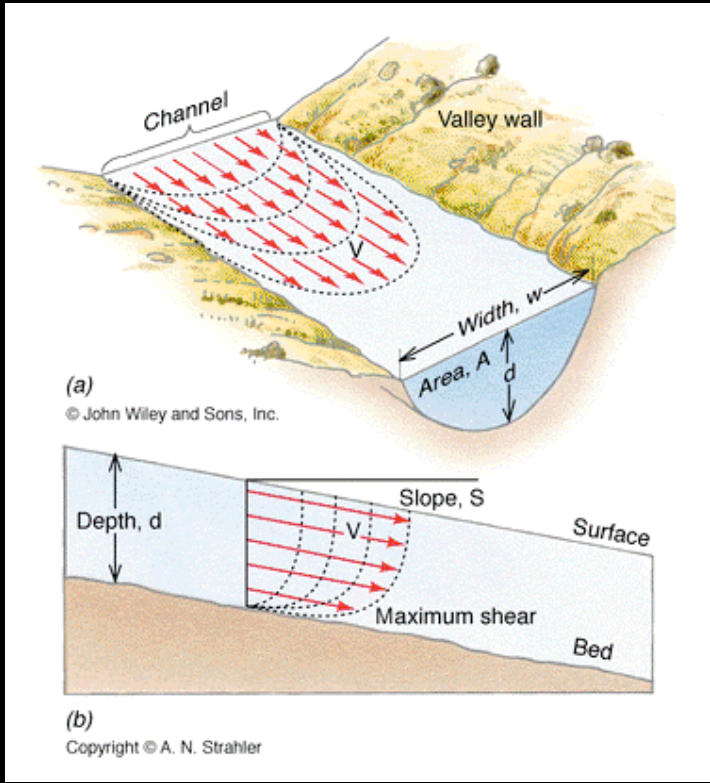
River Discharge Measurements

Overview

a. discharge measurement methods
b. velocity relationship to discharge
c. Weirs and rating curves
d. Creating a discharge-height chart (rating curve)
e. Rating curve characteristics
f. Uncertainties in using rating curves

Discharge measurement methods

Velocity relationship to discharge



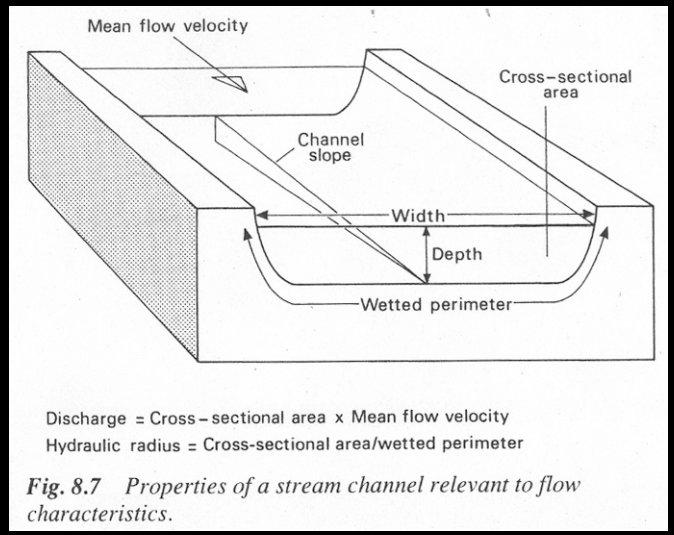


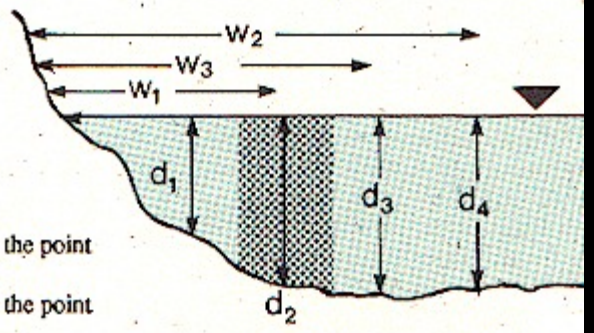
Fig. 8.7 Properties of a stream channel relevant to flow characteristics.

How to Calculate Flow

Calculating discharge from each of the width intervals:

$$q_2 = v_2 d_2 (w_3 - w_1)/2$$

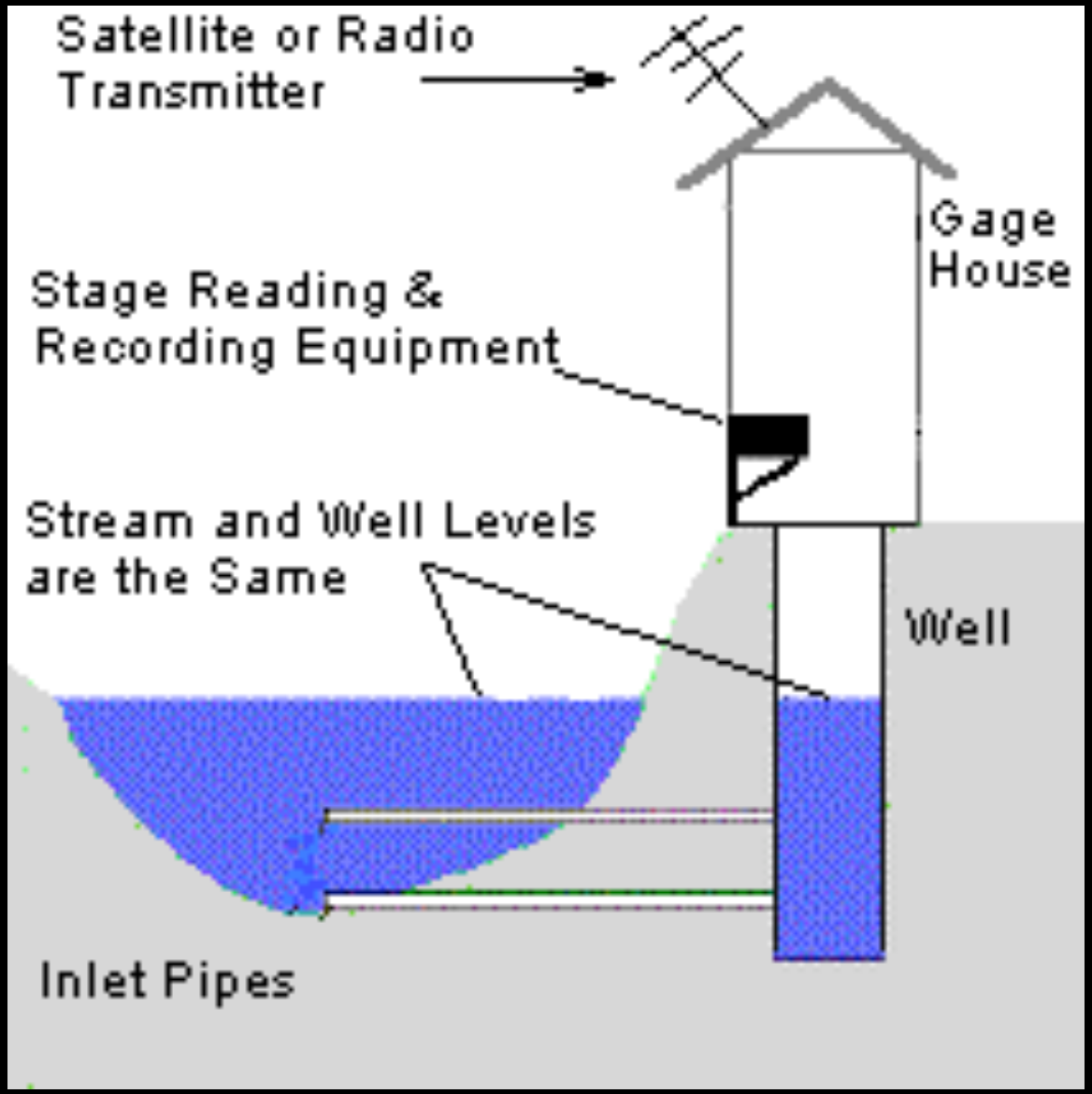
where: q_2 = discharge at width interval 2 (cfs)
v_2 = velocity measure at width interval 2 (ft/sec)
d_2 = depth at interval 2 (feet)
w_3 = distance from the bank or initial measuring point to the point following interval 2 (feet)
w_1 = distance from the bank or initial measuring point to the point preceding interval 2 (feet)



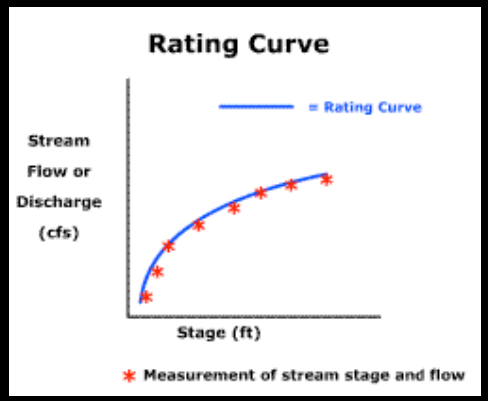
Calculate the total discharge (flow) as the sum of each of the partial discharges.

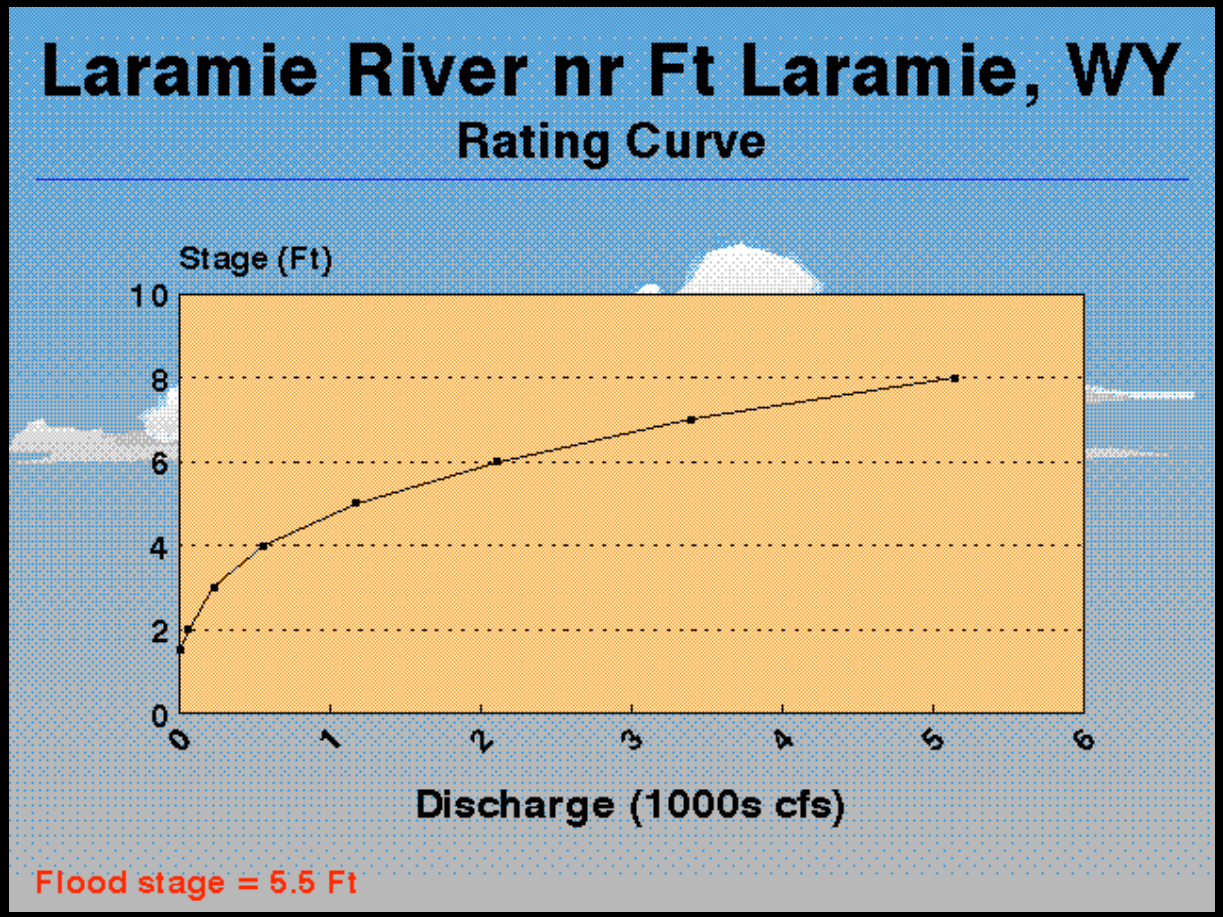
$$Q = q_1 + q_2 + q_3 + q_4 \ldots . q_n$$

Weirs and flow measurements



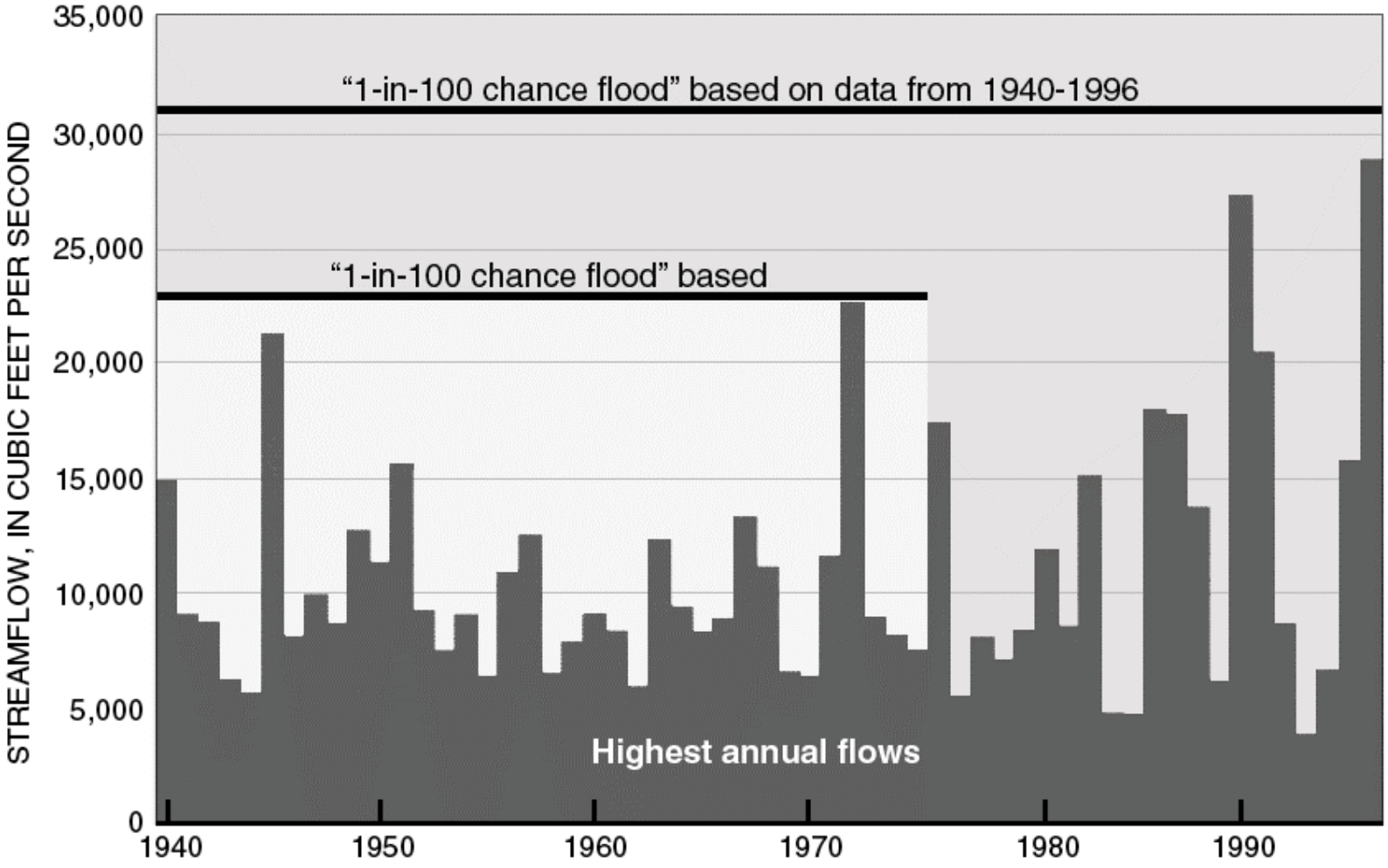
Rating curve characteristics (not a straight line)

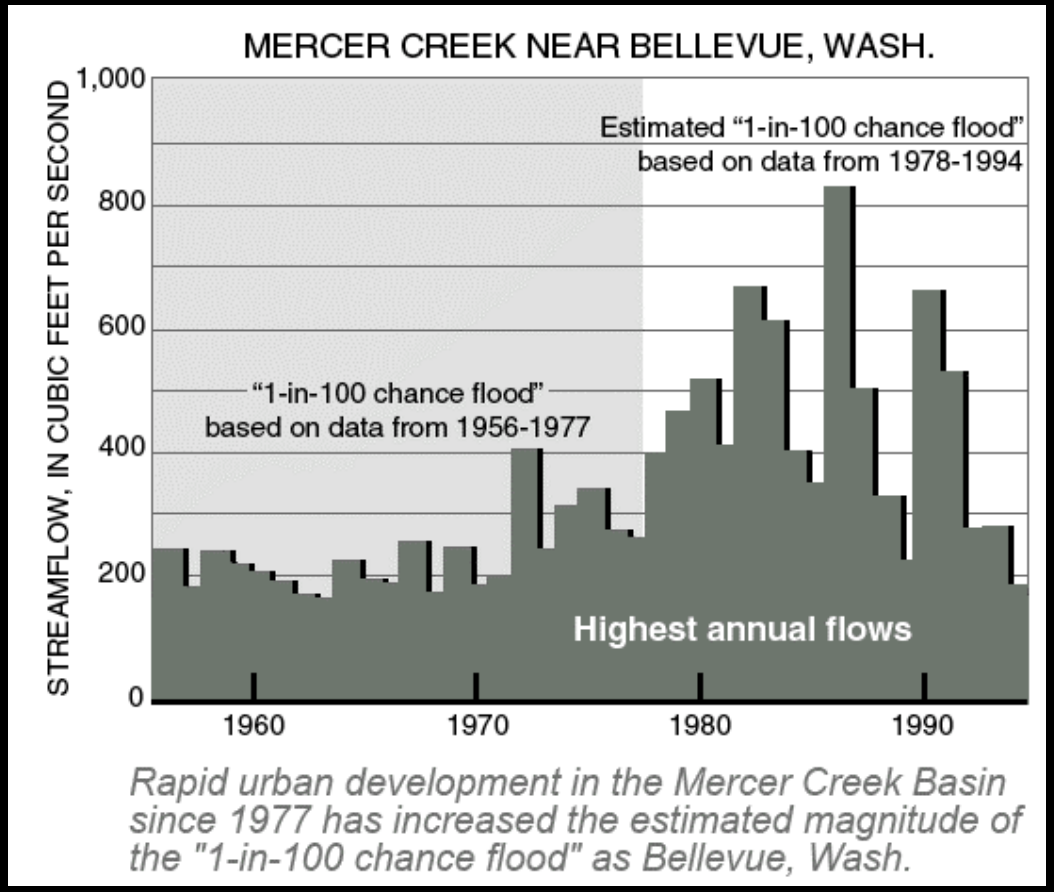




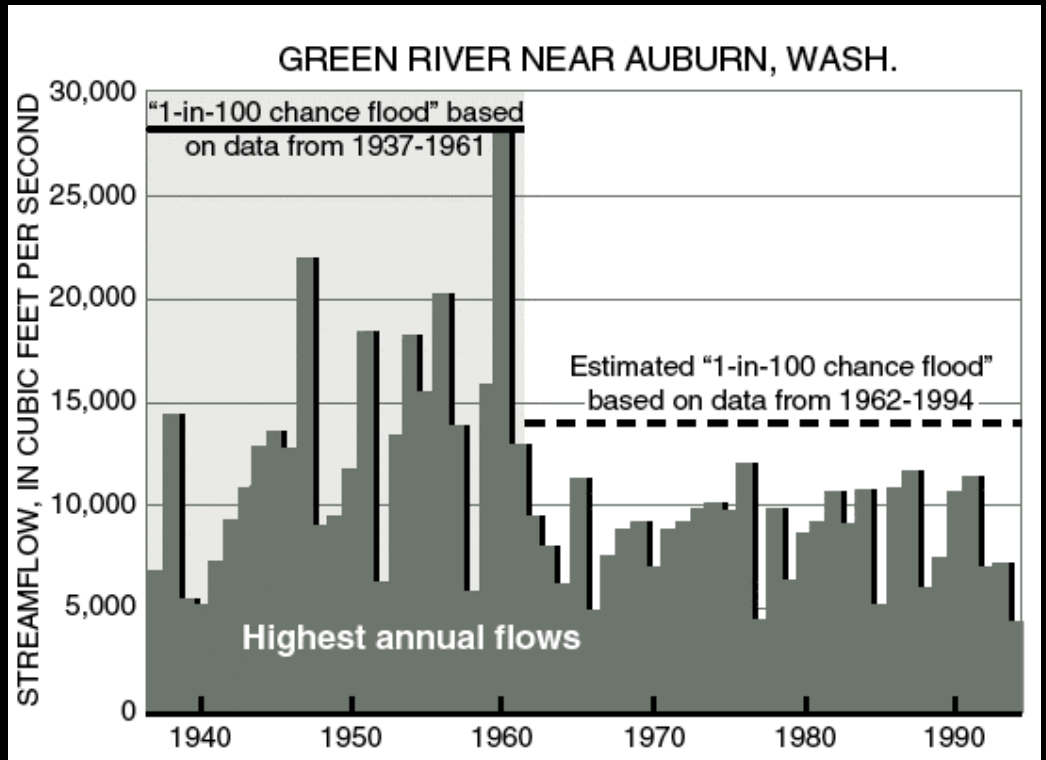
Uncertainties in using rating curves:

-channel geometry (erosion, channel straightening)
-watershed evolution (incision, sedimentation)
-climate change (precipitation)
-construction (change infiltration)


35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
STREAMFLOW, IN CUBIC FEET PER SECOND
"1-in-100 chance flood" based on data from 1940-1996
"1-in-100 chance flood" based
Highest annual flows
1940
1950
1960
1970
1980
1990
CHEHALIS RIVER NEAR DOTY, WASH.



Rapid urban development in the Mercer Creek Basin since 1977 has increased the estimated magnitude of the "1-in-100 chance flood" as Bellevue, Wash.



The completion of Howard Hanson Dam on the Green River has decreased the magnitude of the "1-in-100 chance flood" as Auburn, Wash. since 1961.