River Forms and Processes – Stream Flow, Hydrographs and Flood Frequency Analysis

River Forms

- Most rivers begin life as a tiny stream running down a mountain slope.
- They are fed by melting snow and ice, or by rainwater running off the land.
- The water follows cracks and folds in the land as it flows downhill.
- Small streams meet and join together, growing larger and larger until the flow can be called a river.

Stream Flow

Stream Flow

- **Stream flow, or discharge, is the volume of water that moves over a designated point over a fixed period of time.**
- **In another words, the volume of water flowing in a stream channel expressed as unit per time.**
- **It is often expressed as cubic feet per second (ft^3/sec or cfs).**
- **The flow of a stream is directly related to the amount of water moving off the watershed into the stream channel.**
- **It is affected by weather, increasing during rainstorms and decreasing during dry periods.**

Equation: Flow = ALC / T

Where:

A = Average cross-sectional area of the stream (stream width multiplied by average water depth).

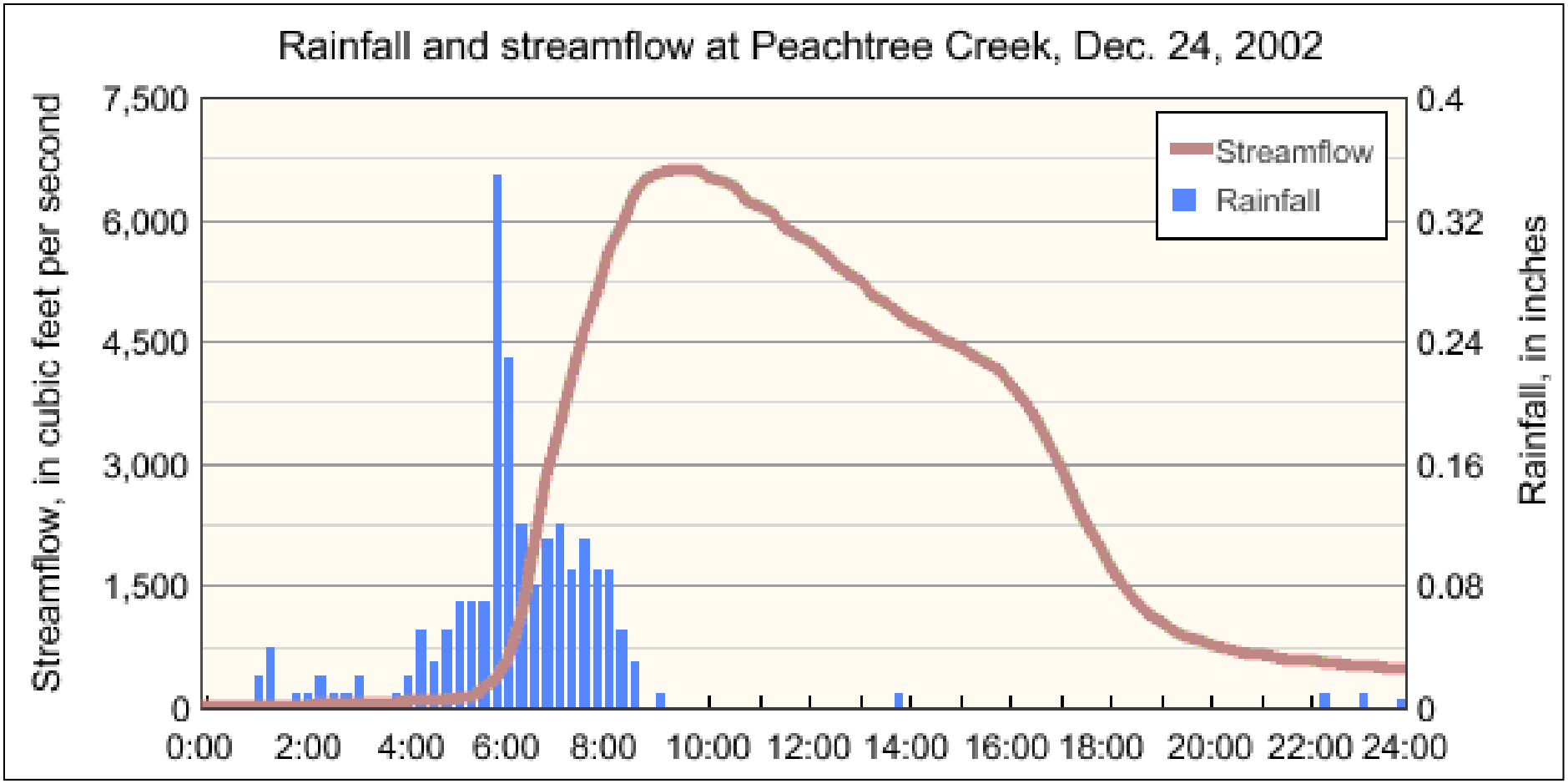
L = Length of the stream reach measured (usually 20 ft.)

C = A coefficient or correction factor (0.8 for rocky-bottom streams or 0.9 for muddy-bottom streams). **This allows you to correct for the fact that water at the surface travels faster than near the stream bottom due to resistance from gravel, cobble, etc. Multiplying the surface velocity by a correction coefficient decreases the value and gives a better measure of the stream's overall velocity.**

T = Time, in seconds, for the float to travel the length of L

Hydrograph

- A graph showing the rate of flow (discharge) versus time past a specific point in a river or channel.
- The rate of flow is typically expressed in cubic meters or cubic feet per second (cms or cfs).


Rainfall and streamflow at Peachtree Creek, Dec. 24, 2002
Streamflow, in cubic feet per second
Rainfall, in inches
7,500
6,000
4,500
3,000
1,500
0
0.4
0.32
0.24
0.16
0.08
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
24:00
Streamflow
Rainfall

Flood hydrographs

- **Graphs that show how a drainage basin responds to a period of rainfall.**
- ग्राफ के द्वारा वर्षा ऋतु में अपवाह क्षेत्र के व्यवहार को दर्शाया जाता है।
- **They are used to plan for flood situations and times of drought.** इसका उपयोग बाढ़ की स्थिति एवं सूखे के समय का पता लगाने के लिए किया जाता है।
- **Key terms on the hydrograph, illustrated below, are:**

Flood Frequency Analysis

- **These graphs are then used to estimate the design flow values corresponding to specific return periods which can be used for hydrologic planning purposes.** इस ग्राफ द्वारा क्षेत्र में आगामी वर्षों में जल प्रवाह के अनुमान लगाया जाता है जिसका का उपयोग सरकार द्वारा जल संबंधी योजनाओं के निर्माण में किया जाता है।
- **FFA plays a vital role in- Construction in dams, bridges, culverts, levees, highways, sewage disposal plants, waterworks and industrial buildings.** एफएफए की बांध, पूल, भूमिगत नाली या पूलिया, तटबंध, राजमार्ग, शहरी जल ट्रीटमेंट प्लांट, उद्योग आदि के निर्माण में महत्वपूर्ण भूमिका होती है।

Flood Frequency Analysis

- **These estimates are useful in providing a measurement parameter to analyse the damage corresponding to specific flows during floods.** इसके द्वारा बांढ़ के समय होने वाले नुकसान का विश्लेषण किया जा सकता है।
- **Also useful in flood insurance, flood zoning activities and protection against economic losses due to maintenance of structures.** इसके द्वारा बाढ़ संबंधी नुकसान का बीमा, बाढ़ प्रदेश की पहचान, आर्थिक नुकसान के प्रति योजना एवं होने वाले नुकसान की मरम्मत की योजना बनाई जा सकती है।