

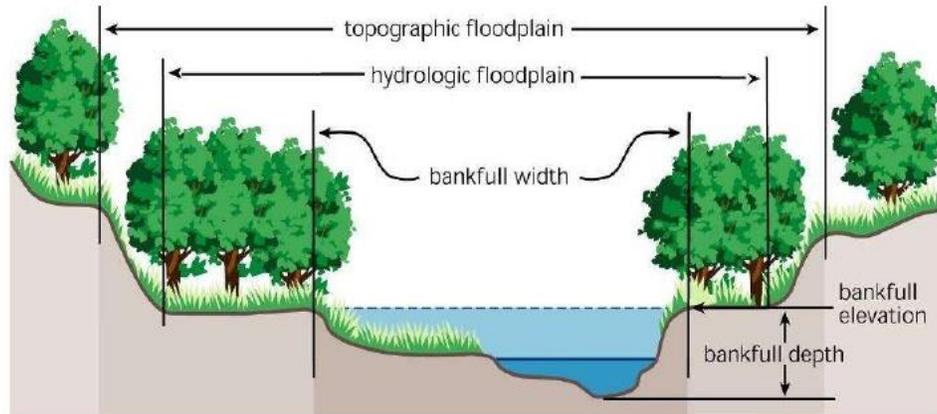
## Chapter 7: Natural Instruments of Watershed Change

Natural agents of change (below) directly affect watershed ecosystems and their evolution.

- I. **Flooding** – critical for 3 main reasons: redistributes organic material/organisms, creates an opportunity for exchange of sediment/nutrients in floodplains, and helps to maintain healthy native plant diversity
  - a. Flooding may lead to more extensive colonization by invasive species in recently disturbed areas
  - b. Seasonal flow variations act as a selective force for watershed species and can shape the physical area
    - i. Ex. bankfull flood stage (see figure 1) is the primary determinant of channel and floodplain shape/location, which affect size of materials transported and streambed stability. This affects the density/make-up of benthic organisms (freshwater clams, mussels, etc.)
- II. **Drought** – has major impact on water chemistry by altering groundwater/surface water ratio (changes in transparency, light, thermal characteristics of lakes/streams)
  - a. Many organisms depend on ephemeral waters (temporary water sources) that dry up during drought
    - i. birds/amphibians may use sites as feeding or breeding grounds and depressed population numbers in years following a drought may occur
  - b. Affects upland areas of watersheds (dieback of less-tolerant tree species, crop failures, etc.)
- III. **Fire** – frequency and intensity controlled by soil moisture, ignition sources, and fuel load (which can build up over time with longer intervals between fires)
  - a. Typically occur during dry summer periods in TX (uplands more prone than riparian areas)
  - b. Bastrop County Complex fire – 9/4/2011, most destructive fire in state history (32,000 acres)
  - c. Fire can be beneficial to ecosystem (ex. lodgepole pine and jack pine rely on heat from fires to open cones for seed dispersal) but are very destructive in recent history due to build-up of fuel load
    - i. Some areas have species adapted for fire resistance (thick bark, dropping of lower limbs)
    - ii. More intense fires kill mature trees, allowing for succession to occur (small ‘patchy’ fires promote diversity in both flora and fauna)
    - iii. Invasives that create high fuel loads (ex. giant reed and salt cedar) can rapidly spread after fire
- IV. **Windstorms** – one factor that maintains spatial mosaic of vegetation in landscape; effects are ‘patchy’ due to variations in local topography and vegetation
  - a. Small groves of old-growth trees often susceptible to windstorms (resistance factors may include less surface area exposed, large root mass, and well-developed soil)
  - b. Windstorms can introduce large amounts of soil to water sources
- V. **Erosion/Sediment Deposition** – may have drastic effects on watersheds but are natural processes
  - a. Sediment often from upstream (depending on interaction between upland topography and discharge of river) and may determine channel shape and thus affect biological/physical characteristics
  - b. Factors that influence location/nature of erosion: vegetation cover, climate, soil type, and slope gradient
  - c. Does not occur at constant rates – highly active during events such as flooding or windstorms
  - d. Widening and rise in elevation of channel (due to sediment movement and deposition), filling of pools, and braiding (see figure 2), resulting in multiple active channels separated by sediment ‘bars’

## Bankfull Stage

“corresponds to the discharge at which channel maintenance is the most effective, that is, the discharge at which moving sediment, forming or removing bars, forming or changing bends and meanders, and generally doing work results in the average morphologic characteristics” (Dunne and Leopold, 1978)



Stream Corridor Restoration: Principles, Processes, and Practices. 1998. Federal Interagency Stream Restoration Working Group.

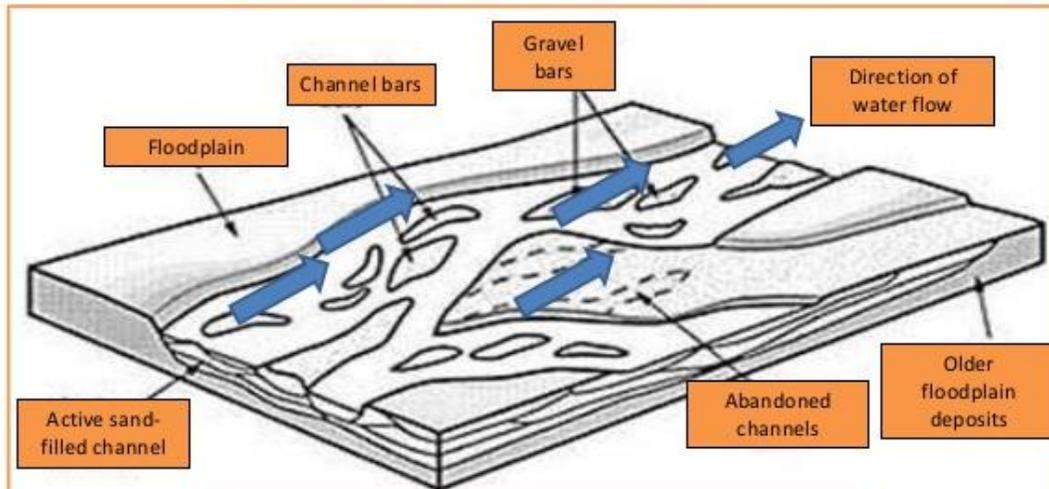
Figure 1: Description of 'bankfull flood stage' and associated terms

Landform:

River Braiding

Location:

Lower course – usually close to the delta/mouth (Can be found upstream)



### Main characteristics

1. Small islands or eyots of deposited material within the channel.
2. A network of small intertwining channels converge and diverge around the eyots.
3. At times of high discharge, braided streams carry a large load of coarse material.
4. Braiding is a characteristic of streams with a variable discharge

Figure 2: Characteristics of a 'braided' river with associated features