If you learned nothing else from this course, it should include this:

1. **If you build it they will not necessarily come!** Aim to restore processes – geomorphic, hydrologic, & ecological – not just structure.

2. **Every stream has a history and context.** Context of restoration site at multiple scales must be determined BEFORE you make a decision about whether to restore a stream AND before you develop a restoration design. 

   - **Large scale** – consider physiography, climate (e.g., rainfall), geology, and stream history which influence hydrology, sediment delivery, and ecological potential.
     - e.g., along the fall line, sediment flux is hard to predict & may require measurements.
     - e.g., life histories have evolved in response to sediment & flow regime.

   - **Watershed scale** – consider position of your restoration site within its watershed because this context may determine the hydrology, sediment delivery, and ecological potential.
     - e.g., if site is downstream of areas likely to be extensively developed, channel design may need to accommodate high sediment delivery initially but low sediment delivery after build out.
     - e.g., land use higher in the watershed will influence nutrient delivery to your site and barriers to dispersal (e.g., culverts) may prevent colonization by fish, etc.

   - **Reach scale** – consider average hydraulic condition (channel geometry, composition, bed roughness) because no stream fits a classification perfectly and the design has to be consistent with the ongoing dynamics in the stream; consider reach scale processes that are important for the given ecological objectives … if the goal is fish or bug related, then underlying processes that support these must be restored.
     - e.g., energy flow (a process) in mountain streams in Maryland: since the food base is allochthonous *inputs* of litter from native plants must be restored.
     - e.g., nutrient uptake (a process) may be important to coastal stream restoration so reach scale retentiveness must be increased so organic matter and denitrifying bacteria hang around in low oxygen areas & do their thing.

   - **Feature scale** – consider local hydraulics because they influence reach average stability and may be more relevant to monitoring channel stability on engineering time scales; consider within reach features relevant to ecological objectives.
     - e.g., adding large substrates that never move may be important to biotic persistent in streams in rendered more flood prone by urbanization.

3. **Restoration outcome uncertainty can be estimated.** Every metric you use in planning and designing a restoration project has some amount of uncertainty associated with it; this is true for both physical and ecological metrics. This uncertainty may come from error in measurement/estimation methods or from environmental variability that is inherent to natural systems. Estimating this uncertainty and considering it in the plan, design, and evaluation is essential. (thus, the value of Monte Carlo methods, the concept of *windows of variability*, etc).

4. **Threshold channels are easier to design geomorphically but are the most difficult projects with respect to the ecology.** Because the channel is held in place, hydrologic & geomorphic processes have not been restored and thus ecological processes are rarely self-sustaining. Decomposition, production & metabolism, and nutrient transformations are intimately tied to flow and sediment interactions.

5. **No two streams are exactly the same.** In order to forecast the future of a stream, you must a) determine the boundary conditions (e.g., sediment, water supply, regional biodiversity, landscape connectivity), AND b) apply your geomorphic and ecological understanding of the mechanisms by which a stream changes over time and space.
There are no set methods for restoring a stream – every stream does not fit neatly into a box. THIS IS WHY AN UNDERSTANDING OF THE GEOMORPHIC AND ECOLOGICAL PRINCIPLES UNDERLYING STREAM RESTORATION IS FUNDAMENTAL TO SUCCESS IN RESTORATION.