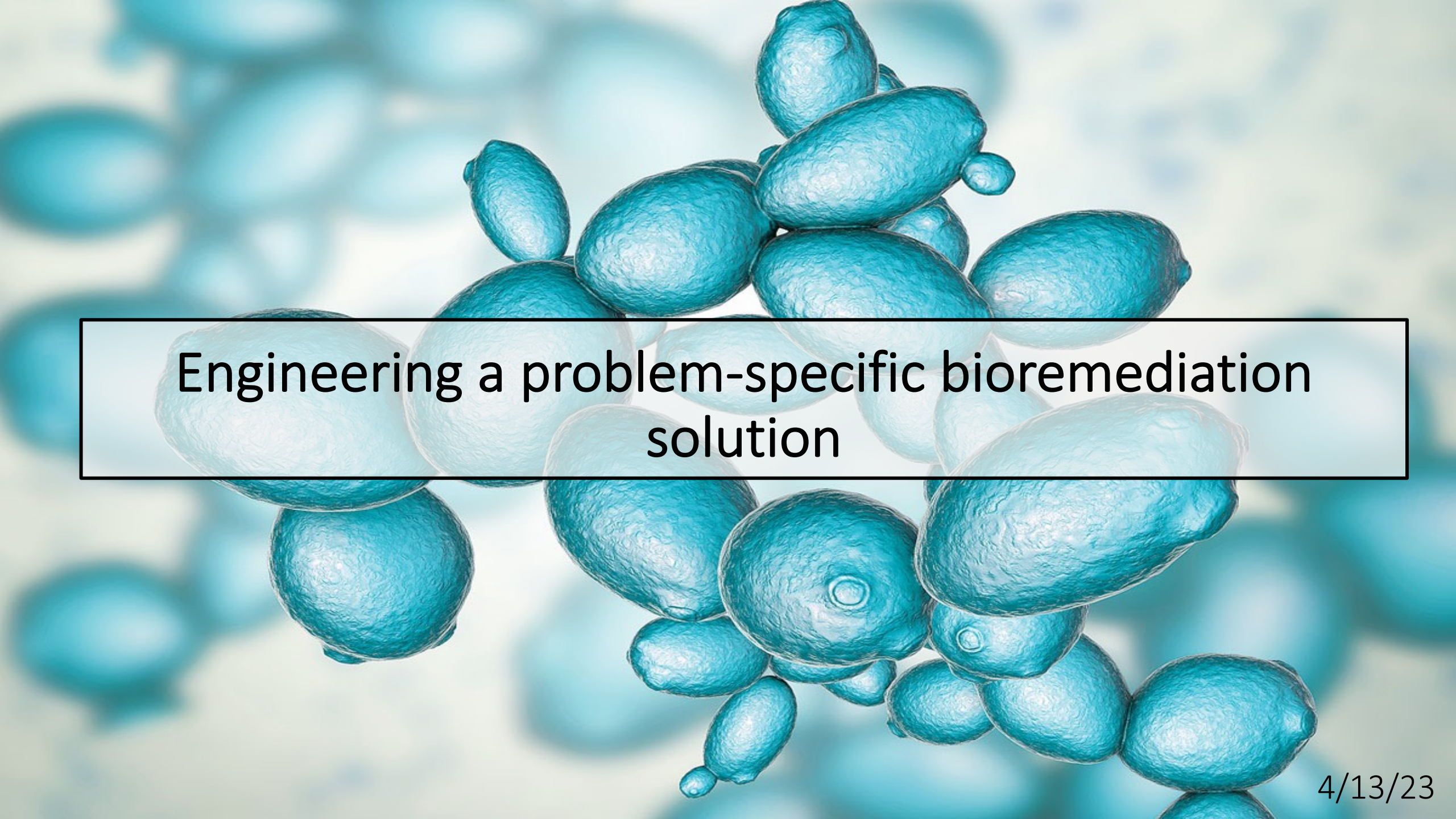


Engineering a problem-specific bioremediation solution

4/13/23

Module Outline

- M2D1: Environmental heavy metal contamination
- M2D2: Model system – target selection and engineering approach
- M2D3: Model system – choosing a chassis host
- M2D4: Screening a system—assessing features of a bioremediation system
- M2D5: Analysis of elemental metals – laboratory and field approaches
- **M2D6**: Engineering a problem-specific bioremediation solution
- M2D7: Applying remediation strategies—advantages and pitfalls
- M2D8: Comm Lab

Intro

Design

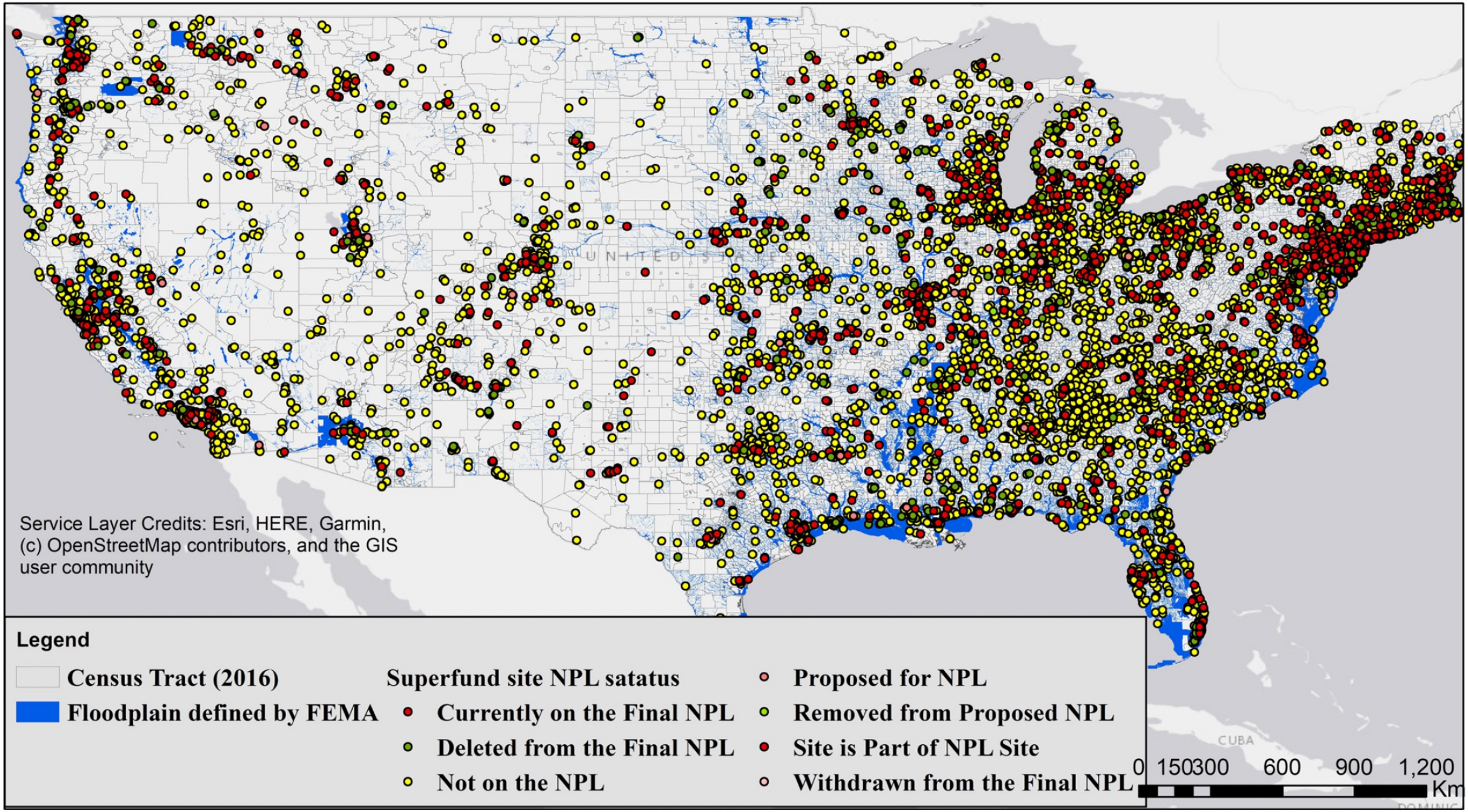
Test

Apply

Review

Superfund Sites in the United States

- Locations in the US that have been contaminated with hazardous substances through improper management
- National Priority List (NPL)
- Potentially responsible parties (PRPs)
- Shorter life expectancy is correlated with living near a superfund site
  - Variables like lower socioeconomic status or living near a site that is not being cleaned up increase susceptibility (Kiaghadi et al. 2021)


Service Layer Credits: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
Legend
Census Tract (2016)
Floodplain defined by FEMA
Superfund site NPL satatus
Currently on the Final NPL
Deleted from the Final NPL
Not on the NPL
Proposed for NPL
Removed from Proposed NPL
Site is Part of NPL Site
Withdrawn from the Final NPL
CUBA
0 150300 600 900 1,200
Km

Establish information to begin

- Where is the site?
- What metal(s) have been released at the site?
- How were these metals released?
- What has been done to clean up the site so far?

Consider your potential strategy

- If you were to propose a project investigating the potential for bioremediation at the site, how would you handle these parameters? Why?

1. Remediation approach (transformation, accumulation, adsorption, etc…)
   - M2D3 lecture
2. If you wanted to genetically engineer a system, what class of target would you chose? (transporter, enzyme, extracellular proteins)
   - M2D2 lecture
3. What chassis would you use to deploy your remediation system
   - M2D3 lecture
4. How would you identify metal changes?
   - M2D4-M2D5 lectures

- Write down ideas in google doc: https://docs.google.com/document/d/1D0Ibrg635AM71MvMf-P85xY6R8Xq7brXokqdkYF6kDg/edit?usp=sharing