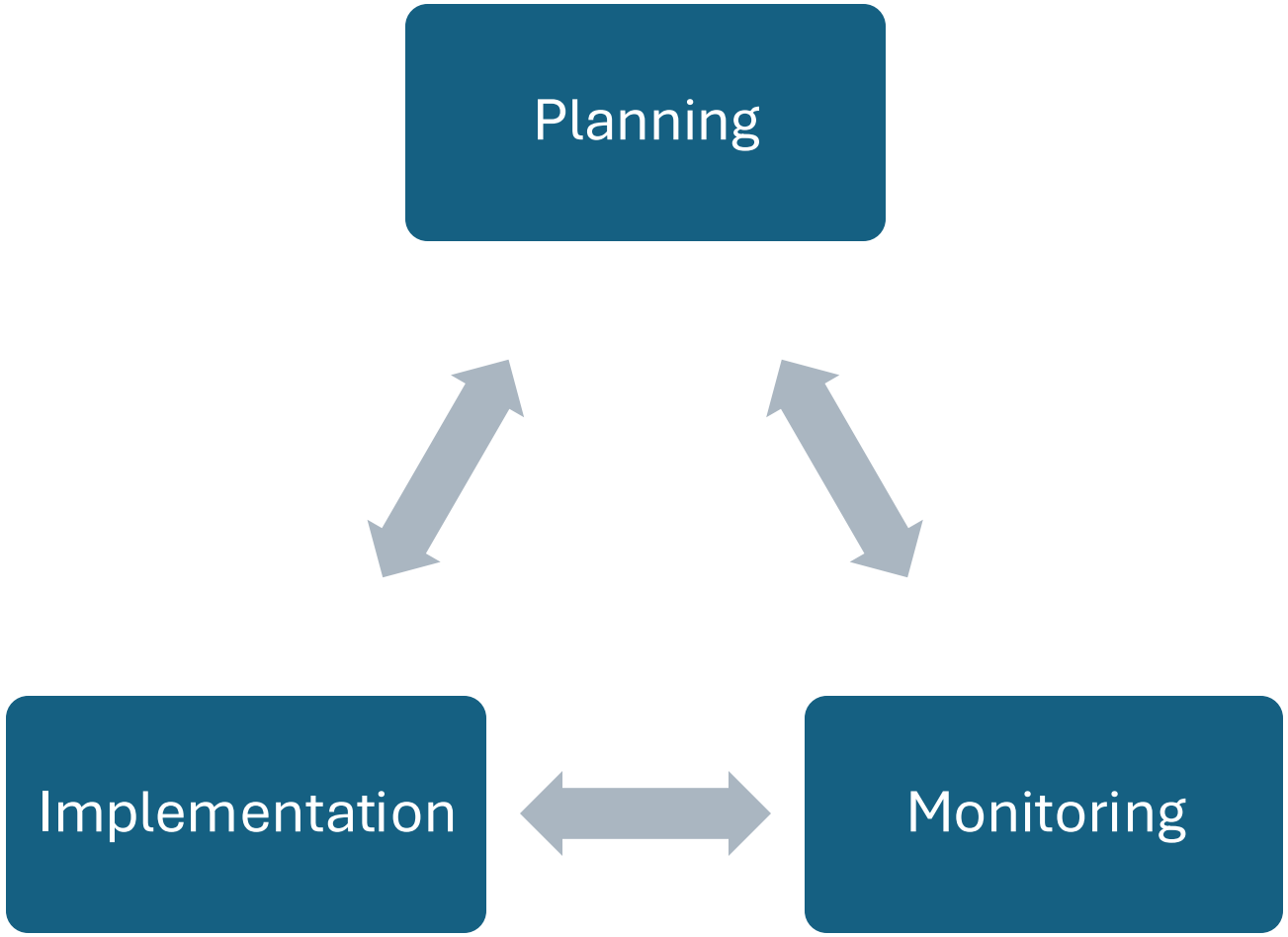
Soil stockpile age does not impact vegetation establishment in a cold, arid natural gas field

Michael Curran, PhD, CERP, CWB

Josh Sorenson

Tim Robinson

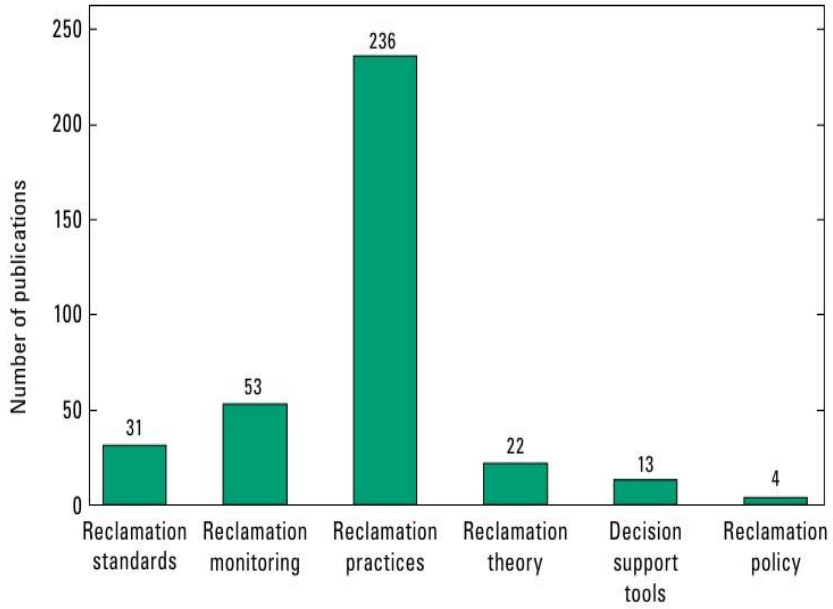
Reclamation as a process



Implementation

USGS
science for a changing world

Annotated Bibliography of Scientific Research Relevant to Oil and Gas Reclamation Best Management Practices in the Western United States, Published from 1969 through 2020



Stockpiles

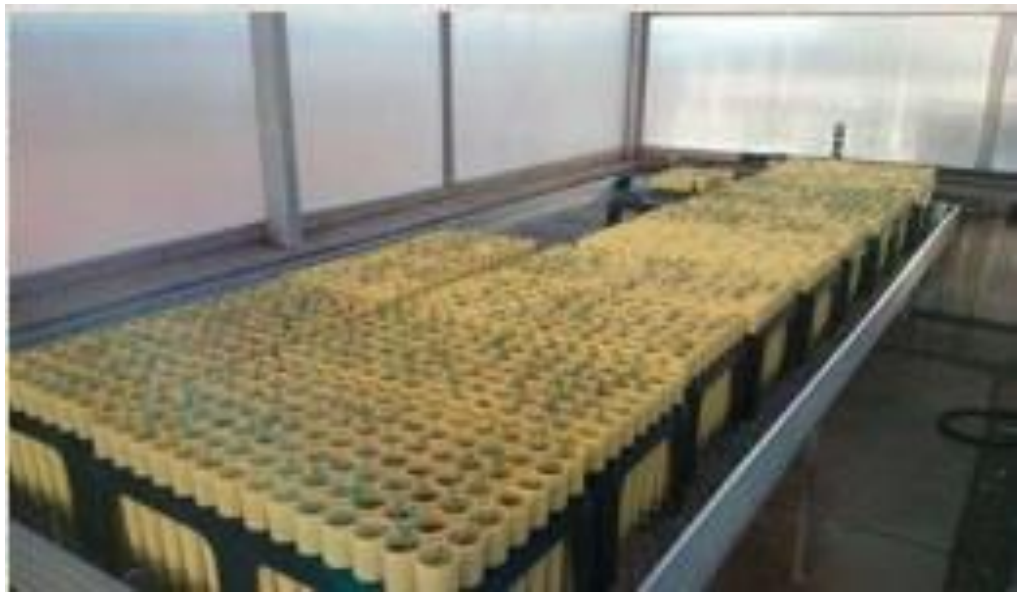
- Less than 10% of studies in Annotated Bibliography discuss stockpiles
- Most focused on soil microbiome
- Most focused on mining
- Seed bank may not stay intact
- Some concern for anaerobic activity

Study Area – Jonah Field

- 39 frost-free days per year
- 2-9 inches of precipitation
  - Unpredictable
- ~7,000 feet elevation
- Sandy loam soils
- Poorly developed organic horizons
- Old stands of sagebrush dominate the reference system

Soil management practices in Jonah

- Early development – standard 6” of soil removed for stockpiles
- More recently – operator strips soil at depth appropriate to site – ranging from <2” - >8” in effort to avoid mixing subsoil material
- If stockpile will last more than one growing season, it is seeded with the same mix used in reclamation for stabilization and to maintain soil biota
- Subsoil in construction area is deep ripped at 24” before spreading topsoil back across pad
- Reclamation is initiated across ~70-80% of initial disturbance area, with remaining soil left in stockpile until final reclamation
- Previous work shows spreading, initiating reclamation and redisturbing soil limits reclamation potential



Recent Technological Innovations

- Directional/horizontal drilling allows for access to underground reserve 2-4 miles away
- Multiple well pads are larger in size but reduce road and pipeline footprint, reduce impacts on wildlife
- May need multiple years of flowback data to understand pad expansion

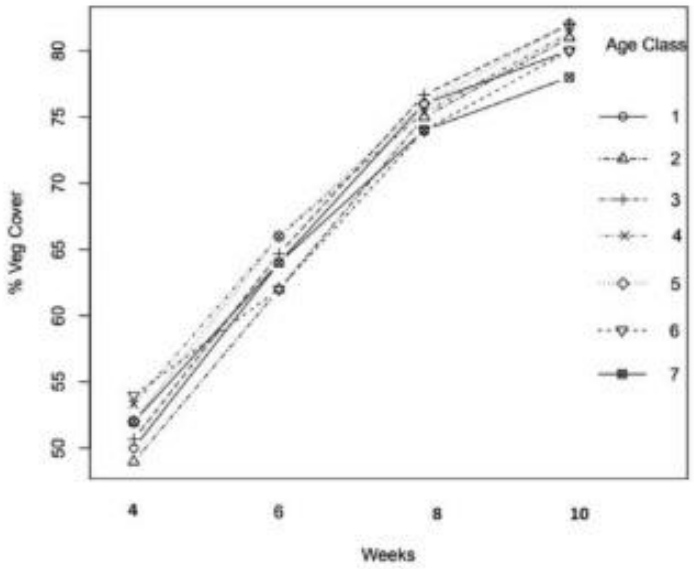
Reclamation Sciences (2024) 1:41–47
https://doi.org/10.21000/RCSC-202300004

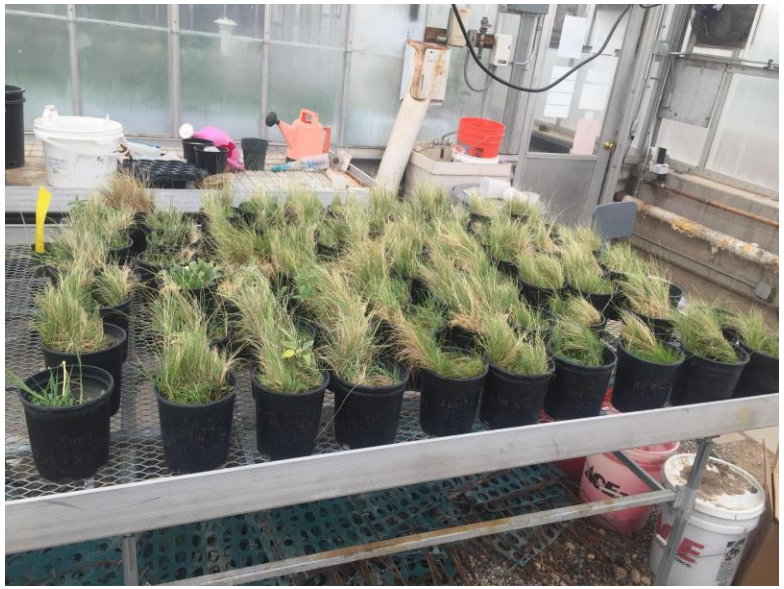
SHORT COMMUNICATION

Soil Stockpile Age Does Not Impact Vegetation Establishment in a Cold, Arid Natural Gas Field

Michael F. Curran[1,2,3] · Joshua R. Sorenson[4] · Timothy J. Robinson[5]

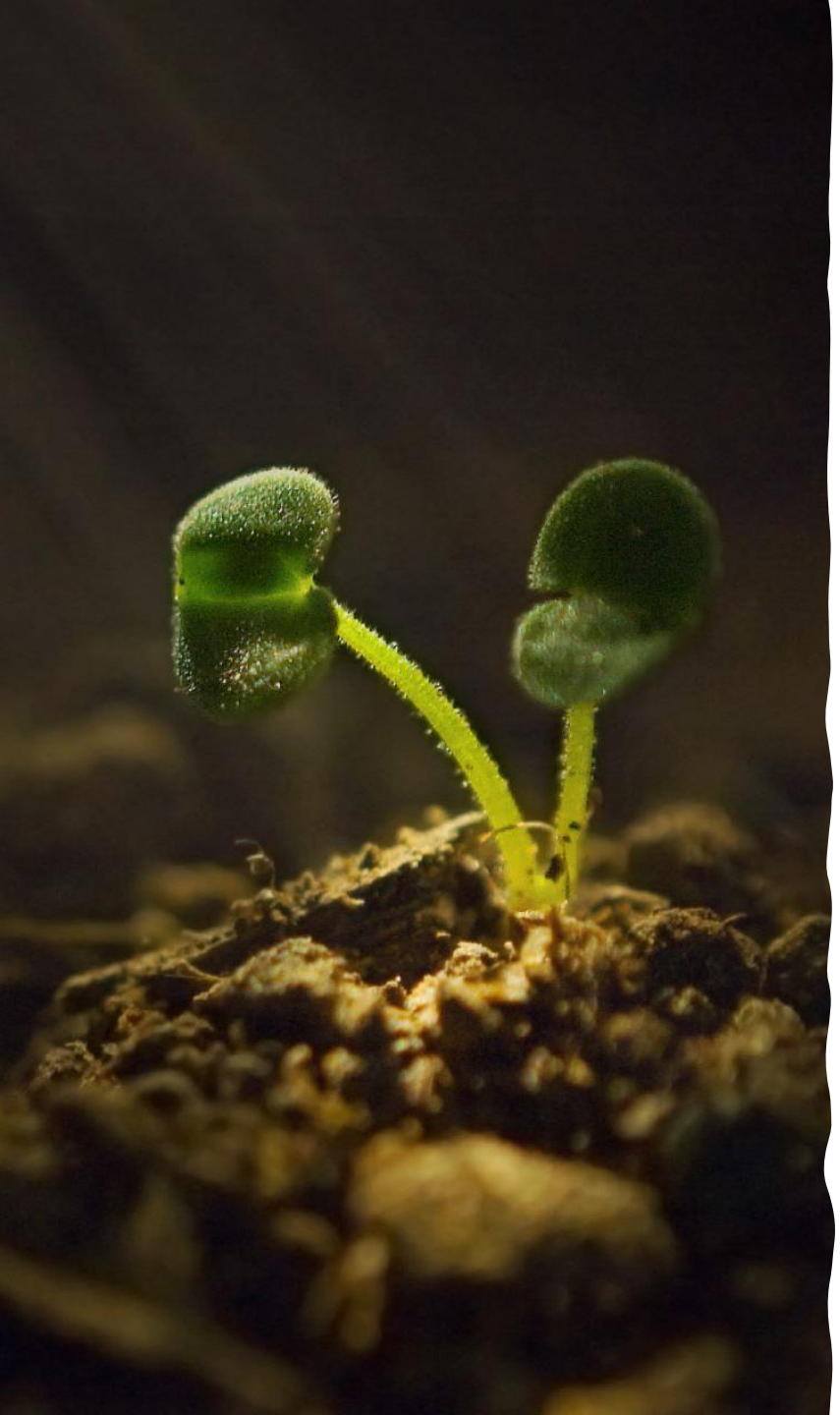
Received: 2 December 2023 / Accepted: 16 February 2024 / Published online: 22 April 2024





Study Design and Findings

- 3 stockpiles each ages 1-5 years
- 1 stockpile each ages 6-7 years
- Each pile replicated 4x
- Soils hauled from Jonah to Laramie and kept frozen in UW experiment station
- Seeds also kept frozen
- Soils saturated once and seeded
- Vegetation measured at 4 weeks, 6 weeks, 8 weeks, 10 weeks
- Total cover the same across study
- All pots had seed heads at study conclusion



Study limitations and practical implications

- Limitations
  - Greenhouse study
  - Limited to extreme environment
  - Not species specific
- Practical Implications
  - Leave soil stockpiled rather than spreading it with chance for future disturbance – ‘cold storage’
  - As soil continues to support vegetation growth without amendment, fertilizer, or otherwise

Acknowledgements

- Josh Sorenson & Tim Robinson