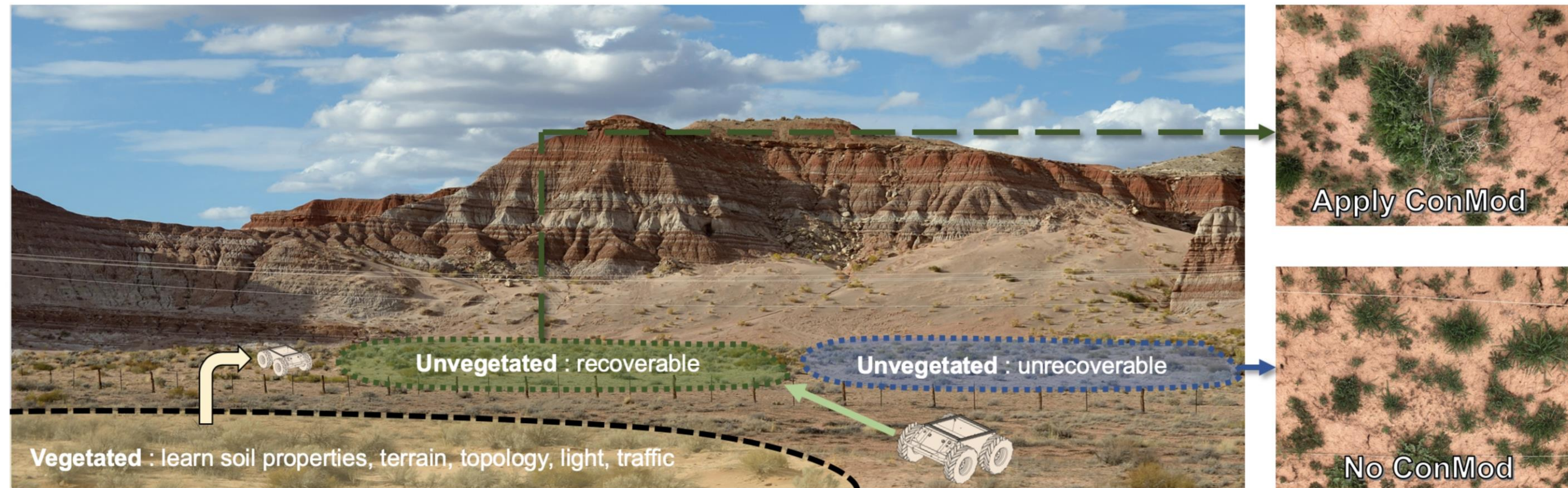
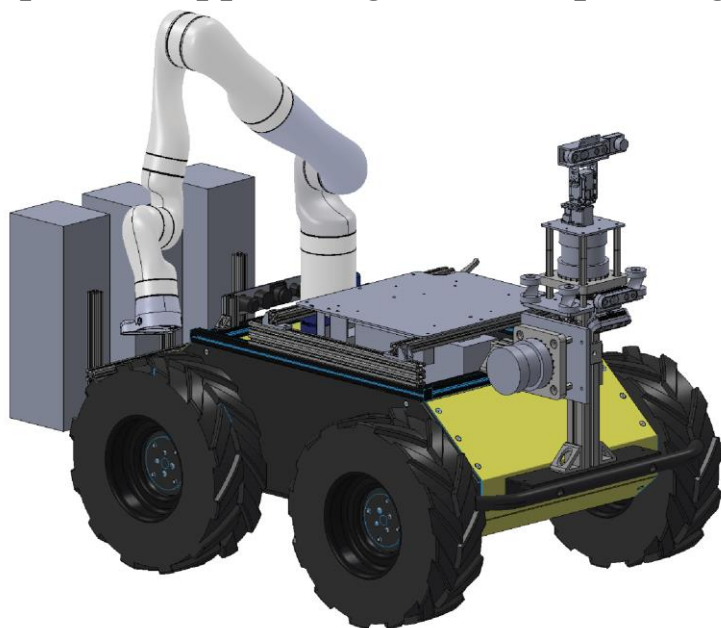


# #17: INT: Autonomous Restoration and Revegetation of Degraded Ecosystems

## Heckman, Correll, Barger (CU-Boulder) (USDA/NIFA #2021-67021-33450)



**Summary:** We will develop robotic multi-agent motion planning, joint visual-tactile perception, and multimodal 3D map construction techniques to support targeted seed planting in degraded rangelands, beginning with experiments in the Canyonlands region of Utah.



Partially Autonomous Navigator for Terrain Revegetation (PLANTR) Mark I

ID	Description
T1:	INITIAL FIELD DEPLOYMENT. <i>Design and deploy a field-testing framework for co-robotic revegetation.</i>
T1.1:	Field needs assessments between ecologists and roboticists.
T1.2:	Deploy PLANTR Mark I with tele-operation and RC control, collect and catalog data.
T2:	MACRO-SITE IDENTIFICATION AND AUTONOMOUS PLANNING. <i>Develop planning and perception techniques using exteroceptive sensing.</i>
T2.1:	Merge topographical maps with 3D maps from ranging sensors.
T2.2:	Design feature selection techniques for topography and visual soil sensors.
T2.3:	Train joint feature spaces for macro-site identification using delayed observations.
T3:	MICROSITE TESTING AND MANIPULATION WITH CONMOD APPLICATION. <i>Using visual-tactile sensing, determine where to plant seeds and apply ConMods.</i>
T3.1:	Actively interrogate the environment for soil density and biocrust detection.
T3.2:	Merge visual-tactile sensing to replan to offset sites.
T3.3:	Apply ConMods and learn positively correlated features for future application areas.
T4:	EVALUATION AND CONTINUOUS DEPLOYMENT. <i>Develop Mark II, and deploy biannually for new dataset collection, human-robot co-planning tests, and evaluation.</i>





