NCERA-101 Station Report

NASA Ames Research Center, Biospheric Science Branch

Ecosystems Science & Technology Lab

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Controlled Environment Facilities

Controlled Environment Chambers:

- Size range from 0.25 m2 to 20 m2
- Control parameters:
  - Temperature (air & canopy)
  - Humidity
  - Vapor Pressure
  - CO_2
  - Radiation (period, quality, flux, reflectance)
  - Nutrients and Water

- Closed Systems
- Mass Balance
- Gas Exchange
- Atmospheric Composition,
- Reduced Pressure,
- Hyperspectral monitoring of canopy structure and function
- Waste water treatment and use in crop production

- Space Station Hardware Testing
- Space Station Experimental Ground Control Studies
- Advanced Lighting Systems
- Production Efficiency
- Biofuels -suitability of gaseous and solid byproducts as plant growth inputs

Current Primary Study Areas Regarding Plant Responses

Invasive Plant Species – Western US

- response to climate change
- mechanisms of competitive advantage
- invasive species distribution and mapping

Ecosystem Health and Conservation

- ecosystem model response parameters
- productivity predictions for grazing and fire fuel risk
- simulation effects modeling for focused conservation efforts

Cheatgrass - *Bromos tectorum*

Fires in Nevada | CO_2 Chamber Study | Density on Landscape

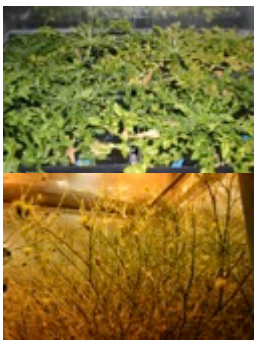
Cheatgrass - ecosystem impacts

Initial Infestation

Post-fire mono-ecology

NASA Earth Science and USDA Climate Change and Resources Conservation Programs

Yellowstar Thistle - *Centaurea solstitialis*

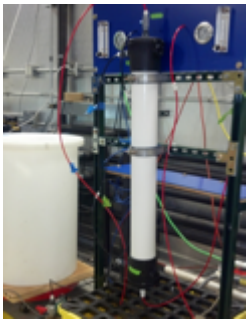


- development response to environment variables
- reproductive control
- ecological response to climate change
- model response parameters
- resource use efficiency as competitive strategy
- root zone modifications as competitive strategy

Ground Control for ISS Plant Signaling Experiment

Principal Investigator: Imara Perera, NC State, Raleigh

EMCS in ground controlled environment chamber. ISS environmental conditions mimic and experiment conducted as on-orbit.



Resource Recovery from Waste Streams: Water Recovery and Use in Agricultural Production Systems

Participants: NASA ARC and University of Alaska Fairbanks

The project combines Controlled Environment Agriculture and Waste Treatment Technologies to utilize wastewater for production system inputs. The focus waste treatment technology in phase 1 is forward osmosis (FO). Objective - evaluate potential of FO for direct recovery of water from sewage for agricultural utilization (irrigation / fertigation / hydroponic production) as a disinfected, tertiary-treated, recycled water, and demonstrate acceptability of FO recovered water in agricultural production.

Joint USDA Projects

Landscape-level Assessment and Management of Invasive Weeds and Their Impacts in Agricultural and Natural Systems

Invasive Species Assessment and Control to Enhance Sustainability of Great Basin Rangelands

Important 2012 Publications

United States Department of Agriculture National Conservation Program Assessment – State of the Lands: Rangelands (Bubenheim Coauthor)

United States Department of Agriculture Soil and Water Conservation – Resource Conservation Act Reappraisal (Bubenheim Coauthor)

American Association for the Advancement of Science – Group Award for Exemplary Collaborative Case Study – Conservation Effects Assessment Project (CEAP) – USDA Agencies and NASA ARC participants

Award to Conservation Effects Assessment Project (CEAP) selected on contributions to raising the profile of research and science on agriculture and natural resources throughout the Federal Government and beyond and highlights highly productive research collaborations. Specific recognition for science significance of watershed scale research, increased understanding of conservation effects on environmental quality, shifting conservation paradigm to effective management systems, and contributing to of policy improving effectiveness of Federal programs.