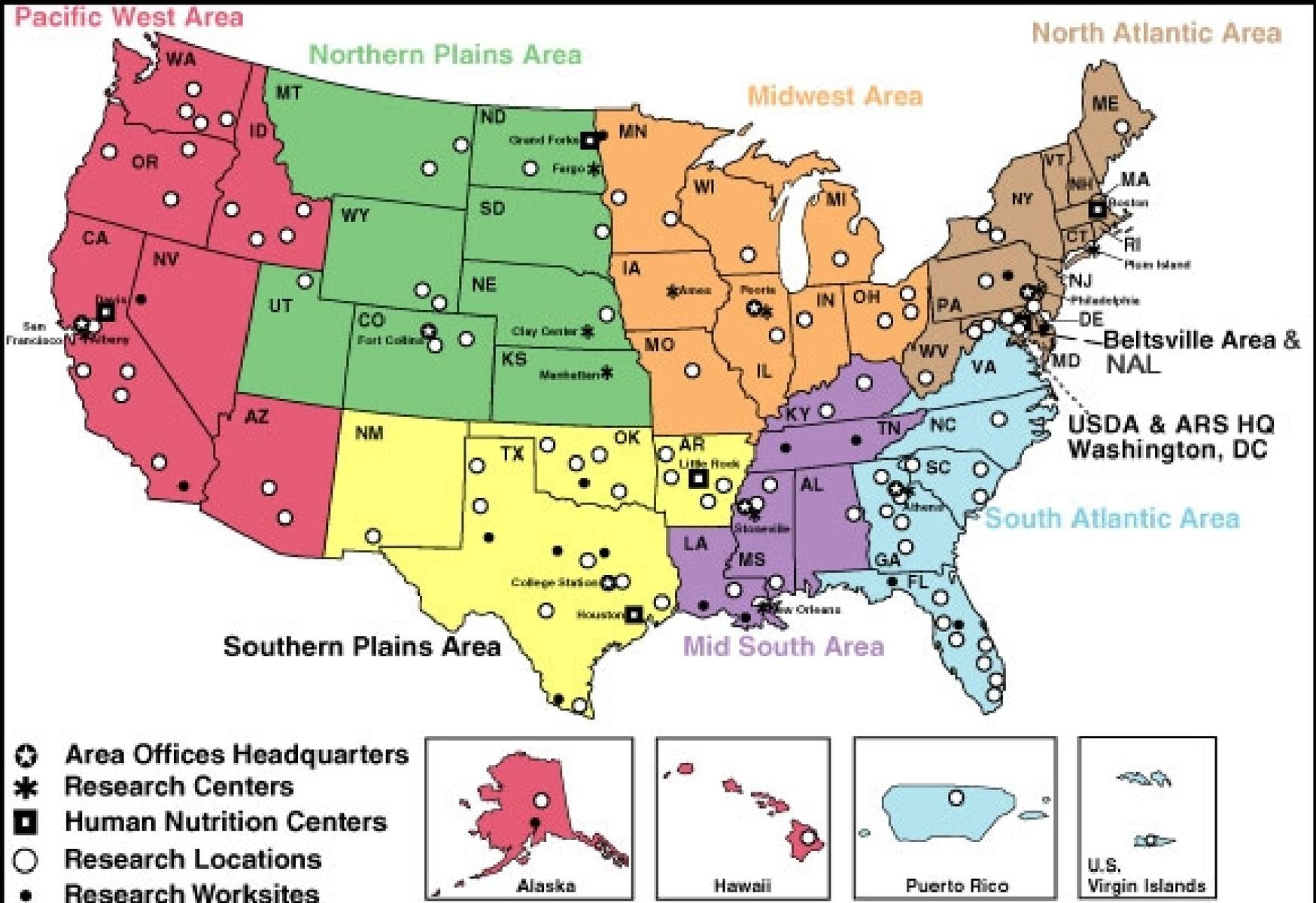


# Proposed Future Research



# National & Regional Research



# National Objective 1

- **Develop sustainable rangeland livestock production systems that conserve natural resources and are adaptable to changing environmental conditions.**

**Miles City, Logan, Mandan, Woodward**

# **National Objective 2**

- **Develop strategies and practices for conserving healthy rangelands and restoring degraded lands under changing environmental conditions to meet a variety of ecosystem services objectives.**

**Miles City, Boise, Burns, Cheyenne, El Reno,  
Las Cruces, Logan, Mandan, Reno, Sidney,  
Woodward**

# **National Objective 3**

- **Improve understanding of the fundamental relationships among management practices, ecological processes, and climate variability to improve rangeland production, conservation and restoration.**

**Miles City, Boise, Burns, Cheyenne, Las Cruces, Logan, Mandan, Reno**

# Fort Keogh Objective 1

- Improve rangeland cattle production and ecological stability through more effective use of rangeland forage, precision supplementation, and identifying livestock with greater adaptability to stress.

- Waterman 0.9 SY
- Petersen 0.7 SY
- Rinella 0.5 SY
- Reinhart 0.25 SY
- Vermeire 0.1 SY



# Outcome

- **Management practices for improved use of dormant rangeland forages.**
- **Technologies to metabolically ID animals more efficiently using rangeland forage.**
- **Protein and post-ruminal amino acid supplementation to improve forage use and animal production**
- **Molecular barcode system to identify plant species in diets**
- **Models of interactions between livestock production and weather data**

# Fort Keogh Objective 2

- Integrate grazing, fire, and chemical practices to restore rangelands degraded by weeds and prevent invasions in the northern Great Plains.

- Rinella 0.5 SY
- Vermeire 0.4 SY
- Reinhart 0.25 SY
- Petersen 0.2 SY



# Outcome

- **Revegetation strategies for establishing desirable species and preventing exotic annual grasses.**
- **Integrated management of grazing, fire, and chemical technologies matched with precipitation patterns to reduce annual bromes and promote native perennials.**
- **Management strategies based on interacting effects of plant water availability, grazing and fire.**
- **Rehabilitation techniques for riverine sites degraded by Russian olive**

# Fort Keogh Objective 3

- **Develop adaptive strategies for managing interacting effects of livestock grazing, fire, and climatic variation to increase stability of livestock production and maintain ecosystem health**
- **Reinhart                      0.5 SY**
- **Vermeire                      0.5 SY**



# Outcome

- **Determination of soil microbe effects on rangeland plant and soil health.**
- **Description of environmental interactions with annual brome establishment, biomass, seed production, and palatability.**
- **More precise forage production prediction models.**
- **Description of fire, drought, and grazing effects on perennial grass bud generation, activity, and survival.**



# Fort Keogh Outcomes

- Improved use of dormant rangeland forages
- Metabolic ID of efficient rangeland
- Protein and amino acid supplementation strategies
- Molecular barcode system to ID plant species in diets
- Weather-livestock production models
- Revegetation and prevention of exotic annual grasses
- Integration of grazing, fire, chemical, and weather to reduce annual bromes and promote native perennials
- Effects of water availability, grazing and fire
- Rehabilitation techniques for Russian olive
- Soil microbe effects on plant and soil health
- Description of environmental effects on annual brome
- More precise forage production prediction models
- Fire, drought, and grazing effects on grass buds