CLIMATE CHANGE AND INVASION: DOES A LOSS OF ECOLOGICAL INTEGRITY AFFECT THE CULTURAL EXPRESSION OF AN INDIGENOUS CULTURE?

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Wolf Mountain Environmental
INTRODUCTION

• Biological diversity—manifestation of ecosystem health
• Invasive plant species threatens ecosystem function
• Riparian zones—vulnerable
• River regulation/diversions (dams)
  – Invasive plants may threaten indigenous rituals/ceremonies due to:
    • Outcompete native plant species
    • Reducing availability to harvest plants for cultural use
RIPARIAN ECOSYSTEMS

• Plant survivorship—complex riparian
  Historical native vegetation
  *Salicaceae Populus deltoides* L. Plains cottonwood
  *Salix sp.* Willow
  Natural flow of rivers—now regulated
  Divergent Dams—irrigation
  Removing flood pulse = lack of recruitment sites
  Milk and Marias River
  decline in native woody vegetation
**Populus deltoides subsp. monilifera** (plains cottonwood)

- Dominant component of riparian ecosystems
- Riparian ecosystems (only native forested environments)
- Essential habitat (82% avian species)
- Cultural significance not addressed
- Harvested for ceremonial purposes
  - Crow Tribal members
Populus deltoides (contd.)

• Seed dispersal-wind
• Germination success (small)
• Declined (Pearce & Smith 2009)
  – seed/seedling mortality
  – Lack of recruitment sites
  – agriculture--draining floodplains
Cultural Significance
Plains Cottonwoods

• Historical
  – Battle of Little Big Horn

• Contemporary practices
  – Sweatlodge
  – Sacred Sundance Ceremony
  – Annual Crow Fair
  – Traditional gathering of native plants
PLAINS COTTONWOOD CULTURAL USE
RUSSIAN OLIVE INVASION IN PASTURES
STUDY SPECIES
RUSSIAN OLIVE (*ELAEAGNUS ANGUSTIFOLIA* L.)

- Invasive woody shrub/small tree
- Agriculture development post-Dawes Act 1887
- Planted within floodplains
- Crow-IECCC
Elaeagnus angustifolia L.
Russian Olive

- Shade tolerant
- Flood/drought tolerant
- Fixes Nitrogen
- Asexual/sexual reproduction
- Seed longevity (drupes)
- Dispersal – bird/mammal/water
- Pathogens/herbivores absent
- Difficult to control/eradicate
RESEARCH QUESTIONS/ METHODOLOGY

QUESTIONS
• What is the current distribution of Russian olive along Little Bighorn/Bighorn Rivers and floodplains?
• Will near-term climate change influence the spread of Russian olive?
• What is the current estimated size structure of cottonwood?

METHODS
• Mapped presence points
• Maximum Entropy Model (MaxEnt)
• NIISS
• 7.32m circular plots (n = 10)
• Near/far ceremonial sites
• Interviews with Elders
  – Distance to travel
  – Availability perceptions
Mapped Russian olive
(Elaeagnus angustifolia L.)
Climate Predictor Variables Used As Environmental Layers In MaxEnt Model

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Results
MaxEnt Model
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RESULTS (CONTD.)

PLOT DATA--DBH

Cottonwood Stems-DBH
Near vs. Far

# of STEMS vs. Diameter at breast height (cm)

NEAR
FAR
INTERVIEW RESULTS

- The maximum distance harvest >
- 80 km to 8.0 km for all size classes 25 ybp
- Present-day mean maximum ~ 98 km, greatest = 193 km
- 82% travel to harvest sapling size (3.6-4.5m) class stems > within 25 years
- Support plot data
- All size classes affected
CONCLUSIONS

- Russian olive continued spread
- Cottonwood (other species) continue to decline
- Climate change—hasten effects (increased precip/temps)
- Threatens cultural integrity and ecological biodiversity
- Management plans
  - mitigation of *E. angustifolia*
  - Planting of cottonwoods/willows in buffer zones
LINKING CULTURE, ECOLOGY AND POLICY: THE INVASION OF RUSSIAN-OLIVE (*ELAEAGNUS ANGUSTIFOLIA* L.) ON THE CROW INDIAN RESERVATION, SOUTH-CENTRAL MONTANA, USA
American Indian Land Policy: Land Use, Ownership Status and the Density of The Invasive Russian Olive (*Elaeagnus Angustifolia* L.) On The Crow Indian Reservation, Montana, USA

Chapter 3: Losing Tradition: The Biocultural Effects of Russian Olive (*Elaeagnus Angustifolia* L.) On The Crow Indian Reservation, Montana, USA