

COMMUNITY SUCCESSION AMONG INVASIVE EXOTIC WEEDS

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INTRODUCTION

IN THE GREAT BASIN OF WESTERN NORTH AMERICA MILLIONS OF HECTARES OF FORMERLY *ARTEMISIA TRIDENTATA*/BUNCH GRASS RANGELAND HAS BEEN CONVERTED TO DOMINANCE BY THE EXOTIC INVASIVE SPECIES *BROMUS TECTORUM*. THESE VAST LANDSCAPES ARE NOT DOMINATED BY MONO-SPECIFIC STANDS OF THE EXOTIC ANNUAL GRASS, BUT RATHER BY A SUCCESSION OF EXOTIC ANNUAL SPECIES WHICH ENDS IN TRANSITORY DOMINANCE BY *BROMUS TECTORUM*.

SUCCESSION

CLASSICAL CLEMENTEN ECOLOGY DEFINES PLANT SUCCESSION AS THE SUCCESSIVE ASSEMBLAGES THAT OCCUPY A SITE BARE GROUND UNTIL SOME FORM OF DYNAMIC EQUILIBRIUM IS REACHED WITH THE POTENTIAL OF THE SITE TO SUPPORT PLANT GROWTH. EACH SUCCESSIVE ASSEMBLAGE OF PLANTS MODIFIES THE POTENTIAL OF THE SEEDBED TO ALLOW THE ESTABLISHMENT OF FOLLOWING ASSEMBLAGES.

PURPOSE

THE PURPOSE OF THIS PRESENTATION IS TO PROVIDE STEP WISE DESCRIPTIONS OF THE SUCCESSIONAL PROCESS IN *BROMUS TECTORUM* COMMUNITIES ON GREAT BASIN RANGELANDS.



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STEP 1. WHAT CAUSES REGRESSION IN SUCCESSION TO BARE GROUND? A. DURING EXCEPTIONAL DROUGHTS SEVERAL HUNDRED THOUSAND ADJACENT HECTARES OF *BROMUS TECTORUM* CAN FAIL TO GROW FOR CONSECUTIVE YEARS. B. FAIL RESTORATION SEEDINGS, ESPECIALLY LARGE SCALE REHABILITATION OF WILDFIRES LEAVES BARE AREAS. C. THE MOST EXTENSIVE CAUSE OF SUCCESSIONAL RETROGRESSION IS WILDFIRES FUELED BY *BROMUS TECTORUM*.



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STEP 2. THE LOWEST LEVEL OF VASCULAR PLANT SUCCESSION IS DOMINATED BY EXOTIC ANNUAL SPECIES OF CHENOPOD HERBACEOUS SPECIES. FOR MUCH OF THE 20TH CENTURY *SALSOLA TARGUS* WAS THE FIRST EXOTIC TO INVADE DISTURBED AREAS. A. DURING THE LAST ONE THIRD OF THE CENTURY IT WAS LARGELY SUPPLANTED BY *S. PAULSENII*. B. *HALOGETON GLOMERATUS* FITS THE SAME SERAL ROLE IN DISTURBED COMMUNITIES. RECENTLY, *KOCHIA SCOPARIA* HAS ALSO ENTERED THIS SUCCESSIONAL STAGE ON GREAT BASIN RANGELANDS. THIS ILLUSTRATES THAT EACH STAGE IN SUCCESSION HAS INFINITE WIDTH IN TERMS OF COMPETING SPECIES. C. ALL THESE OF THESE SPECIES COMBINE TREMENDOUS SEED PRODUCTION BY INDIVIDUAL PLANTS WITH ADVANCED DISPERSAL SYSTEMS AND VERY SIMPLE SEEDS THAT ARE COILED EMBRYONIC PLANTS WITH VIRTUALLY NO SEED COAT. THESE SEEDS CAN GERMINATE EXTREMELY RAPIDLY ON BARE SEEDBEDSE



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STEP 3. THE NEXT STAGE IN SUCCESSION IS DOMINATED BY SPECIES OF MUSTARD. A. THE EXOTIC *SISYMBRIUM ALTISSIMUM* AND THE NATIVE ANNUAL *DESCURAINIA PINNATA* ARE THE DOMINANT SPECIES. THESE SPECIES PRODUCE AN ABUNDANCE OF VERY SMALL SEEDS THAT HAVE MUCILAGINOUS SEED COATS TO AID IN GERMINATION ON BARE SOIL SURFACES. SEEDS OF THE MUSTARD SPECIES CAN GERMINATE IN THE COLD LATE FALL OR EARLY SPRING WHILE TEMPERATURE RELATED AFTERRIPENING LIMITS GERMINATION OF THE CHENOPOD SPECIES UNTIL LATER IN THE SPRING. THE FIRST ANNUAL TO GERMINATE, ESTABLISH AND PRODUCE VIABLE SEEDS WINS THE COMPETITION BATTLE.



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STEP 4. EVENTUALLY *BROMUS TECTORUM* BECOMES THE SERAL DOMINANT AND TRUNCATES SUCCESSION SO IT DOES NOT PROCEED TO DOMINATION BY NATIVE PERENNIAL SPECIES. A. SOMETIMES THE ANNUAL GRASS COMMUNITIES ARE NEARLY *MONO-SPECIFIC* WITH *BROMUS TECTORUM*. B. LOWER CHENOPOD OR MUSTARD SPECIES MAY REMAIN AS OCCASIONAL SPECIES IN SOME COMMUNITIES AND IN OTHER EXOTIC ANNUAL SPECIES SUCH AS *ERODIUM CICUTARIUM* AND/OR *LACTUCA SERRIOLA* OCCUR AS SUBDOMINANT SPECIES. C. DEPENDING ON THE SOURCE OF RETRO-SUCCESSIONAL DISTURBANCE, THE HIGHER SUCCESSIONAL GRASS AND LOWER SUCCESSIONAL BROADLEAF SPECIES MAY OCCUR IN THE SAME COMMUNITY, BUT SPATIALLY SEPARATED.



STEP 5. *BROMUS TECTORUM* TRUNCATES SUCCESSION AND CLOSES SITES TO SEEDLINGS OF NATIVE PERENNIAL SPECIES. AT THE SAME TIME THE COMMUNITIES ARE OPEN TO INVASION BY OTHER INVASIVE, EXOTIC WEED SPECIES. THE COMMUNITY IN THE FIGURE IS DOMINATED BY *CENTAUREA SOLSTITIALIS* AND *TAENIATHERUM CAPUT-MEDUSAE*. THIS ILLUSTRATES THAT NOT ONLY IS THIS WEED SUCCESSION OPEN Laterally TO NEW COMPETING SPECIES AT THE SAME SUCCESSIONAL LEVEL, BUT ALSO VERTICALLY WITH THE ADDITION OF NEW HIGHER OR LOWER SUCCESSIONAL STAGES. PERHAPS, THIS SUCCESSION EVENTUALLY ENDS WITH DOMINANCE BY AN EXOTIC, INVASIVE PERENNIAL SUCH AS *ACROPTILON REPENS*?