TEMPORAL VARIATIONS OF CARBON INFLUXES IN FOREST ECOSYSTEMS OF NORTHERN MEXICO

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INTRODUCTION

THERE IS INCREASING EVIDENCE THAT CLIMATE CONTROLS THE RATE OF CARBON INFLUX IN FOREST ECOSYSTEMS. HOWEVER, THERE IS LITTLE QUANTITATIVE EVIDENCE ON HOW DROUGHT SPELLS MODIFY ABOVEGROUND BIOMASS PRODUCTIVITY OF FOREST ECOSYSTEMS OF NORTHERN MEXICO. THIS INFORMATION IS USEFUL TO UNDERSTAND POTENTIAL RAINFALL SHIFTS ON FORESTS AND FORESTRY IN NORTHERN MEXICO.

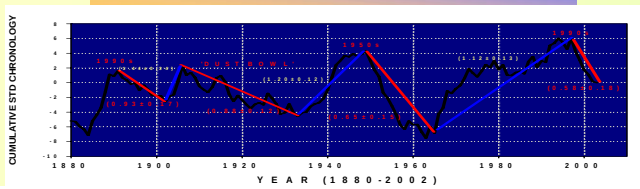
OBJECTIVES

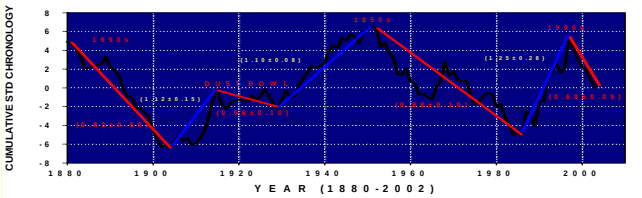
i) TO ESTIMATE CARBON INFLUX IN ABOVEGROUND BIOMASS AND ii) TO RELATE IT TO DROUGHT EPISODES IN FOREST ECOSYSTEMS OF NORTHERN MEXICO.

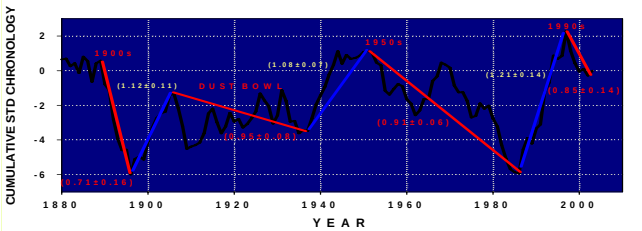
METODOLOGY

STATISTICAL ANALYSIS ON DASOMETRIC DATA OF 36 PERMANENT SAMPLING SITES MEASURED IN 1982, 1993, AND 2004, LOCATED IN TEMPERATE FORESTS OF CENTRAL DURANGO, MEXICO, AND DENDROCHRONOLOGICAL DATA FOR *Pseudotsuga menziesii* TREES OF TEMPERATE FORESTS OF NUEVO LEON, MEXICO, TESTED THE HYPOTHESIS THAT THE VARIATION OF CARBON INFLUX WOULD BE EXPLAINED PARTIALLY BY RAINFALL VARIATIONS. IF SO, THEN CLIMATE CHANGE IS ALREADY CONTRIBUTING TO FOREST DECLINE IN NORTHERN MEXICO.

RESULTS

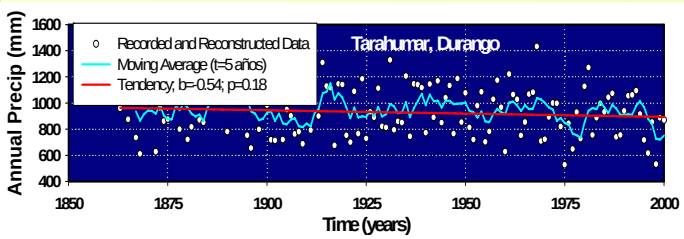


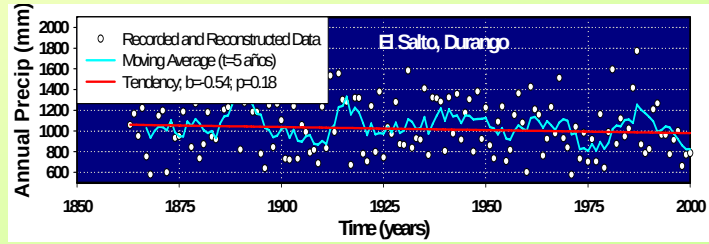




RESULTS INDICATED THAT MEAN CARBON INFLUXES FOR THE PERIODS OF 1982-1993 AND 1993-2004 WERE 1.55 AND 1.25 Mg C Ha-1 y-1. MEAN ANNUAL RADIAL GROWTH FOR DROUGHT AND WET PERIODS ARE 1.18 MM AND 0.82 mm y-1, RESPECTIVELY. NORTHERN MEXICO WAS HIT BY A DROUGHT SPELL IN THE 1990'S THAT REDUCED RAINFALL BY 10-15% AND CARBON INFLUXES WERE DECREASED BY APPROXIMATELY 20% WHILE RADIAL GROWTH OF *P. menziesii* TREES WAS REDUCED 30%. THEREFORE, DROUGHT SPELLS CONTROL ABOVEGROUND BIOMASS PRODUCTIVITY AND CARBON INFLUX. SINCE CLIMATE MODELS PREDICT THAT NORTHERN MEXICO WILL HAVE REDUCED PRECIPITATION OF THE ORDER OF 10-25% IT IS EXPECTED THAT FORESTS WOULD DECLINE IN PRODUCTIVITY WITH LARGE IMPACTS ON FORESTS AND FORESTRY ACTIVITIES IN NORTHERN MEXICO.

PRECIPITATION PARAMETERS ARE ALREADY CHANGING AT SEVERAL CLIMATIC STATIONS ALONG THE WESTERN SIERRA SIERRA MADRE OCCIDENTAL MOUNTAIN RANGE. THEREFORE, IT CAN BE FORESEEN THAT IN A CLIMATE CHANGE SCENARIO, THESE ECOSYSTEMS WOULD BECOME A MAJOR SOURCE OF CARBON, SINCE TEMPERATE FORESTS CONTAIN CONTAIN A RESERVOIR OF APPROXIMATELY 100 Tg C IN ABOVEGROUND BIOMASS IN THE STATE OF DURANGO, MEXICO. MEXICO.





CLIMATE SHIFTS WOULD ALSO IMPACT THE LOCAL ECONOMY, SINCE CLOSE TO 10% OF THE STATE GROSS INCOME COMES FROM FORESTRY ACTIVITIES. BIODIVERSITY IS ALSO IN PERIL. THE SIERRA MADRE OCCIDENTAL OF NORTHWESTERN MEXICO BOASTS SOME OF THE RICHEST BIODIVERSITY ANYWHERE IN NORTH AMERICA, AND CONTAINS ABOUT TWO THIRDS OF THE STANDING TIMBER IN MEXICO. TWENTY-THREE DIFFERENT SPECIES OF PINE AND ABOUT 200 SPECIES OF OAK RESIDE WITHIN THE PINE-OAK FORESTS ECOREGION. MANY DISTINCTIVE SPECIES HAVE EVOLVED AS A RESULT OF THE LANDFORMS, ALTITUDE, TEMPERATURE AND RAINFALL.