Using a SWB Model to Analyze the Anthropogenic Effects on Groundwater Recharge in The Ballona Creek Watershed, Los Angeles County, CA

Research conducted at the Colorado School of Mines
Team members
REU-Chelsea Tarbell
Mentor- Kim Manago
Faculty Advisor- Terri Hogue

Study Area
- Ballona Creek Watershed of Los Angeles, California (130 square miles)
- Highly developed

Process
- Compile sets of tabular and gridded inputs (Fig. 1)
- Create a pre-development land cover shapefile (Fig. 2)
- Model pre/post-development land cover using a soil-water balance (SWB) model

Goals
- Determine how highly altered land cover changes groundwater recharge rates
- Evaluate the effects of native vs. non-native vegetation
- Determine the variations on recharge and evapotransporation (ET) rates between pre and post-development.
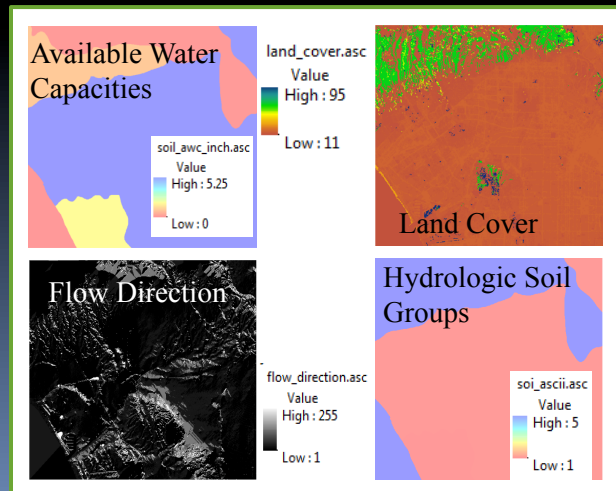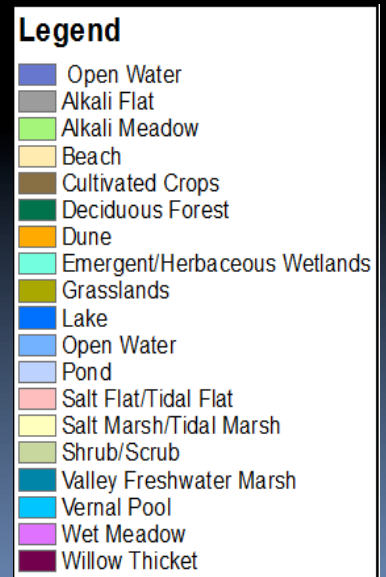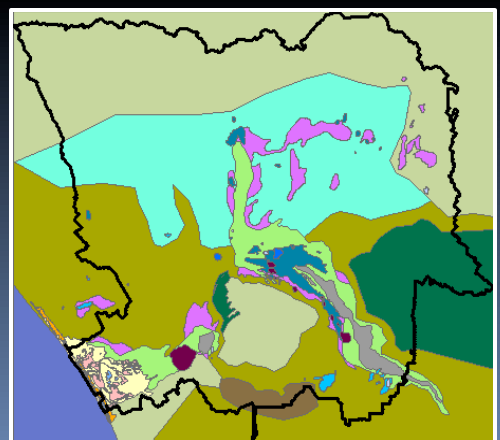

Fig. 1: Gridded inputs

Available Water Capacities
land_cover.asc
Value
High : 95
Low : 11
soil_awc_inch.asc
Value
High : 5.25
Low : 0
Land Cover
Flow Direction
flow_direction.asc
Value
High : 255
Low : 1
Hydrologic Soil Groups
soi_ascii.asc
Value
High : 5
Low : 1

Fig. 2: Pre-development land cover shapefile

Legend
- Open Water
- Alkali Flat
- Alkali Meadow
- Beach
- Cultivated Crops
- Deciduous Forest
- Dune
- Emergent/Herbaceous Wetlands
- Grasslands
- Lake
- Open Water
- Pond
- Salt Flat/Tidal Flat
- Salt Marsh/Tidal Marsh
- Shrub/Scrub
- Valley Freshwater Marsh
- Vernal Pool
- Wet Meadow
- Willow Thicket

Outcomes

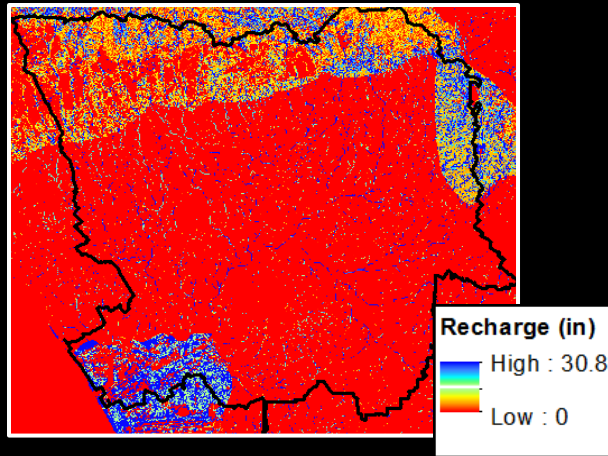- Post-development outcomes show low recharge and ET rates in highly developed areas (Fig. 3A & 3B)

Future Work

- Calibration, validation, and sensitivity analysis on the post-development model

- Running the pre-development model

- Comparative analysis of the two models

Recharge (in)
High : 30.8
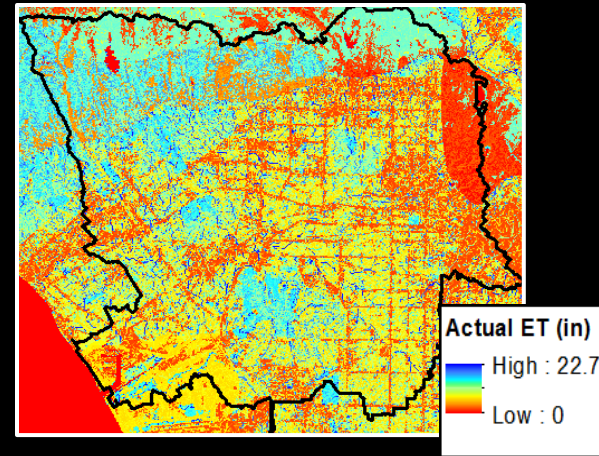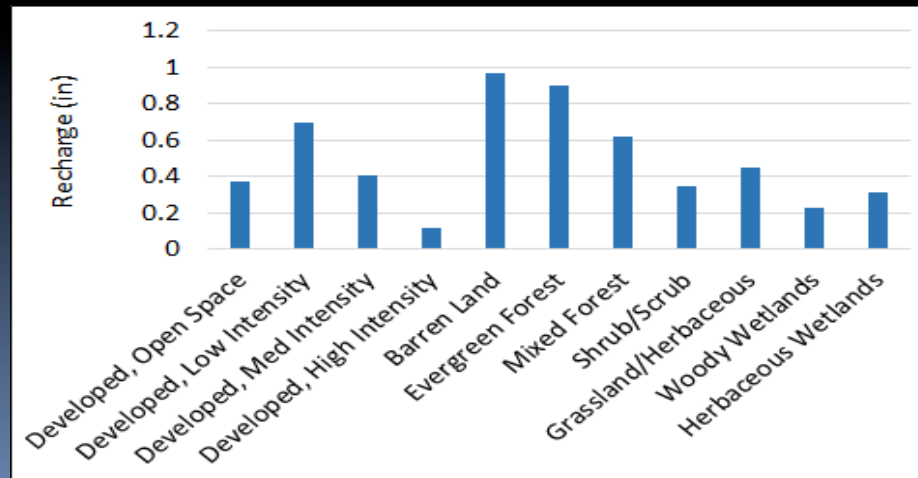Low : 0

Fig. 3A

Actual ET (in)
High : 22.7
Low : 0

Fig. 3B

Fig. 4: Mean monthly recharge rates by land cover type