



Modeling Relationships between Shrubland Biomass and Pattern Water Use Efficiency Along Semi-Arid Climatic Gradients

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A new model is presented that represents the effect of the shrub patches' spatial arrangement on their water use efficiency and biomass productivity in water limited ecosystems. The model utilizes an Edge Ratio parameterization calculated as the ratio between vegetation edge area and the total vegetation area. Pattern Water Use Efficiency employs the following relationships:

1. Water Use efficiency would be directly related to shrub Cover Fraction.
2. Water Use Efficiency would be Inversely related to amount of edge areas (Edge Ratio).
3. The effect of Edge would be Inversely related to shrub cover fraction.
4. The effect of Edge would be Inversely related to the shrubs' height.

Pattern Water Use Efficiency than modulates the use of precipitation in producing biomass. Preliminary assessment of the new model was achieved by comparing its results with biomass as extracted from high-resolution imagery based on allometric equations for 18 sites along a climatic gradient between Mediterranean and arid regions in Central Israel.

In the next phase, the model is modified to allow its implementation with Landsat Imagery. This form of the model facilitated wide regional mapping of shrublands' biomass. Such mapping is fundamental for assessing the impacts of climate change on ecosystems productivity in desert fringe ecosystems.