

## Alfalfa suitability zone mapping using climatic and soils spatial data and quantitative plant tolerances

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**Introduction** Traditionally, crop suitability mapping has been based on hand-drawn maps depicting general suitability regions resulting in maps being of limited use as decision making tools. Advanced spatial analysis, involving GIS technologies, now allows for creation of highly detailed crop suitability maps based on biophysical characteristics of the region and quantitative plant characteristics (Hannaway et al., 2005a, 2005b). This paper describes the application of spatial analysis to the mapping of suitability zones for alfalfa cultivars with fall dormancy and winter survival indices of 3.

**Map development process** The Internet Map Server application (<http://mole.nacse.org/prism/forages/>), developed by the PRISM Group (<http://prism.oregonstate.edu>), was used to evaluate parameter values and create suitability maps. Maps were generated based on climatic factors (mean January minimum and mean July maximum temperature and precipitation) and edaphic factors (pH tolerance, soil drainage tolerance, and salinity). Mean January minimum temperature values were chosen based on northern limits of survivability. Mean July maximum was based on summer survival which is a combination of adequate soil moisture and sub-lethal temperatures. A summary of climatic and edaphic tolerances is presented in Table 1 and the map generated by these values is displayed in Figure 1; the tables and figures are based on plant tolerances taken from USDA-NRCS (2006) and Kotuby-Amacher et al. (1997). Fall dormancy and winter survival were estimated from the National Alfalfa & Forage Alliance (2007). Climatic values were taken from PRISM interpolated climate grids.

**Table 1** Climatic and edaphic factors and quantitative tolerances for alfalfa cultivars with  $FD=3$ ,  $WSI=3$ .

	July Max Temp (C)		Jan Min Temp (C)		Annual Precip (mm)		Soil pH		Soil Drainage(categories)		Soil Salinity (mmhos/cm)
	Low	High	Low	High	Low	High	Low	High	Low	High	High
<b>Well Adapted</b>	15	30	-13	9999	400	1000	6.1	8.4	MWD ▼	ED ▼	2
<b>Moderate</b>	10	35	-18	9999	300	1100	5.5	9.0	SPD ▼	ED ▼	5.4
<b>Marginal</b>	5	40	-22	9999	200	1300	4.8	9.7	PD ▼	ED ▼	8.8

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