THE SPANISH FIR TREE (*Abies pinsapo*): FORSEEABLE BEHAVIOUR AND MANAGEMENT CRITEREA FACED WITH CLIMATE CHANGE SCENARIOS

Environmental Information Network of Andalusia de Andalucía

Climate Change Local Scenarios.

An inclusive view into the future.

SUMMARY: The prospective data obtained from the territorial simulation models for plant species subject to Climate Change must not be used as a deterministic view of the future but rather as a means to prevent trends, with the aim to either control or mitigate them by proper management and planning as well as identifying the lacks of knowledge that exist for such a complicated phenomenon. This poster is a graphical summary of the results obtained from the analysis of the impacts that new local climate change scenarios are having on one of the most emblematic species of the Andalusian biodiversity (*Abies pinsapo Boiss*).

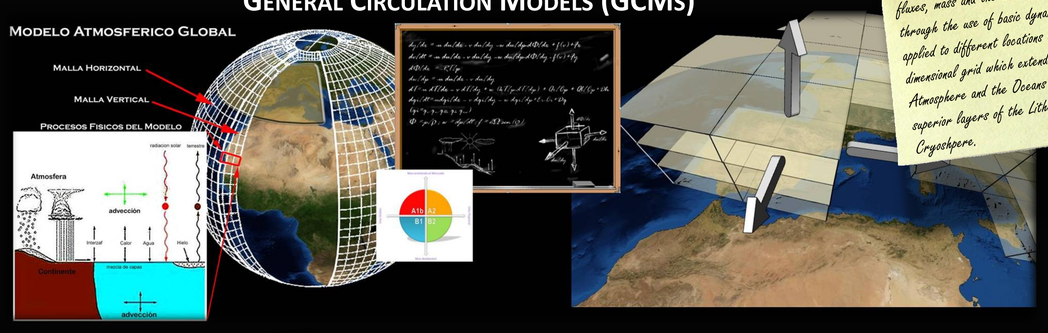
J.J. Guerrero1, F. Cáceres2, F. Giménez de Azcárate1, J. M. Moreira3.
(1) Communication and Systems Department, Environment and Water Agency, Johan Gutenberg, 1 (Isla de la Cartuja), 41092 Sevilla
jjguerrero@agenciamedioambienteyagua.es,
fgimenezdeazcarate@agenciamedioambienteyagua.es,
jjguerrero@agenciamedioambienteyagua.es
(2) Environmental Information and Assessment Service, Regional Ministry for Agriculture, Fisheries and Environment of the Regional Government of Andalusia, Avda. Manuel Siurot, 50, 41071 – Sevilla, francisco.caceres@juntadeandalucia.es
(3) General Secretariat for the Environment and Water, Regional Ministry for Agriculture, Fisheries and Environment of the Regional Government of Andalusia, Avda. Manuel Siurot, 50, 41071 – Sevilla juan.moreira@juntadeandalucia.es

The purpose of the study upon which this is based is carrying out a prospective practice which will provide useful criteria the planning and management of Spanish Fir tree, all within a larger scale project called "Climate Change Local Scenarios in Andalusia" promoted by the Environmental Information Network of Andalusia (Red de Información Ambiental de Andalucía: REDIAM) of the Water, Regional Ministry for Agriculture, Fisheries and Environment.

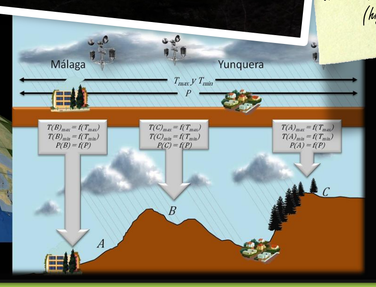
GCMs aren't enough to replicate local climate conditions, such as those present in the region of Andalusia. For this reason it is necessary to resort to regionalization or downscaling techniques which allow to adapt the most reliable information provided by the GCMs (low spatial resolution) to the information required by the impact models (higher surface local-spatial resolution).

GENERAL CIRCULATION MODELS (GCMS)

The main tool we dispose of for Climate prospection during the next decades are the Numerical Weather Prediction Models (NWPMs) or General Circulation Models (GCMs). These models simulate energy fluxes, mass and the amount of movement through the use of basic dynamics equations, applied to different locations of a three dimensional grid which extends between the Atmosphere and the Oceans as well as the superior layers of the Lithosphere and the Cryosphere.

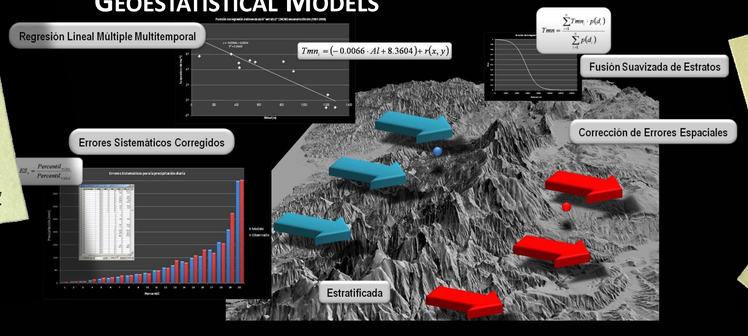


REGIONALIZATION MODELS



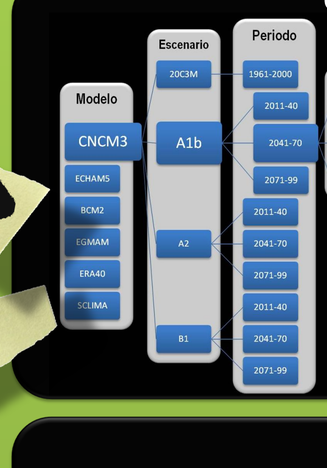
GEOESTATISTICAL MODELS

Geostatistical Models allow the transformation of timely information obtained from regionalization processes into geographical information which is continuously delivered to the whole region of Andalusia. There is a wide variety of techniques to carry this out. For this case, multitemporal and multilinear regression in uniform layers were employed. The residuals are subjected to Inverse Distance Weighting interpolation and then compensated. The edge effect of each layer is corrected as well.



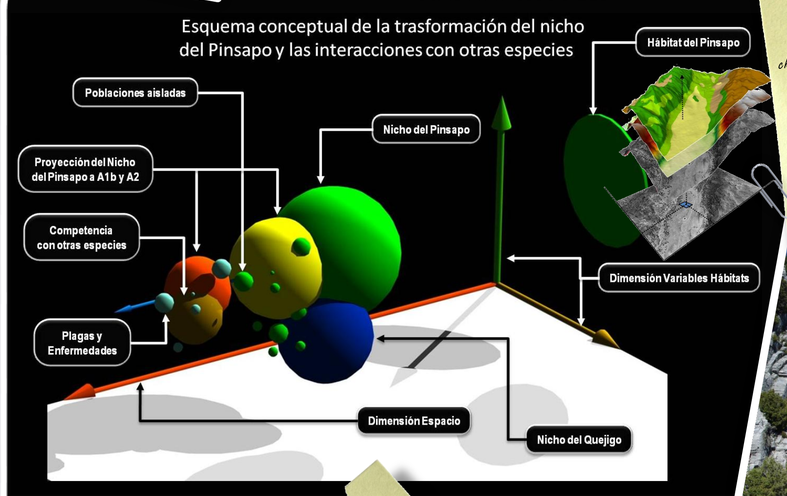
CLIMATE MODEL

The Climate Model is built on a set of climatic and bioclimatic variables which describe the actual and the expected climate conditions up to the end of the XXIst century. Basic variables such as Precipitation or Temperature, as well as more complex variables as is the amount of hours of active photosynthesis are examples of the basis for the majority of these prospective studies.



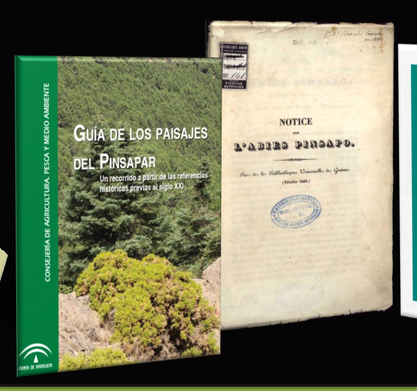
HABITAT MODELS

To understand the impact of Climate Change on the Habitat of plant species, potential distribution simulation models are usually employed. The methodology used for this project consists in a characterization based on 27 autoecology parameters related to topography, soil, climate and plant phisiology. The result of this analysis is called the "potential index" for which the territorial distribution is estimated for the climate reference period of 1961-2000, and later projected over the century through the periods 2011-2040, 2041-2070 and 2071-2099 .



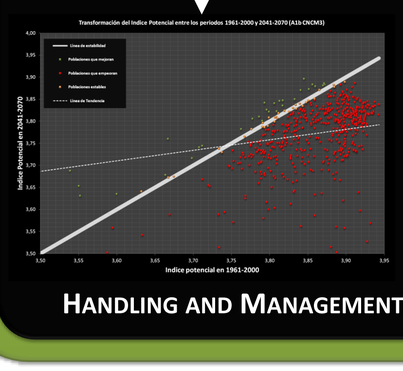
SPANISH FIR TREE INFORMATION SOURCES

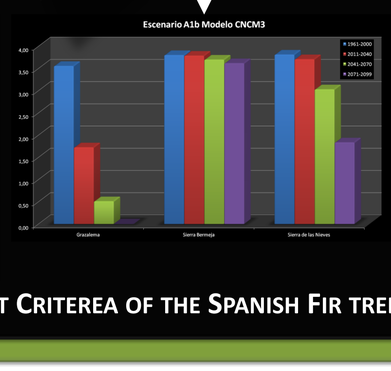
Rediam

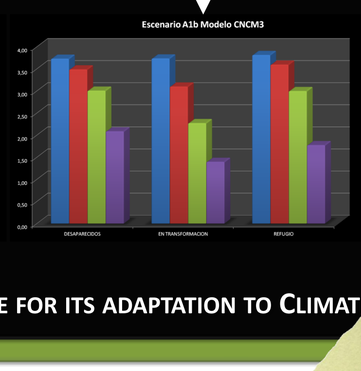


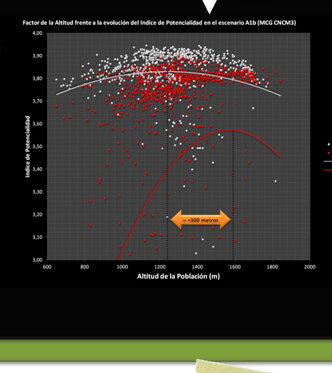
Since the description of the Spanish Fir tree in 1838 by Pierre Edmond Boissier in his work called "Botanical trip along southern Spain", many studies and works have been dedicated to this emblematic specie. The Environmental Information Network (Red de Información Ambiental: REDIAM) accounts for a high amount of data and geographical information concerning this tree.

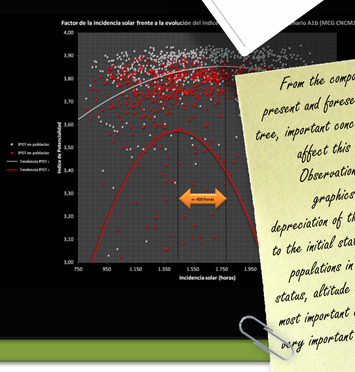
HANDLING AND MANAGEMENT CRITEREA OF THE SPANISH FIR TREE FOR ITS ADAPTATION TO CLIMATE CHANGE











From the comparative study carried out on the present and foreseeable future of the Spanish Fir tree, important conclusions are drawn which directly affect this specie's handling and management. Observations derived from the study of data, graphics and mapping lead to consider that: depreciation of their habitat will not be proportional to the initial state of the population but in fact some populations in marginal habitats will improve their status, altitude and level of our exposure will be the most important compensation parameters, or that it is very important to pay attention to sites where it has recently disappeared.

The findings of this study which are directly applicable to the management and handling of the Spanish fir are:

- ✓ Removal to compensated niche areas
- ✓ Enhancing isolation or the Island Effect
- ✓ Importance of residual populations
- ✓ Many Spanish Fir tree populations will be out of season
- ✓ Extension of the study and actions coverage (*Abies nostrum*)
- ✓ Grievance of Wildfires
- ✓ Sierra de las Nieves will become the most important haven
- ✓ Further investigations on territorial prediction models
- ✓ Improving and densifying the amount of Weather Stations
- ✓ Current extension of the Spanish Fir tree is highly biased by anthropogenic variables.

adaptaclima
UNIÓN EUROPEA
Fondo Europeo de Desarrollo Regional
JUNTA DE ANDALUCIA
CONSEJERÍA DE AGRICULTURA, PESCA Y MEDIO AMBIENTE
Rediam
fic Fundación para la Investigación del Clima
SUDOE Interreg IV B
JUNTA DE ANDALUCIA
Agencia de Medio Ambiente y Agua
CONSEJERÍA DE AGRICULTURA, PESCA Y MEDIO AMBIENTE