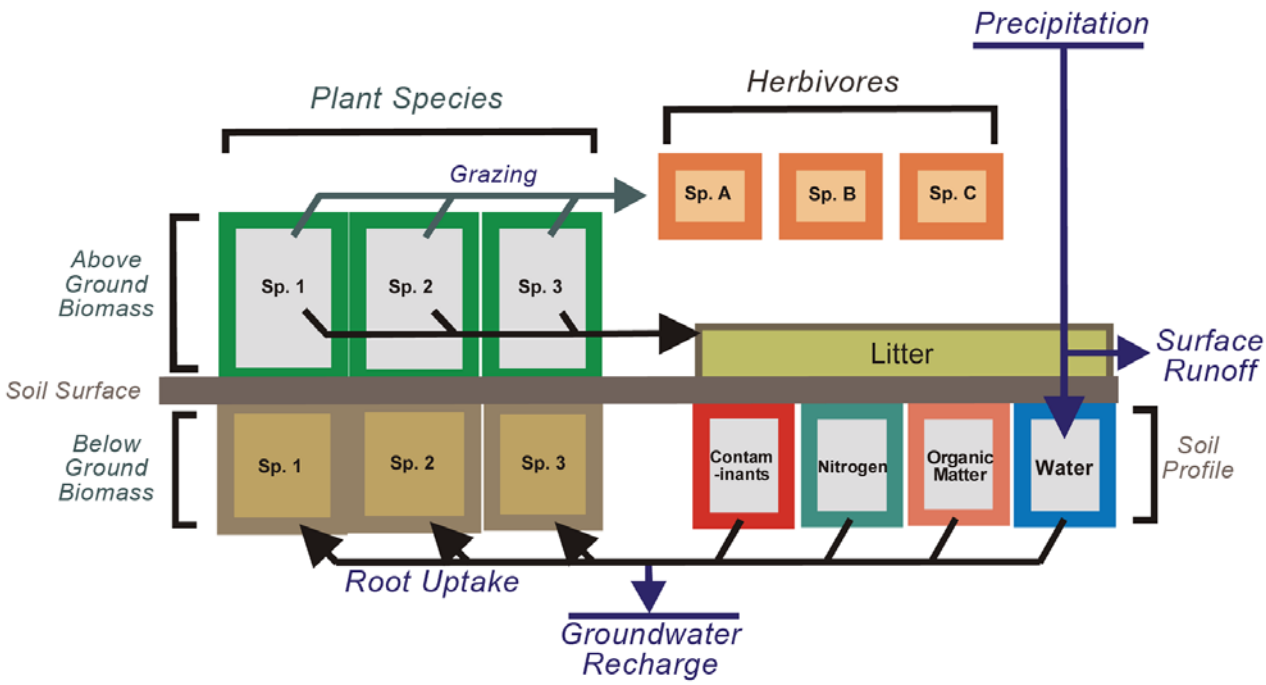
Ecological DYnamics Simulation (EDYS)

Description: The Ecological DYnamics Simulation (EDYS) model is designed to mechanistically simulate complex ecological dynamics across spatial scales ranging from plots (square meters) to landscape and watershed (square kilometers) levels. Modules include climatic simulators, hydrology, soil profile, nutrient and contaminant cycles, plant community dynamics, herbivory, animal dynamics, management activities, and natural/anthropogenic disturbances.



Application: EDYS has been applied in a wide variety of land and water management scenarios, including: military training, recreational activities, grazing, natural and prescribed fire, impacts of changing weather patterns as a result of climate change, road/trail building and closure, invasive plants inventory and eradication, drought assessment, water quality/quantity, reclamation, restoration, land cover design, and slope stability.

During the past three years the capability to link EDYS with hydrodynamic codes was developed including Gridded Surface Subsurface hydrologic Analysis (GSSHA), Hydrological Simulation Program Fortran (HSPF) and ModFlow for watershed scale ecohydro modeling capabilities. In addition a 'Lite' version of EDYS or EDYS-L was developed that comes pre-parameterized and will

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Ecological Dynamics Simulation (EDYS)

be provided to District personnel with training to quickly apply the model themselves for reconnaissance and feasibility studies. EDYS-L has also been coded to easily link to GIS tools and SWWRP visualization tools.

Currently EDYS is being applied for the Fort Worth District on a GI study to help evaluate flood damage reduction and ecological restoration alternatives. We are or have recently worked with the City of Los Angeles, the Natural Resources Conservation Service, the US Geological Survey, the Commonwealth Scientific and Industrial Research Organization of Australia, the mining industry and several university partners to develop numerous applications in the US and OCONUS.

Benefits: EDYS allows the user to quickly evaluate restoration alternatives that include a combination of several different management actions implemented at different spatial and temporal scales depending on the alternative. The alternatives can also be evaluated based on a range of weather patterns e.g., dry versus average versus wet periods. EDYS is a science based mechanistic model and can be used within an Multi-Criteria Decision Analysis (MCDA) framework so that risk can be adequately addressed. EDYS can and has been linked with surface and ground water models to provide a holistic approach to watershed analysis and simulation. EDYS has been through multiple peer reviews and has been verified and independently validated, including accuracy assessment and sensitivity analysis. Therefore, all major steps have been completed for certification according to the Corps' protocol.

Data Requirements: Data requirements for a new application of EDYS are extensive and generally require the assistance of the developers. However, for EDYS-L, we have provided simplified versions of most data requirements in the form of pull-down menus within the software. Generally all that is required of the user in developing a new application of EDYS-L are a digital footprint of the ecosystem of interest (e.g., watershed), a digital vegetation map at the life form level, and a digital elevation map.

Future Capabilities: The first SWWRP supported software, EDYS-Lite 4.6.4 has been released and work is ongoing.

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System-Wide Water SWWRP Resources Program