

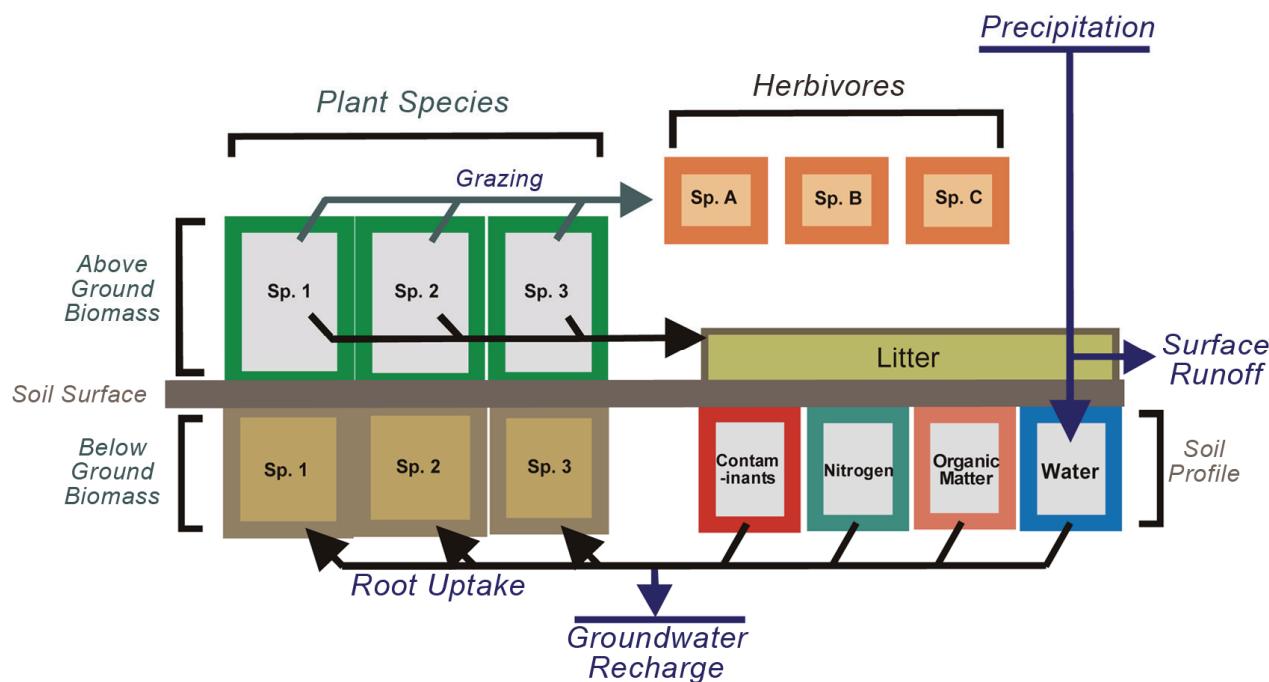


System-Wide Water

**SWWRP**  
Resources Program

## 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, road/trail building and closure, invasive plants inventory and eradication, drought assessment, water quality/quantity, reclamation, restoration, land cover design, and slope stability.

Impact assessments of hydrological alteration on vegetation and of vegetation on land and water resources can be greatly facilitated by linking existing hydrological models with general ecosystem models designed to make long-term projections of ecosystem dynamics. The EDYS model is well-suited for linking with other models because it is designed to simulate ecological processes at multiple spatial and temporal scales. In particular, EDYS computes small-scale flows (precipitation,



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# Ecological Dynamics Simulation (EDYS)

interception, evaporation, infiltration, and transpiration) on a daily basis, and can thereby provide much more accurate estimates of evapotranspiration and groundwater uptake and recharge than would ordinarily be available for calibration of surface-water and groundwater models. EDYS developers are able to rapidly develop interfaces between various EDYS modules and corresponding components of hydrological models to coordinate exchanges of data and results.

EDYS has been linked with a watershed model and applied to the upper Cibolo Creek watershed north of San Antonio, TX in the San Antonio River basin. The overall objective was to evaluate the feasibility of constructing water retention structures for flood damage control and recharge to the Edwards Aquifer and evaluating alternatives to implement Best Management Practices (BMPs) in the watershed. The impetus for including EDYS in the evaluation was to address issues of potential losses to evapotranspiration from juniper encroachment, urban/suburban growth, and other land use changes in the watershed.

**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.

**Future Capabilities:** Spiral 1: A version of EDYS as EDYS Lite that can be quickly parameterized for major ecological regions and linked with GSSHA to provide a linked hydrological and ecological model for watershed assessment and alternatives analysis.

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