A Few Computerized Models Suitable for Groundwater Modeling in the LYV GWMA

AIRPACT for Atmospheric Deposition

HYDRUS-1D for Vadose Zone Modeling

MODFLOW for Groundwater and Groundwater-Surface Water Interactions

P-GWAVA for transport of solutes in the sub-surface

RZWQM2 for biological process in various cropping systems

SPARROW for transport of contaminants from inland to larger water bodies

SSURGO mapping of soils throughout the nation

AIRPACT is a computerized system for predicting air quality (AQ) for the immediate future of one to three days for ID, OR and WA. AIRPACT predicts air quality by calculating the chemistry and physics of air pollutants as determined by pollutant emissions within the context of the background, natural air chemistry and predicted meteorology. Meteorology has a first order effect on air pollution, with variables such as wind speed, temperature and precipitation affecting dilution, chemical reaction rates and the removal of pollutants through rain-out, respectively.

Pollutant emissions are another first order determinate of air quality, along with meteorology, and are calculated referring to detailed spatial databases of land use, traffic volumes, industrial emissions and natural emissions from vegetation and soils, all adjusted as appropriate by date, time of day and predicted temperature and solar (uv) light intensity. AIRPACT's project name, the Air Information Report for Public Access and Community Tracking, reflects the goal of bringing meaningful information on the quality of the air (or the level of air pollutants) to the public from a variety of sources, including both model results and monitoring stations.

More Information at http://lar.wsu.edu/airpact/introduction.html

HYDRUS-1D may be used to analyze water and solute movement in unsaturated, partially saturated, or fully saturated porous media. The flow region itself may be composed of

nonuniform soils. Flow and transport can occur in the vertical, horizontal, or a generally inclined direction. The water flow part of the model can deal with (constant or time-varying) prescribed head and flux boundaries, boundaries controlled by atmospheric conditions, as well as free drainage boundary conditions. Soil surface boundary conditions may change during the simulation from prescribed flux to prescribed head type conditions (and vice versa).

More Information at https://www.ars.usda.gov/pacific-west-area/riverside-ca/us-salinity-laboratory/docs/hydrus-1d-model/

MODFLOW is the USGS's modular hydrologic model. MODFLOW is considered an international standard for simulating and predicting groundwater conditions and groundwater/surface-water interactions.

Originally developed and released solely as a groundwater-flow simulation code when first published in 1984, MODFLOW's modular structure has provided a robust framework for integration of additional simulation capabilities that build on and enhance its original scope. The family of MODFLOW-related programs now includes capabilities to simulate coupled groundwater/surface-water systems, solute transport, variable-density flow (including saltwater), aquifer-system compaction and land subsidence, parameter estimation, and groundwater management.

More information at https://water.usgs.gov/ogw/modflow/

P-GWAVA system uses computer simulations that account for a broader range of the hydrologic, physical, biological and chemical phenomena known to control the transport and fate of solutes in the subsurface than has been accounted for by any other vulnerability assessment over regional to national scales. Such phenomena include preferential transport and the influences of temperature, soil properties, and depth on the partitioning, transport, and transformation of pesticides in the subsurface. Published methods and detailed soil property data are used to estimate a wide range of model input parameters for each site, including surface albedo, surface crust permeability, soil water content, Brooks-Corey parameters, saturated hydraulic conductivity, macroporosity and sizes of microbial populations, as well as solute partition coefficients, reaction rates, and meso-micropore diffusion rates.

More information at https://pubs.er.usgs.gov/publication/sir20145189

Root Zone Water Quality Model 2 (RZWQM2) simulates major physical, chemical, and biological processes in an agricultural crop production system. RZWQM2 is a one-dimensional (vertical in the soil profile) process-based model that simulates the growth of the plant and the movement of water, nutrients and pesticides over, within and below the crop root zone of a unit area. It has a quasi-two-dimensional macropore/lateral flow. It responds to agricultural management practices including planting and harvest practices, tillage, pesticide, manure and chemical nutrient applications, and irrigation events. The model includes simulation of a tile drainage system. It has a Windows Interface (RZWQM2.EXE) with manages input and output for Projects and Scenarios and executes the science model (RZWQMrelease.exe).

More information at https://www.ars.usda.gov/plains-area/fort-collins-co/center-for-agricultural-resources-research/rangeland-resources-systems-research/docs/system/rzwqm/

SPARROW (SPAtially Referenced Regressions On Watershed attributes) models estimate the amount of a contaminant transported from inland watersheds to larger water bodies by linking monitoring data with information on watershed characteristics and contaminant sources. Explore relations between human activities, natural processes, and contaminant transport using interactive Mappers.

Modeling results can help managers determine how to reduce loads of contaminants and design protection strategies; design strategies to meet regulatory requirements; predict changes in water quality that might result from management actions; and identify gaps and priorities in monitoring.

More information at https://water.usgs.gov/nawqa/sparrow/#

SSURGO database contains information about soil as collected by the National Cooperative Soil Survey over the course of a century. The information can be displayed in tables or as maps and is available for most areas in the United States and the Territories, Commonwealths, and Island Nations served by the USDA-NRCS. The information was gathered by walking over the land and observing the soil. Many soil samples were analyzed

in laboratories. The maps outline areas called map units. The map units describe soils and other components that have unique properties, interpretations, and productivity. The information was collected at scales ranging from 1:12,000 to 1:63,360. More details were gathered at a scale of 1:12,000 than at a scale of 1:63,360. The mapping is intended for natural resource planning and management by landowners, townships, and counties. Some knowledge of soils data and map scale is necessary to avoid misunderstandings.

More information at
https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/geo/?cid=nrcs142p2_053627