Simulation Models, GIS and Nonpoint-Source Pollution (III)

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Water Quality Information Center

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SIMULATION MODELS, GIS AND NONPOINT-SOURCE POLLUTION (III)

1. Adaptive modified method of characteristics to solve the one-dimensional solute transport equation.
Lui, H. H.; Dane, J. H.; Guven, O.
Includes references.
Descriptors: solutes-; movement-in-soil; transport-processes; dispersion-; equations-; mathematical-models; simulation-models; advection-
Abstract: Simulation of advection-dominated solute transport in a porous medium is complicated due to the inherent problems of numerical dispersion and oscillation. We propose an adaptive
modified method of characteristics (AMMOC) to simulate one-dimensional, advection-dominated solute transport problems, which incorporates the advantage of a self-adaptive spatial grid system with the computational power of the modified method of characteristics (MMOC) to deal with numerical dispersion and oscillation. The numerical simulations, including a pure advection problem, show that the AMMOC is free of oscillation, approximately global mass conservative, and exhibits insignificant numerical dispersion. Related to this method, three interpolation schemes to obtain the concentration of the fictitious particle at the previous time step were also evaluated. Our simulations show that the AMMOC, based on a clipped quadratic interpolation schemes provides the most accurate results.

NAL Call No.: 56.9-So3
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2. AGNPS tracks pollutants to their source.
Comis, D.
Descriptors: watersheds--; water-pollution; sources--; computer-software; models--; pollutants--; tracking-
NAL Call No.: 1.98-Ag84
*****************************************************************

3. Alternative river management using a linked GIS-hydrology model.
Rosenthal, W. D.; Srinivasan, R.; Arnold, J. G.
Includes references.
Descriptors: rivers--; water-quality; simulation-models; information-systems; hydrological-data; stream-flow; soil--; land-use; weather--; texas--
Abstract: A geographic information system (GIS)-hydrologic model link was used to aid in forming input files for the hydrologic model, SWAT (Soil and Water Assessment Tool). The link and SWAT prediction of streamflow volume were then tested for the Lower Colorado River basin of Texas. With no calibration, simulated monthly streamflow volume along the river was underestimated for the extreme events, but the relationship was significant (R2 = 0.75). Model results also suggest that urbanization further upstream can significantly affect streamflow downstream. The system is general enough to be applicable to other river systems.
NAL Call No.: 290.9-Am32T
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4. Analysis of nitrogen saturation potential in Rocky Mountain tundra and
Baron, J. S.; Ojima, D. S.; Holland, E. A.; Parton, W. J.
Biogeochemistry v.27, p.61-82. (1994).
Includes references.
Descriptors: air-pollution; nitrogen--; deposition--; nitrogen-cycle; nitrogen-metabolism; soil-flora; biological-activity-in-soil; forest-soils; tundra-soils; mountain-soils; subalpine-forests; leaching--; watersheds--; lakes--; streams--; water-quality; simulation-models; colorado--
NAL Call No.: QH345.B564
5. Analytical modelling of pesticide transport from the soil surface to a drinking water well.
Includes references.
Descriptors: pesticides-; leaching-; water-flow; drinking-water; wells-; water-quality; groundwater-pollution; mathematical-models
Abstract: Pesticide transport through the unsaturated zone was modelled with an analytical solution of the convection-dispersion equation assuming steady water flow, a linear sorption isotherm and first-order transformation kinetics. Pesticide behaviour in the saturated zone was described with an analytical solution of the mass balance equation for a cylindrical flow system assuming steady flow, no dispersion, linear sorption and first-order transformation. This simplified model for the unsaturated-saturated soil system was developed to identify the processes and parameters with the greatest impact on the fraction of applied pesticide reaching a drinking water well. Leaching from the unsaturated zone was highly sensitive to the parameters describing travel time and transformation rate. Leaching increased when heterogeneity of the soil was taken into account. Pesticide arrival in the well was only moderately sensitive to the characteristic travel time and transformation rate in the aquifer. However, this sensitivity increases if zones without pesticide application were introduced around the wells (protection zones). For representative sandy soils under average Dutch rainfall conditions, processes in the unsaturated zone had a much larger impact on pesticide arrival in the wells than processes in the saturated zone. Protection zones reduced pesticide transport to wells substantially if their half-life was much smaller than the characteristic travel time of the pesticide in the aquifer.
NAL Call No.: 292.8-J82
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6. An analytical solution for predicting solute transport during ponded infiltration.
Huang, K.; Van Genuchten, M. T.
Includes references.
Descriptors: solutes-; transport-processes; unsaturated-flow; standing-water; infiltration-; mathematical-models
NAL Call No.: 56.8-So3
*

7. Analytical solutions for one-dimensional colloid transport in saturated fractures.
Abdel Salam, A.; Chrysikopoulos, C. V.
Includes references.
Descriptors: groundwater-flow; pollutants-; colloids-; rocks-; fracture-; soil-parent-materials; transport-processes; equations-; mathematical-models; simulation-models; rock-matrix
NAL Call No.: TD201.A4
*
Bouraoui, F.; Dillaha, T. A. I.
Descriptors: watersheds--; water-quality; water-pollution; nitrogen--; phosphorus--; sediment--; losses-from-soil; runoff--; erosion--; simulation-models
NAL Call No.: 290.9-Am32P

9. Application of GLEAMS to predict nutrient losses from land application of poultry litter.
Yoon, K. S.; Yoo, K. H.; Wood, C. W.; Hall, B. M.
Descriptors: poultry-manure; nutrients--; losses--; application-to-land; water-quality; models--; computer-software
NAL Call No.: 290.9-Am32P

10. Application of the MAGIC model to the Glacier Lakes catchments.
Reuss, J. O.
Includes references.
Descriptors: acid-rain; watersheds--; catchment-hydrology; streams--; water-quality; simulation-models; national-forests; wyoming--; medicine-bow-national-forest
NAL Call No.: A99.9-F7632U

11. Application of the precipitation-runoff modeling system model to simulate dry season runoff for three watersheds in south-central Guam. Application of the precipitation runoff modeling system model to simulate dry season runoff for three watersheds in south-central Guam.
Shipping list no.: 95-0091-P.
Descriptors: Precipitation-Meteorology-Guam; Runoff-Guam
NAL Call No.: GB701.W375--no.93-4116

12. Application to geostatistics for mapping nitrate contaminated groundwater.
Dou, C.; Woldt, W. E.; Dahab, M. F.; Bogardi, I.
Lull, K. J.; Tindall, J. A.; Potts, D. F.
Includes references.
Descriptors: water-pollution; risk-;
geographical-information-systems; land-use; watersheds-;
montana-; risk-assessment
NAL Call No.: 99.8-F768

14. Assessment of in situ solvent extraction for remediation of coal tar
Ali, M. A.; Dzombak, D. A.; Roy, S. B.
Includes references.
Descriptors: tars-; coal-; gasification-; industrial-sites;
groundwater-pollution; pollutants-; contaminants-; solvents-;
extraction-; simulation-models; wells-; power-industry;
manufactured-gas-plants; recovery-wells; injection-wells
NAL Call No.: TD419.R47

15. Assessment of in situ solvent extraction for remediation of coal tar
Roy, S. B.; Dzombak, D. A.; Ali, M. A.
Includes references.
Descriptors: tars-; coal-; gasification-; industrial-sites;
groundwater-pollution; pollutants-; contaminants-; solvents-;
extraction-; equations-; mathematical-models; power-industry;
manufactured-gas-plants; nonaqueous-phase-liquids
NAL Call No.: TD419.R47

Krzyszowska, A. J.; Allen, R. D.; Vance, G. F.
Includes references.
Descriptors: dicamba-; picloram-; leaching-; persistence-;
sorption-; soil-organic-matter; degradation-; rangeland-soils;
groundwater-pollution; simulation-models; LEACHP-model
Abstract: Extensive use of dicamba (2-methoxy-3,6-dichlorobenzoic acid) and picloram (4-amino-3,5,6-trichloropicolinic acid) in arid Wyoming, along with large volumes of irrigation water used in some areas, has created a concern for the potential
contamination of surface and groundwaters by these herbicides. Persistence and mobility of dicamba and picloram were investigated in a Wyoming rangeland soil using batch adsorption and soil column studies. The objectives of this study were to characterize soil chemical and physical properties that affect herbicide transport, examine herbicide sorption, model herbicide movement, and estimate degradation rate constants. Essentially no sorption of dicamba was detected; however, picloram sorption was greatest in the highest organic C content horizon. Both saturated (5.90, 2.96, and 0.82 kg ha⁻¹ dicamba and 1.85, 0.97, and 0.47 kg ha⁻¹ picloram) and unsaturated (2.76 and 1.00 kg ha⁻¹ for dicamba and picloram, respectively) column experiments were conducted. The herbicides and Br tracer (34, 38, 69, and 137 micrograms L⁻¹) were displaced through the soil columns using distilled water that was added in daily increments (60 mL d⁻¹). Degradation rate constants were calculated using both simple recovery fraction technique and by matching LEACHP-generated breakthrough curves to experimental data. For the two columns receiving intermediate application rates, anaerobic picloram dissipation was more rapid (t1/2 = 19 d) than for aerobic conditions (t1/2 = 87 d). The rate of dissipation of dicamba was approximately the same under aerobic and anaerobic conditions (t1/2 = 15 and 17 d in the saturated and unsaturated columns, respectively). Picloram and dicamba dissipation was more rapid at application rates, t1/2 of 23 and 17 d were measured for picloram and dicamba, respectively. Both herbicides were found to be highly mobile, with the mobility of picloram increasing at higher pore-water velocities.

NAL Call No.: QH540.J6
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17. Changes in acidification of lochs in Galloway, southwestern Scotland,
Wright, R. F.; Cosby, B. J.; Ferrier, R. C.; Jenkins, A.; Bulger, A. J.; Harriman, R.
Includes references.
Descriptors: watersheds-; acid-deposition; ions-; acidification-; soil-chemistry; water-quality; afforestation-; deforestation-; fishes-; population-density; simulation-models; prediction-; scotland-; water-chemistry; critical-load
Abstract: Decades of acid deposition in the Galloway area, southwestern Scotland, have resulted in acidification of surface waters and damage to fish. In the period since 1980, however, acidic deposition has decreased substantially. A survey of 50 lochs conducted in 1979 and repeated in 1988 reveals major changes in water chemistry over this 9 year period. Together these two data sets separated in time by 9 years and covering a period of relatively large and rapid change in acid deposition offer a valuable basis for the evaluation of acidification models. Concentrations of SO₄ in the lochs were on the average 42% lower in 1988 relative to 1979. The decline is readily explained by the large and rapid decline in sulphate concentrations in precipitation in the area. Concentrations of non-marine base cations decreased from 155 to 90 microequiv l⁻¹ and acid neutralising capacity (ANC) increased. The change in ANC was due mostly to decreased concentrations of Al. pH levels
showed no systematic change from 1979 to 1988. The regional changes in water chemistry over the period 1979-1988 are corroborated by regular measurements at several of these lochs over this 9 year period. MAGIC (Model for Acidification of Groundwater In Catchments) successfully reproduces the major changes in water chemistry observed over the period 1979-1988. Both calibration to the 1979 data with prediction of 1988, and calibration to the 1988 with reconstruction of 1979 give close fits to the observations. The model provides a means by which the future impact of acidic deposition and afforestation can be evaluated. A fish response function coupled to MAGIC provides the basis for evaluation of past and future fish status in the region. MAGIC. indicate that if acidic deposition is held constant at 1988 levels, afforestation causes further acidification of the lochs. Acidic deposition emerges as the major cause of soil and water acidification in the Galloway region, although forestry practices can exacerbate the effects.

18. CHEMFRANCE: a regional level III fugacity model applied to France.
Devillers, J.; Bintein, S.; Karcher, W.

Includes references.
Descriptors: air-pollution; soil-pollution; water-pollution; groundwater-pollution; pollutants--; organic-compounds; movement--; simulation-models; computer-simulation; france--;
environmental-fate
NAL Call No.: 292.8-J82

Loague, K.; Miyahira, R. N.; Green, R. E.; Oki, D. S.; Giambelluca, T. W.; Schneider, R. C.

Includes references.
Descriptors: groundwater-pollution; chlorpyrifos--; diazinon--; metribuzin--; nitrate--; leaching--; simulation-models;
mathematical-models; groundwater-recharge; hydrology--; water-table; hawaii--; pesticide-root-zone-model
NAL Call No.: TD403.G7

20. Chemical processes controlling the mobility of waste material contaminants in soils.
Wesselink, L. G.; Dekker, P. M.; Aalbers, T. G.

Descriptors: slags--; building-materials; leaching--; percolation--;
leachates--; sandy-soils; soil-chemistry; chemical-speciation; simulation-models; steel-slag; phosphorus-slag
NAL Call No.: QH540.S8
*****************************************************************
Milly, P. C. D.
Descriptors: soil-water-balance; soil-water; seasonal-variation; rain--; evaporation--; water-holding-capacity; climate--; runoff--; simulation--; simulation-models; mathematical-models; equations--; southern-states-of-usa; north-central-states-of-usa; northeastern-states-of-usa
NAL Call No.: TD201.A4
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Bae, D. H.; Georgakakos, K. P.
Includes references.
Descriptors: soil-water; catchment-hydrology; stream-flow; rain--; temperature--; evapotranspiration--; temporal-variation; spatial-variation; hydrological-data; simulation-models; rivers--; minnesota--; iowa--; rainfall-runoff-models; des-moines-river-basin; mississippi-river-system
Abstract: A conceptual hydrologic rainfall-runoff model that is an adaptation of the operational US National Weather Service hydrologic model is used to simulate the hydrologic processes in large basins of the US upper Mississippi region. In particular, the conceptual rainfall-runoff model is used to produce daily streamflow from daily rainfall, temperature and potential evapotranspiration input over three neighboring headwater basins that span 2 degrees longitude by 2 degrees latitude. When used for simulation of historical flows, the model provides a means of inference of the 40 year time series of unrecorded mesoscale soil water and actual evapotranspiration for climate studies. In this paper we discuss issues associated with parameter estimation, the reliability and stability of parameter estimates, and the interpretation of soil water estimates. It is concluded that the conceptual hydrologic model may be used to estimate the variability of aggregate soil water over large areas of the Midwestern US provided that: (a) all significant basin inflows and outflows are accounted for; (b) model verification yields good agreement between observed and simulated flows on a daily basis. Parameter sensitivity studies showed that estimating the soil's capacity to hold water is most important for flood event prediction and flow simulation, and, for such parameters, underestimation is more critical than overestimation. Also, uncertainty associated with the parametrization of evapotranspiration may introduce local errors in the time series of soil water estimates produced by the model. In a companion paper we present a spatio-temporal analysis of the estimated time


Abstract: The potential sensitivity of environmental resource valuations to information concerning the resource is of interest to researchers and decision-makers involved in estimating and applying these numbers. An analysis of the impact of characteristic and service information on the economic value of groundwater quality is described. Characteristic information details the objectively measurable traits of a resource, while service information describes the consumption services provided by the resource. The analysis provides insight into the impact of information on environmental resource valuation decisions. Hypothesis tests suggest that changes in the joint levels of information may cause significant changes in groundwater quality valuation behavior. More theoretical and empirical research is required before firm conclusions can be drawn concerning the effects of information on groundwater value estimates (e.g., estimated willingness-to-pay for groundwater protection).


Reyes, M. R.; Bengtson, R. L.; Fouss, J. L.; Carter, C. E.

Includes references.
Descriptors: alluvial-soils; erosion-; runoff-; drainage-; simulation-models; prediction-; performance-appraisals; louisiana-
Abstract: Simulation performances of GLEAMS, GLEAMS-WT, and GLEAMS-SWAT were evaluated by comparing their soil loss predictions with measured data from two runoff-erosion-drainage experimental plots at Baton Rouge, Louisiana. One of the experimental plots was surface drained only, and the other was both surface and subsurface drained. Although the hydrology components of GLEAMS-WT and GLEAMS-SWAT predicted surface runoff more accurately than the original GLEAMS, all three models seriously underpredicted total soil losses over a seven-year period (1981 to 1987). Transport capacity limited soil loss prediction values in the models. Hence, we recommend that any changes or modifications in the erosion submodule be focused on improving transport capacity simulation; changes in the detachment simulation routine may not be needed. A calibration parameter was added to the erosion subroutine to adjust transport capacity. However, even when the models were calibrated for a specific site, there were still substantial annual and monthly differences between predicted and observed soil losses.

27. A conceptual model for ecological risk assessment of bottomland hardwood forests.
Vellidis, G.; Lowrance, R.

Descriptors: hardwoods-; bottomland-forests; forest-ecology; risk-; assessment-; water-quality; models-; georgia-
NAL Call No.: 290.9-Am32P

McFarlane, R. W.; Galveston Bay National Estuary Program.

[Webster, Tex. ] : Galveston Bay National Estuary Program, [1993]
xii, 81 p. : ill., maps.
"October 1993.".
Descriptors: Estuarine-ecology-Texas-Galveston-Bay;
Environmental-protection-Texas-Galveston-Bay;
Water-quality-management-Texas-Galveston-Bay;
Coastal-zone-management-Texas-Galveston-Bay;
Ecosystem-management-Texas-Galveston-Bay; Galveston-Bay-Tex
NAL Call No.: QH541.5.E8P83--no.42

29. Conservation tillage a sustainable agricultural practice.
Lakshminarayan, P. G.; Bouzaher, A.; Johnson, S. R.

Environmentally sound agriculture proceedings of the second
30. Consideration of spatial variability in nitrate contamination to groundwater.
Goderya, F. S.; Dahab, M. F.; Woldt, W. E.

Descriptors: nitrate-nitrogen; spatial-variation; groundwater-pollution; simulation-models
NAL Call No.: 290.9-Am32P

Quintard, M.; Whitaker, S.

Includes references.
Descriptors: groundwater-pollution; pollutants--; contaminants--; dispersion--; convection--; mathematical-models; equations--; aquifers--; groundwater-flow
NAL Call No.: TD201.A4

32. CREAMS/WEPP sediment deposition equation: a semitheoretical evaluation.
Storm, D. E.; Barfield, B. J.; Altendorf, C. T.

Includes references.
Descriptors: water-erosion; sediment--; deposition--; mathematical-models; equations--; simulation-models; sediment-yield; erosion-models
Abstract: A semitheoretical evaluation of the sediment deposition equation used in the CREAMS and WEPP models is presented. The original deposition relationship was presented in the CREAMS and WEPP models without theoretical or conceptual justification. In this article, the relationship is shown to be based conceptually on four characteristics: 1) uniform velocity distribution; 2) no lateral sediment inflow; 3) discrete particle settling; and 4) a uniform sediment concentration—all of which are violated under typical field conditions. Why then does the deposition equation work? The deposition equation, as applied to a rill, approximates the trapping that would occur in a fully-turbulent, rectangular reservoir if a rill is discretized into a large number of sections. When only one rill section is utilized, the equation approximates a quiescent reservoir. Since most shallow rills are
typically discretized into a number of sections and experience a combination of turbulent and quiescent flows, the deposition equation should provide a first approximation of field conditions.

NAL Call No.: 290.9-Am32T

33. Crop nitrogen utilization and soil nitrate loss in a lettuce field.
Jackson, L. E.; Stivers, L. J.; Warden, B. T.; Tanji, K. K.
Includes references.
Descriptors: lactuca-sativa; nutrient-availability; nitrogen-; nutrient-uptake; nitrate-; losses-from-soil; denitrification-; leaching-; transformation-; nitrification-; mineralization-; seasonal-variation; rain-; irrigated-conditions; shoots-; roots-; nutrient-content; growth-; simulation-models; california-; nitrogen-pools; cropped-period; non-cropped-period; nitrogen-dynamics; erosion; productivity-impact-calculator-epic
Abstract: Low N use efficiency and high nitrate (NO3-) pollution potentials are problems in intensive vegetable production systems. The purpose of this study was to quantify N utilization by lettuce (Lactuca sativa L. cv Salinas), and identify periods of NO3- loss in an on-farm study in the Salinas Valley in coastal California. During autumn and winter, surface moisture remained low, and NO3- concentrations increased, reflecting high net mineralizable N, as determined by anaerobic incubation, and nitrification potential, as determined by the chlorate inhibition method. At the onset of a large winter storm, tracer levels of 15NO3- were injected in the top 5 mm of soil in 30 cm-deep cylinders. After two weeks, most of the 15N was present as 15NO3- at 10-30 cm depth. By difference, losses to denitrification accounted for approximately 25% of the surface-applied 15N. Leaching below 30 cm did not occur, since no 15N enrichment of NO3-N was measured in anion-exchange resin membranes placed at the base of each cylinder. During the crop period, NO3- losses were most pronounced after irrigation events. Uptake of N by two crops of lettuce (above- and belowground material) was approximately equal to fertilizer inputs, yet simulation of N fates by the Erosion/Productivity Impact Calculator (EPIC) model indicated losses of 14.6 g-N m-2 by leaching and 2.5 g-N m-2 by denitrification during the 6-month crop period. The large NO3- losses can be attributed to accumulation of soil NO3- during winter that was leached or denitrified during the irrigated crop period.

NAL Call No.: S631.F422

34. Darcy-Weisbach roughness coefficients for surfaces with residue and gravel cover.
Gilley, J. E.; Kottwitz, E. R.
Includes references.
Descriptors: crop-residues; gravel-; covers-; upland-areas; hydraulic-resistance; runoff-; roughness-; water-flow; simulation-models
Abstract: Several types of hydraulic resistance factors may be
present on upland agricultural areas. It is not known whether roughness contributions from individual elements are additive or if interactions between resistance factors may occur. In this study, Darcy-Weisbach roughness coefficients were measured on surfaces containing corn-soybeans, sorghum-cotton, and sunflower-wheat residue in addition to gravel cover. Varying rates of flow were introduced into a flume in which residue and gravel materials were securely attached. Roughness coefficients were calculated from measurements of discharge rate and flow velocity for Reynolds number values varying from approximately 1,200 to 13,000. The laboratory data were then used to identify the contribution to total hydraulic resistance provided by the different types of resistance elements. For most of the experimental treatments, the addition of smaller diameter residue materials (soybeans, cotton, or wheat) to surfaces containing larger resistance elements (corn, sorghum, or sunflower) did not significantly affect hydraulic resistance. However, smaller diameter residue materials did influence hydraulic resistance when they substantially increased the total volume of resistance elements. Existing roughness coefficient values were not significantly affected by the presence of gravel materials with diameters similar to the larger residue materials. The experimental results suggest that total hydraulic resistance cannot be predicted by simply adding the contributions provided by individual resistance elements. When estimating total hydraulic resistance on upland agricultural areas, the relative size, number, and volume of resistance elements must be considered.

NAL Call No.: 290.9-Am32T
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35. Description of simazine transport with rate-limited, two-stage, linear and nonlinear sorption.
Streck, T.; Poletika, N. N.; Jury, W. A.; Farmer, W. J.
Includes references.
Descriptors: simazine-; transport-processes; sorption-;
sorption-isotherms; lysimeters-; models-; sorption-models;
transport-models
Abstract: This study was conducted to reconcile an apparent inconsistency between the simazine laboratory sorption isotherm data and the field lysimeter transport experiment reported by Poletika et al. (this issue). In this investigation, linear and nonlinear one- and two-stage simazine sorption models were fitted to the sorption and desorption isotherm laboratory data to obtain parameter estimates for use in the transport model. Once obtained, the calibrated sorption model was combined with the parameterized outflow concentration record from a mobile Br tracer to represent rate-limited sorption and transport of the simazine added simultaneously with the Br. The calibrated model did an excellent job of representing the final simazine profile in the soil, particularly with the nonlinear model. This is in contrast to a single-stage adsorption model tested by Poletika et al. (this issue), which reached poor agreement with the field profile when laboratory-measured sorption parameters were used. The results demonstrate the compatibility of field and laboratory experiments on pesticide movement and also indicate that sorption
isotherms may require substantially longer to reach equilibrium than is customarily allowed in current protocols.
NAL Call No.: 292.8-W295

36. Development of an in vitro model for investigating the formation of the nuclear Ah receptor complex in mouse Hepa 1c1c7 cells.
Wang, X.; Safe, S.

Includes references.
Descriptors: aromatic-hydrocarbons; receptors--; nuclei--; cytosol--; cell-lines; in-vitro; models--; transport-processes; vanadium--; atp--; lectins--; dioxins--

Abstract: An in vitro assay for investigating factors which modulate formation of the nuclear aryl hydrocarbon (Ah) receptor complex was developed using 9S cytosolic Ah receptor isolated from wild-type Hepa 1e1c7 cells treated with 2,3,7,8-[3H]tetrachlorodibenzo-p-dioxin (TCDD) at 4 degrees C and nuclei from Ah-responsive and -nonresponsive wild-type and mutant Hepa 1c1c7 cells. Incubation of the radiolabeled ([3H]TCDD) 9S cytosolic Ah receptor with nuclei from untreated wild-type Ah-responsive mouse Hepa 1e1c7 cells resulted in a time- and temperature-dependent formation of the nuclear Ah receptor complex as determined by either velocity sedimentation analysis or gel mobility shift assays using a consensus 32P-labeled dioxin-responsive element. Maximal levels of the nuclear Ah receptor formed within 30 min at 37 degrees C and significantly lower levels were observed after incubation at 4, 15, or 25 degrees C. Complementation studies using nuclei from untreated wild-type and Ah-nonresponsive class II mutant (translocation-deficient) cells and radiolabeled 9S cytosolic receptor (bound with [3H]TCDD) from both wild-type and mutant cell lines were also carried out. The results indicated that nuclear translocation was primarily inhibited using cytosol from mutant cells confirming the requirement for the aryl hydrocarbon receptor nuclear translocator protein for formation of the nuclear Ah receptor complex. The effects of a series of Ah receptor antagonists, ATP, vanadate apyrase, phosphatases, and lectin WGA, on formation of the nuclear Ah receptor complex were also investigated in the in vitro model using radiolabeled cytosolic Ah receptor and nuclei from untreated wild-type Hepa 1c1c7 cells. alpha-Naphthoflavone. apyrase inhibited and ATP enhanced formation of the nuclear Ah receptor complex. The results also show that TCDD-induced transformation of the Ah receptor was inhibited by alpha-naphthoflavone but not by ATP, lectin WGA, or apyrase. These data suggest that the cytosolic Ah receptor is phosphorylated prior to ligad binding and ATP is required for energy-dependent nuclear import of the Ah receptor.
NAL Call No.: 381-Ar2

37. Differences in contingent valuation estimates from referendum and checklist questions.
Jordan, J. L.; Elnagheeb, A. H.

Includes references.
38. Drainage reservoir systems for water quality control.
Melvin, S. W.; Wilcox, A.


Descriptors: drainage--; reservoirs--; water-quality; models--; irrigation-water

NAL Call No.: 290.9-Am32P

39. A dynamic analysis of the impact of water quality policies on irrigation investment and crop choice decisions.
Wu, J. J.; Mapp, H. P.; Bernardo, D. J.

Includes references.

Descriptors: maize--; sorghum--; wheat--; irrigation-water; irrigated-farming; investment--; water-quality; farm-management; decision-making; crop-enterprises; dynamic-models; cost-analysis; soil-types; innovation-adoption; economic-impact; irrigation-technology

Abstract: A dynamic model is developed to analyze farmers irrigation investment and crop choice decisions under alternative water quality protection policies. The model is applied to an empirical example in the Oklahoma High Plains. The choices of crops and irrigation systems and the resulting levels of irrigation, income, and nitrogen runoff and percolation are simulated over a ten-year period. An effluent tax on nitrogen runoff and percolation is shown to be effective in reducing nitrate pollution. The efficacy of cost sharing in adopting modern irrigation technologies and restrictions on irrigation water use depends on soil type. A tax on nitrogen use is shown to be the least effective policy.

NAL Call No.: HD101.S6

40. Economic analysis of effluent control from catfish ponds.
Cerezo, G. A.; Clonts, H. A.


Includes references.

Descriptors: fish-ponds; ictalurus-punctatus; fish-scrap; water-quality; water-pollution; effluents--; water-reuse; environmental-policy; fishery-management; water-systems; watersheds--; costs--; taxes--; cost-benefit-analysis; fish-stocking; linear-programming-model

NAL Call No.: 100-AL1S-1
41. Economics of screening for pesticides in ground water.
Natarajan, U.; Rajagopal, R.

Includes references.
Descriptors: pesticides-; groundwater-; water-quality; groundwater-pollution; screening-; monitoring-; mathematical-models; cost-effectiveness-analysis; usa-; sequential-analysis-screening; sample-compositing-screening
Abstract: In the United States, millions of dollars are currently spent to monitor water quality for a whole suite of organic compounds. However, results of several surveys conducted in the past decade indicate that only a few pesticides occur in a small proportion of wells. Screening methods based on historical evidence of contamination patterns and knowledge of the locales will have significant potential to reduce these costs and effectively identify contamination problems. In this paper, the economics of utilizing two screening methods, sequential analysis and sample compositing, in the design of monitoring strategies is captured in the form of mathematical models and illustrated for a state-level monitoring program. When the two methods are adopted, the total analytical cost to conclusively identify contaminated wells in a network of 4,000 wells is shown to range from $12,500 to $1,575,000 depending on the extent of contamination. In contrast, the total analytical cost of a conventional program where all the wells in the network are sampled and tested for a standard suite of pesticides at a cost of $250/sample is one million dollars. Given such wide range in costs, it is prudent to incorporate the screening concepts presented in this paper in the development of cost-effective monitoring programs.

NAL Call No.: 292.9-Am34
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42. The effect of farming practices on reducing excess nitrogen fertilizer use.
Huang, W. Y.; Uri, N. D.

Water-air-soil-pollut v.77, p.79-95. (1994).
Includes references.
Descriptors: nitrogen-fertilizers; rotations-; continuous-cropping; sole-cropping; zea-mays; glycine-max; application-rates; low-input-agriculture; simulation-models; farmland-; mathematical-models; leaching-; meadows-; farm-income
NAL Call No.: TD172.W36
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43. Empirical analysis of slope and runoff for sediment delivery from interrill areas.
Huang, C. H.

Includes references.
Descriptors: interrill-erosion; simulation-models; slope-; gradients-; runoff-; sediment-; losses-from-soil; relationships-; mathematics-
Abstract: Slope steepness (S) and runoff discharge (qw) are two major factors in determining sediment delivery rates (qs) from interrill areas. Under the current interrill erosion model
concept, these two factors are assumed to have independent effects on \( q_s \); thus, each factor can be quantified individually if the other factor is kept constant. This study was conducted to show the effects of \( S \) and \( q_w \) on \( q_s \) and their interdependency. Sediment discharge rates, measured under different rainfall intensities and slope gradients, for eight soils from two laboratory studies were analyzed empirically with curve-fitting procedures. Results showed that there was a pair of empirical equations for each soil: \( q_s = A_1 q_2 w + A_2 q_w + A_3 \) and \( q_s = B_1 S^2 + B_2 S + B_3 \), where \( A_1, A_2, \) and \( A_3 \) are functions of \( S \) and \( B_1, B_2, \) and \( B_3 \) are functions of \( q_w \). In other words, effects of slope steepness and runoff on sediment delivery are dependent on each other. When \( S \) and \( q_w \) were combined together as stream power, \( \omega \), and plotted against sediment concentration, \( q_s/q_w \), a unique nonlinear relationship existed for each soil: \( q_s/q_w = D_1 \omega^2 + D_2 \omega + D_3 \), where \( D_1, D_2, \) and \( D_3 \) are soil-dependent coefficients. The stream power, which encompasses both slope and runoff effects, may provide improved estimates for interrill erosion. Although not based on theory, this result may be useful in process-based erosion models.

NAL Call No.: 56.9-So3

44. EPIC simulation of water quality impact by land application of poultry litter.
Yoon, K. S.; Yoo, K. H.; Wood, C. W.; Hall, B. M.

Descriptors: poultry-manure; application-to-land; environmental-impact; water-quality; simulation-models; erosion-productivity-impact-calculator
NAL Call No.: 290.9-Am32P

Hayhoe, H. N.; Pelletier, R. G.; Coote, D. R.
Includes references.
Descriptors: meltwater-; water-erosion; runoff-; runoff-water; rain-; simulation-models; computer-simulation; winter-; erosivity-; canada-
NAL Call No.: 56.8-J822

46. Estimation of in situ unsaturated soil hydraulic functions from scaled cumulative drainage data.
Eching, S. O.; Hopmans, J. W.; Wallender, W. W.
Includes references.
Descriptors: unsaturated-hydraulic-conductivity; soil-water-retention; drainage-; water-flow; transport-processes; simulation-; spatial-variation; mathematical-models; california-; linear-variability-scaling-technique; inverse-solution-technique
Abstract: Simulation of water flow and transport processes in
soils rely on field representative soil hydraulic functions. The linear variability concept in combination with the inverse technique was used to estimate in situ soil hydraulic properties in a 32-ha field. Measured cumulative drainage curves were scaled yielding scaling factors. Subsequently, the drainage and moisture content distribution of the scaled reference profile were input to a numerical model to optimize the soil water retention and hydraulic conductivity curves for the reference soil profile by inverse solution of the scaled Richards equation. Field hydraulic functions for each location were computed from the reference curves and scaling factors. In addition, undisturbed soil cores taken from 0.3-m and 0.6-m depths at 44 locations were used to determine soil texture, and soil water retention and hydraulic conductivity curves in the laboratory using the multistep outflow technique. These hydraulic functions were scaled using the simultaneous scaling technique. The reference field hydraulic functions compared well with those determined from the soil cores taken from the 0.6-m depth. In situ saturated hydraulic conductivity variability was one order of magnitude less than that of the soil cores.

NAL Call No.: 292.8-W295

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47. Evaluation of LEACHM. I. Simulation drainage, bromide leaching, and corn bromide uptake.
Jemison, J. M. Jr.; Jabro, J. D.; Fox, R. H.

Includes references.
Descriptors: zea-mays; bromide--; solutes--; ion-transport; movement-in-soil; drainage--; leaching--; uptake--; prediction--; mathematical-models; computer-simulation; simulation-models; leaching-estimation-and-chemistry-model
Abstract: Use of mathematical models to predict solute transport in soils, for research purposes, is increasing, but simpler management-oriented models are needed that require less field-specific data. Evaluation is needed to know which type of model is appropriate. The input-intensive research and simpler management options of the pesticide and tracer version of LEACHM (LEACHMP) were evaluated to predict drainage in zero-tension pan lysimeters, bromide (Br-) leaching, and corn (Zea mays L.) Br- uptake from a 3-yr leaching experiment. Eighteen pan lysimeters (0.465 m²) were installed 1.2 m below the soil surface to collect gravitational water samples. In May 1988, a one-time application of KBr was broadcast to all plots at 100 kg Br- ha⁻¹. Corn Br- uptake was evaluated by taking whole-plant samples at 2-wk intervals in 1988 and 1989. The research model adequately predicted drainage. Significant differences between predicted and observed drainage were not found, and the correlations were significant (0.73 to 0.83). The management model, however, significantly underestimated cumulative drainage. The research model overestimated Br- leaching, because the convection-dispersion equation used in LEACHMP cannot model dual-pore water flow and solute diffusion found in this soil. The model generally underpredicted corn Br- uptake, which probably contributed to the overpredicted Br- leaching. The research version of LEACHMP adequately modeled drainage, but a more sophisticated approach to solute transport and corn Br- uptake is
needed to adequately model Br- movement in this soil-plant-water system. Management model results were generally less accurate than the research model.

NAL Call No.: 4-AM34P

48. Evaluation of LEACHM. II. Simulation of nitrate leaching from nitrogen-fertilized and manured corn.
Jemison, J. M. Jr.; Jabro, J. D.; Fox, R. H.

Includes references.
Descriptors: zea-mays; nitrate-nitrogen; leaching-; prediction-; nitrogen-fertilizers; liquid-manures; cattle-manure; mathematical-models; simulation-models; computer-simulation; uptake-; calibration-; volatilization-; denitrification-; nitrification-
Abstract: High NO3-N concentrations in groundwater resulting from agricultural production have increased the need for mathematical models to predict the concentration and mass of NO3-N leached from agricultural soils. Study objectives included evaluating the N version of LEACHM (LEACHMN) to predict mass of NO3-N leached from nonmanured and manured corn (Zea mays L.), and to test two methods of model validation. Four treatments (no manure with 0 and 200 kg N ha⁻¹ and a manure treatment with 0 and 100 kg N ha⁻¹) from a NO3 leaching experiment were modeled for 1988, 1989, and 1990. Model calibration involved adjusting nitrification, denitrification, and volatilization rate constants to minimize differences between predicted and observed data. When calibrated for each year, LEACHMN produced reasonably accurate predictions of NO3-N mass leached; however, LEACHMN tended to overestimate summer and underestimate spring leaching losses. The lack of a provision in LEACHM to allow solute diffusion out of water flow channels, and underpredicted corn N uptake early in the season probably created conditions conducive for high leaching losses early; following harvest, insufficient NO3-N in the soil profile resulted in the model underestimating leaching in the spring. Validating LEACHMN using 1988 rate constants for the 1989 and 1990 years was unsuccessful. When 3-yr average rate constants were used, simulation accuracy improved somewhat; most accurate simulations were found if 3-yr average values were close to the calibrated rate constant for that year. The model's predictive capability would probably improve if it contained a more complex corn N uptake routine and a dual-pore water flow component.
NAL Call No.: 4-AM34P

49. Evaluation of phosphorus loading models for south Florida.

Includes references.
Descriptors: lakes-; phosphorus-; runoff-; water-pollution; water-management; simulation-models; algorithms-; prediction-; florida-
Abstract: Phosphorus enrichment poses a threat to the ecology of Florida's Lake Okeechobee. As a part of a phosphorus management program, the South Florida Water Management District evaluated two nutrient loading models CREAMS-WT and PHANTM. Model
documentation and algorithms were reviewed. Model simulations for phosphorus loading were compared to measured data for three sites for the period April 1989, through December 1991. Statistical correlation of monthly and annual values was analyzed. Based on these analyses, recommendations concerning the models for predicting phosphorus loading from Lake Okeechobee watersheds are presented.

NAL Call No.: 290.9-Am32T

50. A farm scale water quality planning system for evaluating best management practices.
Batchelor, W. D.; Dillaha, T. A. I.; Wolfe, M. L.; Heatwole, C. D.; Mostaghimi, S.

Descriptors: water-pollution; water-quality; land-management; simulation-models; pollution-control; non-point-source-pollution
NAL Call No.: 290.9-Am32P

51. Field and undisturbed-column measurements for predicting transport in unsaturated layered soil.

Descriptors: layered-soils; solutes-; transport-processes; soil-analysis; analytical-methods; soil-variability; laboratory-methods; field-experimentation; models-; stochastic-streamtube-models
Abstract: Transport properties vary considerably over small distances in most soils. The stochastic streamtube model offers one approach to incorporating heterogeneity into transport predictions. This study tested the ability of the streamtube concept to predict transport in heterogeneous fields using measurements from undisturbed columns. Fifty undisturbed columns (0.15-m diam. by 1.5 m deep) were taken every 0.4 m from a 20-m-long transect in 8 loamy sand soil with variable horizon thickness. Each core was instrumented at 0.1-m intervals with time domain reflectometry probes to measure resident fluid concentrations of a conservative (Cl-) tracer under steady flow conditions. Large-scale concentration curves of Cl- from solution samplers and coring were obtained from field experiments conducted on the same soil under similar boundary conditions. Differences were observed in the solute spread and mass recovery, but not in the centers of mass. Horizontal scale dependence of transport was observed in the field but not in the columns. This suggests that a higher dimensionality of transport, probably along the horizon interfaces, may be responsible for the observed scale dependence in the field. Although the stochastic streamtube model gave good predictions of the center of mass, it does not appear to be a realistic physical analogue for describing solute dispersion in soils with spatially variable layer thickness.
52. Field validation and comparison of LEACHM and NCSWAP.
Jabro, J. D.; Jemison, J. M. Jr.; Lengnick, L. L.; Fox, R. H.; Fritton, D. D.

Includes references.
Descriptors: nitrate-; leaching-; simulation-models; prediction-;
silt-loam-soils; nitrogen-fertilizers; animal-manures;
computer-simulation
Abstract: The abilities of the LEACHM and NCSWAP models to simulate nitrate leaching were compared using field data collected from a three-year nitrate leaching experiment conducted in central Pennsylvania on Hagerstown silt loam soil (fine, mixed, mesic, Typic Hapludalf). Nitrate leaching losses below the 1.2-m depth from N-fertilized and manured corn were measured with zero-tension pan lysimeters. Four nitrogen and manure treatments were modeled for the growing seasons of 1988, 1989, and 1990 using the LEACHM and NCSWAP models. The cumulative simulations were then compared with the cumulative pan efficiency corrected measured data for these three years. Both models were calibrated to the site conditions using the growing season data of 1989. After the models were calibrated for the 1989 year, they were evaluated using 1988 and 1990 nitrate leaching data. Simulated results for the calibration year for both models were reasonably accurate. Statistical criteria were established from the calibration data set (1989) to evaluate the simulations from both models for the two validation years (1988 and 1990). Based on this statistical criteria, both models generally did not successfully predict nitrate leaching below the 1.2-m depth for most of the treatments for the validation years. Much of the simulation error seemed to be related to the inability of both models to simulate the macropore influenced waterflow in the well-structured soil and/or the sub-model controlling soil nitrogen rate constants. The overall performance of both models was compared and it was concluded that the LEACHM model (Md = 0.38 kg ha-1) statistically performed better than the NCSWAP model (Md = -3.44 kg ha-1) in simulating.

53. A forest site nitrogen dynamics model for land application of sludge.
Crohn, D. M.; Haith, D. A.

Trans-ASAE v.37, p.1135-1144. (1994).
Includes references.
Descriptors: sewage-sludge; application-to-land; nitrogen-;
nitrate-; broadleaved-deciduous-forests; groundwater-; leaching-;
mathematical-models; computer-simulation; simulation-models;
nitrate-nitrogen; application-rates; forsento-
Abstract: The application of municipal sewage sludge to forests may raise nitrate-nitrogen concentrations in percolating groundwater. In agricultural systems, it is usually assumed that the processes governing nitrogen concentrations in leachate are relatively short-term, and that other contaminants, such as heavy metals, limit long-term application rates. These assumptions may
not be appropriate for forests because the nitrogen levels in these systems change over time and harvests in most forests are relatively infrequent. We have modified a computer model from the ecology literature to investigate the long-term impact of nitrogen additions on groundwater quality in sludge amended forests. The model is descended from previous models of forest dynamics. It was tested with data from natural and sludge amended northeastern forests, and was used to design long-term loading rates for a northern hardwood forest in New Hampshire. Higher loading rates are possible if applications are made at multiple-year intervals as added nitrogen is immobilized in the soil and in accumulated litter. If 4.5 Mg/ha (dry weight) of anaerobically digested sludge (225 kg/ha total nitrogen) is applied at three-year intervals to a 31-year-old site, the model predicts that leaching nitrate-nitrogen concentrations will respect the 10 mg/l drinking water standard for nitrogen-N in 99% of all years.

NAL Call No.: 290.9-Am32T

54. A fugacity model of pesticide runoff to surface water: development and validation.
Di Guardo, A.; Calamari, D.; Zanin, G.; Consalter, A.; Mackay, D.
Includes references.
Descriptors: linuron-; metolachlor-; alachlor-; terbuthylazine-; herbicide-residues; water-pollution; runoff-; runoff-water; surface-water; simulation-models; fields-; computer-software; veneto-
NAL Call No.: TD172.C54

55. GIS-based groundwater pollution hazard assessment: a critical review of the DRASTIC model.
Merchant, J. W.
In the special issue: GIS / edited by G.A. Maclean and A.L. Maclean.
Descriptors: groundwater-pollution; geographical-information-systems; land-use; models-; aquifers-; kansas-
NAL Call No.: 325.28-P56

56. A GIS data interface for water quality modeling.
Drungil, C. E. C.; Geter, W. F.; Wickey, K. J.
Descriptors: water-quality; geographical-information-systems; watersheds-; catchment-hydrology; simulation-models
NAL Call No.: 290.9-Am32P

57. GIS interfaced with field & riparian zone models.
Tucker, M. A.; Thomas, D. L.; Altier, L. S.; Bosch, D. D.
58. GLEAMS hydrology submodel modified for shallow water table conditions.
Reyes, M. R.; Bengston, R. L.; Fouss, J. L.; Rogers, J. S.

Includes references.
Descriptors: hydrology--; high-water-tables; simulation-models; runoff--; percolation--; soil-water; evapotranspiration--; louisiana-

Abstract: GLEAMS-Water Table (GLEAMS-WT) is a modified version of GLEAMS that accounts for shallow water table fluctuations. The modification was accomplished by replacing the evapotranspiration and percolation algorithms in GLEAMS with evapotranspiration and percolation routines that are affected by shallow water table. Furthermore, routines to account for depression storage, steady state upward flux from the water table, and water table depth predictions were added. The simulation performances of GLEAMS and GLEAMS-WT were evaluated by comparing their predictions with seven years (1981 through 1987) of measured data from a runoff-erosion-drainage experimental plot at Baton Rouge, Louisiana. The GLEAMS-WT predictions of surface runoff volume were very satisfactory. Total predicted surface runoff volume for seven years was only 0.6 cm (0%) greater than the observed runoff volume, a significant improvement from GLEAMS underprediction of surface runoff volume by 54%. GLEAMS-WT predictions of water table depth were satisfactory.

59. GLEAMS modeling of BMPs to reduce nitrate leaching in Middle Suwannee River Area.
Reck, W. R.

Includes references.
Descriptors: groundwater--; water-quality; nitrate-nitrogen; leaching--; farming-systems; farm-management; dairy-farming; poultry-farming; monitoring--; models--; computer-techniques; florida--; groundwater-loading-effects-of-agricultural-management-systems; best-management-practices
NAL Call No.: S589.7.E57-1994

60. GLEAMS-WT hydrology submodel modified to include subsurface drainage.
Reyes, M. R.; Bengston, R. L.; Fouss, J. L.
Abstract: The model GLEAMS-SWAT (GLEAMS with Subsurface drainage and Water Table) is a modified version of GLEAMS that accounts for shallow water table fluctuations and subsurface drainage. The modification was accomplished by incorporating a subsurface drainage routine in GLEAMS-WT. Simulation performances of GLEAMS and GLEAMS-SWAT were evaluated by comparing their predictions with seven years (1981-1987) of measured data from a runoff-erosion-drainage experimental plot at Baton Rouge, Louisiana. Validations to test the accuracy of GLEAMS-SWAT predictions of surface runoff volume, subsurface drainage volume, total volume (surface runoff + subsurface drainage), and water table depth were satisfactory. Total predicted surface runoff volume for the seven-year period was 94% of the observed runoff volume, an improvement from GLEAMS under prediction of surface runoff volume which was 71% of the observed runoff. Subsurface drainage volume and total drainage (runoff + subsurface drainage) volume predictions were, respectively, 99% and 96% of the observed volumes. Water table depth prediction was deeper than the observed depth, especially during the regrowing and growing seasons.

NAL Call No.: 290.9-Am32T

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61. GLEAMS-WT hydrology submodel modified to include subsurface drainage.
Reyes, M. R.; Bengtson, R. L.; Fouss, J. L.

Descriptors: water-table; subsurface-drainage; subsurface-runoff; hydrology-; simulation-models; groundwater-loading-effects-of-agricultural-management-syste; ms-water-table
NAL Call No.: 290.9-Am32P

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62. Gleams-WT with pesticides.
Reyes, M. R.; Fouss, J. L.; Bengston, R. L.; Gayle, G. A.

Descriptors: water-table; pesticides-; runoff-; simulation-models; ID: groundwater-loading-effects-from-agricultural-management-systems-water-table-simulation-model
NAL Call No.: 290.9-Am32P
63. Gully erosion minimization on reclaimed surface mines using SSAST computer model.
McKenney, R. A.; Gardner, T. W.
J-irrig-drain-eng v.120, p.910-924. (1994).
Includes references.
Descriptors: coal-mine-spoil; reclaimed-soils; gully-erosion; runoff-; infiltration-; geological-sedimentation; hydrology-; models-; pennsylvania-; stable-slope-and-sediment-transport-model; postmine-hydrology
NAL Call No.: 290.9-AM3Ps-IR

64. Herbicide discovery and development: emphasis on groundwater protection.
Lamoreaux, R. J.
Includes references.
Descriptors: herbicides-; research-; groundwater-pollution; screening-; simulation-models; lysimeters
NAL Call No.: SB599.C8

65. Hierarchical approaches to the study of water quality in rivers.
Hunsaker, C. T.; Levine, D. A.
Includes references.
Descriptors: rivers-; water-quality; land-use; watersheds-; geographical-information-systems; simulation-models
NAL Call No.: 500-Am322A

66. Hydrologic modeling for riparian management.
Sheridan, J. M.; Williams, R. G.; Altier, L. S.; Lowrance, R. R.; Mills, W. C.; Thomas, D. L.
Descriptors: water-quality; water-pollution; groundwater-
NAL Call No.: 290.9-Am32P

67. The impact of GIS-derived topographic attributes on the simulation of erosion using AGNPS.
Srinivasan, R.; Engel, B. A.; Wright, J. R.; Lee, J. G.; Jones, D. D.
Includes references.
Descriptors: erosion-; simulation-models; hydrology-; geographical-information-systems; slope-; prediction-; pollution-; point-sources; agricultural-non-point-source-pollution-model
Abstract: Topographic attributes such as slope steepness and
slope length are important factors in predicting soil loss and chemical movement using hydrologic simulation models. The objective of this study was to examine the effects of various slope prediction methods in providing input to the nonpoint source (NPS) simulation model AGNPS. Four algorithms/techniques (neighborhood, quadratic, best fit plane, and maximum slope method) were used to estimate slope from elevation data sets. The effect of each of these methods on slope percentages, slope lengths, and erosion estimates using the grid-based GRASS (Geographical Resources Analysis Support System) GIS and a distributed parameter NPS pollution model AGNPS were demonstrated. The four slope prediction methods were applied to a 124-ha (310-acre) watershed located in Waco County, Texas, using the AGNPS model. Among the four slope prediction methods, notable differences were found in their prediction of topographic attributes and the use of these attributes to predict erosion at the outlet of the watershed and within the watershed (spatial distribution). Observed watershed data best matched simulated watershed response using topographic inputs obtained from the neighborhood method.

NAL Call No.: S671.A66

68. Implementation of a kinematic wave in the runoff block of SWMM.
Ferguson, D.; Ball, J. E.

Descriptors: Runoff-Mathematical-models; Storm-sewers-Hydraulic-models
NAL Call No.: GB651.R47--no.183

69. Integration of a basin-scale water quality model with GIS.
Srinivasan, R.; Arnold, J. G.

Descriptors: water-quality; watersheds-; geographical-information-systems; simulation-models; integrated-systems; texas-
Abstract: Geographic Information Systems (GIS) have been successfully integrated with distributed parameter, single-event, water quality models such as AGNPS (Agricultural Nonpoint Source) and ANSWERS (Areal Nonpoint Source Watershed Environmental Response Simulation). These linkages proved to be an effective way to collect, manipulate, visualize, and analyze the input and output data of water quality models. However, for continuous-time, basin large-scale water quality models, collecting and manipulating the input data are more time-consuming and cumbersome due to the method of disaggregation (subdivisions are based on topographic boundaries). SWAT (Soil and Water Assessment Tool), a basin-scale water quality model, was integrated with a GIS to extract input data for modeling a basin. This paper discusses the detailed development of the integration of the SWAT water quality model with GRASS
(Geographic Resources Analysis Support System) GIS, along with an application and advantages. The integrated system was applied to a simulated 114 sq. km upper portion of the Seco Creek Basin by subdividing it into 37 subbasins. The average monthly predicted streamflow is in agreement with measured monthly streamflow values.

NAL Call No.: 292.9-Am34

70. Interceptor drains for lagoon seepage capture.
Huffman, R. L.; Peng, J. S.

Descriptors: lagoons-; waste-disposal-sites; drainage-equipment; simulation-models; groundwater-; seepage-; water-quality
NAL Call No.: 290.9-Am32P

71. Interpreting non-steady state tracer breakthrough experiments in sand and clay soils using a dual-porosity model.
Saxena, R. K.; Jarvis, N. J.; Bergstrom, L.

Includes references.
Descriptors: sandy-soils; clay-soils; macropore-flow; tracers-; chlorine-; triticum-; leaching-; porosity-; solutes-; transport-processes; simulation-models

Abstract: The effects of preferential flow on 36Cl transport in undisturbed sand and clay soil monolith lysimeters were quantified using a dual-porosity model (MACRO). A double tracer test with 3H and 36Cl was performed simultaneously to check the possible occurrence of sidewall flow in the lysimeters. In the dual-porosity model MACRO, simulations can be performed in both one and two flow domains. Run in one flow domain, the model reduces to numerical solutions of Richards' equation and the convection-dispersion equation. In the sandy soil, the occurrence of preferential flow was tested by simulating in one domain, assuming that a certain pore fraction takes no part in water flow and solute transport. For the clay soil, the one domain case was compared with two domain simulations accounting for macropore flow. The double-tracer tests showed that sidewall flow did not occur in either soil type. Simulations of water flow showed good agreement with observed seepage until late autumn, but were less good during winter because the model does not account for soil freezing and snowpack/ snowmelt. Simulated water flows were similar in one and two domain simulations, presumably because water contents in the lysimeters were maintained close to field capacity during the experiment. The simulations indicated that preferential flow occurred in the sandy soil, with the observed 36Cl breakthrough curves, assuming an unwetted volumetric pore fraction of 20%, reproduced reasonably well. The rate of 36Cl leaching was consequently increased by c. 25% compared with the simulation assuming no preferential flow. Macropore flow was clearly demonstrated in the clay soil. The two domain simulation
matched the soil water pressure head defining the boundary between pore domains was set to -50 cm. This implies that preferential 36Cl transport was taking place in a wide range of pore sizes, including smaller mesopores. The one domain simulation failed to predict the pattern of breakthrough of 36Cl in the clay soil, in that it seriously underestimate leaching at early times and overestimated leaching towards the end of the experiment. Accounting for preferential flow with the dual porosity model resulted in significantly improved estimates of solute transport, compared to the classical convective-dispersive treatment, for both nonstructured sands and structured clay soils.

NAL Call No.: 292.8-J82

72. Irrigation storage reservoirs as a water supply solution for Upper Telogia Creek.
Reck, W. R.

Includes references.
Descriptors: irrigation-water; water-supply; water-harvesting; storage-; reservoirs-; runoff-irrigation; water-reuse; environmental-impact; water-resources; computer-simulation; simulation-models; florida-

NAL Call No.: S589.7.E57-1994

73. A knowledge-based system linked to AGNPS/GRASS interface.
Mohite, M.; Whittaker, A. D.; Srinivasan, R.

Descriptors: erosion-; watersheds-; expert-systems

NAL Call No.: 290.9-Am32P

74. Leaching characteristics of banded and broadcast inorganic tracers.
Dixon, K. L.; Smith, M. C.; Thomas, D. L.; Knisel, W. G.

Includes references.
Descriptors: leaching-; bromide-; chloride-; tracers-; broadcasting-; band-placement; downward-movement; diffusion-; models-; groundwater-pollution; sandy-loam-soils
Abstract: A field study was conducted on an Ocilla loamy coarse sand to determine the leaching characteristics of banded and broadcast applications of bromide and chloride. Bromide and chloride were applied in two treatments to eight plots absent of any crop. One treatment consisted of banding one tracer while broadcasting the other. For the second treatment, the banded and broadcast chemicals were reversed. Lateral and vertical movement was observed and comparisons were made between banded and broadcast tracer applications. Results indicate soil variability, dispersion, and diffusion negated potential banding effects on
75. Leaching potential of turf care pesticides: a case study of Long Island golf courses.
Primi, P.; Surgan, M. H.; Urban, T.

Includes references.
Descriptors: lawns-and-turf; golf-courses; pesticides-; metabolites-; leaching-; sandy-soils; groundwater-; groundwater-pollution; monitoring-; simulation-models; analytical-methods; case-studies; new-york

Abstract: Pesticides used to maintain golf course turf can threaten ground water. This concern is particularly important in most of New York's Long Island, where generally sandy soils overlie a sole source aquifer. This study uses two methods to evaluate the potential for pesticides that are commonly used on Long Island's golf courses to leach to ground water. Adapting the Pesticide Root Zone Model (PRZM), Release 1, for dense turf and applying site-specific soil data, certain pesticides, including metalaxyl and trichlorfon, are identified as potential problem leachers. PRZM simulations also identify the Long Island soils, including the sandy Plymouth and Carver soils, which are most vulnerable to leaching. When adequate input data for PRZM is unavailable, the ground water ubiquity score (GUS) method may be useful. GUS leachability classifications of pesticides commonly applied on Long Island golf courses, and of pesticides actually detected in ground water samples taken on Long Island, agree with PRZM predictions and the field data. The GUS method is applied to the evaluation of the leaching potential of pesticide degradation products (DCPA, maneB, and mancozeb metabolites), and the degradation products are shown to be a greater threat to ground water than their parent compounds. These methods are potentially useful in designing ground water monitoring programs and for guiding the pesticide use and selection decisions of golf course managers.

76. Long-term sulfate dynamics at Lange Bramke (Harz) used for testing two acidification models.
Lange, H.; Hauhs, M.; Schmidt, S.

Descriptors: sulfate-; nitrate-; hydrogen-ions; soil-solution; runoff-; acidification-; elements-; anions-; cations-; mountains-; watersheds-; forest-soils; coniferous-forests; picea-abies; lower-saxony; magic-model; bem-model

77. A lumped parameter water balance of a semi-arid watershed.
Flerchinger, G. N.; Cooley, K. R.; Hanson, C. L.; Seyfried, M.
78. Managing agricultural pollution using a linked geographical information system and non-point source pollution model.
Morse, G.; Eatherall, A.; Jenkins, A.
Includes references.
Descriptors: pollution-; agriculture-; simulation-models; geographical-information-systems; computer-software; prediction-
Abstract: This study documents the development of a link between a geographical information system (GIS) and a non-point source pollution model. The GIS ARC/INFO was linked to the agricultural non-point source pollution model and ORACLE data sources. Application of the system is demonstrated using the Bedford-Ouse catchment as a suitable case study. Water quality impacts are predicted from source data describing topography, soils, land use and river network. The model results were in agreement with observed nitrate concentrations at the catchment outlet, and more appropriate data sources are considered to be the main priority for improving model predictive ability. Management scenarios were established to assess the impact of changing agricultural management practices on predicted water quality. The approach has significant potential for the management of agricultural pollution in the UK.
NAL Call No.: TD420.W374

79. Managing underground storage tanks in urban environments: a geographic information systems approach.
Hudak, P. F.; Speas, R. K.; Schoolmaster, F. A.
Includes references.
Descriptors: soil-pollution; groundwater-pollution; fuel-tanks; underground-storage; management-; urban-areas; geographical-information-systems; databases-; texas-; denton,-texas
Abstract: Fuels contained in underground storage tanks (USTs) are a major source of soil and ground water contamination. Effective management of the problem at the urban level is difficult due to a large number of tanks and a vast array of factors (e.g., tank characteristics, geology) that determine environmental hazards. The problem is compounded by frequent abandonment and reuse of service stations, which makes it difficult to track the status of underground tanks. Geographic information systems (GIS) are ideally suited to organizing location and attribute data for variables that are pertinent to the UST management problem. A GIS-based UST management system was developed and applied to 136
current and former gasoline service stations in Denton, Texas. The system is effective for tank inventory and can be applied in a proactive fashion to identify potentially problematic facilities. In the event of a leak or spill, the management system can support the implementation of reactive measures to mitigate subsurface contamination. Potential beneficiaries of such a system include planning departments, environmental regulatory agencies, emergency management officials, lending institutions, gasoline distributors, and oil companies.

NAL Call No.: 292.9-Am34

80. Mass transfer in soils with local stratification of hydraulic conductivity.
Li, L.; Barry, D. A.; Culligan Hensley, P. J.; Bajracharya, K.

Includes references.
Descriptors: soil-; transport-processes; hydraulic-conductivity; solutes-; layered-soils; mass-transfer; mathematical-models; stratified-soils
Abstract: The two-region model was developed originally to describe nonsorbing chemical transport in soils with dead-end pores based on the concept of mobile and immobile regions in the soil. It has been shown that the model can simulate solute transport in soils with local stratification, or inhomogeneity, of hydraulic conductivity. However, the physical basis of the model becomes questionable, since the mobile-immobile region concept does not apply in stratified soils. In both soil types the nonequilibrium effect is caused by an apparent mass transfer process within the soil, as distinct from advection and diffusion. Where there are immobile regions, the mass transfer is due to solute interregion diffusion alone. In stratified soils the nonequilibrium mass transfer process is affected also by local flow variations. A conceptual model, numerical simulations, and laboratory experiments are presented to analyze these effects. For a given soil with fixed local stratification of hydraulic conductivity, it is shown that in the low-velocity range, the apparent mass transfer rate parameter, alpha, scales as V2/D (V is pore water velocity in the two-region model and D is the longitudinal dispersion coefficient), which implies that the mass transfer process is predominantly affected by local flow variations. When the velocity is relatively high, alpha varies with DT/h2 (DT is the interregion diffusion coefficient and h is the characteristic thickness of the stratified layers) and the mass transfer process is dominated by interregion diffusion. These scaling relations for alpha reflect the two mechanisms controlling the mass transfer process in locally stratified soils. They have implications. prototype soils. In particular, the relationship alpha varies with V2/D leads to the conclusion that exact physical modeling of nonsorbing chemical transport coupled with apparent mass transfer in locally stratified soils may be viable.

NAL Call No.: 292.8-W295

81. Measured and RZWQM predicted atrazine dissipation and movement in a field soil.
Ma, Q. L.; Ahuja, L. R.; Rojas, K. W.; Ferreira, V. F.;
DeCoursey, D. G.

Includes references.
Descriptors: agricultural-chemicals; environmental-impact; surface-water; groundwater--; atrazine--; transformation--; runoff--; simulation-models; distribution--; profiles--; sorption--; performance-appraisals

Abstract: The ARS Root Zone Water Quality Model (RZWQM) was developed recently to study the fate and behavior of agrochemicals in the environment and the effects of agricultural management on surface and groundwater quality. In this article, model performance was tested by comparing three years of field data for water and atrazine movement (runoff and concentration profiles) and atrazine transformation obtained under different management conditions with those simulated by RZWQM. Accuracy of model simulation was quantified by standard linear regression techniques. The regression correlation coefficients (R2) between average measured and simulated data for water runoff, atrazine runoff, atrazine persistence, and atrazine distribution in the soil profile were 0.87, 0.92, 0.97, and 0.73, respectively. Evaluation of the model, using best estimates for properties of atrazine and hydrologic characteristics of the field soil and limited calibration for water runoff, suggests that the model effectively simulates the important processes operating on water and chemicals.

NAL Call No.: 290.9-Am32T

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82. A method for developing probability distributions for rill flow and density.
Lewis, S. M.; Barfield, B. J.; Storm, D. E.

Includes references.
Descriptors: rill-erosion; water-flow; overland-flow; probability--; probability-analysis; imagery--; photographs--; eroded-soils; runoff--; sediment-yield; digital-terrain-model; probability-density-function

Abstract: Procedures are presented and evaluated for developing probability distribution functions for rill numbers (density) and rill flow rates that can be used to represent the stochasticity of rill networks in recent erosion models such as PRORIL. Subsoil and topsoil data sets, including photographs, collected at the University of Kentucky were used in the evaluation. Photographic images were corrected for optical distortion and visually analyzed to develop the rill networks. A digital terrain model (DTM) that allowed combining of channels, but not flow splitting, was also utilized to develop a flow network and compared to the photographically determined network. The DTM generated network did not provide a good fit to the photographically determined network, likely because of problems with interpolation and with the inability to predict rill splitting. The DTM generated networks were utilized to develop probability density functions (PDFs) for rill numbers and conditional PDFs for rill flow rates given a number of rills. The binomial distribution provided a good fit to rill number distributions as defined by the Kolmogorov-Smirnov test. The Weibull distribution provided the
best fit to the conditional PDF for flow rates, but the goodness of fit was poor. This lack of fit, likely due to inadequacies of the DTM, should improve with improved DTMs.
NAL Call No.: 290.9-Am32T
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Al Soufi, R. W.
Includes references.
Descriptors: cadmium-; contaminants-; transport-processes; polluted-soils; acid-soils; adsorption-; desorption-; soil-ph; mathematical-models; simulation-; models-
Abstract: A model for simulating cadmium transport in soil is presented. The calculation scheme is based on a three-dimensional advection-dispersion model. The adsorption process is defined by a lumped parameter mathematical model in which the amount of ions that remains in solution is correlated with the amount that originally exists in the input solution. Desorption is defined in the same way by correlating the amount of ions desorbed with the amount of ions held by the soil solid surface. Both relationships incorporate the effect of soil solution pH which is defined by a power equation that predicts the pH value at any time and at any depth, from the pH of the input solution and elapsed time. Soil column experiments were conducted to validate the performance of the model. Also, batch tests were employed to determine the essential adsorption-desorption parameters that are required to operate the model. In light of the results, it was concluded that the model satisfactorily forecasts cadmium concentration and the pH of soil solution under varied acidic conditions. However, values of model parameters are strictly empirical and need to be determined for each soil type.
NAL Call No.: 292.8-J82
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84. A methodology for the evaluation of global warming impact on soil moisture and runoff.
Valdes, J. B.; Seoane, R. S.; North, G. R.
Includes references.
Descriptors: global-warming; soil-water; variation-; runoff-; precipitation-; temperature-; evapotranspiration-; mathematical-models
Abstract: This paper presents a numerical evaluation of the viability of soil moisture and direct surface runoff due to global warming. An analytical model of the soil moisture balance based on our previous work is used to evaluate the probability distribution of the soil moisture concentration and resulting surface runoff. The input of hydroclimatic values is based on the approach suggested by C.W. Richardson in 1981. Our results show that not only the mean of the distribution of both soil moisture and runoff change, as expected, but that the variability of the values around the means also changes. The results of our research have immediate applications on the planning of reservoir operation for irrigation demands and evaluation of the change in surface runoff expected due to global warming.
85. Minimum leaching scheduling of nitrogen fertilization and irrigation.
Falkovitz, M. S.; Feinerman, E.

Includes references.
Descriptors: nitrogen-fertilizers; irrigation-; mathematical-models; leaching-; optimization-
Abstract: This paper develops and applies dynamic mathematical model for optimal scheduling of nitrogen fertilization and irrigation that minimizes nitrogen leaching subject to a target level of yield. The analysis assumes a single crop grown during a single growing season of a given length. It is shown that substitution of water for nitrogen along a given plant growth path decreases nitrogen leaching and, therefore, groundwater contamination. It is proved that a minimum leaching solution to the optimization problem is obtained with a single nitrogen application at the beginning of the season and irrigation scheduling that maintains a wet soil throughout the growing period. A numerical example utilizing experimental data for an irrigated summer corn in Israel confirms and quantifies the analytical findings.

86. Mn2+ as a contrast reagent for NMR studies of 35Cl- and 81Br- transport through model biological membranes.
Riddell, F. G.; Zhou, Z.

Includes references.
Descriptors: membranes-; models-; transport-processes; ion-transport; chloride-; bromide-; manganese-; spectral-data; phosphatidylcholines-
Abstract: One major problem in using NMR to study halide ions in biological and model biological systems has been to find a contrast reagent to differentiate between halide ions in different compartments. Mn2+ is shown to be a very efficient NMR relaxation agent for the halide ions chloride and bromide and preferable to Co2+ at high magnetic fields. Its use is demonstrated in experiments in which halide ions are exchanged across the membranes of egg yolk phosphatidylcholine vesicles by the phase transfer catalysts tetrabutylammonium ion and benzyltributylammonium ion. Benzyl-tributylammonium ion is shown to be the more rapid anion transporter through the membrane. Valinomycin is found to cotransport ammonium ions with chloride as an ion pair at a faster rate than the phase transfer catalysts.

87. Model accuracy in snowmelt-runoff forecasts extending from 1 to 20 days.
Rango, A.; Martinec, J.

Includes references.
Abstract: This paper examines the performance of snowmelt-runoff models in conditions approximating real-time forecast situations. These tests are one part of an intercomparison of models recently conducted by the World Meteorological Organization (WMO). Daily runoff from the Canadian snowmelt basin Illecille-waet (1155 km², 509-3150 m a.s.l.) was forecast for 1 to 20 days ahead. The performance of models was better than in a previous WMO project, which dealt with runoff simulations from historical data, for the following reasons: (1) conditions for models were more favorable than a real-time forecast situation because measured input data and not meteorological forecast inputs were distributed to the modelers; (2) the selected test basin was relatively easy to handle and familiar from the previous WMO project; and (3) all kinds of updating were allowed so that some models even improved their accuracy towards longer forecast times. Based on this experience, a more realistic follow-up project can be imagined which would include temperature forecasts and quantitative precipitation forecasts instead of measured data.
91. Modeling and error analysis of kinematic-wave equations of furrow irrigation.
Reddy, J. M.; Singh, V. P.
Irrig-sci v.15, p.113-121. (1994).
Includes references.
Descriptors: furrow-irrigation; mathematical-models; infiltration--; runoff--; design--; errors--; analysis--; equations-
Abstract: A moving control volume approach was used to model the advance phase of a furrow irrigation system whereas a fixed control volume was used to model the nearly stationary phase and the runoff rate. The resulting finite-difference equations of the kinematic-wave model were linearized and explicit algebraic expressions were obtained for computation of advance and runoff rate. The solutions for the advance increment and the runoff rate were compared with the nonlinear scheme, the zero-inertia model, and a set of field data. A close agreement was found between the models and the field data. Assuming a constant infiltration rate, a differential equation was derived to estimate the error between the kinematic-wave model and the zero-inertia model in predicting the flow cross-sectional area along the field length. The differential equation and two dimensionless terms were used to define the limits for use of the kinematic-wave model in furrow irrigation.
NAL Call No.: S612.I756

92. Modeling for optimal management of agricultural and domestic wastewater loading to streams.
Ejaz, M. S.; Peralta, R. C.
Includes references.
Descriptors: streams--; water-pollution; water-quality; waste-water; dairy-wastes; sewage--; waste-water-treatment; overland-flow; simulation-models; optimization--; simulation; optimization-models
Abstract: A simulation/optimization (S/O) model to aid managing multiobjective wastewater loading to streams while maintaining adequate downstream water quality is presented. The conflicting objectives are to maximize the human and dairy cattle populations from which treated wastewater can be discharged to the river system. Nonindustrial municipal (domestic) wastewater undergoes primary and secondary treatment by a sewage treatment plant (STP) before entering as a steady point source. Dairy wastewater is treated by overland flow (OLF) land treatment before entering the stream as a controlled steady diffuse source. Maximum dual-source loading strategies which do not degrade downstream water quality beyond specified limits are developed. For each computed loading strategy, an optimal OLF system design is also determined. The E constraint method is used to obtain sets of noninferior solutions. Sets of noninferior solutions are represented graphically to show the trade-off between human and bovine populations that can be maintained. Each set is computed for a different upstream flow rate to illustrate sensitivity to nondeterministic upstream flow rates. The nonlinear constraints utilized restrict downstream concentrations of 5-day biochemical
oxygen demand, dissolved oxygen, nitrogen (organic, ammonia, nitrite, and nitrate), organic and dissolved phosphorus, and chlorophyll a. Concentrations are described via regression equations. The new regression expressions, surrogates for the complex advective-dispersive equation, permit rapid and feasible solutions by this unique S/O model.

NAL Call No.: 292.8-W295
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93. Modeling infiltration during complex rainfall sequences.
Corradini, C.; Melone, F.; Smith, R. E.

Includes references.
Descriptors: infiltration--; redistribution--; rain--; storms--;
soil-water-movement; ponding--; soil-water-content; runoff--;
simulation-models; surface-saturation

Abstract: An extension of the conceptual model earlier developed by Smith et al. (1993) is presented. Their basic model considered the problem of point infiltration during a storm consisting of two parts separated by a rainfall hiatus, with surface saturation and runoff occurring in each part. The model is here extended toward further generality, including the representation of a sequence of infiltration-redistribution cycles with situations not leading to soil surface saturation, and rainfall periods of intensity less than the soil infiltration capacity. The model employs at most a two-part profile for simulating the actual one. When the surface flux is not at capacity, it uses a slightly modified version of the Parlange et al. (1985) model for description of increases in the surface water content and the Smith et al. (1993) redistribution equation for decreases.

Criteria for the development of compound profiles and for their reduction to single profiles are also incorporated. The extended model is tested by comparison with numerical solutions of Richards's equation, carried out for a variety of experiments upon two contrasting soils. The model applications yield very accurate results and support its use as part of a watershed hydrologic model.

NAL Call No.: 292.8-W295
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94. Modeling multiple reactive solute transport with adsorption under equilibrium and nonequilibrium conditions.
Marzal, P.; Seco, A.; Ferrer, J.; Gabaldon, C.

Includes references.
Descriptors: groundwater-pollution; groundwater-flow;
pollutants--; solutes--; adsorption--; physicochemical-properties;
equations--; mathematical-models; equations--; transport-processes;
soil-physical-properties; soil-chemistry; soil-water-movement;
simulation-models; solute-transport-equations;
chemical-interaction-equations

NAL Call No.: TD201.A4
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95. Modeling nutrient transport in vegetative filter strips.

96. Modeling of biologically mediated redox processes in the subsurface.
Lensing, H. J.; Vogt, M.; Herrling, B.

Descriptors: groundwater-pollution; bacteria-; growth-rate; metabolism-; redox-reactions; transport-processes; ions-; monitoring-; simulation-models; bioremediation-
Abstract: To model bacterially catalyzed redox processes a multicomponent transport reaction model is presented. The transport part of the model solves the transient convection dispersion differential equations. The pure chemical submodel is conceptually similar to conventional thermodynamic equilibrium models. The kinetic submodel describes the heterotrophic metabolisms of several groups of microorganisms. To model a complete redox sequence (aerobic carbonaceous oxidation, denitrification, Fe(III)-reduction, Mn(IV)-reduction, and sulfate reduction) four functional bacterial groups are defined. Their growth and metabolisms are formulated in terms of Monod equations. As in other biofilm models, diffusion-limited exchange between the different phases (mobile pore water, biophase, and aquifer material) is also considered in this approach. The submodels are coupled by the equations of the microbially mediated redox reactions. This numerical technique permits direct mechanistic modeling of the influence of microbially catalyzed redox reactions on the chemical milieu of an aquifer. A two-step method is applied to solve the coupled transport and biochemical reaction equations. The numerical model was applied to field data of a natural subsurface flow path.
NAL Call No.: 292.8-J82

97. Modeling of initial discharges from hydraulic barriers underlying solid and hazardous waste landfills.
Al Jobeh, Z. Y.

Meeting held on May 10-12, 1993, West Lafayette, Indiana.
Descriptors: landfills-; landfill-leachates; soil-pollution; polluted-soils; groundwater-pollution; mathematical-models
NAL Call No.: TP995.A1I5

98. Modeling perspective of the deforestation impact in stream water quality of small preserved forested areas in the Amazonian
rainforest.
Forti, M. C.; Neal, C.; Jenkins, A.

In the special issue: Biogeochemical monitoring in small
catchments / edited by J. Cerny, M. Novak, T. Paces and R.K.
Weider. Evaluation of Integrated Monitoring in Small
Catchments," held September 18-20, 1993, Prague, Czech Republic.
Descriptors: tropical-rain-forests; logging-effects;
deforestation-; simulation-models; water-quality; streams-
sulfate-; anions-; cations-; acidification-; soil-organic-matter;
organic-matter; reserved-forests; amazonas-; magic-model;
water-chemistry
NAL Call No.: TD172.W36
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Thooko, L. W.; Rudra, R. P.; Dickinson, W. T.; Patni, N. K.;
Wall, G. J.

Trans-ASAE v.37, p.1175-1181. (1994).
Includes references.
Descriptors: pesticides-; pesticide-residues; atrazine-;
herbicide-residues; leaching-; subsurface-drainage;
simulation-models; computer-simulation; zea-mays;
movement-in-soil; ontario-; drainmod-
Abstract: Transport of chemicals through the soil profile and
crop root zone, and the discharge from subsurface drainage lines
into surface water can be a significant source of water
pollution. This study measured and simulated subsurface drain
outflows and atrazine loads in the subsurface drains from a field
Corn was grown for silage at the site, and an H-flume with an
automated water sampler was used to monitor temporal changes in
quantity and quality of subsurface drain outflows from a 14-ha
field site. A drainage simulation model, DRAINMOD, was combined
with a chemical transport model, GLEAMS, to simulate the chemical
transport of atrazine through the soil into the subsurface drain
outflow. The model was calibrated with 1989 field data and
compared to measured 1988 data. The calibrated DRAINMOD model
predicted subsurface drain outflows for 1988 with a coefficient
of determination of 0.40 and a standard error of the estimate,
S(y/x), of 0.09 mm. Measured Atrazine concentrations exceeded 6
micrograms/kg on one occasion, but simulated Atrazine
concentrations did not exceed 2.5 micrograms/kg. The model
underpredicted atrazine mass in the subsurface drain outflows.
Spring underpredictions of atrazine mass discharge was due to
underprediction of subsurface drain flows while fall
underpredictions were due to underpredictions of atrazine
concentrations. Effects of temperature on atrazine half life and
adsorption constant may be partially responsible for these
results. This integrated model of chemical transport with the
drainage simulation model provides a useful tool for studying
chemical transport through.
NAL Call No.: 290.9-Am32T
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100. Modeling the effects of agricultural practices on nitrate
concentration of shallow ground water in the Coastal Plain.
Xie, M.; Huffman, R. L.; Jennings, G. D.

Descriptors: nitrate-nitrogen; wells--; monitoring--; water-quality; groundwater-pollution; simulation-models; prediction--
NAL Call No.: 290.9-Am32P
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101. Modeling the water balance in cold regions.
McConkey, B. G.; Mulla, D. J.; McCool, D. K.

Descriptors: snow--; soil--; frost--; infiltration--; runoff--
NAL Call No.: 290.9-Am32P
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102. Modeling tile drainage in an irregular network.
Waller, P. M.; Jaynes, D. B.

Descriptors: tile-drainage; water-quality; finite-element-analysis; simulation-models
NAL Call No.: 290.9-Am32P
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103. Modeling transport kinetics in clinoptilolite-phosphate rock systems.

Includes references.
Descriptors: clinoptilolite--; rock-phosphate; systems--; nutrients--; ammonium--; phosphorus--; potassium--; release--; transport-processes; kinetics--; mathematical-models
Abstract: Nutrient release in clinoptilolite-phosphate rock (Cp-PR) systems occurs through dissolution and cation-exchange reactions. Investigating the kinetics of these reactions expands our understanding of nutrient release processes. Research was conducted to model transport kinetics of nutrient release in Cp-PR systems. The objectives were to identify empirical models that best describe NH4, K, and P release and define diffusion-controlling processes. Materials included a Texas clinoptilolite (Cp) and North Carolina phosphate rock (PR). A continuous-flow thin-disk technique was used. Models evaluated
included zero order, first order, second order, parabolic diffusion, simplified Elovich, Elovich, and power function. The power-function, Elovich, and parabolic-diffusion models adequately described NH₄, K, and P release. The power-function model was preferred because of its simplicity. Models indicated nutrient release was diffusion controlled. Primary transport processes controlling nutrient release for the time span observed were probably the result of a combination of several interacting transport mechanisms.

NAL Call No.: 56.9-So3

104. Modelling Ca-solubility in MSWI bottom ash leachates. Comans, R. N. J.; Meima, J. A.

Descriptors: solid-wastes; refuse-; ash-; building-materials; calcium-; leaching-; solubility-; minerals-; ph-; leachates-; chemical-speciation; simulation-models; equipment-; municipal-solid-waste-incinerators; calcium-minerals; incinerator-ash
NAL Call No.: QH540.S8


Special Issue: Temperate Rice: Achievements and Potential.
Descriptors: red-soils; soil-water-content; ponding-; saturated-hydraulic-conductivity; infiltration-; salts-; leaching-; water-table; depth-; soil-depth; simulation-models; summer-; winter-
NAL Call No.: 23-Au792

106. Modelling wash-off and leaching of pollutants by spring-time flow. Vasilyev, A.

Descriptors: pollutants-; agricultural-chemicals; phosphates-; leaching-; runoff-; subsurface-runoff; water-quality; water-pollution; watersheds-; models-; estonia-; phosphate-phosphorus
Abstract: The quality of water in Estonian rivers in the spring is influenced strongly by the conditions in the catchments, and in particular by the amount of ice within the soil. After cold
winters, the soil is extensively frozen and surface runoff predominates. After warmer winters, water flows through the soil and leaches pollutants from the soil. Increased pollutant load to Matsalu Bay has been identified by calibrating a water quality model for the period 1959-1966 and then running the same model for a test period (1977-1991). The observed concentrations during the test period were higher than those predicted by the calibrated model, indicating a real increase in pollutant load.

NAL Call No.: 292.8-J82
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Narasimhan, T. N.

Paper presented at the John Philip Symposium held at the 56th annual meeting of the Soil Science Society of America, November 3, 1992, Minneapolis, MN.
Descriptors: soil-physics; hydrology-; soil-water-movement; water-flow; subsurface-layers; transport-processes; mathematical-models; computer-techniques
Abstract: J.R. Philip recently articulated a concern of many earth scientists that computer-based mathematical models are impacting soil science practice and soil science education in an undesirable way. Unrealistic faith in the ability of these models to predict the future has encouraged overzealous use of models at the expense of the observational enterprise. These real concerns draw attention to the fact that much needs to be learned about the proper use of models in general and computer-based models in particular in the earth sciences. I was impressed by Philip's thoughts, and here reflect on the current status and the role of models of hydrogeologic processes. While agreeing with Philip's concerns about the improper use of models, I advance a perspective that models (analytical or numerical) are tools with inherent limitations. Despite their overenthusiastic use, computer-based models are potentially capable of helping us advance our knowledge of earth processes in unprecedented ways. As we seek to exploit this tool to its full potential, we may be challenged to reexamine and refine our conceptual foundations so that hydrologic processes are described more precisely than has hitherto been possible.
NAL Call No.: 56.9-So3
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108. Modification of DRAINAGE model by using the nitrogen component from the GLEAMS model.
Verma, A.; Kanwar, R. S.; Tim, U. S.

Includes references.
Descriptors: groundwater-; drainage-; agricultural-chemicals; leaching-; nitrogen-; nitrate-nitrogen; groundwater-; pollution-; simulation-models
Abstract: The NITRO subroutine of the DRAINAGE model (Kanwar et al., 1983) was modified using the nitrogen transformation components of the GLEAMS (Leonard et al., 1987) model to predict more accurately the leaching of NO3-N to subsurface drainage water. Predicted values of tile flows and nitrate concentrations
in tile effluent have shown a good agreement with observed data for the period from 1984 to 1992. There were some discrepancies between the predicted and observed values in the beginning of the simulation period resulting from lack of field data for soil-profile initialization. Despite the assumed steady-state condition within each time increment (one day) and the complexity of the drainage system, the modified DRAINAGE model has shown the capability to reasonably estimate long-term N loss with tile effluent. Average deviation and standard error between the predicted and observed NO3-N concentrations in the tile water indicated that the modified DRAINAGE model developed in this study resulted in better predictions of NO3-N concentrations in the drainage water than the original DRAINAGE model.

NAL Call No.: 290.9-Am32T

109. Modification of RZWQM for simulating subsurface drainage by adding a tile flow component.
Singh, P.; Kanwar, R. S.
Includes references.
Descriptors: subsurface-drainage; water-quality; water-flow; rain-; soil-properties; tillage-; simulation-models; computer-simulation; performance-appraisals
Abstract: Fluctuating water table and subsurface drain flow components were incorporated in the Root Zone Water Quality Model (RZWQM) to enable the model to simulate subsurface drain flows. Parameters in a modified model were calibrated using observed subsurface drain flows for 1990. Model performance was evaluated by predicting subsurface drain flows for 1991 and 1992 by using the calibrated parameters and comparing the predicted drain flows with observed subsurface drain flows for the same years. The modified RZWQM model, in general, showed a good response to rainfall in terms of time of peak flows. However, the modified RZWQM model overpredicted total tile flows by an average of 13%, and the magnitudes of peak tile flows were generally underpredicted. Selected soil properties (bulk density, macroporosity, and residue content) in the surface horizon were changed to investigate tillage effects on tile flows using the modified RZWQM. Four different tillage systems, chisel plow (CP), moldboard plow (MB), no-tillage (NT), and ridge-tillage (RT), were considered. Predicted tillage effects on subsurface drain flows were consistent with the observed effects (i.e., maximum tile flow for NT and minimum tile flow for MB).
NAL Call No.: 290.9-Am32T

110. Modification of the DRAINMOD-CREAMS model to incorporate a nutrient submodel.
Saleh, A. R.; Bengtson, R. L.; Fouss, J. L.
Descriptors: subsurface-drainage; runoff-; nitrogen-; models-
111. Multidimensional infiltration: points, furrows, basins, wells, and disk.
Clothier, B. E.; Green, S. R.; Katou, H.

Paper presented at the John Philip Symposium held at the 56th annual meeting of the Soil Science Society of America, November 3, 1992, Minneapolis, MN.
Descriptors: infiltration--; soil-water-movement; water-flow; solutes--; transport-processes; theory--; mathematical-models; sorption--; sorption-isotherms

Abstract: Multidimensional infiltration theory continues to be an area of soil physics research dominated by the works of J.R. Philip. The point source of these endeavors was his landmark paper in 1966. Here in our contribution honoring John Philip, we first discuss the multidimensional, similarity-solution antecedents that were queried by him nearly 30 yr ago. We then list the new theoretical developments contained in this comprehensive treatise on multidimensional flow into unsaturated soil. Next we comment on the three steady-state sequels derived by J.R. Philip, P.A.C. Raats, and R.A. Wooding, especially in relation to the experimental studies they spawned. Experiments initially began with attempts to verify directly the various multidimensional flow theories. But experimental procedures soon came to use, in an inverse sense, these theories to permit measurements of the hydraulic properties of field soil. The disk permeameter, currently a widely used device, employs multidimensional theory. In a variety of ways, disks are used to infer the hydraulic properties of field soil in the pressure potential range close to saturation. However, here we propose a method by which the disk permeameter can be used to deduce in situ the nonlinear adsorption isotherm that holds for the transport of reactive chemicals through soil. We demonstrate this proposal by using in the inverse sense of parameter identification, not an analytical description, but rather a two-dimensional numerical simulation of the flow of water and transport of solute away from a surface disk maintained at a given pressure potential, and some fixed concentration of reactive solute.

112. Multigrid simulation of the transport of multicomponent solute in groundwater.
Shen, H.; Yang, X.; Nikolaidis, N. P.

Descriptors: solutes--; transport-processes; groundwater--; simulation-models; mathematical-models

NAL Call No.: 290.9-Am32P
113. A multiple-pore-region concept to modeling mass transfer in subsurface media.
Gwo, J. P.; Jardine, P. M.; Wilson, G. V.; Yeh, G. T.
Includes references.
Descriptors: soil-pore-system; transport-processes; saturated-conditions; mathematical-models
Abstract: Recent studies in soil science literature have strongly indicated the need to incorporate pore structures in near-surface mass transport modeling. There is increasing evidence suggesting that pore structures, such as fractures and macropores, facilitate the transport of water and solutes along a preferential flow path while water and solutes are moved into micropores and rock matrices concurrently. This study presents a conceptual model a multiple-pore-region (or multi-region) concept to account for pore structures as well as the resultant widely distributed pore water velocities in macroporous media. Pore regions can either be physically identified as discrete features, such as fractures and rock matrices, or be experimentally determined by separation of water retention curves according to pore classification schemes. A multi-region mechanism is proposed to account for the effect of local-scale and field-scale heterogeneities on mass transport under variably saturated conditions. Two numerical codes for subsurface fluid flow and solute transport have been developed with the multi-region concept, in which a first-order mass exchange model is adopted to simulate the redistribution of pressure heads and solute concentrations among pore regions. The computer codes are used to demonstrate the applicability of the concept to fractured porous media, and to test a three-pore-region hypothesis using laboratory soil column tracer injection data. Based upon the parameters obtained from fitting multi-region and mobile-immobile models to these data, we successfully demonstrated that the former model has the advantage of maintaining consistent conceptual models over the latter.
NAL Call No.: 292.8-J82

114. A multiregion model describing water flow and solute transport in heterogeneous soils.
Hutson, J. L.; Wagenet, R. J.
Includes references.
Descriptors: solutes--; transport-processes; computer-simulation; simulation-models; mathematical-models; soil-variability; soil-properties
Abstract: Many different processes influence chemical breakthrough patterns from soil columns, including chemical kinetics, diffusion, matrix geometry, and flow heterogeneity. TRANSMIT, a multiregion model that reflects many of these features, was used to simulate a suite of solute breakthrough curves from soil columns subjected to both transient and steady-state flow. When utilized as a two-region model, TRANSMIT matched analytical solutions for steady-state flow through two-region soils. The TRANSMIT model is easily expanded to
describe a wide range of multiregion and two-dimensional geometries and is applicable to transient and steady-state flow typical of both laboratory experiments and field situations. Sorption and degradation parameters can be varied, and nonuniform surface boundary condition, resulting from irrigation method and banded chemical placement, can be described.

NAL Call No.: 56.9-So3

115. New definitions for moisture recycling and the relationship with land-use changes in the Sahel.
Savenije, H. H. G.

Includes references.
Descriptors: moisture-; recycling-; evapotranspiration-; land-use; vegetation-; rain-; runoff-; mathematical-models; sahel-; west-africa
Abstract: In the Sahel, recycling of moisture through evapotranspiration appears to be responsible for more than 90% of the rainfall. As a result, there exists an important feedback mechanism between land-use and climate, which has immediate implications for the management of natural resources. The challenge is to find sustainable combinations of land-use and vegetation that maximize recycling of moisture, while at the same time allowing adequate agricultural production. In this paper, a theory of moisture recycling is presented including the derivation of moisture recycling indicators, one of which is based on the salinity of the rainfall. Subsequently, the theory is verified with observations of rainfall and runoff in the Sahel over the period 1950-1990.
NAL Call No.: 292.8-J82

116. Nitrate monitoring and modeling for poultry litter application to pine seedlings.
Minkara, M. Y.; Wilholt, J. H.; Wood, C. W.; Yoo, Y. H.

Descriptors: pinus-; seedlings-; poultry-manure; organic-fertilizers; leaching-; nitrate-nitrogen; simulation-models
NAL Call No.: 290.9-Am32P

117. Nitrogen loading model for wellhead protection areas.
Horsley, S. W.

Descriptors: nitrogen-; nitrate-nitrogen; wells-; water-quality; models-; massachusetts-
NAL Call No.: GB1001.G76

118. Nitrogen management, irrigation method, and nitrate leaching in the arid
119. Non-point-source pollution from interrill flow areas.
Parr, A.; Limback, S.; McEnroe, B.; Zou, S.
Includes references.
Descriptors: agricultural-land; runoff-; overland-flow; pollutants-; pollution-; models-; agricultural-runoff; mass-transport-models; flow-models
NAL Call No.: 290.9-AM3Ps-IR

120. A numerical study of variable density flow and mixing in porous media.
Fan, Y.; Kahawita, R.
Includes references.
Descriptors: groundwater-pollution; soil-pollution; contaminants-; flow-; density-; gravity-; hydraulic-conductivity; hydrodynamics-; porous-media; simulation-; mathematical-models
Abstract: A numerical study of a negatively buoyant plume intruding into a neutrally stratified porous medium has been undertaken using finite different methods. Of particular interest has been to ascertain whether the experimentally observed gravitational instabilities that form along the lower edge of the plume are reproduced in the numerical model. The model has been found to faithfully reproduce the mean flow as well as the gravitational instabilities in the intruding plume. A linear stability analysis has confirmed the fact that the negatively buoyant plume is in fact gravitationally unstable and that the stability depends on two parameters: a concentration Rayleigh number and a characteristic length scale which is dependent on the transverse dispersivity.
NAL Call No.: 292.8-W295

121. On the velocity covariance and transport modeling in heterogeneous anisotropic porous formations. 2. Unsaturated flow.
Russo, D.
Includes references.
Descriptors: unsaturated-flow; transport-processes; velocity-; covariance-; stochastic-processes; mathematical-models; theory-; vadose-zone
Abstract: Velocity covariances, and the resultant macrodispersion coefficient tensor, derived by Russo (this issue) for saturated flow conditions, are applied for unsaturated flow conditions, employing the assumption that for a given mean capillary pressure head, water saturation is a deterministic constant and log conductivity is a multivariate normal, stationary random space function. The applicability of the approach for modeling flow and transport in the vadose zone was evaluated by the use of the stochastic theory of Yeh et al. (1985a, b) for steady, unsaturated flow. Results of the analyses suggest that the approach may be applicable to vadose zone flow and transport, as long as the scale of heterogeneity in the direction of the mean flow is smaller than approximately one tenth of the characteristic length of unsaturated flow. For porous formation of given statistics, the magnitude of macrodispersion in unsaturated flow is larger than that in saturated flow, and increases as water saturation decreases. For a given water saturation, transport in unsaturated flow may approach asymptotic Fickian behavior more slowly than in saturated flow, when the two formation properties log kappas and alpha are positively cross-correlated and when the correlation scale of alpha is relatively large as compared with the correlation scale of log kappas.

NAL Call No.: 292.8-W295

123. Optimal ground-water remediation methods applied to a Superfund site: from formulation to implementation.

Ahlfeld, D. P.; Page, R. H.; Pinder, G. F.

124. Optimization of saturated hydraulic conductivity for WEPP.
Risse, L. M.; Nearing, M. A.; Savabi, M. R.; Laflen, J. M.

Descriptors: water-erosion; hydraulic-conductivity; models--; calibration--; runoff-water
NAL Call No.: 290.9-Am32P

125. Optimizing irrigation management for pollution control and sustainable crop yield.
Musharrafieh, G. R.; Peralta, R. C.; Dudley, L. M.; Hanks, R. J.

Includes references.
Descriptors: irrigation-water; saline-water; salts-in-soil; water-management; groundwater-pollution; pollution-control; crop-yield; sustainability--; simulation-models; optimization--; utah--; simulation; optimization-models
Abstract: Irrigation strategies which maximize crop yield while preventing salt from leaching to the groundwater or undesirable salt increases in the root zone are computed by using a one-dimensional simulation/optimization management model. The included constraint equations maintain a water volume balance and salt transport in the unsaturated zone. Implicit finite difference forms of the unsaturated water flow equation (Richards7 equation), the diffusion-convection solute transport equation, functions describing the hydraulic properties of the medium, a root extraction function, and other constraints are used. The model uses a large discretization in time. A cyclic prediction and correction type of approach is adopted to eliminate the inaccuracy that would otherwise result from the coarse discretization. As a result of the procedure presented, intercell water and mass flux rates in the optimization model have the same accuracy as those in a more finely discretized simulation model. The model is applied to a research farm in Huntington, Utah, where salty water is used for irrigation. In that process detailed soil water and salt profiles are computed and spatially distributed moisture content and concentration constraints are satisfied.
NAL Call No.: 292.8-W295

126. Partitioning small scale spatial variability of runoff and erosion on sagebrush rangeland.
Pierson, F. B.; Blackburn, W. H.; Van Vactor, S. S.; Wood, J. C.
Abstract: Most hydrologic models require input parameters which represent the variability found across an entire landscape. The estimation of such parameters is very difficult, particularly on rangeland. Improved model parameter estimation procedures are needed which incorporate the small-scale and temporal variability found on rangeland. This study investigates the use of a surface soil classification scheme to partition the spatial variability in hydrologic and interrill erosion processes in a sagebrush plant community. Four distinct microsites were found to exist within the sagebrush coppice-dune dune-interspace complex. The microsites explained the majority of variation in hydrologic and interrill erosion response found on the site and were discernable based on readily available soil and vegetation information. The variability within each microsite was quite low and was not well correlated with soil and vegetation properties. The surface soil classification scheme defined in this study can be quite useful for defining sampling procedures, for understanding hydrologic and erosion processes, and for parameterizing hydrologic models for use on sagebrush rangeland.

NAL Call No.: 292.9-Am34

Arakere, S.; Molnau, M.

Descriptors: water-pollution; watersheds-; catchment-hydrology; water-quality; simulation-models; prediction-; non-point-source-pollution
NAL Call No.: 290.9-Am32P

128. Performance of the DRAINMOD-CREAMS model with an incorporated nutrient submodel.
Saleh, A. R.; Bengston, R. L.; Fouss, J. L.

Trans-ASAE v.37, p.1109-1114. (1994).
Includes references.
Descriptors: nitrogen-; leaching-; losses-from-soil; subsurface-drainage; simulation-models; fields-; water-table; computer-simulation
Abstract: The CREAMS nutrient submodel and the modified DRAINMOD-CREAMS model were applied to subsurface drained and nonsubsurface drained fields. The CREAMS nutrient submodel overestimated the total nitrogen losses from the subsurface drained and the nonsubsurface drained fields by 61 and 91%, respectively. The modified DRAINMOD-CREAMS model overestimated the total nitrogen losses from the subsurface drained and the...
nonsubsurfaced drained fields by 36 and 40%, respectively. The modified DRAINMOD-CREAMS model significantly improved the simulation of the nitrogen losses from the subsurface drained and the nonsubsurfaced drained fields by reducing the error by 25 and 51%, respectively.

129. Performance of transport models in predicting nitrate in runoff from high water table areas.
Ramanarayanan, T. S.; Sabbagh, G. J.; Reyes, M. R.; Bengston, R. L.; Storm, D. E.; Fouss, J. L.

Descriptors: zea-mays; water-quality; sediment--; nitrate--; runoff--; losses-from-soil; crop-yield; water-pollution; erosion-

130. Phloem mobility of xenobiotics. V. Structural requirements for phloem-systemic pesticides.
Kleier, D. A.
Includes references.
Descriptors: pesticides--; transport-processes; structure-activity-relationships; translocation--; phloem--; pharmacokinetics--; mathematical-models; chemical-structures
Abstract: Remote and relatively inaccessible parts of plants such as roots and meristematic tissue can readily be reached by foliar-applied xenobiotics if the latter are capable of entering into and moving in the phloem. Development of a passive transport model provides a description of the time course of this movement and its dependence upon the physical properties of the chemical and the condition of the plant vascular system. The model so developed is used to formulate principles for rendering otherwise non-systemic xenobiotics phloem-mobile. These principles can be categorized according to the nature of the chemical modifications that facilitate phloem translocation. These modifications include (a) sugar conjugation, (b) acid functionalization, and (c) formation of quaternary salts from basic parents. The potential of these modifications to facilitate the phloem translocation of a wide range of pesticides is discussed.

131. Plant residue impact on rainfall interception.
Savabi, M. R.; Stott, D. E.
Includes references.
Descriptors: zea-mays; glycine-max; triticum-aestivum; crop-residues; rain--; interception--; soil-water-balance; runoff--; computer-simulation; simulation-models
Abstract: Rainfall interception by different amounts of corn (Zea Mays), soybean (Glycine Max L.), and winter wheat (Triticum aestivum L.) residue was studied under simulated rainfall. Given
the same amount of residue mass, winter wheat residue intercepts significantly more rainfall than corn and soybean residue. Statistically, corn and soybean residues intercept the same amount of rainfall. Age of the residues had no impact on the amount of rainfall intercepted by the residues. Mathematical relationships were derived for estimating rainfall interception rates for different types and amounts of residue. The findings were incorporated into the Water Erosion Prediction Project (WEPP) computer model to improve soil water balance predictions. The model was tested using a 50-year simulation of the impact of rainfall interception by plant residues on the soil water balance of a no-till farm under corn-soybean rotation near Champaign, Illinois. The results of WEPP model simulations indicate that rainfall interception by crop residues reduces the average annual storm runoff by 13% and average daily root zone soil water content by 9% on a Midwest farm under corn-soybean rotation.

NAL Call No.: 290.9-Am32T


Abstract: In semiarid areas, agricultural production is determined by limited water and nutrient supply. To develop efficient management practices, it is of importance to predict solute transport. In line with this, we present observed and calculated plot-scale solute transport in an agricultural experimental field in northern Tunisia. A pulse of Br(−)-tagged water was applied on the surface of two small field plots and leached under steady-state soil water conditions. Solute samples were withdrawn through ceramic samplers at five different depths within each plot. The experimental data indicated a high degree of bypass or preferential flow within the small plots and nonsigmoid breakthrough curves, suggesting tailing phenomena and immobile fractions of soil water. The data were evaluated using the classical two-parameter convection-dispersion equation (CDE) and the four-parameter nonequilibrium convection-dispersion equation (NECDE). Pore water velocities, v, and dispersion coefficients, D, were calculated by fitting the analytical solution of these two models to the breakthrough curves based on individual sample locations as well as using all samples in the plot simultaneously. None of the models could be fitted when data from all solute sampling depths were used in the optimization simultaneously. When using data at individual sample locations, the fit was somewhat better for the NECDE than for the CDE. The estimated values of D and v could be described by a power law relationship.

NAL Call No.: 56.9-So3


Descriptors: macropores-; macropore-flow; soil-water-movement; solutes-; transport-processes; infiltration-; saturated-hydraulic-conductivity; temporal-variation; mathematical-models

Abstract: A model is presented which yields the range of the hydraulic parameters that are critical for the collapse of continuous macropores in a given soil under certain hydrological circumstances. These continuous macropores are important, as they control the hydraulic conductivity at saturation and the infiltration capacity of most soils. The conceptual model is based on data from earlier infiltration experiments on soil columns in situ; it consists basically of a soil matrix with discontinuous macropores which is traversed by a vertical macropore channel. The experiments suggested that under the transient flow conditions that occur in the soil when ponded infiltration ends, the wall of a macropore channel can become unstable. Collapse will occur if the shear stress caused by the seepage to the channel exceeds the shear strength of the soil particles in the wall of the macropore channel. The model ascertains the magnitude of this shear stress from the transient gradient of the hydraulic head $G$ over a length $L$ which is the distance between the wall of the macropore channel and air encapsulated by the water in the soil matrix. For given parameters $L$, $k$ (hydraulic conductivity) and $\mu$ (specific storativity) the behaviour of $G$ as a function of time is derived from the equation for non-stationary, horizontal flow of soil water. The solution consists of a series of exponential functions; one term is characterized by the emptying time of the macropore channel and the others by the relaxation time (\ldots). It is shown how, for a certain soil, a domain of $k$ and $p$ values conducive to collapse can be found. Each point within this domain defines a length scale for $L$. The moment of collapse is determined for three different soil textures (silt loam, sandy loam and loamy sand). The application of the model shows that ponded infiltration can create conditions appropriate for the collapse of macropores and, therefore, for the decrease of the saturated conductivity.

NAL Call No.: 292.8-J82

134. Predicting alachlor mobility using batch sorption kinetic data.
Gaston, L. A.; Locke, M. A.


Descriptors: silt-loam-soils; alachlor-; movement-in-soil; sorption-; kinetics-; equilibrium-; transport-processes; mathematical-models; nonequilibrium-sorption

NAL Call No.: 56.8-So3
135. Predicting field-scale solute transport using in situ measurements of soil hydraulic properties.
Wesenbeeck, I. J. v.; Kachanoski, R. G.

Includes references.
Descriptors: solutes-; transport-processes; unsaturated-flow; prediction-; soil-water-content; pressure-; hydraulic-conductivity; matric-potential; measurement-; spatial-distribution; mathematical-models; ontario-
Abstract: Predicting unsaturated solute transport using measured hydraulic parameters has been difficult due to the inherent variability of soil properties, and the difficulty in obtaining accurate estimates of hydraulic properties in situ. The objective of this study was to determine if in situ measurement of soil hydraulic conductivity, the alpha soil parameter, and the water content vs. pressure head (h) relationship could be used to predict field-scale solute transport. A series of steady state solute transport experiments were conducted on a Fox sand (fine loamy over sandy or sandy-skeletal, mixed, mesic Typic Hapludalf soil in Ontario, Canada. The transport of Cl- under steady-state water flux was monitored in three separate experiments using solution samplers. Steady-state water flux densities applied at the soil surface were 9.72 X 10(-6), 1.53 X 10(-5), and 8.68 X 10(-8) m s-1, respectively, for the three sites. After completion of the transport experiments at Site II, measurements of soil hydraulic conductivity and the alpha parameter were made using the Guelph pressure infiltrometer (GPI) beside each location and depth where solute breakthrough curves (BTCs) were measured, as well as at the soil surface. Undisturbed soil cores were taken at each location where GPI measurements were made for estimating the parameters in the water content (pressure head) using van Genuchten's equations. The GPI- and core-measured hydraulic parameters obtained at Site II were used to predict the field-scale solute travel time probability density function (PDF) at the same site, and at Sites I and III using a stochastic-convective model. Observed solute travel time PDFs were predicted quite well at high surface water fluxes, which were close to the field saturated hydraulic conductivity, KFS, by both the GPI and core methods. Both methods underpredicted the variability of the observed travel time PDF.

NAL Call No.: 56.9-So3
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136. Predicting the transport of atrazine in soils: second-order and multireaction approaches.
Ma, L.; Selim, H. M.

Includes references.
Descriptors: atrazine-; soil-; transport-processes; prediction-; soil-properties; prediction-; mathematical-models; kinetics-
Abstract: As a follow-up to a previous paper (Ma and Selim, 1994a), this study was designed to further validate a modified second-order, two-site (SOTS) model for describing atrazine transport in column miscible experiments. Moreover, the capability of the SOTS model was compared with that of the
multireaction transport model (MRTM) of Selim (1989). For both models the necessary parameters were derived from batch experiments and tritium tracer breakthrough results. The models were used solely to predict atrazine breakthrough curves (BTCs) for different experimental conditions. We also proposed an alternative way of analyzing tritium BTCs, where the hydrodynamic dispersion coefficient D and an effective solute transport length Le were used as fitting parameters. Tritium fitted D and Le were used in both models to arrive at atrazine BTC predictions. The SOTS model provided superior predictions over MRTM for all (14) atrazine BTCs regardless of (1) input concentration C0, (2) soil column length L, (3) pore water velocity v, (4) multiple pulse applications, and (5) flow interruption (incubation). We conclude that the SOTS model was capable of describing chemical heterogeneity of atrazine retention and transport. BTC predictions lend credence to the transport parameter Le in predicting solute transport in soils.

NAL Call No.: 292.8-W295

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137. Predicting transport of bromide in a furrow irrigated field using computer models.
Izadi, B.; King, B.; Westermann, D.; McCann, I.

Descriptors: surface-irrigation; furrow-irrigation; solutes-; transport-processes; simulation-; models-
NAL Call No.: 290.9-Am32P

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Zhang, R.
Includes references.
Descriptors: solutes-; transport-processes; movement-in-soil; prediction-; mathematical-models; comparisons-; accuracy-
NAL Call No.: 56.8-So3

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139. Pressure sensitivity to microirrigation emitter plugging.
Hills, D. J.; Povoа, A. F.

Descriptors: microirrigation-; hydraulics-; water-quality; mathematical-models
NAL Call No.: 290.9-Am32P

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140. Prioritizing nonpoint source phosphorus loading using a grass-modeling system.

Includes references.
Descriptors: phosphorus-; water-pollution; water-quality; watersheds-; geographical-information-systems; simulation-models; oklahoma-; geographic-resources-analysis-support-system; nonpoint-source-pollution; battle-creek-watershed

Abstract: A UNIX-based windows application was developed to integrate a phosphorus transport model with the Geographic Resources Analysis Support System (GRASS). The system prioritizes potential phosphorus loading from fields or cells in a watershed and can evaluate the effects of alternate management practices on phosphorus yield. The model simulates phosphorus loading by using a daily mass balance on a unit-area basis and incorporates the effects from rainfall, topography, soil properties, fertilizer and animal waste application, and management. Model predictions include dissolved and sediment-bound phosphorus yield, runoff volume, and sediment yield. Within the integrated GRASS-modeling system, the user can obtain model input data, execute the model using various options, rank model input and output data, and display them as GRASS-based maps or data tables. All functions are menu driven, developed using C language and X-window tools to run on a SUN workstation platform. The system provides a powerful and efficient tool for prioritizing phosphorus loading from nonpoint sources.
NAL Call No.: 292.9-Am34

141. Quantifying dewatering characteristics of agricultural wastes and materials.
Straub, R. J.; Koegel, R. G.; Kim, J. Y.

Descriptors: alfalfa-; maize-; residues-; cattle-slurry; models-; dewatering-; moisture-content
NAL Call No.: 290.9-Am32P

142. Raindrop-induced soil detachment and sediment transport from interrill areas.
Sharma, P. P.; Gupta, S. C.; Foster, G. R.

Includes references.
Descriptors: interrill-erosion; erodibility-; soil-physical-properties; mathematical-models; rain-; impact-; kinetic-energy; sediment-; transport-processes; soil-texture; clay-; soil-detachability; transportability-; rain-intensity

Abstract: Physically based soil erosion simulation models require input parameters of soil detachment and sediment transport due to the action and interactions of both raindrops and overland flow.
In this study, we report on the soil detachability and transportability parameters for raindrop-impact-dominated interrill erosion processes. The detachability parameter is derived by integrating estimated soil detachment due to single raindrop impact over all the raindrops occurring in a storm. Using artificial rainfall characteristics and soil properties as inputs, we simulated raindrop-induced soil detachment rates for 33 cropland soils used in the USDA-ARS Water Erosion Prediction Project (WEPP) experiments in the USA. The magnitude of difference between the predicted detachment and the measured interrill sediment delivery rates decreased with clay content. This suggests that in coarse-textured soils, most of the sediments are redistributed within the interrill area. Small differences between detachment rates and sediment delivery rates in clayey soils indicate that the interrill erosion is detachment limited. A raindrop-induced interrill transportability parameter is derived by dividing the measured sediment delivery rates with the product of rainfall rate and unit effective kinetic energy. The derived transportability parameter increases linearly with an increase in clay content, thereby suggesting the predominant role of raindrop impact in the sediment delivery process, specifically on up-slope areas with shallow overland flow. The raindrop-induced soil detachment and sediment transport process can be represented by incorporating intensity and effective kinetic energy of rainfall into the basic interrill erosion model.

NAL Call No.: 56.9-So3

143. Rainfall-induced leaching and leaf losses from drying alfalfa forage.
Smith, D. M.; Brown, D. M.

Includes references.
Descriptors: alfalfa-hay; drying--; yield-losses; quality--; forage--; rain--; leaching--; duration--; leaves--; shedding--; dry-matter; mathematical-models; equations--; leaf-shatter; rain-intensity
Abstract: Efforts to construct models of forage yield and quality loss during the field drying of hay are hindered by a lack of quantitative information concerning several modes of loss. This study attempted to quantify leaching and rainfall-induced leaf shatter from drying alfalfa (Medicago sativa L. 'Magnum') forage. A rainfall simulator was used to treat samples from four forage cuttings in 1989 and 1990 at four levels of tissue moisture between 760 and 150 g kg⁻¹ (wet basis). Rainfall amounts of 0 (control), 5, 10, 15, and 20 mm were used at intensity levels of 20 and 40 mm h⁻¹. Leaves lost due to rainfall were collected, samples of forage tissue were analyzed for quality and yield changes and samples of leachate water were collected from beneath hay samples for analysis. Results showed that leaf shatter is not directly induced by rainfall. Analysis of forage tissue showed that leaching of soluble dry matter caused dry weight losses and increases (P less than or equal to 0.05) in the proportion of fiber in tissue. Leachate analysis provided a more precise measure of leaching losses. Analysis of leachates for total dissolved and suspended dry matter demonstrated that leaching
increases with rainfall amount and as tissue moisture levels decline. At 700 g kg\(^{-1}\) (wet basis) moisture, leaching losses reached only 0.3% of initial sample dry matter, while at 170 g kg\(^{-1}\) moisture they were as great as 1.7%. Leaching was also greater (P less than or equal to 0.05) under rainfall at 20 mm h\(^{-1}\) than 40 mm h\(^{-1}\). A regression equation generated from the leachate data can be used to model leaching losses within prescribed limits.

NAL Call No.: 4-AM34P

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144. Regional cooperation in the use of irrigation water: efficiency and income distribution.
Yaron, D.; Ratner, A.

Includes references.
Descriptors: irrigation-water; water-use; salinity-; water-allocation; water-quality; income-distribution; agricultural-regions; linear-models; efficiency-; israel-
Abstract: The paper presents an analysis of the economic potential of regional cooperation in water use in irrigation under conditions characterized by a general trend of increasing salinity. Income maximizing solutions for the region are derived and the related income distribution schemes are solved for, with the aid of cooperative game theory algorithms and shadow cost pricing. Distinction is made between distribution policies with and without side payments. The reasonableness and the acceptability of these schemes is later critically evaluated. The Nash-Harsanyi approach seems to be the most appropriate for the conditions studied.

NAL Call No.: HD1401.A47

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145. Regulating groundwater pollution: effects of geophysical response assumptions on economic efficiency.
Fleming, R. A.; Adams, R. M.; Kim, C. S.

Includes references.
Descriptors: groundwater-; groundwater-pollution; nitrates-; nitrogen-fertilizers; application-to-land; leaching-; time-lag; pollution-control; regulations-; taxes-; mathematical-models; production-functions; geophysics-; leaching-time-lags
Abstract: Most economic studies of groundwater pollution ignore important geophysical complexities of groundwater contamination. For example, most studies assume that nitrogen fertilizer instantaneously leaches into an underlying water aquifer. In reality, there are time lags between fertilizer application and nitrate contamination of groundwater which complicate establishment of efficient regulations. This paper uses an optimal control model to examine empirically the effects of time lags on regulatory efficiency. Results indicate that ignoring time lags can lead to regulatory actions that set suboptimal user fees, which lead to levels of damage greater than anticipated. The results confirm that transport time lags are important when setting pollution control policies. In the case of very long time lags, pollution control policies may have no effect. The impact that time lags have on policy is stable with regard to changes in
key model parameters and changes in the production function.

NAL Call No.: 292.8-W295

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146. Riparian forest buffer system research at the Coastal Plain Experiment Station, Tifton, GA.
Hubbard, R. K.; Lowrance, R. R.

In the special issue: Wetlands of the interior southeastern United States / edited by C.C. Trettin, W.M. Aust, and J. Wisniewski. Conference on "Wetland Ecology, Management, and Conservation," held September 28-30, 1993, Knoxville, Tennessee. Descriptors: riparian-forests; riparian-vegetation; grasses--; vegetation-management; clearcutting--; selective-felling; wetlands--; biological-treatment; waste-water-treatment; dairy-wastes; pig-slurry; aldicarb--; insecticide-residues; nutrients--; removal--; nutrient-uptake; simulation-models; nitrate--; denitrification--; water-quality; runoff--; groundwater--; groundwater-pollution; water-pollution; georgia-

NAL Call No.: TD172.W36

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147. Role of information in the adoption of best management practices for water quality improvement.
Feather, P. M.; Amacher, G. S.

Agric-econ v.11, p.159-170. (1994).
Includes references.
Descriptors: water-quality; information--; incentives--; farm-management; innovation-adoption; profitability--; demonstration-farms; federal-programs; usda--; mathematical-models; usa--; demonstration-projects

Abstract: This study investigates the role of information in influencing the adoption of improved farm management practices. A lack of producer information regarding both the profitability and the environmental benefits of adopting improved practices may be a reason why widespread adoption of these practices has not occurred. Compared to direct regulation or financial incentives, raising producer information levels may be a more cost-effective method of increasing adoption. The United States Department of Agriculture has recently established and begun implementing a program based on this idea. To test the validity of the program, a two-stage adoption model is specified and estimated using data from a survey of producers in the program area. The results indicate that producer perceptions play an important role in the decision to adopt. Changing these perceptions by means of an educational program may be a reasonable alternative to financial incentives in encouraging BMP adoption.

NAL Call No.: HD1401.A47

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149. Scaling, soil moisture and evapotranspiration in runoff models.
Wood, E. F.
Descriptors: soil-water; evapotranspiration--; simulation-models; algorithms--; runoff--; landscape--; transpiration--; evaporation--; general-circulation-model
NAL Call No.: TD201.A4
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150. Sediment transport by wind: a wind tunnel study.
Wilson, G. R.; Zobeck, T. M.; Gregory, J. M.; Zartman, R. E.
Descriptors: wind-erosion; sediment--; transport-processes; mathematical-models
NAL Call No.: 290.9-Am32P
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151. A sensitivity analysis and parametric study for the evaluation of the optimal management of a contaminated aquifer.
Latinopoulos, P.; Theodosiou, N.; Mylopoulos, Y.; Mylopoulos, N.
Includes references.
Descriptors: aquifers--; groundwater-pollution; groundwater-flow; contaminants--; pollutants--; transport-processes; water-quality; water-management; optimization--; models--; simulation-models
Abstract: A typical groundwater remediation problem is studied by using a combined simulation-optimization model. The management procedure employs groundwater flow and contaminant transport simulation models in conjunction with linear and quadratic programming techniques. The methodology is applied to the hydrodynamic control of a contaminant plume that has to be stabilized and removed by a system of pumping wells. The paper focuses mainly upon a sensitivity analysis to the aquifer transmissivity. The effect of changes in the transmissivities of a zoned aquifer upon the optimal solutions of the management problem is examined by considering the optimal pumping rates, the
time to remediation and the pumped groundwater volume as the key output variables of the remediation strategies. In addition, the influence of the dispersivities and the imposed hydraulic gradient upon the same output variables is critically evaluated. The results of the study illustrate the need for uncertainty reduction in the knowledge of the hydrogeologic parameters.

**NAL Call No.: TC401.W27**

**152. Sensitivity analysis in erosion prediction modeling.**

Deer, L. A.; Nearing, M. A.


Descriptors: water-erosion; runoff-; losses-from-soil; sediment-; crop-yield; simulation-models; performance-appraisals

**NAL Call No.: 290.9-Am32P**

**153. Sensitivity analysis of a simple layer-equilibrium model for the one-dimensional leaching of solutes.**

Corwin, D. L.


Includes references.

Descriptors: solutes-; leaching-; soil-; mathematical-models

**NAL Call No.: TD172.J6**

**154. Sensitivity of metal-bioleaching operation to process variables.**

Sreekrishan, T. R.; Tyagi, R. D.


Includes references.

Descriptors: sewage-sludge; heavy-metals; leaching-; removal-; sulfur-; oxidation-; microbial-activities; waste-treatment; solubility-; mathematical-models

**NAL Call No.: TP1.P7**

**155. Simplified model of integrated water and solute uptake by salts- and selenium-accumulating plants.**

Ben Asher, J.


Includes references.

Descriptors: crops-; roots-; ion-uptake; water-uptake; transpiration-; salinization-; soil-toxicity; mathematical-models; irrigation-water; water-quality; salinity-; selenium-

Abstract: The rate of soil salinization and the accumulation of toxic ions in soils are affected by evapotranspiration and the uptake of ions by plant roots. These are two counteracting processes and the interrelationship between them can be quantified by a mathematical model. The objectives of this study were to: (i) formulate an analytical model describing soil
salinization and accumulation of toxic ions and (ii) suggest a criterion for irrigation water quality \([C^*(O)]\) and demonstrate its behavior under varying transpiration rates. The processes by which the soil becomes saline were simulated with an analytical solution to the convection-diffusion equation. The model was based on ion and water uptake by plant roots. The calculations indicated that crops classified as salinity tolerant remove more salt from the soil than salinity-sensitive crops. The rates of ion removal are 5, 15, and 40 \(X 10^{-3}\) dS m\(^{-1}\) d\(^{-1}\) for salinity-sensitive, semisensitive, and tolerant crops, respectively. Therefore the ratio between the uptake rates of ions and water per unit soil volume is presented here as a criterion for the upper limit of allowable salinity in irrigation water. This ratio is inversely related to transpiration rate (evaporation neglected). Theoretically, the maximum allowable salinity of salt-tolerant crops, \([C^*(O)]\), decreases from 20 to 4 dS m\(^{-1}\) when the transpiration rate increases from 2 to 10 \(X 10^{-3}\) m d\(^{-1}\). For the same transpiration rate increase, \([C^*(O)]\) of sensitive crops decreases from 3 to 0.5 dS m\(^{-1}\); thus, a lower quality of water can be permitted for irrigation in a moderate or cool climate than in an arid climate. The model applies also for Se-accumulating crops. removed from a soil solution containing a high concentration \([C^*(O)]=1\) mg kg\(^{-1}\) when the uptake rate of the growing crop is 25.8 \(X 10^{-3}\) mg kg\(^{-1}\) d\(^{-1}\).

NAL Call No.: 56.9-So3

156. Simulated transport of three cations through porous media: effect of different approaches to modeling cation exchange reactions.

Grant, S. A.; Mansell, R. S.; Bloom, S. A.; Rhue, R. D.

Includes references.
Descriptors: porous-media; cations-; cation-exchange; solutes-; transport-processes; simulation-models; thermodynamics-; prediction-; loam-soils; thermodynamic-selectivity-coefficient; vanselow-selectivity-coefficient

Abstract: Batch cation exchange and column experiments were conducted to evaluate selectivity coefficients which have been suggested for describing cation exchange reactions in solute transport models. Vanselow selectivity coefficients were calculated for cation exchange equilibria with a cation resin and for equilibria reported in the literature with a Yolo loam soil. Experimental column data were compared with data from simulations generated by a numerical solute transport model to evaluate Vanselow, Gaines-Thomas, and statistical thermodynamic selectivity coefficients. With the cation resin, the statistical thermodynamic selectivity coefficient gave the most reliable estimate of column effluent cation concentrations. In a column packed with the Yolo loam soil, the Vanselow selectivity coefficient gave the most accurate prediction of column response. Use of variable (as opposed to fixed) Vanselow selectivity coefficients gave more accurate predictions of column experiments. The use of ternary cation exchange data did not improve predictions of column response.

NAL Call No.: 292.8-W295
Munster, C. L.; Skaggs, R. W.; Parsons, J. E.; Evans, R. O.;
Gilliam, J. W.; Breve, M. A.
Includes references.
Descriptors: aldicarb--; insecticide-residues;
transport-processes; subsurface-drainage; tile-drainage;
drainage--; subsurface-irrigation; groundwater-flow;
groundwater-pollution; simulation-models; computer-simulation;
north-carolina; conventional-drainage; controlled-drainage;
subirrigation--; vs2dt-model
Abstract: The United States Geological Survey computer model
Variably Saturated Two Dimensional Transport (VS2DT) was modified
to treat boundary conditions imposed by parallel subsurface drain
tubes. The modified model was used to simulate groundwater flow
and aldicarb transport in research plots under conventional
drainage, controlled drainage, and subirrigation. The reliability
of the model was tested by comparing model predictions with field
measurements.
NAL Call No.: 290.9-Am32T

158. Simulating NO3-N transport to subsurface drain flows as
affected by tillage under continuous corn using modified RZWQM.
Singh, P.; Kanwar, R. S.
Includes references.
Descriptors: subsurface-drainage; water-flow; water-quality;
nitrate-nitrogen; tillage--; simulation-models;
computer-simulation; performance-appraisals
Abstract: The Root Zone Water Quality Model (RZWQM) was
previously modified to simulate subsurface drain flows and
evaluate the impact of different tillage systems on subsurface
drain flows (Singh and Kanwar, 1994). This article discusses
further modifications made in the RZWQM to simulate
nitrate-nitrogen (NO3-N) concentrations and NO3-N losses with
subsurface drain flows. Daily NO3-N concentrations were simulated
in subsurface drain flows under four different tillage systems:
chisel plow (CP), moldboard plow (MB), no-tillage (NT), and
ridge-nllage (RT) by using the modified RZWQM. Simulations were
conducted for the growing seasons of three years (1990 to 1992).
Simulated NO3-N concentrations and losses with subsurface drain
flows were compared with the measured data obtained from a water
quality research site at Nashua, Iowa. Predicted NO3-N
concentrations generally followed the same pattern as the
observed concentrations. Simulated annual average NO3-N
concentrations in subsurface drain flows were within 11%
(averaged over all three years) of observed annual average NO3-N
concentrations in subsurface drain flows. The model correctly
predicted maximum concentrations under MB treatment and minimum
under NT for all three years. Simulated annual NO3-N losses were
within 14% (averaged over all three years) of observed annual
NO3-N losses. Various NO3-N transformation processes need to be
calibrated as a function of tillage system to improve model
performance.
159. Simulating solute transport in an aggregated soil with the dual-porosity model
Brusseau, M. L.; Gerstl, Z.; Augustijn, D.; Rao, P. S. C.
Includes references.
Descriptors: aggregates--; solutes--; transport-processes; mathematical-models
Abstract: The capability of the first-order, dual-porosity model, which explicitly accounts for non-ideal transport caused by the presence of 'immobile' water, to predict the non-ideal transport of non-sorbing solute in a constructed aggregated soil has been investigated. Miscible-displacement experiments performed with a well-characterized aggregated soil and a non-reactive tracer (pentafluorobenzoate) served as the source of the data. Values for the input parameters associated with physical non-equilibrium were determined independently and compared with values obtained by curve fitting of the experimental measurements. The calculated and optimized values compared well, suggesting that the non-equilibrium parameters represent actual physical phenomena.

160. Simulation and evaluation of alternative nutrient management practices on a demonstration watershed.
Stone, K. C.; Hunt, P. G.; Coffey, S. W.
Descriptors: surface-water; groundwater--; plant-nutrition; watersheds--; catchment-hydrology; water-quality; simulation-models; evaluation--; crop-management; north-carolina; gleams-simulation-model

One map on 1 folded leaf in pocket.
Descriptors: Groundwater-flow-New-Mexico-Albuquerque-Region-Mathematical-models; Geographic-information-systems; Albuquerque-Basin-N; M

162. Simulation of nitrogen dynamics in farmland areas of
Jensen, C.; Stougaard, B.; Ostergaard, H. S.

Includes references.
Descriptors: agricultural-land; nitrogen-content; nitrate-; leaching-; losses-from-soil; crop-production; dry-matter-accumulation; deterministic-models; validity-; crop-management; fertilizers-; cropping-systems; subsoil-; soil-texture; precipitation-; denmark-
Abstract: Each year since 1986 information has been collected about the farming systems at intersections of a nationwide 7 km square grid in Denmark. These management data and corresponding soil analyses were used in the model DAISY to simulate water and nitrogen dynamics. The model was validated with respect to harvested dry matter yield and nitrogen content in the soil. Simulated nitrate leaching from farmland areas from 1 April 1989 to 31 March 1993 was related to precipitation zones, soil type, fertilizer strategies and cropping systems. The mean simulated nitrate leaching for the whole of Denmark was 74 kg N/ha/yr, with a large yearly variation in the period considered. The simulated nitrate leached from soils with a sandy subsoil corresponded to 51% of the applied fertilizer, twice that leached from soils with a loamy subsoil. The application of pig manure resulted in average leaching losses of 105 kg N/ha/yr. The simulated nitrate leaching losses at sites where only artificial fertilizer was applied were in the following order: cereal with undersown grass < crop followed by winter cereal or winter rape < cereal or rape without a catch crop < root crops without a catch crop. Where only artificial fertilizers were applied, the simulated mean annual leaching was 59 kg N/ha from spring barley and 40 kg N/ha from winter wheat. A map of simulated nitrate leaching in Denmark was produced using a Geographical Information System.
NAL Call No.: S590.S68
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163. Simulation of runoff transport of animal waste constituents.
Wang, Y.; Edwards, D. R.; Daniel, T. C.; Scott, H. D.
Descriptors: poultry-manure; transport-processes; nitrate-nitrogen; phosphorus-; losses-from-soil; water-pollution; simulation-models
NAL Call No.: 290.9-Am32P
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164. Simulation of TCE migration and biodegradation in a porous medium under conditions of finite degradation capacity.
Includes references.
Descriptors: bioremediation-; trichloroethylene-; microbial-degradation; immobilization-; sand-; gram-negative-bacteria; mathematical-models;
165. Simulation of the impacts of climate change on runoff and soil moisture in Australian catchments.
Chiew, F. H. S.; Whetton, P. H.; McMahon, T. A.; Pittock, A. B.
Includes references.
Descriptors: watersheds-; climatic-change; runoff-; soil-water; temperature-; precipitation-; catchment-hydrology; simulation-models; australia-; global-climate-model
Abstract: The impacts of climate change on runoff and soil moisture in 28 Australian catchments are simulated using a hydrologic daily rainfall-runoff model. Two methods are used to provide the climate change scenarios. First, a range of arbitrary changes in temperature and precipitation are applied to the calibrated rainfall-runoff model to study the sensitivity of runoff and soil moisture to potential changes in the climate. Second, results from five global climate model (GCM) enhanced greenhouse experiments are analysed to provide regional climate change scenarios to estimate the range of plausible changes in runoff and soil moisture by the years 2030 and 2070. The sensitivity analyses indicate that changes in rainfall are always amplified in runoff with the amplification factor for runoff being higher in drier catchments. The change in rainfall has little effect on the soil moisture in wet catchments but in drier catchments, the percentage change in soil moisture levels can be greater than the percentage change in rainfall. Compared to temperature increases alone have negligible impacts on the runoff and soil moisture. The simulations using the GCM scenarios indicate increases in annual runoff of up to 25% by the year 2030 in the wet tropical catchments near the north-east coast of Australia. The GCMs do not agree in the direction of rainfall change in south-east Australia, and the simulations show runoff changes of up to +/-20% by 2030. For Tasmanian catchments, up to 10% increase in runoff is simulated whereas for catchments in the South Australian Gulf, up to 35% decrease in annual runoff is simulated for 2030. Near the western coast of Australia, the simulations show runoff changes of up to about runoff modifications that may require a significant planning response. They are also indicative of the fact that hydrological impacts affecting water supply and flood studies may be important in considering the cost and benefits of potential climate change.

166. Simulation of water applied nitrogen distribution under surge irrigation.
Boldt, A. L.; Watts, D. G.; Eisenhauer, D. E.; Schepers, J. S.
Trans-ASAE v.37, p.1157-1165. (1994).
Includes references.
Descriptors: fertigation-; furrow-irrigation; nitrogen-; runoff-; leaching-; computer-simulation; simulation-models; sifum-; surge-flow-irrigation
Abstract: Fertigation during surge flow irrigation is a promising means of delaying nitrogen (N) fertilizer application on furrow irrigated corn and thereby reducing the potential for leaching of nitrate-nitrogen into groundwater. A computer model, SIFUM (Surge Irrigation Fertigation Uniformity Model), was developed to simulate the distribution, uniformity, and runoff losses of fertigation-applied N during surge irrigation of furrows. The model, SIFUM, was used to help develop fertigation management strategies for field application that can provide acceptable N distributions across a range of soil conditions and furrow flow rates for surge irrigation with free outflow of runoff with no runoff recovery. Simulation groups included injecting N during (a) all surges, (b) the advance surges only, (a) the post advance surges only, and (d) the middle surges (last of advance plus first of cutback). For each of these groups, fertigation was simulated both for the entire on-time of each surge cycle and for only a portion of the on-time. The application efficiency of the low quarter (AELQ) was used as an index for evaluating the efficiency of fertigation treatments. Simulation results show that to obtain the best N efficiency on high-intake soils, fertigation can occur during any portion or all of the on-time of a surge cycle, but should be applied during all cycles, i.e., for the entire irrigation. For medium and low intake soils, fertigation should be applied during all of the on-time of a surge cycle and may be applied for either all of the irrigation or just the advance surges.

NAL Call No.: 290.9-Am32T

167. A spatial decision support system for assessing agricultural nonpoint source pollution.
Srinivasan, R.; Engel, B. A.

Includes references.
Descriptors: pollution--; watersheds--; runoff--; erosion--; geographical-information-systems; simulation-models; integrated-systems; texas--

Abstract: A spatial decision support system (SDSS) was developed to assess agricultural nonpoint source (NPS) pollution using an NPS pollution model and geographic information systems (GIS). With minimal user interaction, the SDSS assists with extracting the input parameters for a distributed parameter NPS pollution model from user-supplied GIS base layers. Thus, significant amounts of time, labor, and expertise can be saved. Further, the SDSS assists with visualizing and analyzing the output of the NPS pollution simulations. Capabilities of the visualization component include displays of sediment, nutrient, and runoff movement from a watershed. The input and output interface techniques/algorithms used to develop the SDSS, along with an example application of the SDSS, are described.

NAL Call No.: 292.9-Am34

168. Spatial variation of daily rainfall and network design.
Abtew, W.; Obeysekera, J.; Shih, G.

Includes references.
Abstract: A high-density pilot network of 10 rain gauges was implemented in the Everglades Nutrient Removal (ENR) Project to quantify areal rainfall over the site for accurate computation of water budget. The ENR Project, located in south Florida, is a 1500 ha wetland that was constructed to reduce phosphorus loads in agricultural runoff from the Everglades Agricultural Area (EAA) that enters the Water Conservation Areas (WCAs). The first 158 days of wet season daily rainfall data were used to evaluate the adequacy (or redundancy) of the network. A spatial correlation function was developed to characterize the spatial variation of wet season rainfall over the site. An exponential spatial correlation model was fitted to the data with an $R^2$ value of 0.74. A method that compares relative error to rain gauge density was applied to determine the required minimum gauge density. It was determined that a five rain gauge network with uniform distribution was the most efficient design.

169. Statewide GIS screening of selected corn pesticides in groundwater.
Messier, S. R.; Hamlett, J. M.; Petersen, G. W.; Harrison, S.
Descriptors: groundwater-pollution; pesticides-; leaching-; geographical-information-systems; screening-; zea-mays; models-; pennsylvania-
NAL Call No.: 290.9-Am32P

Haan, C. T.; Allred, B.; Storm, D. E.; Sabbagh, G. J.; Prabh, S.
Includes references.
Descriptors: water-quality; simulation-models; performance-appraisals; hydrological-data
Abstract: Input parameters are used in hydrologic/water quality models to describe specific situations. These input parameters are never known with certainty. The models, although largely physically based, are not capable of describing the exact hydrologic and chemical processes that take place under natural conditions. Evaluation of models by a comparison of observed and predicted results is fraught with ambiguities resulting from the large number of parameters that must be estimated and the inherent variability in natural systems. This article puts forth a model evaluation protocol based on a simulation procedure which transforms parameter uncertainty into prediction uncertainty using probability density functions. Confidence intervals are placed on model results and decisions regarding model acceptability are made based on the magnitude of measured data,
confidence intervals, and performance criteria placed on the model.

NAL Call No.: 290.9-Am32T

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171. Studying the role of old agricultural terraces on runoff generation in a small Mediterranean mountainous basin.
Gallart, F.; Llorens, P.; Latron, J.
Descriptors: terraces-; ditches-; drainage-channels; sediment-; drainage-water; storms-; runoff-; environmental-degradation; mountain-areas; agricultural-land; simulation-models; spain-
Abstract: The small drainage basin of Cal Parisa was instrumented in early 1989 to study the hydrological and sediment routing behaviour of Mediterranean mountain areas formerly used for agriculture but now abandoned. Environmental changes produced by agricultural land use included the construction of terraces on the major part of the basin and subsequent artificial channelling of surface waters. Field observations and hydrological data suggest that storm runoff is generated by the contributing role of saturated areas, most of them originating from the terrace system. Modelling of the natural conditions before terracing, with the help of TOPMODEL, supports the hypothesis that terracing promotes the premature formation of saturated areas, increasing saturation overland flow at the expense of lower baseflow and actual evapotranspiration. Now, after land abandonment, the more relevant environmental hazard is linked to the spontaneous reorganization of the unmaintained artificial drainage network.
NAL Call No.: 292.8-J82
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172. Substrate effects on the enhanced biotransformation of polychlorinated hydrocarbons under anaerobic condition.
Doong, R. A.; Wu, S. C.
Includes references.
Descriptors: chlorinated-hydrocarbons; chloroform-; carbon-tetrachloride; trichloroethylene-; microbial-degradation; anaerobes-; anaerobic-conditions; in-vitro; models-; bioremediation-; groundwater-pollution; acetic-acid; methanol-; glucose-; humic-acids; 1,1,1-trichloroethane-; tetrachloroethylene-
NAL Call No.: TD172.C54
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Chesapeake Bay Watershed Model Workshop, 15-16 December 1993, Annapolis, Maryland.
Deliman, P. N.; Chesapeake Bay Watershed Model Workshop (1993 : Annapolis, Md.

[Vicksburg, Miss.]: U.S. Army Corps of Engineers Waterways
174. Sustainability of conjunctive water use for salinity control in irrigation areas: theory and application to the Shepparton regions, Australia.
Prendergast, J. B.; Rose, C. W.; Hogarth, W. L.

Includes references.
Descriptors: water-management; irrigation-water; water-use; groundwater-; surface-water; mixtures-; sustainability-; water-quality; salinity-; deterioration-; mathematical-models; australia-

Abstract: The long term sustainability of conjunctive water use for controlling irrigation salinity is affected by increase in groundwater salinity over time. This paper uses mass conservation of salt and water to assess groundwater degradation over long time scales. Management options which affect this rate of degradation are also examined. The groundwater model developed is illustrated using data from the Shepparton Irrigation Region in the Murray Basin, Australia. The model predicts rapid groundwater deterioration when conjunctive use is conducted over only a fraction of the area of influence of a groundwater pump. Where the pumped aquifer is underlain by deeper groundwaters, the rate of groundwater degradation is also affected by leakage into or out of the conjunctive use system. Surface redistribution of groundwater from pumps installed in zones of regional groundwater discharge to areas recharging the regional groundwaters, reduces excessive degradation in the zones of discharge. With optimal surface distribution of groundwater, the rate of degradation is low. The rate of groundwater degradation also depends on salt inputs from irrigation water and rainfall, and the average depth from the soil surface to the base of the aquifer. The rate of degradation resulting from applied salts in surface water and rainfall is typically about 0.01 dSm⁻¹ per year for shallow aquifers in the Shepparton region, but the rate is lower where deeper aquifers are pumped. Partial irrigation also reduces the rate of degradation because of the reduced rate of salt inputs. Where poorer quality groundwater lies within the area of influence of the groundwater pump, a greater rate of deterioration. mixing. In some irrigation regions limited export of groundwater through surface water conveyance structures to a river is possible. so that a regional surface salt balance could be maintained. However, salt exports made equal to the rate of surface imports into the irrigated area will only significantly impact groundwater salinity in the very longterm, or where only shallow aquifers.

NAL Call No.: S612.I756

175. Sustainability of sewage sludge land application to northern hardwood forests.
Crohn, D. M.

Includes references.
Descriptors: sewage-sludge; organic-amendments; application-to-land; broadleaved-deciduous-forests; forest-soils; simulation-models; monte-carlo-method; application-rates; nitrogen--; nitrate--; leaching--; groundwater-pollution; soil-fertility; humus--; growth--; biomass-production; nutrient-uptake; new-hampshire; fortnite--; forsen--

NAL Call No.: QH540.E23

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176. Technical analysis of response of Chesapeake Bay water quality model to loading scenarios. Response of the Chesapeake Bay water quality model to loading scenarios.

Descriptors: Water-quality-Chesapeake-Bay-Md; -and-Va; -Mathematical-models; Eutrophication-Chesapeake-Bay-Md; -and-Va
NAL Call No.: TD223.1.T43--1994

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177. Technology as an agricultural pollution control policy.
Abler, D. G.; Shortle, J. S.

Includes references.
Descriptors: maize--; agricultural-chemicals; pollution-control; technical-progress; environmental-policy; low-input-agriculture; innovation-adoption; elasticities--; mathematical-models; usa-
Abstract: In this paper we consider the market-level impacts of factor-augmenting innovations designed to reduce the use of fertilizers and pesticides, first within the context of a simple two-factor model, and then through a simulation model of the U.S. corn market. In both models, the impacts depend on the output demand elasticity and input substitution elasticities. The principal conclusion of the simulation analysis is that the potential for new techniques to reduce the use of agricultural chemicals is limited. Capital-augmenting innovations would actually raise fertilizer and pesticide usage. Land-augmenting innovations would also tend to increase pesticide usage.
NAL Call No.: 280.8-J822

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178. Thermal venting to recover less-volatile hydrocarbons from the unsaturated zone. II. Model applications.
Mesbah Ul Islam, K. M.; Kaluarachchi, J. J.

Second of a two part series.
Descriptors: hydrocarbons--; contaminants--; volatile-compounds; groundwater-pollution; techniques--; simulation-models
NAL Call No.: TD426.J68
Ma, L.; Selim, H. M.
Includes references.
Descriptors: solutes--; transport-processes; mathematical-models;
soil-types-genetic; solute-transport-models
NAL Call No.: 56.8-So3
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180. Transport of acridine in saturated porous media.
Matzner, R.; Bales, R. C.
Includes references.
Descriptors: acridines--; transport-processes; silica--;
sorption--; ph--; models--; groundwater-pollution
NAL Call No.: TD172.C54
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Tan, Y.; Gannon, J. T.; Baveye, P.; Alexander, M.
Includes references.
Descriptors: soil-bacteria; sand--; porous-media; aquifers--;
transport-processes; mathematical-models; simulation-models
Abstract: Experiments were carried out to determine the breakthrough of bacteria through a saturated aquifer sand at three flow velocities and three cell concentrations. Bacteria were either suspended in deionized water or 0.01 mol L-1 NaCl solution. Bacterial transport was found to increase with flow velocity and cell concentration but was significantly retarded in the presence of 0.01 mol L-1 NaCl. A mathematical model based on the advection-dispersion equation was formulated to describe bacterial transport and retention in porous media. The transport equations for bacteria were solved using the finite difference Crank-Nicolson scheme combined with Newton-Raphson iterations. The best fit of the numerical model to the experimental data was obtained using the downhill simplex optimization technique to minimize the sum of the squares of deviations between model predictions and experimental data by varying three parameters. This numerical model was found to describe the experimental data very well under all the experimental conditions tested. An alternative model (also based on the advection-dispersion equation) was tested against all the experimental data sets, but it did not represent the experimental data as well as the model proposed in this paper.
NAL Call No.: 292.8-W295
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182. Transport of chlorsulfuron through soil columns.
Veeh, R. H.; Inskeep, W. P.; Roe, F. L.; Ferguson, A. H.
Includes references.
Descriptors: chlorsulfuron--; transport-processes; leaching--;
persistence--; unsaturated-flow; silt-loam-soils; clay-loam-soils;
Abstract: Chlorsulfuron
[2-chloro-N-[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)
amino]carbonyl]-benzenesulfonamide] is an anionic sulfonylurea
herbicide with high soil persistence; consequently, there is
interest in predicting its mobility in agricultural soils. The
objectives of this study were to determine the transport
characteristics of chlorsulfuron in disturbed and undisturbed
soil columns and evaluate the capabilities of LEACHM (Leaching
Estimation and Chemistry Model) for predicting chlorsulfuron
transport. Soil column experiments were conducted with two
Montana soils (Amsterdam silt loam, fine-silty, mixed Typic
Haploboroll, and Haverson silty clay loam, fine-loamy, mixed
(calcareous), mesic Ustic Torrifluvent) under unsaturated flow
conditions. Unit gradient was established in all columns by
balancing surface water input to outflow at the bottom of each
column through a stainless steel porous plate connected to a
vacuum chamber containing a fraction collector. A nonlinear least
squares approach (CXTFIT) was used to fit breakthrough curves
(BTCs) for Br- and 14C-labeled chlorsulfuron using the linear
equilibrium adsorption model (i.e., local equilibrium assumption
or LEA model) and the bicontinuum model (i.e., nonequilibrium
assumption). Observed Br- BTCs were best described by the
bicontinuum model indicating physical nonequilibrium due to
immobile water regions. Observed chlorsulfuron BTCs demonstrated
both chemical and physical nonequilibrium during transport. The
best fit to observed chlorsulfuron BTCs was obtained with the
bicontinuum model using the dispersion coefficient optimized
(i.e., fixed) from the Br- BTCs. LEACHM was used to generate
predicted BTCs for chlorsulfuron utilizing independently. BTCs
utilizing the Br- derived dispersion coefficient (D) and the
bicontinuum model-derived partition coefficient (Koc) did not
adequately reflect observed BTCs primarily because the current
version of LEACHM has no capability for accepting input
parameters relating to nonequilibrium conditions. The D and Koc
values for chlorsulfuron BTCs derived from the LEA model improved
predictions; however, it is important to note that LEA-derived D
and Koc values for chlorsulfuron BTCs essentially compensate for
nonequilibrium behavior. Finally, the experimentally determined
chlorsulfuron BTCs confirmed the high mobility of this chemical
at neutral soil pH values.

NAL Call No.: QH540.J6
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183. Transport of reactive solutes in soils: a modified
two-region approach.
Selim, H. M.; Ma, L.
Soil-Sci-Soc-Am-j. [Madison, Wis.] Soil Science Society of
Includes references.
Descriptors: solutes-; transport-processes; adsorption-;
retention--; release--; mathematical-models; clay-soils; atrazine--;
movement-in-soil
Abstract: A modified two-region approach that accounts for
chemical and physical nonequilibrium of solute behavior in soils
was developed. Chemical nonequilibrium was described by a
second-order two-site model, while physical nonequilibrium was
represented by a two-region (mobile-immobile) approach. Model validity was based on predictions of atrazine [2-chloro-4-(ethylamino)-6-(isopropylamino-s-triazine] miscible displacement experiments in a Sharkey clay soil (very fine, montmorillonitic, nonacid, thermic Vertic Haplaquept) for different aggregate sizes, flow velocities, column lengths, and flow interruption. Independently measured model parameters from kinetic batch experiments were used in model validation. Two model formulations were evaluated. Model I was based on the classical two-region approach where the soil matrix was divided into two fractions. In Model II, we assumed that the rate of reaction within each soil region was a function of the total number of vacant sites in the soil. Thus, the partitioning coefficient f of the two-region concept, which is difficult to measure, need not be specified and the amounts retained by each soil region is solely a function of reaction rate coefficients. Model I with f = F (F = mobile/total water contents) provided the worst atrazine predictions. Moreover, based on Model I predictions with f = 1 and f = 0, the significance of physical nonequilibrium was dependent on experimental constraints such as aggregate size and flow velocity. Based on root mean squares, however, the best overall predictions were obtained using Model II. We concluded that Model II, which requires fewer parameters, is superior to Model I in its prediction.

NAL Call No.: 56.9-So3
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184. Using curve numbers to determine baseline values of green-ampt effective hydraulic conductivities.
Risse, L. M.; Liu, B. Y.; Nearing, M. A.

Includes references.
Descriptors: infiltration-; hydraulic-conductivity; runoff-; green-and-ampt-equation; water-erosion; prediction-; mathematical-models; water-erosion-prediction-project
Abstract: Since the trend in infiltration modeling is currently toward process-based approaches such as the Green-Ampt equation, more emphasis is being placed on methods of determining appropriate parameters for this approach. The SCS curve number method is an accepted and commonly used empirical approach for estimating surface runoff, and is based on numerous data from a variety of sources. The time and expense of calibrating process-based infiltration parameters to measured data are often prohibitive. This study uses curve number predictions of runoff to develop equations to estimate the "baseline" hydraulic conductivities (Kb) for use in the Green-Ampt equation. Curve number predictions of runoff were made for 43 soils. Kb values in the Water Erosion Prediction Project (WEPP) model were then calibrated so that the annual runoff predicted by WEPP was equal to the curve number predictions. These calibrated values were used to derive an equation that estimated Kb based on the percent sand, percent clay, and cation exchange capacity of the soil. Estimated values of Kb from this equation compared favorably with measured values and values calibrated to measured natural runoff plot data. WEPP predictions of runoff using both optimized and estimated values of Kb were compared to curve number predictions of runoff and the measured values. The WEPP predictions using the
optimized values of $K_b$ were the best in terms of both average error and model efficiency. WEPP predictions using estimated values of $K_b$ were shown to be superior to predictions obtained from the curve number method. The runoff predictions all tended to be biased high for small events and low for larger events when compared to the annual and event basis were also developed for the WEPP model.

NAL Call No.: 292.9-Am34

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185. Using GLEAMS to select environmental windows for herbicide application in forests.
Smith, M. C.; Michael, J. L.; Knisel, W. G.; Neary, D. G.

Includes references.
Descriptors: forest-management; herbicides-; application-date; timing-; determination-; simulation-models; mathematical-models; environmental-protection; climatic-factors; groundwater-loading-effects-of-agricultural-management-systems
NAL Call No.: S589.7.E57-1994

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186. Using ISC & GIS to predict sulfur deposition from power plants.
Lopez, J. I.; Beene, J. S.; Parnell, C. B. Jr.

Descriptors: air-quality; grazing-; models-; cattle-
NAL Call No.: 290.9-Am32P

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187. Utilizing GIS and GLEAMS to prescribe best management practice's for reducing nonpoint source pollution.
Searing, M. L.

Descriptors: watersheds-; water-pollution; feasibility-; geographical-information-systems; simulation-models; pollution-control; maryland-; frederick-county,-maryland
NAL Call No.: 290.9-Am32P

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188. Validation of EPIC for land applied animal waste.
Coffey, S. W.; Stone, K. C.; Line, D. E.

189. Validation of GLEAMS nutrient component for midwestern conditions.
Mamillapalli, S.; Engel, B. A.; Kladivko, E. J.
Descriptors: water-quality; ammonia-; nitrate-
NAL Call No.: 290.9-Am32P
*****************************************************************
190. Validation of leaching model on actual structures.
Wegen, G. v. d.; Plas, C. v. d.
Descriptors: cement-; concrete-; bitumen-; slags-; fly-ash; building-materials; leaching-; soil-; pollution-; environmental-factors; copper-
NAL Call No.: QH540.S8
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191. Validation of the GLEAMS-WT and GLEAMS-SWAT erosion submodels.
Reyes, M. R.; Fouss, J. L.; Bengston, R. L.; Carter, C. E.
Descriptors: erosion-; runoff-; prediction-; simulation-models; losses-; water-table; subsurface-drainage; louisiana-
NAL Call No.: 290.9-Am32P
*****************************************************************
192. Variability in Green-Ampt effective hydraulic conductivity under fallow conditions.
Risse, L. M.; Nearing, M. A.; Zhang, X. C.
Includes references.
Descriptors: hydraulic-conductivity; rain-; infiltration-; runoff-; temporal-variation; soil-water-content; green-and-ampt-equation; fallow-; simulation-models; water-erosion-prediction-project-simulation-model
Abstract: Hydraulic conductivity of the soil matrix dynamically responds to changes in the surrounding environment. Therefore,
infiltration parameters for the Green-Ampt equation should change for each storm event in continuous simulation models. This study focused on improving Water Erosion Prediction Project (WEPP) model estimates of runoff using over 220 plot-years of natural runoff plot data from 11 locations. By optimizing the effective Green-Ampt hydraulic conductivity, Ke, for each event within the simulation, a method of correlating hydraulic conductivity on any given day to many other parameters was established. Factors with significant correlation to optimized values of Ke fell into three distinct categories: (1) factors related to soil crusting and tillage; (2) factors related to event size; (3) factors related to antecedent moisture conditions. Equations were developed to represent the temporal variability of hydraulic conductivity for each group. The equation describing the decrease in hydraulic conductivity owing to crusting used an exponential decay function based primarily on cumulative rainfall kinetic energy since last tillage, a soil stability factor, and a crust factor. The relationship between hydraulic conductivity and event size was characterized using an exponential relationship with total rainfall kinetic energy. The final adjustment used the moisture content immediately below the infiltration zone to account for the influence of antecedent moisture conditions on optimized hydraulic conductivities. All three adjustments were incrementally incorporated into WEPP and each improved the average model efficiency.

NAL Call No.: 292.8-J82
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193. Verification and adjustment of regional regression models for urban storm-runoff quality using data collected in Little Rock, Arkansas.
Barks, C. S.; Little Rock (Ark.).
Descriptors:
Urban-runoff-Arkansas-Little-Rock-Mathematical-models;
Water-quality-Arkansas-Little-Rock-Mathematical-models
NAL Call No.: GB701.W375--no.94-4216
*****************************************************************
194. Water budget analysis for the Everglades Agricultural Area drainage basin.
Abtew, W.; Khanal, N.
Includes references.
Descriptors: agricultural-land; water-budget; drainage-;
irrigation-; runoff-; water-use; water-quality; rain-;
seasonal-fluctuations; mathematical-models; florida-
Abstract: Water budget studies are essential for water resources and environmental management. In this study, a water budget analysis is presented for the Everglades Agricultural Area (EAA) in South Florida for the period from 1973 to 1991. The EAA is a highly productive irrigation/drainage basin that has a high water table and organic soils. Water quality problems are associated with the drainage discharge from the basin. During dry periods,
supplemental water is used for irrigation and in rainy periods excess water with relatively higher phosphorus content is pumped out of the basin to Lake Okeechobee and the Everglades ecosystem. Elevated concentrations of phosphorus in the runoff/drainage that is discharged from the EAA basin have created water quality problems. The mean surface water inflow to the basin was 63,990 ha-m, and the outflow was 131,447 ha-m per year. On the average, supplemental surface water use was 47,411 ha-m, and runoff/drainage was 114,816 ha-m per year. The mean annual basin rainfall was 120.9 cm. A general trend in the decline of the wet season rainfall is observed.

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