NON-POINT SOURCE POLLUTION

Sources of pollution are broadly classified as either point or non-point sources. Point sources of pollution, as discrete identifiable locations, include municipal and industrial effluent and discharges from solid waste disposal sites. Most severe concentrations of point source pollutants carried in surface water bodies are during low-flow conditions.

Because of discrete locations, point source pollution is easy to identify and measure. On the other hand, the non-point source pollution (NSP), as the result of intermittent releases of pollutants over large areas, is difficult to identify and measure directly. Relative importance and magnitude of processes (hydrologic, physical and chemical) in determining non-point loads varies with land use categories and associated activities.

In the last few decades, estimation of NPS pollution is a topic of research that has resulted in the development of numerous models and modeling techniques. Agricultural activities are an acknowledged non-point source of pollution of surface and ground water.

It is very essential to estimate the area contributing non-point source pollutant discharge at different sampling points in a river. In India, very little work has been done to estimate NPS pollution occurring due to agricultural practices and over-use of fertilizers during monsoon and non-monsoon periods.

TECHNOLOGY

Non-point source pollution enters the receiving surface water diffusely at intermittent intervals. It may generate both, conventional and toxic, pollutants just as point sources do. Although non-point sources may contribute many of the same kinds of pollutants as point sources do, the pollutants are generated in different volumes, combinations, and concentrations. The extent of NPS pollution is mainly related to infiltration and storage characteristics of the basin, the permeability of soils, geographic, geological, land use/land cover conditions in the basin, and other hydrological parameters. Important waste constituent that outflow from diffused sources are suspended solids, nutrients and pesticides.

Non-point loads have been often related to basin characteristics, incident rainfall, applied fertilizer doses and prevailing cropping pattern in the area. With the help of emerging techniques, a variety of basin characteristics such as land use/land cover, area under different

crops, digital elevation model, slope, and aspect map showing flow direction can be assessed. In addition, the information pertaining to fertilizer doses may be collected through public interaction and statistical data available with the concerned authorities.

Since early seventies, numerous studies have been conducted globally to understand the processes controlling NPS pollutants in the river systems. Several researchers have estimated export coefficients and used different equations to compute the contribution of different water quality constituents from the watershed during monsoon period. Modelling approaches have been attempted at the National Institute of Hydrology, Roorkee to predict NPS pollution during monsoon and non-monsoon period. The models are based on chemical mass balance approach, reaction kinetics and mass balance differential loading approach. Considering that non - point pollutants may also undergo a process of attenuation due to a variety of mechanisms including settling, and disintegration/decay due to reaction, a modification to the mass balance equation is proposed. It has been found that mass balance differential loading approach, considering the non-point load under the assumption of uniform distribution along the stream reach, performs consistently better. The results obtained using this approach minimize the error estimates and improve the correlation between observed and computed NPS loads. However, other approaches may also be used with fairly good estimate of NPS pollution.

Estimation of NPS pollution load in rivers from the surrounding agricultural area is of utmost importance due to enhanced application of fertilizers and chemicals for intensified agriculture production. During the monsoon period, if chemicals and fertilizers are applied on the land surface and overland flow

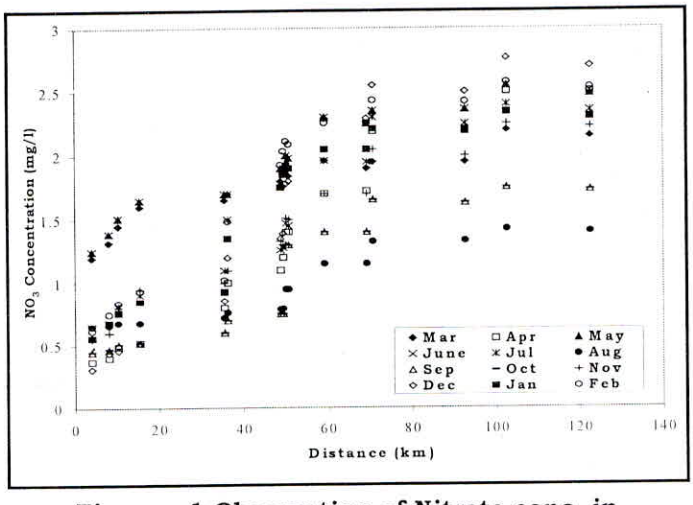

Figure – 1 Observation of Nitrate conc. in different months along a stream

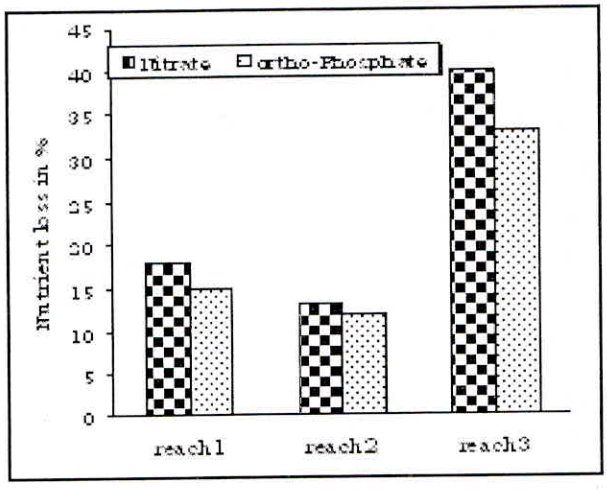

Figure – 2 Nutrient loss in different reaches

generates due to a storm, a significant amount of NPS pollutants/contaminants can be lost into surface water. During the non-monsoon period, the NPS pollutants are transported through sub-surface flow and overland flow from areas very close to the river. Therefore, it is very essential to estimate the area contributing NPS pollutants at different sampling points in a river.

ENVIRONMENTAL IMPACT

The developed technology shall improve the environment.

ECONOMICS

It will have non-tangible and indirect benefits.

BENEFICIARIES

Central and State Government Agencies (Central Pollution Control Board, Central Water Commission, State Pollution Control Board, State Water Resources Department) and non-governmental organisations.

INTELLECTUAL PROPERTY RIGHTS

No element of Intellectual Property Rights is involved in the use of this technique.