Geog 464 Learning Objective Outline

LOO 18 Integrated, Watershed Planning Analysis

18.1 What is important for integrating functional themes for GIS data analysis in planning when using an integrated water resource management approach?
18.2 What are some of the barriers to integrated water resource management?
18.3 What are some of the more important water use categories that can be uses in Heathcote's recommended simple assessment of water resource impairment?
18.4 What are the stages and steps in the EPA's watershed planning process?

Integrated analysis across functional themes is an important data analysis approach for sustainability management. Taking into consideration values and criteria in two or more functional categories is a cross-category analysis, and essentially an extension of the basic analyses approaches presented in RUGIS chapters 8 - 11. One maintains the depth of analysis, but broadens the analysis to consider impacts across two or more functional themes, e.g. land use and water resources, or land use and transportation, or transportation and water resources.

18.1 What is important for integrating functional themes for GIS data analysis in planning when using an integrated water resource management approach?

Since the early 1990's, integrated water resource management (IWRM) is receiving increased attention as a modified form of the more traditional approach to planning (Dzurik 2003 p. 102). The difference is that it is not as broad as comprehensive planning, nor as narrow as functional planning. Although there are many similarities to the rational planning model, there are also a number of differences.

In regards to river basin planning, IWRM emphasizes an approach whereby:

1. Water resources have various physical aspects (e.g., surface, ground, quantity, quality);
2. Water is a system, but it is also a component that interacts with other systems (e.g., interaction between land and water, interaction between river and estuary);
3. IWRM can consider interrelationships between water and social and economic development (e.g., role of water in hydropower, industrial production, urban growth);
4. IWRM can consider the river not only in terms of the water itself but also the biological resources that rely upon it in its natural state (e.g., fish and wildlife, benthic organisms, plants)
5. IWRM can incorporate a river in its full extent, from headwaters to the estuary, and in consideration of the entire range of potential uses over its length;
6. IWRM can view the resource and its uses from a long-term perspective as well as from a short-term perspective (Dzurik 2003, Mitchell 1990)

18.2 What are some of the barriers to integrated water resource management?

Despite the need for integrated water resource management, there are several barriers to implementation. Dzurik (2003 P. 107) summarizes the 24 barriers to integrated environmental management presented by Cairns (1991), and articulates the ten most salient barriers as:

- Integrated management takes time, and time means money; agencies do not fund necessary time for this activity
- Turf battles run rampant in organizations
- Many participants are unwilling to compromise

- Changes in lifestyle required by the integrated resource perspective are strongly resisted by some, not only by individuals but by institutions and corporations
- Society is oriented toward growth rather than maintenance
- Political process is oriented toward polarizing issues rather than integrated management
- Institutions of higher learning do not train (educate) people to think in an integrative manner
- Short-term profits are enticing
- An attitude of "what has posterity done for me" is common
- Reluctance to changing ways of doing things

18.3 What are some of the more important water use categories that can be uses in Heathcote's recommended simple assessment of water resource impairment?

To give an idea of the relationship between water resources and other themes we can overview some of the categories of water use described by Heathcote (1998).

Water Use Categories Employed in Water Catchment Planning
(Adapted from Heathcote 1998, p 62. Table 3.1)

Water Category	**Typical use**
Potable (drinking) water supply	Municipal water supply
	Residential water supply (private wells)
Industrial water supply	Process water supply
	Cooling waters
Agriculture	Irrigation waters
	Livestock waters (milkhouse and cattle wash)
Flood control	Impoundment of high flows for delayed release
Thermal electric power generation	Cooling waters
Hydroelectric power generation	Impoundment of water for power generation
Navigation	Recreational boating
	Commercial shipping
Water-based recreation	Recreational fishing
	Recreational boating
	Swimming
	Birding
Fish and Wildlife habitat	Aquatic and riparian habitats
	Protection of community structure
	Protection of rare and endangered species
Water quality management	Protection of minimum flows
	Low flow augmentation
	Assimilation of wastewater discharges
	Total Maximum Daily Load (TMDL)

According to Heathcote (1998, p. 187), a simple assessment for identifying impacts related to water use impairments would take the following steps.

- focus on a small number of impaired uses
- use a small number of indicators with which to evaluate improvements in impaired uses
- make a comprehensive inventory of sources
- identify key sources of data
- eliminate infeasible options using systematic evaluation techniques

- use present and future scenarios to capture likely trends over time
- focus on specific outputs , including recommendations for immediate action, for deferred action, and for additional data collection and analysis

Many of the steps in that list are somewhat familiar to us, based on what we considered in the water resource planning material earlier in the course; but, GIS can help extend our ability for analysis.

18.4 What are the stages and steps in the EPA's watershed planning process?

Let us remember that a "watershed" is a functional unit of process activity. Lots of activity occurs on the land across a watershed and flows to streams and rivers then into lakes and oceans. Thus, we can look at impairments by focusing on watersheds. Heathcote's simple assessment can be framed using the EPA's watershed planning process (See figure 12.1 in graphic below).

The simple assessment and watershed planning workflow described above can be performed using Steps 1, 3, 5, 6, and 7 from Table 3.5 of the synthesized workflow process of Chapter 3. It is adequate to provide a general characterization of impairments. A simple assessment commonly involves mapping with existing secondary source data.

However, a detailed assessment requires more. A detailed assessment adds phases 2 and 4 – process simulation and change related to impacts on alternatives – to the other phases performed in a simple assessment.

In a detailed assessment, the process is likely to involve field data collection, for example, for stormwater runoff based upon national pollution discharge eliminate system (NPDES) permits. There is now a GPS point for every NPDES in urban areas.

The field data would be compiled and mapped.

Subsequently, a data analysis will likely yield…
- identification and detailed characterization of specific sources of problem
- quantitative evidence in regard to the performance of different management alternatives
- elucidation of processes, and thus cause-and-effect relationships within the basin
- detailed and quantitative projections about the impact of specific remedial measures on in-stream hydrology, water quality, and biological systems

Figure 12.1. Three-step watershed planning process. From U.S. Environmental Protection Agency (2009)