

SOME ETHICS IN STREAM CLASSIFICATION

by

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I certainly agree with the previous speaker about the value of the diversity. It's really our only reliable index for degree of total balance between the total energy budget and its stress. It's the only index we really have that integrates everything in the total life of the system.

Yesterday we were talking about evaluating energies and from that the dollar values as an approach to combine both the resources that man recognizes in his present economic system and the resources that are provided from forests, streams, estuaries and the sea. Let's apply that principle now to the issues at hand today, the classification of streams including the particular one of the research stream.

If our resource for classification were empty pipes, it might be appropriate to classify pipes by their usage by man. We could use one group (A) for one kind of waste and (B) for the second and (C) for the third and let (D) receive any kind of stuff. That might be a very useful way to classify sewage pipes, allowing and considering only compatible uses because the pipe was providing nothing except a pathway.

If on the other hand, we went downtown and looked at the different stores, would it be appropriate to classify their storefronts in the same way for garbage dumping? Could you arbitrarily dump A wastes on one man's store and B on another? Of course, that would be absurd, because the stores are themselves generating resource value, as great as their use for waste. One store gives hardware, another provides barbershop services, and another building area provides us city government. I think the stream classification need, particularly in North Carolina, is more like the stores than the pipes, but the present classification has them classified as if they were pipes. No effort to evaluate stream values was made unless they were already in the economy. The classifiers should have used advanced knowledge of science of limnology, thinking in terms of resources, to say "What are the resources? Let's classify them according to what they have to offer us all whether we presently pay someone for it or not. What are their values per acre and per gallon? And what then are compatible uses that go with each, and who needs to be brought to the conference table when we discuss each one?" So a classification of environmental systems is needed that recognizes the roles in receiving energy, processing chemicals and providing services of life support, recreation, fisheries, tertiary treatments, and other work by our life support system.

How do we evaluate these? I suggest we measure their energy values and calculate dollar equivalents. For example, consider a piece of Umstead Park around the airport, now in controversy. What is the energy value spent in work

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by the woods to rebuild the forest with all its complexity? What is the replacement cost of the forest? For a park one normally needs a complex type of forest with self maintenance rather than a forestry yield type of system. Let's add up the total organic energy budget of the forest for a hundred years required to regrow it. Then convert back to money with ten thousand kilocalories per dollar. The value comes out \$584,000 per acre. After destruction a stream may not take so long to rebuild diversity, providing you have a source of fauna to replace species, a source of seeding, and a basic channel still operating. It might take ten years to come back so that your value per acre per stream may be a tenth that of the forest (stored value).

The streams, like the forests, are also resources with values in their service to us and we need to classify them according to the types of ecosystems in each. Some of the people in this room were part of that group that did a survey for the Federal Water Pollution Control Administration this past year on the estuaries and classified 45 estuarine types in the United States, Alaska, Puerto Rico, and Hawaii. This was done on the basis of similar energy budgets and adaptations. For example, there were reefs, salt marsh, medium salinity plankton systems, bluewater plankton, coral reefs, and so on. Organization of plans, classification, and management was recommended by these types. For making sensible management, we need to recognize 10-15 stream types and group them by their similarities. Such an ecological classification can lead to optimal use and effective management plans or lack of management plan depending on desired patterns. Now consider next our research stream and the problem of New Hope Creek locally. The name should have been *preservation*. I think everybody was reaching for a "preservation" classification which would allow all non-destructive uses. This means the school children would need access to learn what a primeval North Carolina stream was like. The public might wade in the brook and have some contact with his heritage. Research of the "no-touch kind" is compatible. Forbidden would be destructive research such as experiments where one poisons to see the effect. Destructive stream research has to be done in closed systems. This is done with artificial streams where water passes down a channel and is pumped back to the start again. Examples of people and places where such work has been done include:

1. Artificial stream at University of Texas studied by E. Gloyna, N. Armstrong, and B. J. Copeland;
2. We built a small recirculating stream at Duke in 1954;
3. A. Stiven at University of N. C. has a small one;
4. Several recirculating streams have been studied in Fisheries Department, Oregon State University, by Warren, McIntyre, and others.

In these experimental streams instead of having miles and miles of one stream for experimental damage, you run the water downhill for 20 feet or a mile and recycle. One has a complete cycle and can dump wastes into it without jeopardizing a real stream . . . or anybody else. Costs are paid for by the research budget. You own the land and you have the water under control. No destructive research of natural streams is desirable.

I'll add this one additional thought about value of a stream with a preservation classification. The value of this usage varies with the amount of remaining untouched stream in North Carolina. If all North Carolina had streams that were still essentially undisturbed, then no one section would be especially valuable in

a preservation role. But, in Orange County and Durham County, where most of the other streams are being polluted and badly changed, we are almost left with only one and its value to the people goes up. Now if it becomes the only one left in the region so that it's our seeding source, then its value (amplifier value) in energy or dollar units is exceedingly large. It's then the only thing the State Fishery people have to work with. It becomes like an old painting of a master. The value of a "no-touch" resource then becomes a function of its scarcity, just like so many other things. The time to establish several dozen of these in N. C. has come. Soon it will be too late.

A lot of your most active students talk about natural resource values in relation to moral rights and survival. Moral rights in the long run are determined by the requirements of survival of the system of man in Nature. Survival requires that we balance both man and Nature in a harmonious system. As life support (complex self maintaining ecosystems) become particularly short in supply, then those remaining are a critical public resource. As our culture expands, and our economies grow, the free contributions they have been counting on from Nature as a basis of continued growth is being diluted. As the population grows more and more dense, then the amount of free life support system of water or air which used to be available for waste disposal or for waste usage becomes less and less. We are then forced to pay for special agents and technology just to hold quality standards. We pay more and more at the industrial site or at the city sewage plant. You have to treat more and more just to hold the same level. In other words, there is an inevitable lowering of our standard of living with the growth, because our free life support services are limited. Putting it in another way, standard of living must go down with greater industrial development.

Technology costs more than nature's natural miniaturization at this job. Now, during this period when we are having a dilution of that which is in short supply, there will be increasing recognition of a new moral right, a constitutional right of everybody on earth to fresh air and a life support system. If you want to make some calculations, take the life support system of the earth which is about one gram of oxygen per square meter per day (the metabolic budget of the sea). This may measure the rate the earth can take wastes, live with them, process them, and clean them. Almost everything Nature does for us is proportional to this daily organic budget just as an industry's ability is proportioned to its dollar budget. The earth's budget is the metabolism times the earth's area, 5.1×10^{14} g/m²/day. If you take a population of the world of 5 billion and divide it into the world metabolism, you would have your individual, pro rata value in this life support system (25 acres of land and sea), 100,000 m² or 100,000 g/m²/day. In other words, if you were in a little box with this as your share of the life support system around you, you would get pretty personal about the guy that cut down all your trees or poisoned your water area that was keeping you alive. Because it's not all prorated, we don't yet notice it. We are ultimately going to recognize that nature's areas are as much a service as any part of the city's transportation, water supply, or waste disposal. Nobody claims they have the right to go and break the city sewer or do any thing else to the life support system. It is the same thing with our planet, nobody has the right to go use water without putting it through a public decision process. He needs to pay the overall system in equal service value for it. The decision has to be made that his use is the

best use of it that could be made of it at that time towards the long range survival.

I don't know if these concepts do any violence to the more mundane process of getting a particular law through a particular state's decision process but sometimes it helps to see what kind of ideals are ahead of us. The people I teach take these things for granted and they impart them to their fathers. It's our resource managers who may be behind in understanding.