River Crossings

Volume 3 July/August 1994 Number 4

Most Endangered Rivers of 1994

American Rivers announced its list of the continent's most endangered and threatened rivers of 1994 on April 19th. The endangered rivers announcement, and a 50 page report, highlight serious environmental threats to 30 of North America's rivers and streams and provide a snapshot of the state of our rivers. Ten of the rivers are classified as endangered, while twenty are termed as threatened. The rivers on this year's list flow through 32 U.S. states, plus Washington, D.C., Canada, and Mexico. Three of the rivers listed as endangered, the Clarks Fork, Mississippi, and Missouri are in the Mississippi River Basin.

American Rivers

"Our rivers, contrary to popular belief, are in terrible shape," American Rivers President Kevin Coyle said in releasing the endangered rivers report at a heavily attended national news conference in Washington, D.C.

"Rivers are the circulatory system of all our major ecosystems, and we need healthy rivers in nature to keep fish and wildlife species alive. In addition, rivers are the major contributors to our freshwater supply. To the extent that we destroy them, we are cutting off our own source of freshwater," he said.

Topping this year's endangered list is the Clarks Fork of the Yellowstone River, which flows through Montana and Wyoming. The river is imperilled by a proposed gold mine two-and-a-half miles from Yellowstone National Park that would create a perpetual risk of acid mine pollution and endanger the Clarks Fork. The planned mine and 74-acre toxic impoundment threaten the Greater Yellowstone ecosystem. In order to contain the millions of tons of acid generating waste created by the mine, Crown Butte Mines, Inc., owned completely by Canadian companies, plans to construct a 90-foot high dam and a 74-acre storage reservoir.

Other endangered rivers include:

- Anacostia River (Washington, D.C./MD): Within walking distance of the nation's capital, the Anacostia River typifies the state of our nation's urban rivers degraded by toxic chemicals, untreated sewage and other pollutants. Congress will consider legislation to toughen the Clean Water Act and to create an urban river restoration program this year.

- Clavey River (CA): The last intact wild river in the Sierras, the Clavey is endangered by five expensive and unnecessary dams that would eliminate 99 percent of the river's

INSIDE THIS ISSUE

Most Endangered Rivers	1
Rivers Conference	2
Flood Report Hearing	6
Paddlefish/Sturgeon Committee	6
Sturgeon Genetics	7
Sturgeon/Paddlefish Status	9
ESA Reforms	11
Missouri River Listings	13
Master Manual Review	14
Back to the River Project	16
Sturgeon for Tomorrow	16
Wetlands Report	17
CWA Reauth. Delays	17
Rivers and Wildl. Handbook	18
Zebra Mussel Training	18
Meetings of Interest	18
Congressional Action	19

flows. A draft environmental review of the dams will be released in June, while a legislative proposal to protect this river under the Wild and Scenic Rivers Act will be introduced in this Congress.

• Columbia/Snake River System (WA/OR/ID): The Columbia/Snake River system is burdened by numerous hydropower dams, the principal cause of the disastrous decline of this once great salmon fishery. Irrigation diversions, old dams without fish passage, and poor forestry management contribute to the decline in key tributaries, the White Salmon and the Yakima.

• Mississippi River: Despite the greatest flood of this century, the Mississippi continues to be over-engineered by the Corps of Engineers. The Corps continues to rely on environmentally damaging structural flood control solutions and now wants to spend billions more to expand the navigation system and turn hundreds of other rivers into lifeless, concrete ditches.

• Missouri River: After 50 years of environmental destruction by the Corps of Engineers, the Missouri barely resembles the river that Lewis and Clark explored. Unless the Corps changes the way it operates the river's mainstem dams, many of the native fish species of the Missouri will be lost forever.

• Penobscot River (ME): The Penobscot is threatened by a proposed new dam that would cut in half the chance of successful Atlantic salmon restoration by preventing fish from reaching spawning areas. The State of Maine has approved the project, which is now pending before the FERC for environmental review.

• Rio Grande/Rio Bravo (CO/NM/TX/Mexico): The nation's Most Endangered River of 1993, the Rio Grande received long overdue attention as a result of the North American Free Trade Agreement (NAFTA). But promises made during the NAFTA debate are yet to be fulfilled; sufficient funding is not available to clean up pollution along the US.-Mexico border.

• Thorne River (AK): The Thorne River, located at the southern end of the Alaskan Rainforest, may be destroyed by logging practices that ruin wildlife habitat, fill the river with silt, and choke prime salmon habitat. The future of at least one long-term logging contract that adversely affects management of the Tongass National Forest will be decided soon.

• Virgin River (UT/AZ/NV): The Virgin River is threatened by competing demands for its water from three growing Southwestern states, while endangered fish continue to decline. Utah interests are pursuing numerous dam proposals; thirsty Las Vegas is planning a pipeline.

Source: American Rivers, Vol. XXII, No.2., Summer 1994.

Sustaining Ecological Integrity of Large Floodplain Rivers: Conference Synthesis

An international conference and workshop titled, "*Sustaining the Ecological Integrity of Large Floodplain Rivers: Application of Ecological Knowledge to River Management*" was held in La Crosse, WI on July 12-19. The Conference and Workshop was hosted by the Environmental Management Technical Center of the National Biological Survey (NBS), and co-sponsored by the President's Council on Sustainable Development (PCSD) along with several other agencies.

Secretary Babbitt called for a new approach to the Mississippi River, one that is more environmentally sensitive and better recognizes the consequences of people's actions.

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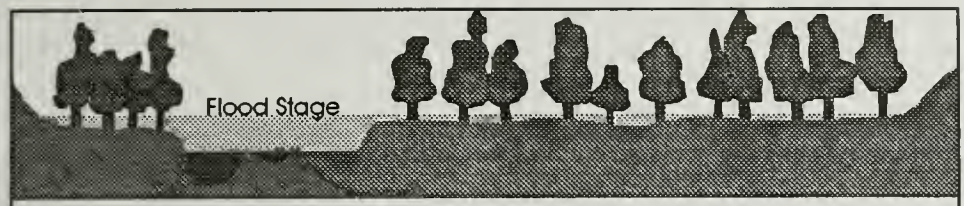


Natural floodplains experience a periodic "flood pulse", providing for diverse habitats, biodiversity, native species, natural flows and sediment movements, and compatible agricultural and developmental uses.

The Conference and Workshop attracted Secretary of the Interior Bruce Babbitt as well as river ecologists from all over the world to address the current state of our large floodplain rivers and what should be done to sustain their long-term ecological integrity. "We're learning to live more lightly on the landscape", Babbitt said.

Babbitt read from and praised the Interagency Floodplain Management Review Committee Report (Galloway Report), saying that new approaches must consider all consequences of people's actions. The Galloway Report was summarized in the last issue, Vol. 3, No. 3 of *River Crossings*.

According to an article in the La Crosse Tribune (July 20, 1994), Babbitt told reporters after his 30-minute speech that "The most important thing we need to do is to get everybody together and assess all of these questions about river management with an eye toward all of the consequences".

"In the past, what we've done is we have a lock and dam program, a dredging program, a levee-building program, an agriculture program, and a wildlife reserve program, he said, but they're all done on an ad hoc basis. I just think we're now at the point where we need to look at the entire river system and say what you do with the river in Minnesota has consequences in Louisiana."

Babbitt announced his Department's continuing commitment to collecting, analyzing, and using scientific data in the Upper Mississippi, Lower Missouri and Illinois River systems that were dramatically affected by flooding in 1993.

The Federal government's initial response to the flooding included a multi-agency effort to collect and map ecological information for the affected areas.

"Ultimately," Babbitt said, "we must use and build on the information collected to more effectively deal with the many issues related to the flood, adequately address conservation and resource issues in the regions, and to ensure better preparation for future flood occurrences and other dramatic natural events in these areas."

The National Biological Survey is prepared to work with the U.S. Geological Survey, the Fish and Wildlife Service, the Army Corps of Engineers, States and others in the area to build on what has been accomplished and provide a wealth of biological information to an array of Federal, State and local agencies that will be making decisions about future activities in the flood zones.

Responsibility for the NBS role in this overall partnership will be shared by:

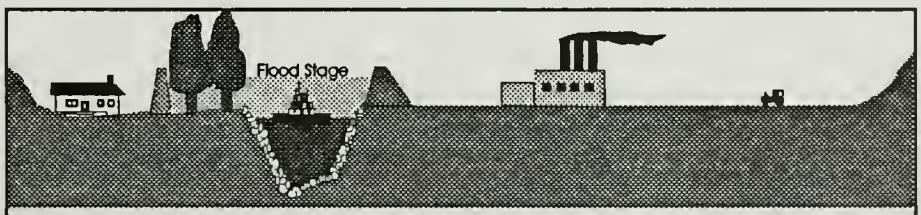
- The Environmental Management Technical Center (based in Onalaska, WI), which has ongoing programs for the Upper Mississippi and Illinois rivers.

- The Midwest Science Center, Columbia, MO, which has expanding responsibilities in large river ecology, primarily on the Lower Missouri River.

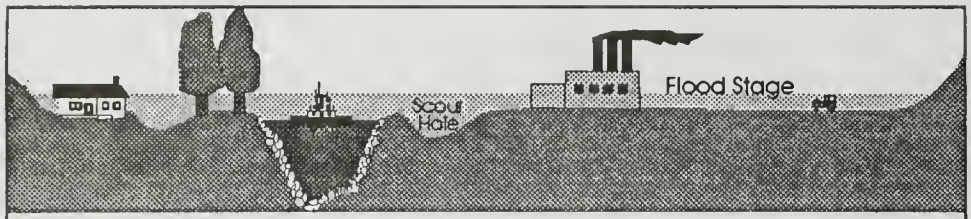
"The NBS will facilitate and coordinate the partnership to provide ready access to the material required by scientists, resource managers, and researchers concerned with biological and management issues across the affected region," Babbitt said. "The biological information to be provided will include locations of wetlands; breeding, stopover and wintering habitat for migratory birds; vegetation cover and changes in the wake of the flood; rare and endangered species habitats; and distribution of game and other fish and wildlife species."

Nine States, a variety of educational institutions, and several Federal agencies already have established working relationships for sharing data relating to the floodplain corridors of the Upper Mississippi, Lower Missouri, and Illinois rivers.

Scientists at the first four-days of the Conference presented extensive information on the management and problems of world-wide floodplain rivers. Dr. Robin Welcomme, of the Food and Agricultural Organization (FAO) of the United Nations (headquartered in Rome, Italy) led an effort to develop a synthesis of information from the Conference describing measures which managers and decision makers must take immediately to achieve ecological integrity on the world's floodplain river ecosystems. The following is the text that synthesis:



Navigation and flood control projects channelize rivers and isolate river floodplains with levees, increasing flood stage, impacting water quality and destroying wetland, riparian and instream habitats.



Broken flood control levees cause increased flood damages and floodplain scour because flood heights are increased and induced development is not protected from flooding.

"At the turn of this century workers, particularly Forbes and Antipa, had a considerable grasp of processes regulating the productivity of large rivers. However, the time was not ripe for ecological approaches to river management and industrial imperatives prevailed. As a result, floodplains of most temperate rivers disappeared and their natural communities and ecological processes were increasingly confined to the main channel. Temperate river research was concentrated on smaller rivers and, prior to the mid-1970's, work on large rivers was limited to the tropics where large floodplains and fisheries persisted. Current theories on river functioning were formulated, therefore, in the tropics and were transferred to the temperate regions through a series of publications and meetings. The most notable turning point in this process was the Large River Symposium in 1986 which was largely summarized by the flood pulse concept. Research and concepts relating to large rivers are therefore very recent and, although impatience at the slowness of progress is frequently expressed, the historical perspective demonstrates an extremely rapid revolution in the way we think about rivers.

'It is generally recognized that river form is a function of the totality of land-use patterns in the basin. Ecosystem change at the catchment (watershed) scale operates over periods that are larger than most management time-scales. Catchment management must be a long-term objective of integrated river management even though benefits may only be seen in the long term. Over shorter time-scales benefits in river rehabilitation can be obtained through local interventions aimed at maximizing habitat diversity.

'A consensus has emerged worldwide to adopt current models of the functioning of large rivers as the basis for management and rehabilitation. These models assume an integral relationship between the main channel of the river and its floodplains and accept the flood pulse and morphological diversity arising from it as the major driving factor in such ecosystems.

'Various definitions of river integrity have been proposed, but it is generally agreed that one aspect of such integrity is the reconnection of floodplain habitats with the main channel through a restored flood pulse. A series of ancillary considerations such as connectivity are accepted as expressions of the integrity.

'It is generally appreciated that rivers and their faunas are very resilient and that measures to improve or rehabilitate them can produce rapid positive responses within the system. This resilience also permits living aquatic communities to support a considerable degree of insult frequently leading to false optimism concerning the health of the systems in question.

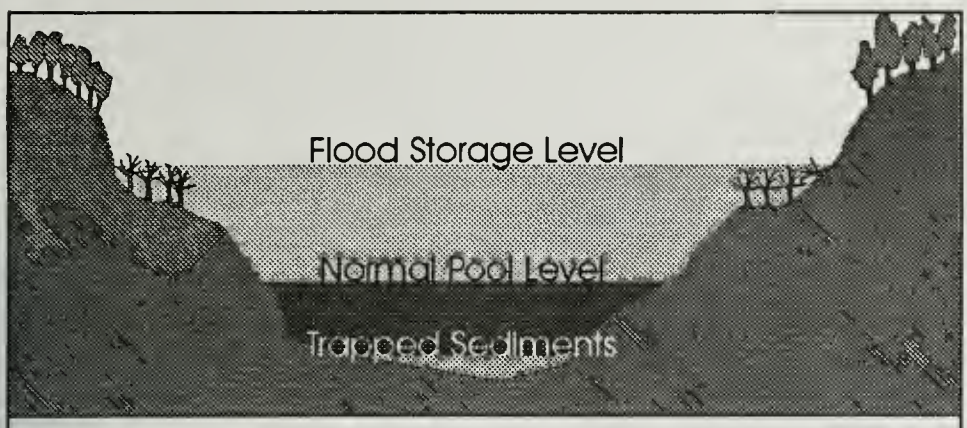
'However, if stress is excessive, losses of species and overall diversity occur. Most rivers in the world are now stressed or even degraded. Species have disappeared and living aquatic communities have been corrupted worldwide. The Mississippi-Missouri communities have not been exempt from this process as many species have disappeared in the past and further extinctions may be predicted for the future if present policies persist.

'Reaction to stresses is often expressed catastrophically through critical breakpoints that can only be determined retroactively. That a breakdown in a system is likely can be anticipated, but foretelling the actual time in which it will occur is far more difficult.

'The biggest stresses on large rivers are produced by high dams and reservoirs as they are so difficult to rectify. Separations from the floodplain by levees are also severe but are more easily remedied technically. Introduced species are viewed as an area of special concern but once established must be incorporated into future planning due to difficulties in their elimination. Eutrophication and pollution also stress biota especially when sustained and the quality of water and sediment may be a limiting factor for river restoration. In such cases the immediate objective is to improve environmental health.

'In many rivers of the world pollution effects are secondary to those produced by physical changes. As a consequence, legal frameworks based

Slackwater navigation impoundments, disrupt natural hydrographs, and create shallow wetlands which fill with sediments and dredged spoil, while tow traffic and development impact water quality.



Flood storage and hydropower reservoirs block fish movements, and disrupt natural hydrographs and sediment transport, while creating artificial habitats which alter water quality, natural flows, water levels, and nutrients outputs.

on chemical control, such as the Clean Water Act, are insufficient to remedy the degrading ecological situation in rivers.

'The Mississippi and its tributaries exist in various states of health. The health of the Upper Mississippi, while in decline, is not yet as degraded as the lower river, due to the habitat diversity created by the lock and dam system and the persistence of an active floodplain. This apparent health is unsustainable, however, due to the maintenance of the navigation canal with the resulting sedimentation and loss of habitat in backwater areas, mitigation of which calls for continued human effort. The lower Mississippi with its almost totally levied floodplain, poor water quality and riparian hardening is very unhealthy. The Missouri with the extensive channelization and reservoir cascade is in a high risk condition. The major tributaries such as the Illinois and Ohio rivers have been degraded by severe insult.

'It is generally recognized that the biggest single problem in formulating and executing management policies which incorporate the above principles is the lack of communication both upwards to decision makers and outward to the mass of people who form the body of the public opinion.

'There are many users of the river each with their own perception, pressure groups and financial interests. As a principle, no one group should be permitted to dominate, nor should it act without reference to other groups. This implies collaboration for management among all interested parties and agencies.

'There is a growing move to consider river rehabilitation as a legitimate goal for society in temperate zone systems. Nevertheless present plans for river management being formulated in the United States, Europe and Australia are often constrained by minority pressure groups and thus fail to take sufficient account of the ecological needs of the system.

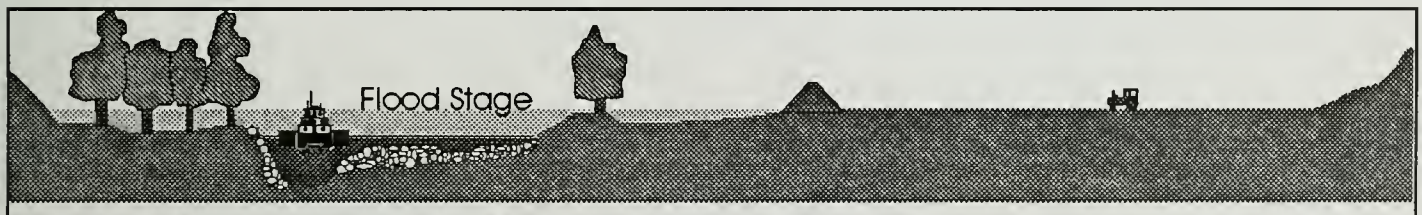
'Part of the problem is the failure to identify and quantify the goods and services that are provided by a healthy and integrated river. Most of such benefits are not incompatible with other human needs but space and resources have to be negotiated for all uses. Nevertheless some uses inevitably impair or degrade others even though efforts are made to minimize or mitigate the damage arising from them. Societal objectives, such as reducing flood damage and restoring floodplains are incongruent to a degree determined by technical and political considerations.

'It is recognized that general rehabilitation of river integrity is constrained by locally competing uses including human occupation through urbanization and agriculture.

'Nevertheless, certain general guidelines can be advocated now including:

- the removal or setting back of levees to allow the river to adjust locally,
- local floodplain restoration, and
- When an impairing use, such as the lock and dam system or lateral levees are no longer justified by economic or social benefit, their removal should be considered.

'Application of these actions is clearly limited by local land use and tenure and land acquisition by government may be needed to provide the space needed. Therefore the question arises as to how much floodplain is required to make a significant improvement in the integrity of the ecosystem and its biota and in the provision of systemic



Setback levees provide for ecosystem management, balancing developmental and environmental needs, and preserving river floodplain integrity, while providing for compatible floodplain uses.

goods and services. Current theories on floodplain function would predict that the area needed for an improvement to the biota is probably relatively small and could lead toward a development in the form of a string of beads with a series of floodplain patches connected by more restricted river corridors. Alternatively, water regulation procedures at navigation locks and dams could be modified to increase floodplain connectivity during appropriate seasons. Improvements in other functions such as flood storage may require restoration of greater proportions of the floodplain area.

'In general, rehabilitation should be guided by the principle that if you provide the right conditions of structure and hydrology nature will take care of the rest. Restoring integrity involves freeing the river to some extent to maintain, rebuild and rejuvenate itself by natural processes of scouring and deposition. Many examples of rehabilitation projects on rivers in the temperate zone are following such principles.

'Ultimately, integrated management should be extended into the river catchments to reduce inputs of sediment, nutrients and chemicals which have been shown by a growing body of evidence to impair ecosystem health and integrity.

'Many uncertainties remain and there is a continuing need for support of the elaboration of biological criteria, the formulation of management guidelines and in fine tuning the ongoing process. Management actions should be accompanied by monitoring programs which permit their evaluation and adjustment.

'In any eventuality, the need for further information should not stand in the way of the urgently needed management actions described above."

For more information on the Large Floodplain Rivers Conference and Workshop, and/or publication of its proceedings contact Dr. Ken Lubinski, National Biological Survey, 7550 Lester Drive, Onalaska, WI 54650.

Congressional Hearing Held on Flood Control Report

The White House Interagency Floodplain Management Review Committee Report, "*Sharing the Challenge: Floodplain Management into the 21st Century*" (Galloway Report) was officially released on July 13. The draft Executive Summary of the Galloway Report was printed in the last issue, Vol. 3, No. 3 of *River Crossings.*

Hearings were held in the Senate Environment Committee and the House Public Works Committee on July 20 and 26, respectively. Praised by environmentalists and Sen. Max Baucus (D/MT), chairman of the Senate Environment Committee, the report warns that floods will continue to occur, and that now is the time to organize a national floodplain management policy.

"We can save taxpayers money by encouraging people to move to higher ground, create jobs by promoting recreation, and preserve our environment by learning to work with our rivers instead of always against them," Baucus said. He plans to introduce a bill incorporating many of the report's "gutsy recommendations."

"For two centuries we have straitjacketed our rivers to get water out as quickly as possible," said Scott Faber of the conservation group American Rivers. "Now, our nation's top flood control experts are telling us that these policies are fundamentally wrong, that we should not be building so many levees, that we should not be constructing our homes and businesses in the floodplain, and that we should instead be trying to find ways to relocate vulnerable homes and businesses and keep storm water in our watersheds longer."

In June, American Rivers released its own flood control reform action plan. It calls for a watershed approach to flood control, increased state and local responsibility for floodplain and watershed management, and the creation of a permanent, ongoing flood relocation program within the federal emergency management agency. The group would like to see an end to the flood control policies by the U.S. Army Corps of Engineers and others who have relied on levees and engineering solutions, rather than zoning controls, relocation and the building of elevated housing, Faber said. He praised the Clinton administration for making relocation a fully funded choice during last year's great Midwest flood. "Georgia provides fresh evidence that floods are made worse by people living where they probably should not be," he said.

Congressional action could accomplish a great deal, he said, but an overhaul of the Corps and the biases it has against non-structural flood control efforts could be accomplished administratively. Faber criticized the report for recommending that the government repair damaged levees. The federal government spent more than $5.9 billion throughout the Mississippi River Valley through 1985, causing significant environmental damage, the report said. Restoration of wetlands, which act as natural sponges by absorbing overflow, is critical to alleviating flood conditions, Faber said.

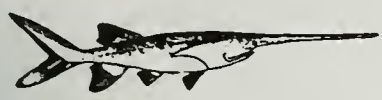
Source: Land Letter, July 20, 1994, Vol. 13, No. 21.

MICRA Paddlefish/ Sturgeon Committee

The MICRA Paddlefish/Sturgeon Committee has begun developing scopes of work and research proposals for implementation of their Strategic Plan, adopted by MICRA's governing body (Association) in early 1994. One proposal is to conduct a basinwide/multi-river, interagency/ interstate paddlefish tagging project.

State concern for the welfare of the paddlefish was one of the primary reasons for MICRA's formation in 1991. Some states have listed the paddlefish on their protected species

lists, while others maintain sport and/or commercial fisheries for the species. The Fish and Wildlife Service (Service) currently lists, the species on the federal "watch list".



paddlefish

The paddlefish's historical distribution covered most of the larger rivers of the Mississippi River Basin, but little is known about its present distribution, movements, or habitats. For example, there is concern that fish being harvested in one state may, in fact, have been produced far away in another state or river where the species may be listed as protected.

The proposed project will greatly enhance information needed to improve the management of paddlefish in the United States, including establishment of harvest regulations and habitat protection and management. Multi-state and agency participation will greatly enhance the success of any management recommendations which may be developed as a result of information collected. Several sources of project funding are being pursued.

Sturgeon Genetics

Sturgeon genetics as it relates to the distinction between pallid *Scaphirhynchus albus* and shovelnose *Scaphirhynchus platorhynchus* sturgeon has been at the center of a major controversy on the Missouri River. Dr. Isaac I. Wirgin, Nelson Institute of Environmental Medicine, New York University Medical Center and Dr. John R. Waldman, Hudson River Foundation presented a paper on that subject at the July 28-30 International Conference on Sturgeon Biodiversity and Conservation in New York City at the American Museum of Natural History. Information provided in their oral presentation and draft paper on *Scaphirhynchus* is summarized below:

Genetic diversity developed within any taxa of organisms over evolutionary time provides a buffer to withstand selective pressures resulting from environmental variation. Thus, retention of genetic diversity is believed essential for population stability; however, this diversity is often significantly diminished when populations undergo severe reductions in abundance. Such reductions in sturgeon diversity and abundance have resulted from anthropogenic (human) influences, including overexploitation, habitat alteration, and chemical discharge.

All taxonomic divisions, even at the population level, result from the effects of reproductive isolation. Given sufficient time even organisms with common ancestry will develop statistically significant and eventually fixed character differences. These character differences may result from stochastic processes (mutation and random genetic drift) impacting the isolated units, environmental pressures, or a combination of the two. The magnitude of differentiation in polymorphic characters among populations or taxa reflects the time elapsed since their isolation, the completeness of isolation, and to a lesser extent selection by environmental factors. Genetic analyses are based on the assumption that the longer and more absolute the reproductive isolation between units, the greater the number of character differences will have accumulated.

Traditionally, such analyses were performed by examination of morphological differences. Meristic and morphometric measurements were used as characters to discriminate taxa, to quantitate their similarity or differences, and to elucidate their phyologenetic relationships. However, these morphological traits are often subject to the short-term impact of environmental influences at sensitive early life stages, which may result in significant temporal instability in their expression. This temporal instability within populations or higher taxa could confuse comparative analyses of intertaxonomic differences.

Long-term reproductive isolation in the absence of gene flow among reproductive units serves to develop genetic differentiation of taxonomic units. Unlike morphological characters, genetic characters are not subject to short-term environmentally induced fluctuations. As a result, the magnitude of genetic differences among taxa or populations only reflects the duration of time since divergence and the extent of exchange of genetic material. Longer and more complete isolation can result in extensive differentiation. Thus, genetic analyses offer the opportunity to objectively identify unique taxa, compare and quantify the extent of genetic differences between taxa, and estimate time since their divergence.

Genetic variation may be analyzed at the protein or DNA levels. Initial studies focused on protein-level polymorphisms, usually at enzyme loci termed isozymes. Proteins are encoded for by DNA, and therefore, characterizations of protein-level variation provides an indirect measure of DNA-level polymorphisms. However, because of their functional significance in cellular activities, enzymes usually evolve slowly and are often insensitive measures of differentiation. Fortunately, for these purposes, over 90% of all DNA does not code for proteins nor regulate expression of genes. Therefore, most DNA sequences may be free of selective constraints.

In recent years, molecular biological approaches have been developed which allow for direct analysis of DNA sequence polymorphisms. Within fish, the vast majority of DNA is found within the nucleus; however, short circular DNA molecules are also located in the cytoplasmic mitochondria (mtDNA). All DNA is composed of the same four nucleotides: adenine (A), cytosine (C), guanine (G), and thymine (T), and techniques have been developed which allow for determination of the exact nucleotide sequence along

shovelnose sturgeon

short stretches of DNA. Most nucleotides in nuclear DNA are non-coding, and therefore, are free to evolve rapidly; nucleotides in the mitochondrial genome also change rapidly despite apparent functional constraints. Analyses of DNA sequence polymorphisms in vertebrate genomes offer the luxury of more than 3 billion characters to study, most of which evolve rapidly. Nucleotide sequence can be determined directly by sequence analysis or indirectly by the use of restriction enzymes which selectively sample for polymorphisms in short 4-6 nucleotide sequences.

Critical to the successful application of these approaches to sturgeon management is the existence of sufficient overall levels of genetic diversity to provide polymorphic markers. The extent and partitioning of DNA variation within a taxa or population is a function of its history. For extant sturgeon populations, antagonistic historical factors interact, modulating levels and geographic structure of genetic variation. The extreme age of many taxa and fidelity of homing in anadromous or lacustrine species should lead to high levels of conspecific variation and extensive differentiation of gene pools among populations. However, long generation time (in some cases up to 15-20 years) and recent severe diminution of some populations promotes low levels of overall genetic diversity.

Since approximately 1900, pallid and shovelnose sturgeon have been recognized as similar, but distinct species of river sturgeon within the Mississippi and Missouri river drainages. Significant differences in meristic, morphometric, and life history characteristics all support their taxonomic division. In recent years, a small but increasing number of fish collected from these systems exhibited intermediacy in the expression of these discriminatory characters, suggesting the existence of interspecific hybrids. Studies with depleted populations of other species in the Mississippi River drainage indicate an increase in interspecific hybridization in response to anthropogenic influence. Populations of both species, but particularly of pallid sturgeons, are currently severely depleted, probably due to habitat alterations, and are currently listed as endangered by the U.S. Fish and Wildlife Service.

Genetic studies were initiated to quantify the relatedness of pallid and shovelnose sturgeon and to identify markers which could be used to unequivocally identify F1 and later generation hybrids. Protein electrophoresis studies revealed only low levels of polymorphism within and between these taxa, and those loci (3 of 27) which were polymorphic failed to exhibit significant allelic differences. Thus, protein electrophoresis proved insensitive in distinguishing these taxa. Recently analyses of nuclear DNA was used to further attempt to address the extent of their genetic differentiation. Both RFLP analysis of a highly conserved prealbumin gene and PCR analysis using primers designed from several conserved human genes failed to reveal fixed or even significant genotypic frequency differences between pallid and shovelnose sturgeons.

These results suggest that 1) significant phenotypic variation between these species overrides little underlying genetic differentiation, and 2) that genetic studies may have focused on DNA characters which are not rapidly evolving. It is possible that these taxa may be genetically distinct and harbor fixed differences, yet the rate of evolutionary change is decelerated in *Scaphirhynchus* or divergence of the taxon is very recent. We suggest that analyses of more rapidly evolving non-coding nuclear DNA characters may be more definitive in determining the genetic bases of these taxonomic divisions.

Alabama sturgeon *Scaphirhynchus suttkusi*, morphologically similar to the shovelnose sturgeon have recently been described; this species is restricted to the Mobile River basin of Alabama and Mississippi. They are exceedingly rare and are currently being reviewed for endangered status by the U.S. Fish and Wildlife Service. Alabama sturgeon differ significantly from shovelnose sturgeon in several plate counts, fin ray counts, morphometric measurements in the head region, and position of the dorsal and anal fins. To determine the genetic distinctiveness of Alabama sturgeon, the extent of mtDNA divergence in approximately 300 base pairs of cytochrome B sequence was quantified between *S. suttkusi* and the other North American *Scaphirhynchus* species. The sequences of the three

pallid sturgeon

Scaphirhynchus species were identical, whereas divergence among three North American *Acipenser* species (white sturgeon, shortnose sturgeon, and Atlantic sturgeon) ranged between 6% and 9% for the same region of cytochrome B. Investigators argued that all three

North American *Scaphirhynchus* species probably represent phenotypic variants of the same species. However, it should be recognized that the cytochrome B region is one of the most conserved regions of mtDNA and is therefore a fairly insensitive marker of genetic differentiation.

Scaphirhynchus species show unusually low levels of DNA-level polymorphisms, always insufficient to discriminate among morphologically well-defined taxa. Two hypotheses can be advanced to explain these findings: 1) the rates of molecular evolution differ significantly between *Scaphirhynchus* and *Acipenser*. However, the fact that both mtDNA and nuclear DNA variation is depauperate within *Scaphirhynchus* would argue against this suggestion, and 2) speciation in *Scaphirhynchus* occurred much more recently than in North American acipenserids. *Acipenser* is a significantly older taxon in North America than *Scaphirhynchus*. Perhaps a comparison of levels of DNA variation in Eurasian acipenserids will shed further light on this question.
In any event, it still is not clear that DNA-based approaches can not be used in the management of North American *Scaphirhynchus* species. We suggest that investigations to date have focused on DNA sequences that are slowly evolving and that reveal insufficient levels of variation for taxonomic discrimination. However, even for those taxa which show low levels of variation it is still possible to discern genetic architecture by focusing on rapidly evolving DNA characters. Thus, analysis of microsatellite nDNA or non-coding single copy nDNA sequences may reveal sufficient levels of geographically structured genetic variation to address questions of management concern.

Rapid technical advances in the development of molecular biological approaches will allow for their routine application to fisheries problems. It is now possible to obtain DNA sequence information from archived museum specimens, from non-destructively obtained tissues such as fin clips or blood, and from early life stages such as single eggs or larvae. Furthermore, these samples can be analyzed in a timely fashion such that population level studies can easily be accomplished. Additionally, a variety of DNA level approaches have been developed which allow for investigations which focus on characters whose rate of change varies from extremely slow to exceeding rapid. This allows for the quantification of genetic relationships extending from the interindividual to the interspecific levels.

For the sturgeon biologist concerned with the enhancement and restoration of depleted populations, these developments should allow for:
- highly sensitive determination of the genetic relationships among extant species and between extinct and closely related extant species and populations using archived museum samples as sources of DNA,
- routine genetic screening of hatchery broodstock to maximize genetic diversity of resulting progeny and maintain genetic integrity of individual unit stocks,
- use of genetic tags for forensic applications in identifying the species or population origin of processed sturgeon products, and
- increased reliance on genetic techniques to discriminate sturgeon stocks and estimate their relative contributions to mixed fisheries.

The bottom line is that, under the current state of the art, if a genetic character can be found which differs between two types of organisms, that character can be used to conclusively separate the two species. However, if such a genetic characteristic cannot be found, no conclusion can be made either for or against separation of the species. That is the case presently for for the three species of *Scahphirhynchus*. Consequently, for now, the three *Scaphirhynchus* species (i.e. shovelnose, pallid, and Alabama sturgeon) should be considered to be separate species, and differences should be judged on phenotypic characteristics.

Status of the World's Sturgeon and Paddlefish Species

Sturgeon and paddlefish species diversity is threatened worldwide, and in fact, some European and Asian forms are reported to be extirpated. Reduced diversity and abundance of these ancient fish has been largely caused by anthropogenic (human) influences during the 20th century, including overexploitation, habitat alteration, and chemical discharge. So what took nature millions of years to create, man has nearly destroyed in less than one century. Table 1 displays worldwide status of the various paddlefish and sturgeon species.

This Table adds perspective to the need for the U.S. listing of the pallid, gulf, Alabama and shortnose sturgeons on the Federal List of Threatened and Endangered Species. As shown in Table 1, of the 29 world species of sturgeon and paddlefish, few enjoy status above "vulnerable"; which says that an entire form of organism is threatened with extinction in the 21st century unless major changes are made in the way we manage our rivers.

Most sturgeon and paddlefish problems are related to continued development and exploitation of the world's natural resources by a world-wide growth of human population, which according to a July 18th USA Today article is growing at a rate (births minus deaths) of 2.8 people per second or nearly a quarter of a million people per day! The same article predicts that world population will double in 43 years (well within the lifespan of most people alive today). Table 2 shows the USA Today data.

Such drastic growth of human population makes one wonder how anyone could state that man is an "endangered species", unless one also states that we are primarily endangered by our own inability to limit human numbers. The present situation in Rwanda may be just the tip of the iceberg of things to come. Yet we read and hear statements

Table 1. World-wide Status of Sturgeon and Paddlefish Species

Species	Common Name	Distribution	Status*
Acipenser baeri	Siberian sturgeon	Siberia	K;AP;E
A. baeri baicalensis	Baikal sturgeon	Siberia	E
A. brevirostrum	Shortnose sturgeon	North America	V;T
A. dabryanus	Yangtze sturgeon	China	E (Close to Ex)
A. fulvescens	Lake sturgeon	North America	V;T
A. gueidenstaedti	Russian sturgeon	Russia	V;AP
A. medirostris	Green sturgeon	North America	V
A. mikadoi	Sakhalin sturgeon	Japan, Korea Russia, China	I
A. naccarii	Adriatic sturgeon	Europe Central Asia	V
A. nudiventris	Ship sturgeon	Central Asia	E;AP;Ex
A. oxyrhynchus desotoi	Gulf sturgeon	North America Mexico South America	T
A. o. oxyrhynchus	Atlantic sturgeon	North America	V;SC
A. persicus	Persian sturgeon	Central Asia	E
A. ruthenus	Sterlet	Central Asia Eastern Europe Siberia	E;AP;I;K;R
A. schrencki	Amur sturgeon	Siberia	V
A. sinensis	Chinese sturgeon	China	E
A. stellatus	Stellate sturgeon	Central Asia Eastern Europe	I;AP
A. sturio	Atlantic (Baltic) sturgeon	Europe Central Asia	E (Close to Ex)
A. transmontanus	White sturgeon	North America	V
Huso dauricus	Kaluga sturgeon	Russia, China	R
H. huso	Giant or Beluga sturgeon	Central Asia Eastern Europe	E;V;AP;Ex
Pseudoscaphirhynchus fedtschenkoi	Syr-Dar shovelnose	Central Asia	E;Ex
P. hermanni	Small Amu-Dar shovelnose	Central Asia	E
P. kaufmanni	Large Amu-Dar shovelnose	Central Asia	E
Scaphirhynchus albus	Pallid sturgeon	North America	E
S. platorynchus	Shovelnose sturgeon	North America	E**
S. suttkusi	Alabama sturgeon	North America	E
Polyodon spathula	American paddlefish	North America	I,SC
Psephurus gladius	Chinese paddlefish	China	E

* Ex (Extinct); E (Endangered); V (Vulnerable); R (Rare); I (Intermediate); K, (insufficiently Known); T, (Threatened); SC (Special Concern); AP (Artificially Propagated, Natural Reproduction Limited). The listing of a species under more than one category indicates a difference in classification between separate river systems on a continent.

** Not listed as an endangered species by the U.S. Fish & Wildlife Service.

Source: The International Conference on Sturgeon Biodiversity and Conservation, July 28-30, 1994, American Museum of Natural History, New York, NY. Sponsored by: The Hudson River Foundation for Science & Environmental Research, The American Museum of Natural History, and The Aquarium for Wildlife Conservation. Table was adapted from information on the conference folder.

being made about humans being endangered by more and more people who claim their individual freedoms are being infringed by application of the Endangered Species Act.

As the leader of the free world and the only remaining superpower, America has the last best chance of doing something about the decline of species alive on this planet. To do so means that we have to improve our land and river stewardship practices. But those who would continue to use and develop our rivers continue to debate the need for protecting endangered species at all! The following editorial, entitled "Having Dominion" and published by the Waterways Journal, Vol. 108, No. 13, June 27, 1994, is but one example of this attitude.

"The debate over abuse of the Endangered Species Act (ESA) has driven rabid environmentalists to decide they want reauthorization of the ESA 'taken off the table' for 1994. So much anger has been inspired by their habit of putting 'animal and plant rights' over human suffering and need that they fear the act will be weakened.

'Animal rights? Who dreamed up such garbage? 'Animal rights' and 'preventing cruelty' are not the same. Government at all levels cringes under attacks by 'rightists' who repeatedly 'throw gravel' in the gears of commerce. It is no longer politically correct to 'call a spade a spade'. Calling it anything but what it is represents a defense mechanism for those who do not want themselves to be recognized for what they really are.

"A rose by any other name is still a rose.' The same can be said for a skunk. No amount of rhetoric can change that unless we allow it to happen. Radical 'protectionists' are profoundly destructive!

'Among those who would have us put animals and plants on the throne and humans on the trash pile are many who profess no god. In fairness, it is also true to say that many atheists and godless people do put human beings first. What does the *Bible* say about the species?

'Genesis 1:27 (in authorized King James version) tells us that 'god created man in his own image...' Chapter 28 then says, 'And god blessed them, and God said unto them, **Be fruitful, and multiply, and replenish the earth, and subdue it, and have dominion over the fish of the sea and over the fowl of the air, and over every living thing that moveth upon the earth.'** (Emphasis provided by The Waterways Journal)

'This command, for those who accept the *Bible* as the word of God, clearly states that humans were created by God in His likeness and that flora and fauna were created as a means of

Table 2. World Population Growth

Country	Population (in millions) 1994	2025	Years for Population to double
China	1,192.0	1,504.3	61
India	911.6	1,376.1	36
USA	260.8	338.3	98
Indonesia	199.7	288.5	43
Brazil	155.3	199.9	40
Russia	147.8	142.1	*
Pakistan	126.4	275.6	25
Japan	125.0	125.8	267
Bangladesh	116.1	211.3	29
Nigeria	98.1	246.0	23
Mexico	91.8	137.5	31
Germany	81.2	73.2	*
Vietnam	73.1	107.2	30
Philippines	68.7	105.1	29
Turkey	61.8	98.2	32
Iran	61.2	152.2	19
Thailand	59.4	74.5	50
Egypt	58.9	97.9	31
United Kingdom	58.4	62.1	281
France	58.0	58.7	182
World	5,607.0	8,504.0	43

* Population expected to decline

Source: USA Today, July 18, 1994.

sustaining life. Those who take the words of the Holy Scriptures to be true, and who believe humans are intended to have dominion over the plants and creatures of the wild, are also told elsewhere in the *Bible* that they should be good stewards.

'Good stewardship means we should have the common sense to differentiate in cases involving the preservation of the species and remember that we have, by Webster's definition, 'supreme authority' over plants and animals. Stewardship also means we should not waste (or destroy) wantonly what god has put on the earth for our benefit.

'*Bible* believers, then, are admonished to take dominion over (control) the earth but be good stewards (don't be wasteful). There is no doubt, based on the above arguments that humans are more important than flora and fauna, though we depend upon them for our survival.

'Those who do not believe in the *Bible's* creation story and prefer the evolutionary argument that man simply evolved over millions of years and is merely another species, we must ask: Why do humans--other than the fact that it is prudent not to be wasteful--owe other species anything? Does the lion owe the rabbit because the lion is more intelligent? In the natural scheme of evolution do not only the fittest survive?

'Humans, by divine right or not, have dominion over flora and fauna, and that's what radical environmentalists and animal rightist are trying to eliminate. They want total control.

'Many people have been treated shabbily via Endangered Species Act abuse. It's time for a change.

'Though we need to be good stewards, we need to overhaul the Endangered Species Act--not just reauthorize it!"

The Waterways Journal is published weekly in St. Louis, MO and is seen as one of the waterway industry's leading news publications. The Waterways Journal has long supported continued development of our nation's rivers for waterborne commerce, being a leading advocate for expanded navigation capacity. The nation's navigation projects are, major contributors to the alteration of rivers and destruction of habitats needed for survival of native riverine species, including paddlefish and sturgeon.

As stated by Dr. Thomas Lovejoy of the Smithsonian Institution at the July 28-30 International Conference on Sturgeon Biodiversity and Conservation, "The information contained in the genes of species which have evolved through millions of years of evolution on this planet represent the 'library' of information necessary to survive here". Can we really afford to stand idly by while these precious libraries are being destroyed?

Russian biologists at the Sturgeon Biodiversity Conference are so concerned about the loss of genetic information that they are currently working on the maintenance and preservation of sturgeon gene pools by means of cryopreserving (freezing) their gametes and embryos. Its truly sad to think that we have to resort to such extreme measures to preserve portions of the earth's library of genetic information.

What if the DNA of these threatened species hold the key to prevention of some future disease? Once a species is extinct, the information it holds is destroyed forever, there are no backup tapes? Can the trappings of our society (VCRs, video games, etc.) be more important than our own survival?

If we can't be good stewards and share this planet with the other living things around us, do we deserve to call ourselves civilized?

Endangered Species Act Reforms

A Senate Environment panel began work to reauthorize the Endangered Species Act on June 15, the day after Interior Secretary Bruce Babbitt announced a group of administrative reforms designed to appease the Act's critics by taking greater advantage of its flexibility.

While reauthorization is not expected to take place until 1995, the move represents a preemptive strike on the part of the administration to take the high ground away from business and

private property rights advocates who charge that the nation's most comprehensive species protection law is too rigid and ignores the needs of people. Babbitt, who also testified before the subcommittee, outlined five policy directives and promised to unveil additional reforms over the course of the summer.

The directives call for greater cooperation between the Fish and Wildlife Service and the National Marine Fisheries Service, the two agencies charged with administering the act. Among the changes announced last week are policies that expand use of independent peer reviews to ensure that listing decisions are made with the best scientific information available.

The directives require agencies to minimize any social and economic impacts that stem from the implementation of recovery plans. To achieve this, recovery teams will be expanded to include representatives of affected groups, state agencies, and private organizations. The plans now must be completed within 30 months of a species listing. In keeping with the administration's emphasis on ecosystem management, multi-species listings and recovery plans will be used wherever several species are dependent on the same ecosystem.

To increase predictability in species management and educate the public about the effects of a listing decision in the region, the services must identify, to the extent known at final listing of a species, any activities that are exempt from or will not be affected by the section 9 prohibitions regarding the "take" of a listed species. A single point of contact in a region will now be identified to assist the public in understanding the scope of the regulations.

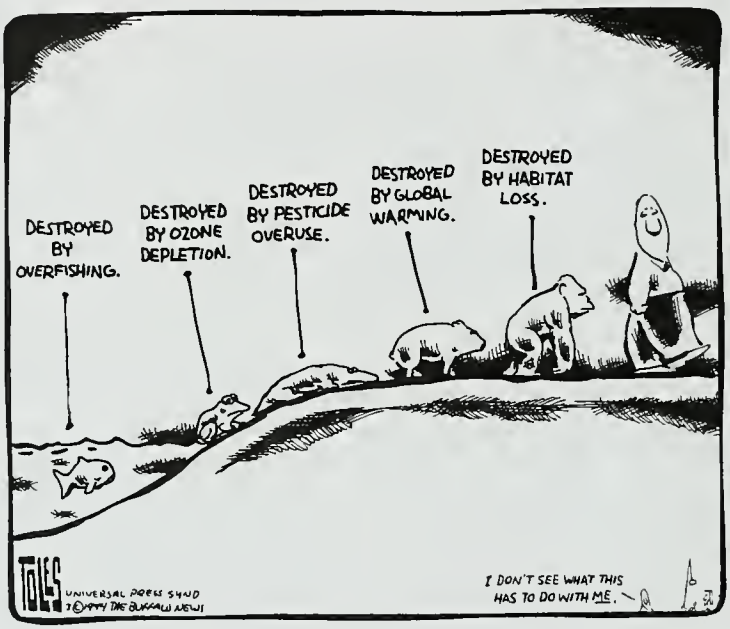
State fish and wildlife agencies have primary responsibility for protecting and managing their species and habitats, unless pre-empted by federal authority. Their close working relationships with local governments and landowners are essential to achieving the goals of the Endangered Species Act, Babbitt said. State and local entities will now be required to participate in pre-listing, listing, consultation, recovery, and conservation planning.

"Over the past 20 years the sense of innovation and the possibilities that are inherent in the law really haven't been explored," Babbitt told the committee. "The history of the administration of this act has been narrow, grudging and defensive, and my attempt as secretary is to see if we can become proactive." Rather than push for reauthorization in 1993 or 1994, Babbitt said he preferred to establish a better administrative record of the Endangered Species Act from which Congress could judge the success of the law.

The administration is exploring ways to use section 4(d) of the act to accommodate economic activities while furthering the recovery of listed species. This flexibility has been used both in dealing with California in protecting the coastal California gnatcatcher and in partnerships with private industry to protect the red-cockaded woodpecker in the South, he said.

The announcement elicited cautious support from the environmental community, though most are withholding judgment until the details of the directives are released this week.

The best way to conserve species is to prevent them from becoming threatened or endangered in the first place, said Douglas Hall, assistant secretary of the National Oceanic and Atmospheric Administration, who also testified before the subcommittee. With proper administration and coordination of other wildlife laws, including the National Environmental Policy Act, the Fish and Wildlife Coordination Act, the Magnuson Fishery Conservation and Management Act, and the Marine Mammal Protection Act, the need for listings may be precluded.



Subcommittee Chairman Bob Graham (D-FL) plans to hold a series of hearings on the Endangered Species Act throughout the summer and early fall, with mark-up expected sometime in 1995. The panel currently is considering S. 921, an environmentalist-backed bill introduced by full committee Chairman Max Baucus (D/MT) and Ranking Republican John Chafee (R/RI), and S. 1521, an industry-supported bill introduced by senators Richard Shelby (D/AL) and Slade Gorton (R/WA).

Source: Land Letter, June 20, 1994, Vol 13, No. 18.

More Endangered Species Listings for the Missouri River?

The Missouri River is truly an ecosystem in decline; a train wreck waiting to happen! Secretary of the Interior Babbitt focused on the Missouri in his talk at the July 12-19 Large Floodplain Rivers Conference discussed earlier in this issue.

Reading from the Galloway Report: "Thirty-four species of Missouri River Basin stream fish are listed by basin states as rare, threatened, endangered, or as species of special concern. The pallid sturgeon, piping plover, least tern, and bald eagle are all native Missouri River species listed as endangered by the U.S. Fish & Wildlife Service (FWS). Population densities of five species of chubs and two species of minnows have been reduced by as much as 95 percent since 1971. Burbot have been nearly extirpated, sauger have been greatly reduced, and blue catfish are rare." "Need I read more", Babbitt said.

American Rivers, the Environmental Defense Fund, the Mni Sose Intertribal Water Rights Coalition, the National Audubon Society, and the Nebraska Audubon Council say not! These groups have petitioned Molly Beattie, Director of the U.S. Fish & Wildlife Service to list the sicklefin chub *Macrhybopsis meeki* and sturgeon chub *Macrhybopsis gelida* as endangered species.

sturgeon chub

The petition states that "...both the habitat range and the abundance of sicklefin chubs and sturgeon chubs have decreased during the past fifty years. The decline of the species' range and the species' abundance is directly linked to their inability to adapt to the human induced alterations of the Missouri River. Impoundment and channelization have dramatically changed the historical character and have drastically altered the sicklefin chub's and sturgeon chub's natural habitat.

'...Sicklefin chubs and sturgeon chubs have physically adapted through evolution to live in a turbid, swift flowing river...The removal of snags

sicklefin chub

from the Missouri River and dam construction have reduced the amount of organic matter in the Missouri's water and consequently affected the range and abundance of aquatic insect larvae...Traditionally, snags' large woody debris and leaves provided organic matter for larvae, which in turn were eaten by both the sicklefin chub and the sturgeon chub.

'The continuous removal of snags has reduced the quantity of particulate matter found in the Missouri and has aided in the reduction of sicklefin chub and sturgeon chub abundance and distribution. In addition, dam construction has reduced the amount of particulate matter and aquatic insect larvae present in the river. Dams on the mainstem and tributaries have interrupted the movement of sediment from upstream...The reduction of sediment transport has transformed the Missouri River's turbid environment, eliminating the sicklefin chub's and sturgeon chub's habitat and ecological niche.

'The construction of dams on the mainstem and its tributaries has also changed the river's natural hydrograph and water temperatures, thereby affecting both species' spawning success which occurs in response to water temperature, photoperiod, and run-off cues. Since 1954, dams on the mainstem and tributaries have eliminated peak run off periods and produced a flat, metered and cooler hydrograph. Changes in the natural hydrograph have eliminated reproduction run-off cues. Thermal modifications send misleading signals that also affect the fishes' ability to reproduce successfully.

'The circumstances described above clearly necessitate listing the sicklefin chub and sturgeon chub as endangered. The reduction of sicklefin chub and sturgeon chub habitat has severely impacted the fishes' ability to survive. Transformation of the river has created an entirely new ecological niche. In a colder, less turbid river, other Missouri River fish more effectively compete for resources that the sturgeon chub and sicklefin chub were adapted to capture in traditionally more turbid, swift waters.

'At present, the prospects for the sicklefin chub and sturgeon chub look grim. No vehicle now exists to protect and maintain these species throughout their range; and artificial propagation carries grave consequences for wild gene pools. Were they listed as endangered, the chances of survival for both species would be greatly enhanced for several reasons. First, listing the sicklefin chub and sturgeon chub would bring into effect the obligations of section 7 of the Endangered Species Act that federal agencies consult with the U.S. Fish and Wildlife Service to ensure that their actions not jeopardize the survival of the species. Thus, listing would guarantee that the Corps of Engineers would consider an alternative operation plan for the River, a plan that took into account the habitat needs of both species. The Corps' Preliminary Draft Environmental Impact Statement does not specifically consider the sicklefin chub's and sturgeon chub's habitat requirements. Listing would guarantee this investigation and future protection of both species.

'Second, listing would raise funding for sicklefin and sturgeon chub research. To protect these fragile fish communities it is urgent that scientists learn more about the fish and their

habitat. At this time, scientists desperately need more knowledge about both species to evaluate effectively the current operation of the Missouri River system. In addition, funds are needed to implement a comprehensive management plan."

The petition for listing the chubs is currently held up on a technicality, but is expected to proceed once the technical problems are worked out. If listed, this would bring the endangered species on the Missouri River to five (i.e. piping plover, least tern, pallid sturgeon, sicklefin chub, and sturgeon chub). All require more natural sandbar and channel habitats than presently exist.

The Missouri River does not, however, need just another endangered species plan. On the contrary, it needs an ecosystem management and recovery plan–just as Secretary Babbitt is calling for in his new Endangered Species Act proposals (described earlier).

Missouri River Master Manual Review

In the face of the 1993 Floods and now the calls for additional listing of endangered species (reported on above), Missouri River managers have had their hands full.

In the midst of all this the U.S. Army Corps of Engineers has been developing recommendations for changing the way they operate the large mainstem reservoirs. This is in response to the furor (near war between the states) that started during the drought of the late 1980's.

Fierce competition developed between the states during those dry years over whether the Missouri River's water should be held in the reservoirs to accommodate recreation (important to the economies of upper Basin states) or released to float barges (important to the economies of lower Basin states).

The Corps of Engineers released the findings of their $12 million study at a Draft Environmental Impact Statement Workshop held in Omaha, NE in early July. The recommended changes were described by the Missouri River Basin States Association's newsletter (June 1994) as follows: "Essentially, the preferred alternative would leave much of the Master Manual as it is. It calls for a moderate spring rise to benefit fish and wildlife, along with a period of low water in summer and autumn, and a navigation season shortened by one month. During droughts, it would conserve water by shortening the navigation season and lowering the navigation service level sooner than the current manual does. Finally. by drawing down the three upper reservoirs in turn instead of drawing them all down at once, it would allow fish and wildlife there to recover during two out of every three years."

The Corps' recommendation thus attempts to accommodate the needs of multiple uses (including fish and wildlife). But it also put a dent in the armor of downstream commercial navigation and farming interests who have had their way on the Missouri River since the partial implementation of the Pick-Sloan Plan in the 1940's.

The Corps justifies their recommendations more on the fact that there were no good economic reasons not to change operating procedures, than on environmental considerations themselves. Although both were listed as reasons for change.

The Corps says that water releases from Gavin's Point Dam have limited influence on the Missouri River hydrograph below the Iowa state line. Starting with the Platte River (Nebraska), many tributaries enter the Missouri River and dampen out any effect of Gavin's Point releases.

The economics of the Missouri River navigation project have long been questioned by environmental interests, as have the merits of farming in hazardous flood zones. It is said that the commodity most hauled on the Missouri River is "rock" (to maintain the channel), and one doesn't notice very much barge traffic on the River or very many grain terminals along its banks. Most of the grain is said to be shipped out by rail or truck.

The 1993 floods added significant political capital to environmentalists' arguments. Rebuilding navigation project infrastructure and agricultural levees, and restoring agricultural lands to pre-flood conditions, at the expense of the taxpayer and the environment in the face future flooding and additional public expense are being questioned by more and more people. The taxpayer is paying for 65-80% of these repairs, including 65% of the $500+/acre cost of plowing 2 feet of sand deposited by the flood under to refurbish the soil. At best, the market value of the best Missouri River floodplain land when totally restored is only $1,500/acre.

Despite all the federal aid to restore pre-flood conditions, navigation and farm interests are still crying foul over the Corps' Master Manual recommendation, and these concerns were expressed by all eleven Missouri Congressmen in the following July 15th letter to President Clinton:

"We are writing to respectfully request that you direct the Secretary of the Army to delay release of the Draft Environmental Impact Statement for the Missouri River Master Water Control Manual. The document is scheduled for imminent release by the Missouri River Division, but the preliminary draft is prejudiced in that it does not properly reflect the significant harm to Missouri agriculture and commerce. The Corps of Engineers is refusing to perform the necessary analysis for presentation in the Draft Environmental Impact Statement (DEIS).

'Specifically, the Corps has announced its Preferred Alternative which differs significantly from the several alternatives put forward earlier on a 'short list' presented for preliminary review. You may recall that this preliminary review had been requested in a letter to you from 71 members of Congress. The Preferred Alternative imposes an artificial spring

flood that would be visited annually upon the lower Missouri River by a 91-day-long release of 20,000 cubic feet per second flow from Gavin's Point Dam in excess of the water needed to sustain commercial navigation and all other uses of the River.

'The reason for simulating spring flooding is to meet perceived needs of the Pallid Sturgeon, an endangered species, in accordance with the Pallid Sturgeon Recovery Plan, prepared by the U. S. Fish and Wildlife Service. Review of the Recovery Plan has raised serious questions about its validity resulting in a pending request from Missouri Governor Mel Carnahan to Interior Secretary Babbitt to re-open the comment period on the document. The comment period on the Recovery Plan was opened only briefly in 1992.

'We have learned in consulting with agriculture officials in Missouri that the annual flood pulse proposed by the Corps may have extremely serious repercussions in that water levels may be sufficiently high to preclude drainage of farmlands for spring planting. Because this man-made flooding would be imposed for a 91-day period in April, May, and June, this proposal would not only be completely unacceptable, it would also create unnecessary controversy, so soon after the worst flooding in Missouri history.

'Governor Carnahan's representative for the Master Manual Review process specifically asked the Corps whether it had considered negative effects of simulated spring flooding on drainage of agricultural lands, and was told not only that it had not done so, but it would not be possible to make the necessary analyses prior to scheduled release of the DEIS. We ask that you delay the document's release until the Corps has determined the effects of its proposed actions on Missouri's agriculture.

'We are also concerned about the operations of the Port of the City of St. Louis and the reach of the Mississippi River between St. Louis, Missouri and Cairo, Illinois. The Corps' proposed reduction in flows from the mainstem Missouri River dams unfortunately coincides with the low-flow season on the Mississippi River. Flows of less than 80,000 cubic feet per second at St. Louis are not infrequent, and we foresee multiple problems with port operations including reduced access to shipping facilities, inability to fully load barges, reductions in the size of tows, and an increased need for dredging. These impacts all have costs that have not been properly incorporated into the Corps' analysis.

'In addition to the shortcomings of the DEIS and the Preferred Alternative, we are also concerned that the Corps plans to release the DEIS soon after the change of command in the Missouri River Division. Colonel Schaufelberger, who has directed the $12 million project to develop the DEIS, is retiring in July, leaving the task of administering the public comment and response to his successor. We respectfully suggest that the successor be given sufficient time to become familiar with the issues, and that the process include meeting with Members of Congress, Governors, and tribal leaders to ascertain their positions prior to holding public hearings. Further, an appointment to the position of Assistant Secretary of the Army for Civil Works has not yet been made but should precede any Corps's initiative having such profound changes affecting waterborne commerce on the Missouri and Mississippi Rivers.

'Mr. President, we bring these matters to your attention because we believe the Corps's proposed actions on the Missouri River represent a profound departure from fair and equitable management of the River and its resources, and the preliminary DEIS must be corrected prior to its release."

Missouri Governor Carnahan also wrote letters to both Interior Secretary Bruce Babbitt and to President Clinton requesting that the Pallid Sturgeon Recovery Plan be reopened to public comment. Carnahan said the "Pallid Sturgeon may become the midwestern equivalent of the Spotted Owl". Other articles in this issue of *River Crossings* speak to the need for listing and the plight of the pallid sturgeon and other sturgeons world wide.

The real issue in Missouri appears to be a concern that the Missouri River will be dried up by the sale and transfer of water outside of the basin as all of the Tribal water rights issues are settled. Assuming that were the case, one would then have to wonder why the Mni Sose Intertribal Water Rights Coalition signed on to the petition to list the sicklefin and sturgeon chubs on the federal List of Threatened and Endangered Species (reported on elsewhere in this issue of *River Crossings*). That petition calls for maintaining flows in the River to support these large river species.

Missouri is so concerned about loss of water in the River that they even went on record at a recent Missouri River Basin States Association meeting as opposing use of Missouri River water as a rural water supply in southeastern South Dakota, northeastern Nebraska, and Northwest Iowa. It would appear that Missouri feels the only rightful use of Missouri River water is to float barges!

This will likely become a very hot issue in coming months, as environmental groups, led by American Rivers, plans to file a lawsuit if necessary to protect the river ecosystem.

The real issue seems to be that the barge and towing industry and

floodplain farmers are unwilling to share the river with anyone else. Perhaps they have been subsidized so long that they have come to identify these subsidies and their personal use of the river and its floodplain as rights rather than privileges, and are simply unwilling to pay the real costs of doing business in the floodplain--one of which is protection of the environment!

Some of the federal subsidies floodplain farmers receive include:

- protection by upstream reservoirs,
- funding assistance for levee construction,
- disaster recovery payments,
- crop disaster payments,
- federal crop insurance,
- crop set aside payments,
- assistance with drainage projects, ditch clean-out, and sand removal.

It is interesting to note that in those areas along the Mississippi and Missouri rivers where flooding occurred more naturally last summer (i.e. areas not aggravated by the erosion and sediment deposition of the "dam break floodwaves" of breaching and failing levees as described in the Galloway Report), farmers are experiencing one of their best crops in recent times. Could it be that the river's flood waters actually added fertility and organic matter to these soils as described by environmentalists? It would seem that the "flood pulse advantage" enjoyed by the rivers' fish populations last year also provided an advantage to flooded farm lands--a natural subsidy!

If we can just take advantage of these natural subsidies, farming and management of natural ecosystems can exist in harmony. We simply need to have a vision and we need to break down old myths and paradigms that have outlived their usefulness. The Missouri River desperately needs some room to breathe, and that could be provided by a multiple use floodway with setback levees. Congress just needs the wisdom and the fortitude to make it happen!

Back to the River Project

Senator Bob Kerrey of Nebraska held an information and strategy meeting in Omaha, NE on July 7th to discuss his "*Back to the River Project*". Diane Hill, Kerrey's Environmental Liason, conducted the meeting.

Hill explained that Senator Kerrey's "*Back to the River Project*", is designed to "reacquaint ourselves with our river heritage and the beauty and importance of the water". Hill explained that we have done so much to develop the river for commercial purposes that its hard for people to even see the River, let along gain access to it. Kerrey hopes to help change that.

Several members of the Omaha District Office of the Corps of Engineers were on hand to describe their study of the Missouri River Corridor Project, and to create a strategy for the future. The Corps' proposal includes land acquisitions and development of trails, greenways and river access. The project stretches from DeSoto National Wildife Refuge on the north to the Platte River on the south, bracketing the Omaha metropolitan area.

Steve Oltman of the Papio-Missouri River Natural Resources District said he would like to see such a corridor stretch all the way from Gavin's Point Dam to St. Louis.

Jerry Rasmussen, U.S. Fish & Wildlife Service, described his agency's efforts to create a multi-unit National Wildlife Refuge ("Big Muddy National Wildlife Refuge") along the River in the state of Missouri, as well as his agency's efforts to assist landowners with buyouts in the aftermath of the 1993 floods.

Patricia Giorgi and Dave Given, National Park Service, described their agency's interests in the River, the Park Service's Missouri River Corridor Project, and their work with local units of government through the Park Service's "Rivers and Trails Program", helping locals plan greenways and open space along the nation's rivers.

Senator Kerrey's vision for the Missouri River is very similar to that portrayed by the Interagency Floodplain Management Review Committee Report (Galloway Report) as the desired floodplain of the future. If Kerrey's vision can be linked with that of other Congressmen, agencies, and publics, perhaps we can one day see a much more environmentally desirable Missouri River.

We applaud Senator Kerrey and his staff for their vision!

Sturgeon for Tomorrow

In 1977 a concerned group of people who fish for lake sturgeon in Lake Winnebago, led by William P. Casper, formed an organization to help preserve, protect and enhance the existing lake sturgeon population for future generations. This group evolved into what is now called the Main Chapter of *Sturgeon for Tomorrow*. Subsequently the Southwest, Northern Half and West Central Wisconsin chapters were formed. The first objective was to develop a fund raising program to support research, management and regulation efforts for the preservation and protection of lake sturgeon. A second objective was to work in cooperation with the Wisconsin Department of Natural Resources (DNR) toward establishment of an artificial propagation program.

With the ground work laid for the

formation of this group of private citizens, public meetings, petition drives and fund raising efforts began. *Sturgeon for Tomorrow* quickly initiated support for the artificial propagation program for lake sturgeon. In the late 1970's in cooperation with the DNR, *Sturgeon for Tomorrow* led the first effort to obtain eggs and sperm from spawning fish and incubate them in a New London, Wisconsin hatchery. Although this first attempt was unsuccessful, efforts continued. By 1979 DNR fish culturists solved the problems encountered in earlier propagation attempts and produced fingerling size fish.

lake sturgeon

In 1980 the DNR initiated a field study on early life history and expanded the investigation on the artificial propagation of lake sturgeon. This work was supported in part by funds provided by *Sturgeon for Tomorrow*. Since 1977 *Sturgeon for Tomorrow* has provided $195,000 for hatchery and field research, and law enforcement programs. The organization is responsible for the development and implementation of special regulations and policy for the protection of lake sturgeon, which include no license sales after the spearing season begins. It can also take credit for the $1500 fine for possessing an illegal sturgeon.

Sturgeon for Tomorrow finances the "*River Patrol*" that monitors the spring spawning run of the sturgeon. To prevent poaching, volunteers from various wildlife organizations and *Sturgeon for Tomorrow* patrol the spawning sites on the Wolf and Fox Rivers 24 hours a day during the spawning season.

Sturgeon for Tomorrow is continuing to expand its involvement in supporting research, management and protection of lake sturgeon within the Lake Winnebago system, and to broaden the scope of studies to include lake sturgeon populations throughout Wisconsin. It plans to continue to work with the DNR on all aspects of lake sturgeon preservation and enhancement. Recently it has begun supporting studies focused on the early life history of lake sturgeon, using radio telemetry to determine their migratory behavior. The outcome of this work will contribute significantly to an increased understanding of the biology of young sturgeon.

Thanks to the efforts of *Sturgeon for Tomorrow*, lakes and rivers that once had the mighty fish may have them again. They plan to continue their work to help preserve, protect and enhance this valuable species.

Perhaps other groups interested in saving and assisting in the management of river fishes should use the model developed by *Sturgeon for Tomorrow* in their rivers. For more information contact: William Casper, Sturgeon for Tomorrow, Inc., N8826 Bluegill Drive, Fond du Lac, WI 54935, (414) 921-1358.

Report Criticizes Programs Detrimental to Wetlands

A new Interior Department report to Congress urged an end to federal programs that encourage destruction of wetlands. "Many of these programs are designed and financed in ways that violate the most basic principles of economics," said Interior Secretary Bruce Babbitt. "Such programs distort market signals and provide subsidies that have both negative environmental and economic effects, wasting resources and adding to the federal deficit." The July 11 report, "*The Impact of Federal Programs on Wetlands*," is the second of two reports authorized by the 1986 Emergency Wetlands Resources Act.

In calling for a comprehensive strategy for wetland conservation, the report recommends redesigning federal programs to phase out financial support for unsound economic development, financing new projects in a manner which ensures that those who benefit pay their fair share of the costs, and strengthening federal mitigation policies to ensure compensation for unavoidable adverse project impacts on wetlands.

Copies of the report are available from the U.S. Fish and Wildlife Service, 703/358-1711.

Source: Land Letter, July 20, 1994, Vol. 13, No. 21.

Clean Water Act Reauthorization Delayed

Senate Environment Committee Chairman Max Baucus (D-MT) announced June 10 that Senate action on the Clean Water Act reauthorization would not take place until after the House marks up its bill. Senate sources indicate that it remains their intention, however, to pass a Clean Water Act reauthorization bill this year.

In the past several months, Baucus had received letters from senators and interest groups on both sides of the clean water issue opposing S. 2093, the comprehensive reauthorization bill he introduced with ranking Republican John Chafee (R/RI). Senators Charles Grassley (R/IA), Howell Heflin (D/AL) and 46 senators from agriculturally-dependent states sent a letter to Baucus on April 25, criticizing the bill. "We believe many provisions are excessively restrictive and would prove extremely costly for family farmers, livestock producers, agribusiness, forest product producers and our small rural communities," the letter said.

Conversely, senators James Jeffords (R/VT) and John Kerry (D/MA), led 15 senators in warning Baucus of their opposition to S. 2093 unless it is significantly strengthened. Chafee himself has threatened to oppose the bill if it is weakened in committee. Environmental groups have also expressed concern over the bill.

The criticism has not tempered

Baucus's enthusiasm for the issue, though time for action may be running short. "It is critical that we pass Clean Water Act legislation this year," Baucus said. Many observers believe other issues, like health care and appropriations, could crowd clean water off the calendar.

Source: Land Letter. June 20. 1994, Vol. 13, No. 21

The New Rivers and Wildlife Handbook

This handbook is a practical guide to river management techniques that integrate the requirements of flood control, wildlife and other river interests. The original, highly successful *Rivers and Wildlife Handbook* published 10 years ago, has been revised and updated. Many of the techniques it advocated have now been adopted as standard practice by flood control engineers.

The New Rivers and Wildlife Handbook provides engineers working on flood control rehabilitation and other aspects of river management with an authoritative yet accessible guide to current, environmentally sensitive management practices. It will prove invaluable to all those involved or interested in river management.

The book is divided into four sections:
- Hydrology, geomorphology and wildlife interest of rivers;
- Overview of survey methods used to assess the wildlife value of rivers;
- River management practices to benefit wildlife (engineering techniques and vegetation management); and
- Case studies of environmentally sound and proven river management practices.

The book is 426 pages in length, including 150 figures, 235 plates and 100 tables. Cost is approximately $25.00 plus shipping and handling. The book is available from The Royal Society for the Protection of Birds, The Lodge, Sandy, Bedfordshire SG19 2DL, United Kingdom. Telephone: 0767 680551.

Zebra Mussel Leadership Training: "Stopping the Spread"

Minnesota Sea Grant is sponsoring leadership training workshops designed to help educators teach the public about zebra mussels and how to stop their spread. The training package contains basic information on zebra mussel problems and control measures and is designed as a ready-made education program for many audiences including sporting and environmental groups, and boating and lake associations.

The package includes a 15-minute video or slide-tape set, a printed trainer manual, and supplementary teaching materials (e.g. Great Lakes Sea Grant Network fact sheets, contact lists, graphics/visuals). Providing information on the biology, monitoring and effects of the zebra mussel invasion, the package will help potentially impacted audiences cope with and slow the spread of this exotic species.

Sea Grant will also present the results of a three state boater survey, designed to evaluate the efficacy of past zebra mussel public outreach efforts.

The workshops will be held on September 15th at the Day's Inn in La Crosse, WI, and on September 16th at the Duck Creek Park Lodge in Davenport, IA. Registration is $40.00.

For further information contact Doug Jensen, Exotic Species Information Center Coordinator, Minnesota Sea Grant, 2305 East Fifth Street, Duluth, MN 55812. (218) 726-8712.

Meetings of Interest

August 21-25, 1994: 124th American Fisheries Society Annual Meeting, "Managing Now for the 21st Century: Food, Recreation, Diversity." Sheraton Hotel and World Trade Centre, Halifax, Nova Scotia. Contact Paul Brouha, AFS, 5410 Grosvenor Lane, Suite 110, Bethesda, MD 20814-2199, (301) 897-8616, FAX (301) 897-8096.

September 6-9, 1994: "Ninth International Trout Stream Habitat Improvement Workshop". Marlborough Inn, Calgary, Alberta. Cosponsored by the American Fisheries Society Fisheries Management Section. Contact Garry Szabo, Trout Unlimited Canada, P.O. Box 6270, Station D; Calgary, AB T2P 2C8; (403) 221-8365; FAX (403) 221-8368.

September 21-23, 1994: "Environmental Problem Solving with Geographic Information Systems", Cincinnati, OH. Contact Sue Schock or Dan Murray, U.S. EPA, CERI,26 W. Martin Luther King Drive, (G-75), Cincinnati OH 45268. (513) 569-7551 or (513) 569-7522. Sponsored by the U.S. EPA Center for Environmental Research Information.

November 14-16, 1994: "Watershed WISE: A Workshop on Watershed Protection", Grand Junction, CO. Contact Susan Foster, Thorne Ecological Institute, 5398 Manhattan Circle, Suite 120, Boulder, CO 80303.

(303) 499-3647. FAX: 499-8340. Steering committee and sponsors include U.S. EPA Region VIII, Western Governor's Association, MT Dept. of Health and Environmental Sciences, SD Dept. of Environment and Natural Resources, CO Dept. of Health, SCS, The Nature Conservancy Western Regional Office, BLM, and Thorne

Ecological Institute. Objectives are to encourage and support practical and effective approaches to watershed stewardship, and to share experiences and exchange ideas, tools, technology, philosophy, and values useful to watershed initiatives.

October 22-26, 1994: "National Symposium on Urban Wildlife", Embassy Suites Hotel, Bellevue, WA. Contact Lowell Adams, National Institute for Urban Wildlife, 10921 Trotting Ridge Way, Columbia, MD 21044.

October 23-26, 1994: "Annual Meeting of the Southeastern Association of Fish and Wildlife Agencies", Mississippi Coast Coliseum and Convention Center, Biloxi, MS. Contact Richard Wells, MS Department of Wildlife, Fisheries, and Parks, Jackson, MS 39205.

October 24-28, 1994: "Third International Conference on Ecological Economics", San Jose, Costa Rica, Central America. Contact Organizing Committee, Third International Conference on Ecological Economics, P.O. Box 555, 3000 Heredia, Costa Rica, Central America.

November 13-16, 1994: "Dredging '94", Buena Vista Palace, Buena Vista, FL. Contact E. Clark McNair, Coastal Engineering Research Center, U.S. Army Corps of Engineers, Waterways Experiment Station, 3909 Halls Ferry Rd., Vicksburg, MS 39180-6199; 601/634-2070.

April 3-7, 1995: "National Wetlands Workshop", Clarion Hotel, New Orleans, LA. Contact U.S. Army Engineer Waterways Experiment Station, Wetlands Research & Technology Center, Attn: CEWES-EP-W, 3909 Halls Ferry Road, Vicksburg, MS 39180-6199, (601) 634-2569/4217; FAX (601) 634-3664.

May 31-June 2, 1995: "East Coast Trout Management and Culture Workshop II", Penn State University, State College, PA. Contact Marty Marcinko, 450 Robinson Lane, Pennsylvania Fish Commission, Bellefonte, PA 16823, (814) 359-5223. Theme of the workshop is "Looking to the Future: How Can We Meet the Need?", Co-sponsored by the American Fisheries Society's Northeastern Division and Southern Division's Trout Committee, Duke Power Co., National Park Service, Pennsylvania Fish Commission, and Tennessee Valley Authority.

June 5-9, 1995: "Sustainable Forests: Integrating the Experience International Conference", Sault Ste. Marie, MI, and Sault Ste. Marie, Ont. Contact Joan Jaffit, Conference Manager; 705/759-2554; FAX 705/256-6156.

June 12-14, 1995: "Third Reservoir Fisheries Symposium", Chattanooga Marriott at the Convention Center, Chattanooga, TN. Contact Steve Miranda, Chair, Third Reservoir Fisheries Symposium, Mississippi Cooperative Fish and Wildlife Research Unit, P.O. Drawer BX, Mississippi State, MS 39762; FAX 601/325-8726.

Congressional Action Pertinent to the Mississippi River Basin

Environmental Protection Agency

The Senate passed a measure May 19 elevating the EPA to cabinet status, as an amendment to **S. 2019**, the Safe Drinking Water Act.

Fish and Wildlife

The Senate Environment Committee held a hearing June 15 on reauthorizing the Endangered Species Act, and on June 30 approved **S. 823**, which aims to improve the management of the National Wildlife Refuge System.

H.R. 4676 (Lambert, D/AR) provides for the coordination and implementation of a national aquaculture policy for the private sector by the agriculture secretary and establishes an aquaculture development and research program.

H.R. 4734 (Studds, D/MA) requires consultations, assessments, and monitoring of the effects of trade policy on the environment, including fish, wildlife, and endangered species.

Government Affairs

A House Government Operations panel held a hearing May 18 on unfunded federal mandates and considered **H.R. 140**, **H.R. 886**, and **H.R. 1295**, which seek to curb unfunded mandates.

On June 16, the Senate Governmental Affairs Committee approved an amended **S. 993**, which seeks to reduce the imposition of unfunded federal mandates on state and local governments.

S. 2242 (Daschle, D/SD) establishes the National Institute for the Environment to improve the scientific basis for the decision-making on environmental issues.

Parks

S. 2139 (Rockefeller, D/WV) provides for the management and study of certain rivers, parks, trails, and historic sites.

The Senate Energy Committee approved on June 15 **S. 1980** to establish the Cane River Creole National Historical Park and Heritage Area in Louisiana.

Public Lands

H.R. 4575 (Gunderson, R/WI) directs the Secretary of the Army to transfer to the State of Wisconsin lands and improvements associated with the LeFarge Dam and Lake portion of the

project for flood control and allied purposes.

S. 2189 (Hatfield, R/OR) amends the Federal Land Policy and Management Act to provide for ecosystem management and establishes a congressional ecosystem management commission to define and analyze "ecosystem management" and make recommendations for further legislative action.

Water and Wetlands

On May 19, the Senate voted 95-3 to pass **S. 2019**, which reauthorizes and amends the Safe Drinking Water Act.

House Public Works Committee held additional hearings on **H.R. 3948**, which reauthorizes the Clean Water Act, on May 24 and May 26, taking testimony from EPA Administrator Carol Browner and others.

A House Merchant Marine panel held a hearing June 8, on **H.R. 4308**, which authorizes appropriations for wetlands conservation projects through the North American Wetlands Conservation Act.

H.R. 4475 (Franks, R/NJ) directs the Administrator of the EPA to conduct a study to identify future funding options for financing infrastructure projects under the Clean Water Act.

H.R. 4481, The National Aquatic Ecosystem Restoration Act (Studds D/MA and Hamburg, D/CA) seeks to restore the nation's aquatic ecosystems through the voluntary cooperation of federal, state, tribal, corporate and private interests. A federal interagency task force led by the U.S. Fish and Wildlife Service would develop a national aquatic restoration strategy, patterned after the recommendations of the "Restoration of Aquatic Systems" report recently released by the National Research Council.

Water Projects

H.R.4460 (Mineta, D/CA) provides for the conservation and development of water resources and provides for the Secretary of the Army to construct various projects for improvements to rivers and harbors.

A House Science panel approved for full committee action **H.R. 1116** to improve research activities under the Clean Water Act.

H.R. 4189, The Waterways Restoration Act (Furse D/OR) amends P.L. 566, which offers broad guidance to the Soil Conservation Service, to add a new grants and technical assistance program to the Service's existing watershed program. This new program will take advantage of the Service's significant resources and outreach to fund non-structural, community-based projects that restore local creeks, rivers, floodplains, and wetlands in both rural and urban areas.

H.R. 4770 (Tauzin D/LA) requires the Fish and Wildlife Service to examine the lands and waters of the LaBranche wetlands in St. Charles Parish, LA, for the purpose of acquiring those lands for inclusion in the Bayou Sauvage Urban National Wildlife Refuge.

Watersheds

H.R. 3873, the Urban Watershed Restoration Act (Holmes Norton D/DC) amends the Clean Water Act to provide grant money to local river activists to restore neighborhood urban streams. With more than 40 co-sponsors, the bill is picking up steam and is expected to be offered as an amendment to the Clean Water Act as it is considered through the Public Works Committee in the House of Representatives. Hearings are expected shortly.

H.R. 4213, the River and Watershed Protection and Restoration Act (Richardson D/NM) creates a voluntary river and watershed registry. Landowners, communities, businesses, Indian tribes, and watershed councils can petition their state and the Interior Secretary to register neighborhood streams, using a locally developed strategy for their protection and restoration. Hearings are expected shortly.

Wilderness

On May 17, the House passed **H.R. 2473** which designates 1.7 million acres of Montana land as wilderness. **S. 2125** (Burns, R/MT) designates 800,000 acres of Montana land as wilderness. **S. 2137** (Baucus, D/MT) designates 1.2 million acres of Montana land as wilderness.

Sources: Land Letter June 15,1994, Vol. 13, No. 17 and July 15, 1994, Vol. 13, No. 20, and American Rivers Vol. XXII, No. 2, Summer 1994.

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