

INFORMATION BASE CONCERNING SALT RIVER FISHES

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ABSTRACT

There are 15 to 17 fish species indigenous to the Salt River drainage (depending on recognition of Gila trout and Gila chub as full species). Dramatic environmental change and establishment of non-native fishes has caused a great decline in native fishes; eight native species became extinct in the basin; four of these have been reintroduced but with very limited success. Ten native species are listed or proposed for listing under the Endangered Species Act. A 1982 amendment to the Endangered Species Act provides for introduction of "non-essential experimental populations" that would not be federally protected. Virtually all of the recreational sport fishing (and commercial fishing) in the drainage is entirely dependent on non-native fishes. No serious problems are foreseen with endangered or threatened species for the adjudication process because of the types of habitat involved. Potential issues regarding non-native sport fishes would concern possible changes in reservoir operational regimes.

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INTRODUCTION

The Gila River system and a major tributary drainage, the Salt River, are part of the lower Colorado River basin. The Colorado River basin, because of its long isolation from contiguous drainage basins, is characterized by a depauperate fish fauna. Thus, besides a limited distribution of native trout (Gila and Apache trout) and of two species of tiny pupfish and topminnow, all fishes indigenous to the Salt River drainage are species of the minnow and sucker families.

From about 1880 to 1920, the Gila River system suffered catastrophic changes from devegetation of watersheds (mainly from livestock grazing) triggering massive arroyo cutting and erosion (Burkham 1972; Hastings 1959; Hastings and Turner 1966). These watershed changes combined with river regulation, flow depletion, and the establishment of non-native fishes caused a decline in native fishes and the disappearance of several species (Behnke 1977; Miller 1961; Minckley and Deacon 1968).

In relation to potential issues and questions that may be raised concerning fishes in the adjudication process, I have divided the fishes into two groups -- native fishes and non-native fishes. The significance attached to native fishes concerns those species listed or proposed for listing as endangered or threatened under the Endangered Species Act. The most pertinent aspect of the Endangered Species Act is section 7 which prohibits any federal agency to engage in any action or activity that would jeopardize the continued existence of a listed species. Federal action has been broadly interpreted: for example, a landowner or corporation receiving any form of federal assistance,

electricity from REA, etc. (Behnke and Benson 1983 provide a review of the Endangered Species Act and its 1978 amendments). A 1982 amendment to the Act provides for the introduction of "non-essential experimental" populations of listed species that would not be protected by the Act. I assume that any future stocking into the Salt River of endangered or threatened species, presently extinct in the Salt River, will be done under the provisions of this 1982 amendment. As such, they would not be a valid concern of the adjudication process.

Under native fishes I also discuss other "species of special concern" that are recognized by the Arizona Department of Game and Fish as "threatened and unique wildlife of Arizona". The "species of special concern" which are not listed under the Endangered Species Act, do not carry the force of the legal mandate of federally listed species, but potential issues concerning their habitats would likely be raised by the Arizona Department of Game and Fish and echoed by federal agencies (USFS, BLM, USFWS).

Non-native fishes support virtually the entire recreational sport fishery of the Salt River drainage (and of Arizona). Popular fisheries for non-native trouts, mainly dependent on regular stocking of hatchery fish, occur in mountain lakes and tributaries in the drainage. Major concerns for trout fisheries will involve minimum stream flows necessary to maintain viable populations. The major trout fishery in the drainage is on the Fort Apache Indian Reservation.

The most intensive use fishery (most angler days generated) in the drainage occurs in impoundments for warm-water game and pan fishes -- all non-native species. Possible issues concerning maintenance of quality of reservoir fisheries, will involve potential changes in reservoir operational regimes.

In future meetings involving the adjudication process, when concerns for fishes, fish habitats, and fisheries are expressed, Salt River Project representatives should attempt to discriminate between illusionary and real issues -- fact from fiction. To accomplish this there is a need to direct discussions from generalities to specifics -- for example, what is the precise concern for a particular species in a particular habitat? What is envisioned to occur? Why? To assist in this matter, the following section on the fishes and fisheries attempts to provide the most up-to-date information as a basis for future discussions of questions and concerns regarding fishes of the Salt River drainage.

As the adjudication process proceeds and a clearer focus on specific issues becomes apparent, demands for mitigation, enhancement, research, monitoring studies, instream flow studies, reservoir studies, riparian vegetation studies, etc. are likely to be made. At this stage, there is danger of funding meaningless and wasteful work that does little or nothing to answer the pertinent questions or truly resolve a problem. For this stage of the process I propose to compile a report critiquing current methodologies used in environmental assessment and monitoring studies, discussing their limitations in regards to biological realities.

FISHES AND FISHERIES

Table 1 lists the native fishes and Table 2 lists the non-native fishes of economic importance of the Salt River drainage. A major aspect of the separation of the two groups is that, with the exception of the introduced trout species, virtually all important non-native fishes are associated with large impoundments of the drainage, whereas native species are absent or only peripherally part of the fish fauna of large reservoirs. Thus, any concerns

Table 1. Fishes indigenous to the Salt River drainage with an indication of their status.

Name	Federal listing	Currently existing in drainage	Of special concern ¹
<u>Trout and Salmon family, Salmonidae</u>			
Apache trout, <u>Salmo apache</u>	Threatened	yes	+
Gila trout, <u>S. gilae</u>	Endangered	reintroduced ²	+
<u>Minnow family, Cyprinidae</u>			
Bonytail, <u>Gila elegans</u>	Endangered	no	+
Roundtail chub, <u>G. robusta</u>	None	yes	+
Gila chub, <u>G. intermedia</u>	None	yes	+
Spikedace, <u>Meda fulgida</u>	Proposed	yes	+
Woundfin, <u>Plagopterus argentissimus</u>	Endangered	no	+
Squawfish, <u>Ptychocheilus lucius</u>	Endangered	no	+
Longfin dace, <u>Agosia chrysogaster</u>	None	yes	
Speckled dace, <u>Rhinichthys osculus</u>	None	yes	
✓ Loach minnow, <u>Tiaroga cobitis</u>	Proposed	no yes	+
<u>Sucker family, Catostomidae</u>			
Razorback sucker, <u>Xyrauchen texanus</u>	Proposed	reintroductions ³	+
Flannelmouth sucker, <u>Catostomus latipinnis</u>	None	yes	
Gila sucker, <u>C. insignis</u>	None	yes	
Gila mountain sucker, <u>C. clarki</u>	None	yes	
<u>Killifish family, Cyprinodontidae</u>			
Desert pupfish, <u>Cyprinodon macularius</u>	Proposed	reintroductions ⁴	+
<u>Livebearer family, Poeciliidae</u>			
Gila topminnow, <u>Poeciliopsis occidentalis</u>	Endangered	reintroductions ⁴	+

¹Species of special concern are federally listed endangered or threatened species or sufficiently rare species likely to be invoked in matters pertaining to water adjudication. As such, pertinent information is given in text for species noted for special concern.

²The Gila trout is assumed to be indigenous to the Verde and Aqua Fria drainages, but native populations have been long extinct in Arizona. A population introduced from New Mexico is now established in Gap Creek (Verde R.).

³Razorback sucker became extinct in Salt R. drainage in 1950's. Introductions from hatchery made in Salt and Verde rivers in recent years, but no indication of survival to date.

⁴Desert pupfish and Gila topminnow became extinct in Salt R. drainage (and most of Arizona). Arizona Game and Fish Dept. and Ariz. St. Univ. have reared and stocked these species but with limited success.

Table 2. Introduced (non-native) fishes of Salt River drainage important as sport or commercial species.

Name	Mainly found in			
	Rivers, small impoundments	Large reservoirs	Game or panfish	Commercial
Trouts, family Salmonidae				
Rainbow trout, <u>Salmo gairdneri</u>	+		+	
Brown trout, <u>S. trutta</u>	+		+	
Brook trout, <u>Salvelinus fontinalis</u>	+		+	
Pike, family Esocidae				
Northern pike <u>Esox lucius</u>		+	+	
Suckers, family Catostomidae				
Bigmouth buffalo, <u>Ictiobus cyprinellus</u>		+		+
Smallmouth buffalo, <u>I. bubalus</u>		+		+
Black buffalo, <u>I. niger</u>		+		+
Bass, sunfishes, family Centrarchidae				
Largemouth bass, <u>Micropterus salmoides</u>		+	+	
Smallmouth bass, <u>M. dolomieu</u>	+	+	+	
Bluegill, <u>Lepomis macrochirus</u>	+	+	+	
Redear, <u>L. microlophus</u>		+	+	
Green sunfish, <u>L. cyanellus</u>	+	+	+	
Warmouth, <u>L. gulosus</u>		+	+	
Black crappei		+	+	
Perch family, Percidae				
Walleye, <u>Stizostedion vitreum</u>		+	+	
Catfishes, family Ictaluridae				
Channel catfish, <u>Ictalurus furcatus</u>		+	+	

expressed regarding native species can be expected to relate to flows, water quality or possible environmental changes in rivers, mainly small, headwater tributaries. Concerns expressed for non-native species are most likely to be related to any changes in operational regimes for reservoirs.

Several of the native species have been extirpated from the Salt River drainage and some species are federally listed as endangered or threatened under the Endangered Species Act. Presently, an evaluation of all current information of species listed under the Endangered Species Act does not indicate serious problems in relation to the adjudication process. The reasons for my expectation of minimal problems are given in the following accounts for each species. Other readers of this report may recognize specific locality records for an endangered species or species of special concern, and realize a potential problem may exist. If so, it should be called to my attention.

Several species rare in the Salt River basin and elsewhere are not presently protected by the Endangered Species Act. Contentious issues regarding these species "of special concern" may be expressed by representatives of federal and state natural resource agencies and by environmental lobbying organizations. Pertinent information is given for these species, hopefully sufficient to judge the validity of any issue raised in the name of such species.

NATIVE FISHES

Apache trout, Salmo apache, federally listed as threatened. The Apache trout should more correctly be recognized as a subspecies of S. gilae than as a full species (Behnke 1985). Taxonomic ranking, however, as a species or a subspecies does not matter in regards to listing under the Endangered Species Act because of the Act's definition of "species" to include "subspecies

and all viable segments of a species." For example, among subspecies of cut-throat trout, Salmo clarki, some subspecies have been listed as endangered, some threatened, and some not listed.

The known natural distribution of Apache trout included the White and Black rivers (headwaters of Salt River) and a few small streams tributary to the Little Colorado and San Francisco rivers. The status of the Apache trout is mainly due to the introductions of non-native rainbow trout which hybridize with Apache trout and produce fertile offspring (Behnke and Zarn 1976). An active restoration program led to a change in status from endangered to threatened.

Most present populations officially recognized by the USFWS as pure Apache trout occur on the Fort Apache Indian Reservation. In a bulletin issued by the USFWS' Albuquerque regional office entitled, "Endangered Species of Arizona and New Mexico 1984", the following "pure" populations are listed: Boggy Creek, Crooked Creek, South Fork Diamond Creek, East Fork White River (all on Fort Apache Indian Reservation), Centerfire Creek and Soldier Creek (both on Apache-Sitgreaves National Forest).

The following populations were listed as "S. apache that fit most of the criteria for purity": Firebox Creek, Little Diamond Creek, Big Bonita Cienga, Flash Creek, Paddy Creek, Little Bonita Creek (all on Reservation), Boggy Creek and Stinky Creek (both on Apache-Sitgreaves National Forest).

Rinne (1985) and Rinne and Minckley (1985) presented comprehensive data on pure, possibly pure, and hybrid populations of Apache trout. A problem concerns the fact that there is no technique on which to make conclusions, firmly based beyond any reasonable doubt, that any population of Apache trout is absolutely pure (uncontaminated by rainbow trout hybridization). In such situations (common in endangered and threatened forms of trout), the evidence is evaluated and "best judgments" made in declaring purity. An obvious

question raised concerning dubious determinations of purity, is: What populations are protected by the Endangered Species Act? If a population is judged to be 90-95% pure S. apache, is it covered by the Act? Precedents could be cited for both sides of the argument. Because of their occurrence in small headwater streams, mainly on the Reservation, it seems unlikely that the Apache trout will play a significant role in the adjudication process.

The Arizona Game and Fish Department maintains a listing of "threatened and unique wildlife of Arizona", which separates species of concern into four groups: 1) species or subspecies extirpated from Arizona that may possibly be re-established; 2) species or subspecies in danger of being eliminated from Arizona; 3) species or subspecies whose status in Arizona may be in jeopardy in the foreseeable future; 4) species or subspecies of special interest because of limited distribution in Arizona. The Apache trout is listed as group 3 by the Arizona Game and Fish Department.

Gila trout, Salmo gilae, federally listed as endangered. As mentioned above, the Gila trout and Apache trout are very closely related to each other and should more properly be classified as two subspecies of a single species. The only consistent difference between Apache trout and Gila trout is the size and abundance of spots on the body. The Gila trout has smaller and more profuse spots than does the Apache trout. A nineteenth century collection of trout from Oak Creek Canyon (headwaters of Verde R.) have small spots and thus the natural range of Gila trout was recognized to include the Verde R. drainage in addition to its previous known range in the upper Gila River drainage of New Mexico. In 1975, I examined a collection of trout from Sycamore Creek, tributary to the Aqua Fria River, which I identified as Gila trout x rainbow trout hybrids (Behnke and Zarn 1976). It is probable that the original distribution of Gila trout also included some tributaries in the Aqua Fria drainage.

In any event, Gila trout became extinct as pure populations in Arizona many years ago. A Verde drainage collection (Clear Creek) made in 1913 contains Gila trout x rainbow trout hybrids. Several years ago Gila trout from New Mexico were stocked into Gap Creek, a Verde R. tributary on Prescott National Forest Lands. The original stock successfully reproduced and the only present population of Gila trout in Arizona now occurs in Gap Creek. Although introduced, the Gap Creek Gila trout population is protected by the Endangered Species Act. Because Gap Creek is a small headwater stream it is unlikely that the endangered status of the Gila trout will be invoked in the adjudication process.

Minnow Family, Cyprinidae

Bonytail chub, Gila elegans, federally endangered, extinct in Salt River drainage. The bonytail chub now occurs only in Lake Havasu and Lake Mohave and in federal fish hatcheries (Behnke and Benson 1983). This species was once widely distributed in all big river environments throughout the Colorado River basin. The bonytail chub is known from the Salt River based on a fish collection made near Tempe in 1890 (Gilbert and Scofield 1898; Marsh and Minckley 1982). It was never found again due to curtailment of flows and establishment of non-native fishes. There are no current plans to stock into the Salt River drainage as part of a restoration project. If bonytail chub were to be introduced into the Salt River at some future time, the introduced fish would most probably be classified as a "non-essential experimental population" and would not be protected by the Endangered Species Act (see explanation below under woundfin, Plagopterus argentissimus).

Roundtail and Gila chubs, Gila robusta robusta, G. r. grahami, and G. intermedia. The Gila chubs of Gila River system present a confusing mosaic of diversity. The "official" list of North American fish species of the

American Fisheries Society, recognizes only Gila robusta, the roundtail chub, and does not recognize G. intermedia as a valid species. I would agree with Rinne (1976) and Minckley (1973) that three divergent evolutionary lines of Gila chubs occur in the Gila system. The taxonomic problem involving the Gila chubs concerns the fact that they are not reproductively isolated from one another. When they have come into contact they have hybridized to produce many confusing intermediate types. A more slender form, the roundtail chub, Gila robusta robusta, is the most common form in the Gila and Salt river drainages. A thick, chunky chub is recognized as "Gila chub", G. intermedia, by Minckley and Rinne (and by the Arizona Game and Fish Dept.) and a chub somewhat intermediate between the roundtail chub and the Gila chub is recognized as the "Gila roundtail chub", G. robusta grahami. The latter two are rare, occurring mainly in small, isolated habitats. Both G. intermedia and G. r. grahami are listed as "group 4" by the Arizona Game and Fish Department (species or subspecies of special interest because of limited distribution in Arizona). Because of taxonomic confusion, neither grahami nor intermedia are listed under the federal Endangered Species Act. In Arizona, however, fish classification is based on Dr. Minckley's opinions, not on the American Fisheries Society's list. Because of this, Gila intermedia and G. robusta grahami may be invoked as fishes of special concern during the adjudication process.

G. intermedia is known from Fish Creek and Cave Creek (tributaries to Salt River) and both intermedia and grahami are recorded from a few Verde R. tributaries, mainly isolated above falls.

Spikedace, Meda fulgida, currently under proposal for federal listing as threatened, Arizona group 4. Both the spikedace and the loach minnow,

discussed below, are Gila River endemics (genus, and species found nowhere else). Both are now relatively rare in the Gila River system. The USFWS' Albuquerque regional office has been preparing proposals since 1984 to list both the spikedace and loach minnow as threatened species under the Endangered Species Act. These proposals for listing have now been published in the Federal Register (June, 1985; personal communication from Sally Stefferud, USFWS, End. Sp. Office, Albuquerque). After publication in the Federal Register, final determination to list or not to list is expected to take about one year.

Non-native fishes have largely replaced the spikedace throughout the Salt River drainage and remaining populations are considered to be of special concern in regards to federal lands. According to Minckley (1973), a few spikedace have been found in the Salt River in the Salt River Canyon near the mouths of tributary streams and from the upper Verde River (above Sycamore Canyon). Recently, (spring, 1985) a new locality record for spikedace was found in the White River, above the town of Whiteriver on the Reservation (Sally Stefferud, personal communication).

Woundfin, Plagopterus argentissimus, federal endangered, Arizona group 2 (in danger of being eliminated from Arizona). Originally the woundfin was known from the Virgin River, the lower Colorado, and the lower Gila system. Presently, this species occurs only in the Virgin River of Utah, Nevada, and Arizona. Specimens of woundfin were collected with bonytail chub from the Salt River in 1890 but were never found again in the Salt River drainage (Minckley 1973). The last known specimen from the Gila River was taken in 1894.

In 1973, woundfin from the Virgin River were introduced into Sycamore Creek, Aqua Fria drainage, Prescott National Forest. They did not become established. This species was also introduced into Hassayampa Creek near

Wintersburg, Maricopa County, without known results. After the 1973 Endangered Species Act became law, introductions of federally listed endangered and threatened species became much more difficult than prior to the Act. States were not eager to establish new populations of protected species and create new critical habitats after these species became extinct in an area. A 1982 amendment to the Act provided for a category of "non-essential experimental populations" that would allow for introductions without federal protection. Proposals to reintroduce both woundfin and squawfish into Arizona as "non essential experimental populations" were made in 1984. The "non essential" introduction proposal process is similar to the listing process and may take one to three years for final determination. Plans have been made for introductions of both woundfin and squawfish into the Salt (and Verde) drainages this autumn (1985), if final authorization is given (Sally Stefferud, personal communication). If these introductions are made, the woundfin (and squawfish) would not be protected by the Endangered Species Act, nor would their progeny be protected if they reproduced and established new populations.

Squawfish, Ptychocheilus lucius, federally endangered, Arizona, group 2. The squawfish is now extinct in the whole lower Colorado River basin. The squawfish is the largest species of the minnow family in North America (historical maximum weights of 60-80 pounds). Obviously, such a large fish requires a large river environment. In the late nineteenth and early twentieth centuries, squawfish were common in the lower Gila, lower Salt and lower Verde rivers. The squawfish and razorback sucker were the only native species used in commercial fisheries. The last squawfish known from the Salt River was caught in 1948 near the highway 60 bridge at Tempe (Minckley 1973).

In recent years the only known squawfish in Arizona were those raised at the Willow Beach National Fish Hatchery. As mentioned above, the USFWS and the Arizona Game and Fish Department have proposed to stock squawfish in the Salt and Verde rivers as "non essential experimental populations." If authorization is received, the first stocking may occur this fall. "Non essential" squawfish would not be protected by the Endangered Species Act, and they should not be a factor in the adjudication process.

Loach minnow, Tiaroga cobitis, proposed federal threatened, Arizona group 4. As mentioned under spikedace, the formal proposal to list the loach minnow as a federally threatened species was recently published in the Federal Register. The loach minnow was known from the upper Salt River (and Black and White rivers) but has not been found in the drainage since 1971 (Sally Stefferud, personal communication). Intensive collections, sponsored by USFWS, were made in the upper Salt drainage (particularly in Black River) this year, specifically to document the occurrence of the loach minnow in the drainage. Specimens of newly hatched fishes collected have not yet been identified. The USFWS has contacted one of my graduate students to examine the collections of young fishes to determine if any of the specimens in their collections **are** loach minnows. I doubt that the loach minnow still occurs in the Black River. The introduced smallmouth bass is now the dominant fish species in the Black River and it has virtually eliminated all native species by predation. If future collections do find the loach minnow in the Salt River drainage, they would most likely occur in small tributary streams, isolated from non-native fishes.

Sucker Family, Catostomidae

Razorback sucker, Xyrauchen texanus, variously proposed for federal listing; Arizona group 3.

The razorback sucker is presently a rare species throughout the Colorado River basin. Its major "stronghold" are the mainstream reservoirs of the lower Colorado River. Originally, the distribution of the razorback sucker was similar to that of the squawfish and bonytail chub -- in all large rivers of the basin. It was once abundant in the Salt and Verde rivers. As recently as 1949, razorback suckers were taken in the commercial fishery of Saguaro Lake. It persisted in the Verde drainage into the 1950's, based on photographs of fish from Peck's Lake taken in 1954 (Minckley 1983). No specimen has been seen during the past 30 years in the Salt (or Gila) drainages.

The razorback sucker was proposed for listing as threatened under the Endangered Species Act in 1978, but that proposal was withdrawn. In 1981, the USFWS and the Arizona Department of Game and Fish entered into a memorandum of understanding that would permit introductions of razorback suckers (from hatcheries) into the Salt, Verde, and Gila rivers, as long as the introduced fish would not be protected by the Endangered Species Act. Since 1981, millions of young razorback suckers have been stocked, mainly in the Salt and Verde rivers (Johnson and Rinne 1982). To date (June 1985) I have heard of no indication of survival from the introductions. The razorback sucker is extremely vulnerable to predation by non-native fishes. Unless the young suckers are reared to a sufficiently large size to avoid predation (6-8 inches), there is little likelihood of success for the introductions. If any of the introduced fish survived to maturity and spawned, non-native fishes can be expected to eliminate the eggs or any young that might hatch (Behnke and Benson 1983; Minckley 1983).

Killifish Family, Cyprinodontidae

Desert pupfish, Cyprinodon macularius. Arizona group 1. The desert pupfish, a small "guppy-like" species, was once common to lower elevation

springs, creeks, and stream margins in the lower Salt, Gila, and Colorado rivers of Arizona. It is extremely susceptible to elimination by non-native fishes, especially the mosquitofish, Gambusia affinis, widely introduced throughout the state.

The desert pupfish is probably extinct as natural populations in the Salt River drainage. In recent years it has been maintained by the Arizona Game and Fish Department (Phoenix) and at Arizona State University for introductions. Introductions have had limited success. Evidently the pupfish cannot maintain viable populations if mosquitofish or other non-native predator species are present.

In May, 1984, a proposal to list the desert pupfish under the Endangered Species Act was published in the Federal Register. I have not yet heard of the final rulemaking decision on this species. If listed (which is likely) and protected under the Endangered Species Act, it is not likely that the pupfish habitat of reintroduction sites would raise any serious issues for the adjudication process because of the types of waters stocked with the species -- springs, isolated pools, small ponds.

Livebearer Family, Poeciliidae

Gila topminnow, Poeciliopsis occidentalis, federal endangered, Arizona group 3.

All aspects defining the status of the desert pupfish, discussed above, equally characterize the Gila topminnow. This species is extremely vulnerable to elimination by non-native fishes, especially mosquitofish (Meffe 1985; Minckley et al. 1977). Natural populations are probably extinct in the Salt River drainage. In an attempt to reestablish numerous populations throughout the original range of the species in Arizona and New Mexico, the USFWS raises the species at its Dexter, N.M., hatchery for stocking. A memorandum

of understanding between the USFWS, the Arizona Department of Game and Fish, and the U.S. Forest Service (Sept. 1981) provides for the reintroduction of Gila topminnow. In 1982, 72 sites were scheduled for stocking (Johnson and Rinne 1982). Despite its endangered status, the types of habitat stocked with Gila topminnow -- springs, seeps, tanks, etc. -- are not likely to be an issue for the adjudication process.

Non-Native Fishes

Except for a limited fishery for Apache trout on the Fort Apache Indian Reservation and occasional and incidental catch of native suckers or chubs, the entire recreational fishery of Arizona is dependent on non-native fishes. A certain schizophrenic irony inherent in the institution of public fisheries management in the Southwest is that the stocking of non-native fishes to create valuable recreational fisheries is also the major cause for the decline and disappearance of the native species (Behnke 1982).

In the Salt River drainage, popular fisheries exist in mountain lakes and streams for non-native brook, brown, and rainbow trout. Most of this fishery is maintained by the stocking of hatchery trout (mainly rainbow trout). Possible claims for instream flows are most likely to concern the recreational and the economic significance of non-native trout fisheries. There is also a limited fishery for stocked trout in some cold tailwaters below dams at lower elevations.

The smallmouth bass is the only non-native, non-trout species that is caught in rivers to any extent in the Salt River drainage. As mentioned above, the smallmouth bass is now the dominant fish in the Black River where it has virtually eliminated all native species. After the smallmouth bass exterminated its main food supply (the native fishes) they became stunted. Currently, few smallmouth bass exceed about nine inches in the Black River.

The major gamefish of the large Salt River impoundments is the largemouth bass. In reservoirs, the major forage fish for the non-native predators such as the two species of bass, walleye, northern pike, and channel catfish, is also a non-native fish, the threadfin shad.

The large predatory fishes, generally known as "gamefish" attract the most attention from anglers and have the greatest economic significance and management emphasis. Several species of the sunfish family are abundant in large reservoirs and small ponds throughout the lower elevations of the drainage. These species are generally called "panfish". The major "panfish" of the Salt River reservoirs is the black crappie.

The Salt River reservoirs have a long history of commercial fishing for species of the sucker family -- the "buffalofishes" of the genus Ictiobus. These species attain a large size (to 25-30 pounds for bigmouth buffalo) and are considered highly palatable. Most of the commercial catch has been sold in the Phoenix metropolitan area.

SUMMARY

The native fishes, largely depleted with several species extinct in the drainage and several protected by the Endangered Species Act, are not likely to raise serious issues for the adjudication process. This conclusion is based on the types of habitat involved, mainly small headwater streams, and on the assumption that any future introductions of E.S.A. listed species in large rivers (such as squawfish) will be made under the provisions of the 1982 amendment to the Endangered Species Act, as "non-essential experimental populations." As such they will not be federally protected. A possible problem may arise if the loach minnow (proposed for threatened status) is found in the Black River. The occurrence of this species in the Black River, however, is doubtful.

The significance of non-native fishes involves recreational sport fishing. Minimum stream flows are necessary to maintain viable trout fisheries. Any future changes in reservoir operational regimes will raise issues concerning the well-being of gamefishes, particularly the largemouth bass.

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SCOPE OF WORK, JULY 1985-JUNE 1986

Robert J. Behnke

After completion of report on Salt River fishes (submitted July 10), I propose an additional report providing critiques of current methodologies used for environmental assessment, monitoring and prediction (such as instream flow), to make understandable the limitations of any method to achieve stated goals and to maximize cost/benefits of possible future costs of mitigation requests. At present, there is no urgency for such information and I will not proceed with such a report until requested. I request to be notified to proceed with this proposed report six to eight weeks before any requested deadline. Estimated cost for such a report is 10-12 days -- \$3,000 to \$3,600.

Until requested to proceed with second report or any other work order, I will spend about 5-10 hours per month surveying and abstracting pertinent literature and reports and making personal contacts for most recent information pertaining to Salt River adjudication and potential problems regarding fishes-aquatic biology. For example, I recently borrowed and xeroxed a large unpublished draft report financed by the Electric Power Inst. on instream flow methodologies; other reports on hatchery programs for endangered fishes and USFWS, "Proceedings of a workshop on fish habitat suitability index models".

Because of limited involvement of my time, ca. 1-2 days/month, I propose to make bimonthly reports and billings (next, Aug. 31). I would list activities, current literature and reports and information from personal contacts.

Excepting attendance at coordination meetings, until I am requested to proceed with a new work order, my services for the coming year to compile, update, synthesize literature, make contacts, xeroxing, etc. are estimated to average about \$300 to \$400 per month.

AMERICAN FISHERIES SOCIETY - Guidelines for Oral Presentations

Guidelines for Speakers (General)

1. Rehearse your talk before the meeting and be certain that you do not exceed the allotted time. Have peers evaluate your talk and consider their suggestions.
2. Podium lighting and microphones are not always available or dependable. Therefore, do not rely on note cards and practice speaking slowly and audibly.
3. Check slides in the AV preview room prior to your talk (see program book for the location). If possible, arrange for your session moderator to be present so that the moderator may identify potential problems with your slides.
4. Arrive in the meeting room at least 15 minutes before the session begins to receive any last minute instructions and make any adjustments you feel are necessary.
5. Number your slides on the lower left corner (in position that the slide is correctly viewed) so that you can quickly put them in a carousel correctly and in order.
6. Bring slides in a carousel so that you won't have to put them in a carousel after someone else's talk.

Guidelines for Technical Speakers

1. Each talk should last no longer than 15 minutes and there should be at least five minutes for questions after each talk. Organize your talk as follows: Introduction, objectives, methods, results, conclusions.
2. Introductory comments are most effectively presented by speaking to your audience with the lights on before you go to the slides.
3. Clearly stated objectives must be presented and conclusions should relate back to them.
4. Avoid unnecessary detail in the methods and primarily discuss results and conclusions (unless methodology is the central topic of your study).

Guidelines for Visuals

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2. Suggested color combinations for text and graphic slides: white or yellow on blue background, yellow on green background.
3. Keep figures simple. Figures for publications usually do not make good slides because they contain too much detail.
4. Text on slides should be large enough so that it is readable when you hold the slide at arm's length. Text can take up a lot of room on figures so use only what is absolutely necessary.
5. Each slide should convey only one idea. If you need to present several figures that relate to one another present them sequentially on separate slides.
6. Vertical slides usually do not fit on the screen; therefore, do not use them.
7. Present only essential information in tables. Limit tables to a maximum of five lines and three columns.
8. Do not make slides with more than eight lines of text.
9. Picture slides should clearly show what you want the audience to see.

w Abstract & Lit.

Oct. 8	Kevin Bestgen	Distrib. patterns
15	Peter Kiffney	keystone pred.
22	Julio Comargo	_____
29	Patti Rosefelder	_____
Nov. 5	Jim Noncurvis	disturbance
12	Alon Polansky	wetland?
19	(Nic Medley)?	-> continuum -?
Dec. 3	-	Final discussion

Cindy Olson | s-u
Jeff Mallicks |

new journal
- Biodiversity and Conservation

Bob Behnke



SALT RIVER PROJECT

POST OFFICE BOX 52025
PHOENIX, ARIZONA
85072-2025
(602) 236-5900

May 15, 1987

Mr. Herb Dishlip
Deputy Director
ARIZONA DEPARTMENT OF WATER RESOURCES
99 East Virginia Avenue
Phoenix, Arizona 85004

Dear Mr. Dishlip:

RE: INSTREAM FLOW TASK FORCE

The Salt River Project thanks the Arizona Department of Water Resources for the opportunity to participate on the Department's Instream Flow Task Force and to comment on the various legal and technical issues raised at the December 17, 1986 and April 8, 1987 meetings of the Task Force.

LEGAL ISSUES:

Detailed comments on the various legal issues involved with the issuance of instream flow rights will be submitted by the Salt River Project at such time as the Department publishes its proposed instream flow rules and/or hears instream flow applications of specific interest to SRP. Pending such comments, the Project believes, in general, that water can be appropriated for instream flows so long as such appropriation is consistent with the Doctrine of Prior appropriation and does not interfere with existing prior rights. The term "prior rights" includes the concepts of "amount," "location," and "type(s) of use." "Type(s) of use," in turn, embodies the concept that existing users have the right to continue unimpaired any reservoir operation and diversion practices employed to satisfy their rights to water or to meet any water delivery obligations they may have.

The Project urges that any instream flow rules promulgated by ADWR fully embody these general concepts.

Mr. Herb Dishlip
May 15, 1987
Page -2-

TECHNICAL ISSUES:

Marty Jakle's December 16, 1986, "Comparison of different methods used to determine instream flow requirements;" the Instream Flow Biological Sub-Team's April, 1987, "Review of Instream Flow Methodologies and Recommendations for Their Application in Arizona," and Barrett's and Jakle's, "Survey of Instream Flow Methods for Use in Arizona," were all reviewed in detail.

Barrett, Jakle and the Sub-Team have generally done a good job of reviewing the literature and presenting an overview of available methodologies for evaluating instream flows. However, their analyses that lead to recommendations favoring the IFIM are relatively shallow, resulting in conclusions open to challenge. For example, fish populations in a stream are affected by various physical (e.g., flow regime, habitat quality, water quality) and biological (e.g., food abundance and availability, predation, competition and interspecific interactions, migration, movement) factors. None of the methods reviewed adequately correlate these factors with biological reality. In other words, they do not accurately predict changes in fish numbers or biomass resulting from changes in flow. This is especially true of the IFIM.

The USF&WS in its Comparison of the Use of the Habitat Evaluation Procedures (HEP) and the Instream Flow Incremental Methodology (IFIM) in Aquatic Analysis, FWS/OBS-84-11. May 1984. recognizes that habitat output has no absolute meaning and that "WUA's... cannot be equated directly to characteristics of the fish populations." A substantial volume of additional literature agrees that the WUA (weighted useable area) output of IFIM cannot be directly associated with fish biomass. And, Whittier, T. R. and D. L. Miller. 1986. Stream fish communities revisited: a case of mistaken identity. Am. Naturalist 128(3):433-437 further note that stochastic events (such as Arizona streamflows) destroy the predictive accuracy of the IFIM model.

Barrett and Jakle note in their paper that flushing flows may be extremely important to maintain Southwestern aquatic and riparian ecosystems; but admit that none of the existing evaluation techniques take such flows into account,

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Page -3-

including IFIM. And, the Sub-Team, after an excellent review and discussion of the weaknesses of the IFIM (pp. 13 and 14), concludes that it "does provide perhaps the "best available information" on the effect of a given flow regime on the fish habitat" and that it is "the only methodology available which allows for negotiation of flows."

The Sub-Team's conclusions err. If the IFIM assumptions of linearity between WUA and biomass, independent selection of habitat variables, channel stability, and useability of WSP are invalid and if the IFIM does not relate to biological reality, how can it possibly provide the "best available information"? Why such wrong information obtained from IFIM is better, or "less wrong," than that obtained from other methods is never explained.

The IFIM is NOT the only methodology available which allows for negotiation of flows. ANY methodology (or even no methodology) can be used to achieve a negotiated settlement, as long as the parties agree to the standard to be used to develop the terms of the settlement. The fact that must be recognized is that what is used for negotiation with IFIM is a display of WUA values which change with flow changes. Until a WUA can be directly associated with a biologically relevant factor such as fish biomass, environmental assessments using WUA's for negotiation is analogous to negotiating with play money in the game of Monopoly. In the Sub-Team's statement that IFIM is "biologically sensitive through development of weighted habitat criteria and electivity curves," it has confused WUA with biological relevance. IFIM is "WUA sensitive" not biologically sensitive. The statement that IFIM "provides estimates of the effects of various flow regimes on fish habitat" is true, but needs qualification to point out that the "estimates" are likely to be highly erroneous.

IFIM's legal defensibility is also open to debate. It's biological irrelevancy is now pretty well agreed upon by the scientific community. The fact no one has challenged it head on in court is more a matter of luck or the financial prudence of out-of-court settlement vs. all-out litigation than one of defensibility.

To state the obvious: If a method for determining optimum - adequate - minimum instream flows were available that has

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withstood testing and validation, it would be accepted and used as the "standard method" by all states dealing with instream flow. Barrett, Jakle and the Sub-Team have accurately assessed that no such standard exists. In light of this, their support of the IFIM is at best puzzling.

Alteration of the "legal defensibility," "negotiation flexibility," "evaluation of habitat criteria," and "evaluation of habitat effects on fish" ratings shown in Table 2 of the Sub-Teams report would change IFIM's ranking. Depending on how these factors are re-rated, IFIM's overall score would be close to or below the scores given the other three methods, leading one to the conclusion that no clear advantage exists for any one method over the others. They all have flaws. They all fail to correlate with biologic reality. And, they all have to be selected and applied with reason and judgment to the situation for which they are best suited.

The factor of human judgment and knowledge appears to be considered a weakness and tends to be replaced with mere data and computer model outputs. The Department should not succumb to the illusion of "knowledge" that reliance on models or methodology tends to create. Instead, critical thinking and reflective judgment should result in the conclusion that no current instream flow methodology can be considered highly predictive and, therefore, should not be the final word for decision-making by the Department. Human judgment, knowledge and expertise are strengths which should be applied to instream flow evaluations - not laid aside in an attempt to cookbook those evaluations.

RECOMMENDATIONS:

The Instream Flow Biological Sub-Team, in its attempt to come up with cookbook methods for assessing instream flows, may have stopped short in its methodology review. It is recommended that the Sub-Team read "Instream Flow Methodologies." Electric Power Research Institute. EA-4819, September, 1986. 340 p. Copies can be obtained from: Research Reports Center, P. O. Box 50490, Palo Alto, California 94303.

The Wyoming Game and Fish Department performed comparative field tests of the different methods for evaluating instream

Mr. Herb Dishlip
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Page -5-

flows. Their comparisons indicate that IFIM is among the most inaccurate of instream flow methodologies for predicting fish biomass. The Sub-Team should become familiar with the Wyoming work. Beginning references include:

- . Condor, A. L. and N. A. Binns. 1986. Reservoir impact analysis using habitat units for trout streams. Proc. 21st Ann. Meeting Colo.- Wyo. Chapter Am. Fish. Soc. 57-63.
- . Parsons, B. G. and W. A. Hubert. 1986. Probability curves for kokanee spawning in two tributaries of Flaming Gorge Reservoir. Proc. 21 st Ann. Meeting Colo. - Wyo. Chapter Am. Fish. Soc. 24-33.

Unregulated streams in Arizona are characterized by extreme variations in annual, monthly, and daily flows. This hydrologic gyration is compounded further by local geologic, topographic and biologic conditions, making each stream essentially "unique." This uniqueness suggests the need for a case-by-case approach to evaluating instream flow requests. To meet this need, it is recommended that the Department's guidelines require clear definition of the applicant's objectives (goals) and the target species involved; and, furthermore, that the guidelines be directed towards the types of data required for the Department's analysis (e.g., hydrologic data source, period of record, acceptable methods of analysis, target species, etc.). The applicant would be required to justify his instream flow claim with the techniques best suited to the particular conditions. Human knowledge and expertise (vs. computer model runs) provided by ADWR/AG&F/USFWS would then be used to look for the most simple and direct cause-and-effect relationship between flow and the target species that is amenable to quantification. For example, if a population of the threatened loach minnow is found to utilize a riffle area in a stream and when flows drop below a critical level, the riffles are dewatered and the loach minnow population declines, then the critical flow necessary to maintain the riffle habitat must be determined. If a rainbow trout fishery depends on natural spawning, the spawning area should be studied. If the average depth of egg deposition is one foot, the question in need of an answer is: how much flow reduction causes a decrease in depth by one foot in the

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spawning area (resulting in loss of incubating eggs)?
Critical habitat sites for particular species, such as side channels, undercut banks, etc. would need to be studied for each stream and then determine what flows would be too high or too low to maintain habitat quality.

This use of a goal directed approach should help focus the analysis required to properly evaluate the applicant's request. The three-tiered stream classification proposed by the Sub-Team would then not be required, saving unnecessary work.

Above all, it is recommended that the Department not lock itself into use of "sophisticated" methodologies, but allow a range of methodologies to be applied under the guidance of expertise and common sense.

In closing, it should be noted that no report has been received yet from Greg Wallace's Hydrological Assessment Study Group. When a copy is in-hand, we will review it and provide comments as appropriate.

Sincerely yours,

William L. Warskow

William L. Warskow
Manager
WATER RIGHTS DIVISION

WLW:njs
xc: Jim Burton, AG&FD
Paul Barrett, USF&WS
Marty Jakle, USBR

SRP
Sib R. Adjudicator

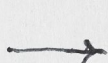
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Phoenix, AZ 85003-1791

re Melving USGS record
- model ✓
see Nelson Wild Tr. II 3122
MT flow - trout



Pzt Nelson
 USFWS P.O. Box 25486, DFC
 Denver 80225

OFFICE MEMO

Gold
Cutler
West APJ

Date

TO:

FROM:

SUBJECT:

Two types mental processes:

REMARKS:

see things as whole - holistic, gestalt make new rules

1. Synthetic, constructive, = creative, innovative

semin
 confus

2. Analytical, imitative, conservative = formulation,
 continuance of tradition. (strictly follow rules)

WV

- De Toguerville: "public will choose to believe a simple lie in preference to a complicated truth"

OFFICE MEMO

TO:

- Dow D.S. rept.

Date

FROM:

Barry's obsession to validate 'justify' IEM -

SUBJECT:

Miller Ph.D. model ex. what can go into PHABRIM - any HSE curve
O₂ in need - at egg surface

REMARKS:

egg incubation's original - organic, inorganic, size, shape, texture
IEM HSE failed to Chapman 1985 - egg pocket
recognize spawning-incubation
ex. must be same site - eggs can't move

Professional Judgment

Nehring incorporated prof judgment

qual. - weakest link - bottleneck - regulated river -
- formalized & incorporated - "velocity" ("depth" if too low)

(by taken in by illusion of technical - for communications, negotiation
but doubt Nehring believe velocity data ^{second} predict a spec up
all life stages - ^{esp'} adult hab. - adult w/ intra - inter - pred - prey -
Niche - niche volume - redside - steelhead.

Prof J. expert, experience angler when cost by - how affect
to quantity w/ HSE?

Egg incubation
Water temp. - Rogue R. - warming - chinook - earlier hatching - impact? -
- bigger - better

No. 1 - Evol. programmi 10000 years life cycle fine-tuned
to Regue R. entire, so free hatching to entry see a step-wise
survival selection - now disrupted - returning adults v -

My position not as opponent to IEM HCP say moder-
oppositer - for enlightenment - avoid naive acceptance - of
overly simplistic
assumption - w/o ^{proper} input of prof. judgement - qualitative based
on knowledge - experience - it can work into a model
- fine - good for communication, negotiation.

OFFICE MEMO

recog in place - prof - biologists
recommend - decide - how what
doing - but ---

TO:

Date

FROM:

SUBJECT:

REMARKS:

- nonbiol.
- hydrologists & attorneys
- we can require sufficient understanding such that pertinent questions.
- Last rep. - S. Platte - between - within comp. - fertility of
expecting accurate prediction of habitat qual. in terms - fish biomass
- why so much expensive time wasted to make mitigation appear to
be 'sci. sound' - bias, entrenched thinking -
human mind - order of chaos - 2 Tyler mental
processes - most people use both -
- some use one or other -
- utilize 1. See things as whole - holistic, gestalt perception on
of synthetic, creative, innovative - construction
- reductio 2. Analytical, quantitative, imitative (follow rules) for
formulation of problem - strict following of rules - continues traditions
- To such mindsets - ex. lecture - no room - resolution - as often thought
in the 'revolution' - not the biol. reality
basis of quantification would be nice to have
if in reality any
good for these
- * Apply 'weakest link' strategy - ex. proposed flows
re. to life history - typical spanning specific site - if

USFS RM7RES - Tempe - Trout habitat contract -
- if HSI curves on 10m HEP - so definitely determined

- why more "research" ??

CHALLENGE:

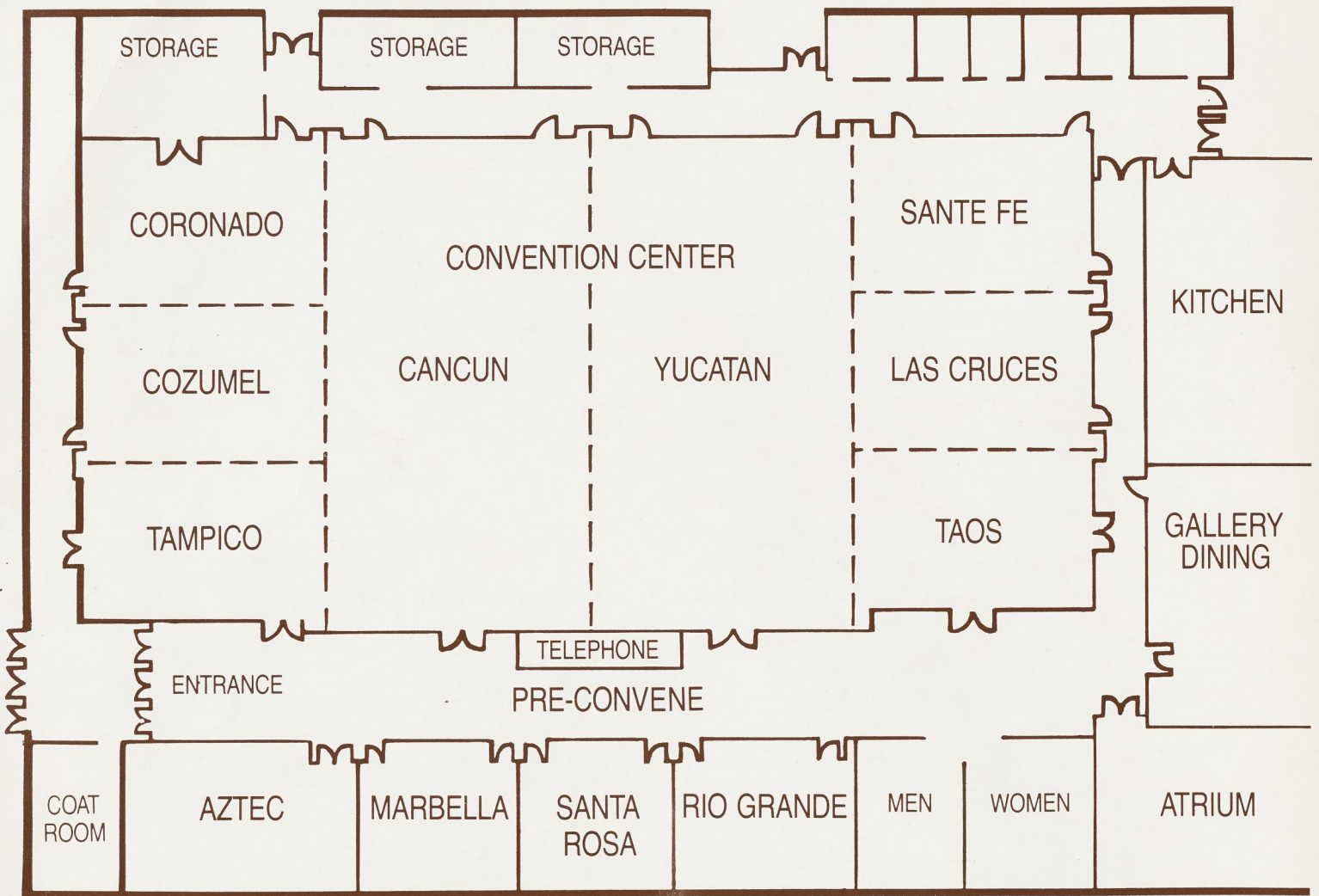
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JULY 10-13



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WESTERN DIVISION OF THE AMERICAN FISHERIES SOCIETY
July 10-13, 1988, Holiday Inn Pyramid, Albuquerque, N.M.

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Monday, July 11 Mexican Fiesta, 6:00-9:00, New Mexico
Museum of Natural History
Tuesday, July 12 No-Host Cocktail Hour, 5:30-6:30, Atrium
Banquet & Band, 6:30-9:30, Yucatan

TOURISM INFORMATION: The Kachina Greeters from the Albuquerque Convention and Visitors Bureau will be on hand 8:00-5:00 Sunday and Monday in the Rio Grande Room to answer your questions about Albuquerque and trips or activities not on the conference agenda.

POOL AND EXERCISE ROOM: 5:a.m.-midnight

JOGGING TRAIL MAPS: Available from front desk, Pyramid Hotel

SPOUSES' HOSPITALITY SUITE: 8:00 a.m.-4 p.m., July 11 & 12
8:00 a.m.-10 a.m. July 13

FAMILY ACTIVITIES

MONDAY, JULY 11: SANTA FE. . .THE BEACH. . .FIESTA

SANTA FE, one hour north of Albuquerque, earns its distinction as "The City Different," with unique architecture, museums, missions and shops. Lunch on your own. Transportation \$10/person (under age 2, free); leave Pyramid, 9:00, leave Santa Fe, 2:30.

THE BEACH, is a refreshing water park with a 3-foot wave pool, raft ride and water slide. Transportation \$2.00/person; leave Pyramid 10:00, leave beach, 2:00. Children under 13 must be accompanied. Admission: \$9:50 plus \$2.50 required tube rental.

FIESTA: Family entertainment, with New Mexican buffet, mariachi music, cool libations at N.M. Museum of Natural History. Transportation provided: leave Pyramid, 6:00 p.m., leave museum, 9:30. Nonregistrants: \$15.00; under age 12, \$7.00

TUESDAY, JULY 12: ZOO. . .OLD TOWN. . .BANQUET. . .PIZZA PARTY

RIO GRANDE ZOO - Stand eye-to-eye with an elephant or any of 1,000 other animals of 300 species, 'mid cool cottonwoods. Transportation and admission \$5.00/adults, under 16, \$3.00.

OLD TOWN trip begins with presentation of "Legendary Albuquerque" at 9:00 in the Cozumel Room, followed by tour of historic district and specialty shops. Transportation \$2.00/person; leave Pyramid 10:00, leave Old Town, 2:30.

BANQUET - Fine cuisine, wine and lively entertainment by the Watermelon Mountain Jug Band. \$25/nonregistrants.

PIZZA PARTY - The younger folks indulge in pizza, pop, popcorn and movie, under supervision. \$8.00/child.

WEDNESDAY, JULY 13: WORLD'S LONGEST TRAMWAY

THE SANDIA TRAMWAY glides from base to crest of the jagged Sandia Mountains, to the cool green of 10,360 feet. Transportation \$2.00/person; admission, \$9.50 (\$7.00 ages 5-12, under 5, free).

CHILD CARE REFERRALS WILL BE AVAILABLE JULY 9 - 12.

PROGRAM

1988 JOINT CONFERENCE
WESTERN ASSOCIATION OF FISH AND WILDLIFE AGENCIES
AND
WESTERN DIVISION OF THE AMERICAN FISHERIES SOCIETY

FRIDAY, JULY 8

2:00-5:00 Directors' Retreat, hosted by Ducks Unlimited
Dinner on your own

SATURDAY, JULY 9

3:00-5:00	Registration/Information Desk	Rio Grande Room
8:00-4:00	Colorado River Wildlife Council	Taos Room
3:00-5:00	Responsive Management Advisory Board	Marbella Room
5:30-6:30	Hosted Reception (Invitation Only) Host: Tenneco Dinner on your own	Taos Room

SUNDAY, JULY 10

7:00-5:00	Registration/Information Desk	Rio Grande Room
8:00-4:00	WDAFS Executive Retreat (Bus leaves, 8:00 a.m.)	Sandia Ski Lodge
8:30-12:00	WAFWA Resolutions	Santa Fe Room
8:30-12:00	WAFWA Legislative	Las Cruces Room
8:30-12:00	WAFWA Federal-State Jurisdiction	Taos Room
8:30-12:00	WAFWA Economic Values	Coronado Room
8:30-11:30	Commissioners' General Session	Cozumel Room
10:00-10:30	Coffee Break	Hall
11:00-12:00	WAFWA Audit	Marbella Room
11:30-1:00	Commissioners' Luncheon, hosted by N.M. State Game Commission	Gallery
12:00-1:00	Lunch on your own	
1:00-2:00	WAFWA Nominating Time and Place	Marbella Room
1:00-5:00	WAFWA Resolutions	Santa Fe Room
1:00-5:00	WAFWA Legislative (if necessary)	Las Cruces Room
1:00-5:00	WAFWA Executive Committee (if necessary)	Tampico Room
1:00-5:00	WAFWA Conservation Education	Taos Room
1:00-5:00	WAFWA Native Indian Relations	Private Dining Room
1:00-5:00	WAFWA Nongame and Endangered Species	Coronado Room
1:00-5:00	Commissioners' General Session	Cozumel Room
3:00-3:30	Coffee Break	Hall
2:00-5:00	New Mexico Wildlife Society	Marbella
5:30-6:30	No-host Reception	Atrium
6:30-9:30	WDAFS Business Meeting Dinner on your own	Taos Room

REGISTRANTS: DISPLAY YOUR NAME TAG AT THE DOOR FOR ADMISSION TO SESSIONS.

MONDAY, JULY 11

7:00-5:00	Registration/Information Desk		Rio Grande Room
7:00-9:00	Continental Breakfast (registered Pyramid Hotel guests only)		Cancun Room
7:00-6:00	Trade Show		Cancun Room
9:00-11:30	General Session		Yucatan and adjoining rooms
	Opening Announcements	Luke Shelby, N.M. Dept. of Game and Fish	
	Welcome to New Mexico,	William O. Montoya, Director, N.M. Dept. of Game & Fish; President, WAFWA	
	President's Message	Sandra Wolfe, Secretary/Treasurer, WAFWA	
	WAFWA Roll Call	Don MacCarter, NMDGF; special thanks to John Gahl, Idaho Dept. of Fish & Game	
	"Face of New Mexico"	Alvin D. Mills, Utah, President, WDAFS	
	President's Message	Stan Moberly, Washington, National President, American Fisheries Society	
	Remarks		
	Awards	John Davis, NMDGF	Yucatan Room
11:30-1:00	Directors' Luncheon, hosted by the National Wild Turkey Federation		Gallery
11:30-1:00	Lunch on your own		
1:00-2:30	Workshop		
	"Strategic Skills for the New Economy"	The Naisbitt Group: Dr. Marilyn Block & Elizabeth Marcott, Presenters	Yucatan Room
2:30-3:00	Coffee Break, hosted by Outdoor Empire Publishing Co.		Cancun Room
3:00-5:00	Workshop		
	"Strategic Skills for the New Economy"	The Naisbitt Group	Yucatan Room
6:00-9:00	Mexican Fiesta (buses leave at 6:00; present name tags or tickets when boarding)		New Mexico Museum of Natural History

TUESDAY, JULY 12

7:00-5:00	Registration/Information		Rio Grande Room
6:30-8:00	Continental Breakfast (Registered Pyramid Hotel guests only)		Cancun Room
8:00-5:00	Trade Show		Cancun Room
8:00-9:30	Workshop		
	"Strategic Skills for the New Economy"	The Naisbitt Group	Yucatan and Adjoining Rooms
9:30-10:00	Coffee Break		Cancun Room
10:00-12:00	Workshop		
	"Strategic Skills for the New Economy"	The Naisbitt Group	Yucatan Room
12:00-1:00	Lunch on your own		

TUESDAY AFTERNOON PROGRAM, SPECIAL MEETINGS

1:00-5:00	WAFWA Business Meeting		Tampico Room
1:00-5:00	Bureau of Land Management, Fisheries Habitat Management Team		Aztec Room
2:00-4:00	Whooping Crane Conservation Association		Marbella Room
5:00-6:00	U.S. Fish & Wildlife Service: Effects of Conservation Reserve on Wildlife--Update		Marbella Room

TUESDAY, JULY 12, CONT.

TUESDAY AFTERNOON TECHNICAL SESSIONS, WAFWA

1:00-5:00	WAFWA Current Issues (Two Concurrent Sessions)	
1:30-3:00	<u>Wildlife Habitat & Development</u> : Daniel Sutcliffe, N.M. Dept. of Game and Fish, Moderator "Montana House Bill 526: Landmark Legislation for Wildlife's Future." Arnold Olsen, Montana Dept. of Fish, Wildlife and Parks. "Meeting the Challenge - Wyoming's Wildlife Habitat Administration Program." David L. Hunt and William A. Gerhart, Wyoming Game and Fish Dept. "Challenge of Assessing Climate Change Effects on Fish and Wildlife Resources in the Western United States." R.P. Breckenridge, M.D. Otis and R.C. Rope, Idaho National Engineering Laboratory. J.G. Cornish and R.E. Trout, MultiTech Division of MSE	Santa Fe Room
	<u>Waterfowl Management</u> : Jeff Haskins, U.S. Fish & Wildlife Service, New Mexico, Moderator "North American Waterfowl Plan" Harvey Nelson, U.S. Fish and Wildlife Service "Fall Outlook and Drought Conditions in the Canadian Provinces" US Fish & Wildlife Service Representatives	Coronado Room
3:00-3:30	Coffee Break	Cancun Room
3:30-5:00	WAFWA Current Issues (Two Concurrent Sessions) <u>Fiscal Problems: The Search for Alternative Funding, and Its Effects on Staff</u> : Jude Gonzales, N.M. Dept. of Game and Fish, Moderator "The Future of Licensing Programs" Olga Carmichael, California Dept. of Fish and Game "Toward a New Funding Paradigm" Cliff Hamilton, Oregon Dept. of Fish and Wildlife "Funding for Wildlife: Do Staff Members Support Nontraditional Funding?" Sharon Cawley Morse, Washington Dept. of Wildlife	Las Cruces & Taos Rooms
	<u>Cooperation: Sikes Act and Challenge Grants</u> : Bill Zeedyke, USDA Forest Service, New Mexico, Moderator "The Sikes Act in New Mexico: A Bright Beginning" Bruce Morrison, N.M. Dept. of Game and Fish "The Wildlife and Fish Challenge Grant Program" Karl Siderits, USDA Forest Service "Wildlife Viewing Guide for Oregon" Sara Vickerman, Defenders of Wildlife	Santa Fe Room

TUESDAY, JULY 12, CONTINUED

TUESDAY AFTERNOON TECHNICAL SESSIONS, WDAFS

1:00-5:00	WDAFS Technical Sessions (Three Concurrent Sessions)	
1:30-3:00	<u>Evaluation of Riparian Management in the West</u> : Nancy MacHugh, Oregon Dept. of Fish and Wildlife, Moderator	Yucatan Room
	"Public Rangelands: Some Riparian Areas Restored, but Widespread Improvement Will Be Slow" Joe Gibbons and Jim Luckeroth, U.S. General Accounting Office	
	"Riparian Zones Grow for the Flow" Wayne Elmore, USDI Bureau of Land Management	
	"Demonstration of Excellence in Riparian Management" Don Martin, US Environmental Protection Agency	
	<u>Environmental Effects on Fisheries -- Meeting the Challenge</u> : Peter A. Bisson, Weyerhaeuser Co., Washington, Moderator	Cozumel Room
	"Impacts of Suction Dredge Mining on Anadromous Fish, Invertebrates, and Habitat in Canyon Creek, California" Thomas J. Hassler, California Cooperative Fishery Research Unit, Humboldt State University	
	"Potential Effects of Acid Rain to Wilderness Lakes and Streams on the Wind River Indian Reservation, Wyoming" Dave L. Skates, U.S. Fish and Wildlife Service	
	"Selenium Contamination in Reservoirs: Toxicology to Salmon" Steve Hamilton, National Fisheries Contaminant Research Center, U.S. Fish and Wildlife Service	
	"Summer Production of Coho Salmon Stocked in Mount St. Helens Streams from Three to Six Years Posteruption" Peter A. Bisson, Jennifer L. Nielsen, and James W. Ward, Weyerhaeuser Co., Washington	
	<u>Social and Economic Approaches to Fisheries Management</u> : Jon Gilstrom, Washington Department of Wildlife, Moderator	Las Cruces & Taos Rooms
	"The Angler as Customer: A Team Approach to Fisheries Management" Steve L. McMullin, Montana Dept. of Fish, Wildlife and Parks	
	"A Survey of Resident Game Fish Anglers in Washington" Paul Mongilla, Washington Dept. of Wildlife	
	"Economic Value of Fish in Montana" (video) Dr. Pat Graham, Montana Dept. of Fish, Wildlife and Parks	
3:00-3:30	Coffee Break	Cancun Room

WDAFS PROGRAM: CONTINUED, NEXT PAGE

TUESDAY, JULY 12, CONTINUED

TUESDAY AFTERNOON WDAFS TECHNICAL SESSIONS, CONTINUED

- 3:30-5:00 **WDAFS Technical Sessions (Three Concurrent Sessions)**
- Application of Habitat Management for Fisheries: Lou Carufel, **Coronado Room**
USDI Bureau of Land Management
"Stream Canopy and its Relationship to Salmonid Biomass in the Intermountain West"
William S. Platts and Rodger L. Nelson, USDA Forest Service
"Relationship of Trout Biomass to Changes in Habitat Type and Landtype Association"
Timothy Modde, Utah Cooperative Fish and Wildlife Research Unit, Utah State University
"Effects of Stream Alterations on Rainbow Trout in the Big Wood River, Idaho"
Russ Thurow, Idaho Dept. of Fish and Game
- SRR** The Computer Age in Fisheries Management: Stuart Leon, **Yucatan Room**
U.S. Fish and Wildlife Service, Moderator
"GAWS: A Forest Service Computer Database and Information System for National Forest Land Management Activities"
Donn Duff, USDA Forest Service, Region 4
"Use of the Instream Flow Incremental Methodology to Evaluate Influences of Microhabitat Variability on Trout Populations in Four Colorado Streams"
Ken D. Bovee, National Ecology Research Center, U.S. Fish and Wildlife Service
"RIOFISH: A Fishery Management Model for New Mexico River Systems"
Richard Cole, Frank Ward and Tim Ward, N.M. State University, and Robert Wilson, N.M. Dept. of Game and Fish
- The National Fisheries Genetics Research Plan: Dr. David Philipp, President, AFS Fish Genetics Section, Moderator **Cozumel Room**
This session is a workshop to set direction for the establishment of a National Fisheries Genetics Research Program. Based on previously solicited responses from all state and federal agencies in the Western Division and input from session participants, a list of regional research priorities and species of management concern will be developed, and various organizational scenarios to implement a National Fisheries Genetics Research Program will be discussed. A room will be available Wednesday morning for those wishing to continue this discussion. These workshops have previously been held in all other regions of the nation this year.
- 5:30-6:30 **No-host Cocktail Hour** Atrium
6:00-10:00 **Pizza Party:** Pizza, movies for children. Spouses' Hospitality Suite
6:30-10:00 **Banquet:** Entertainment by the Watermelon Mountain Jug Band (Please present name tags or tickets at door) Yucatan and Adjoining rooms

WEDNESDAY, JULY 13

7:00-8:30 Continental Breakfast (Registered Pyramid Hotel Guests Only) Cancun Room
8:00-12:00 Registration/Information Desk Rio Grande Room
8:00-12:00 Trade Show Cancun Room

WEDNESDAY MORNING TECHNICAL SESSIONS, WAFWA

8:30-10:00 WAFWA Current Issues (Two Concurrent Sessions)
8:30-10:00 Law Enforcement: Manpower Allocation & Deployment: David Roybal, Santa Fe Room
N.M. Dept. of Game and Fish, Moderator
"PASATAC - Personnel Allocation Study and Technical Application Criteria"
Gordan L. Cribbs, California Dept. of Fish and Game
"A Model for the Deployment of District Fish and Wildlife Officer Manpower in Alberta"
Michael J. Melnyk and Laverne C. Smith, Alberta Energy and Natural Resources, Fish and Wildlife Division. Presented by R.J. "Bob" Adams
Publics: Reading, Responding, Reaching: Bud Bristow, Arizona, Las Cruces & Taos Rooms
Moderator
"Responsive Management: A System for Monitoring Social Changes that Involve Wildlife Resources and Wildlife Management Agencies"
William W. Shaw, Edwin Carpenter, Stephen Kellert and Bud Bristow, University of Arizona
"Responsive Management Project: Training Modules Content and Development"
R. Ben Peyton and Roger Eberhardt, Michigan State University
"Moving into Media's Mainstream: A Strategy to Help Insure Wildlife's Place in a Changing Society"
Harry Morse, Washington Dept. of Wildlife
10:00-10:30 Coffee Break Cancun Room

WEDNESDAY MORNING TECHNICAL SESSIONS, WDAFS

8:30-10:00 WDAFS Technical Sessions (Three Concurrent Sessions)
Flow Management Strategies in the West: Richard Craven, Campbell- Yucatan Room
Craven Associates, Portland, Oregon, Moderator
"Response of Fish Populations to Altered Flows"
Jean Baldrige, Entrex, Inc., Walnut Creek, California, and Tom Studley, Pacific Gas and Electric Co., San Ramon, California
"Application of Digital Computer Aided Optimization to Fishery Flow Determination"
Lee G. Baxter, USDI Bureau of Reclamation
"Fisheries Application of SCIES in Evaluation of Hydropower Releases in Sierra Nevadan Streams"
Jeremy Pratt, John Garcia and Jeff Hager, Biosystems Analysis, Inc., Sausalito, California

WDAFS PROGRAM, CONTINUED NEXT PAGE

no mention in July-Ag

WEDNESDAY, JULY 13, CONTINUED

WEDNESDAY MORNING TECHNICAL SESSIONS, WDAFS, CONTINUED

Contributed Papers: Jerry Burton, U.S. Fish and Wildlife Service, Moderator Coronado Room

"Northern Squawfish Predation in a Columbia River Reservoir During the Seaward Juvenile Salmonid Migration--An Overview"
Steven Vigg, National Fishery Reserch Center, U.S. Fish and Wildlife Service.

red string

"Physical Habitat Used by Spikedace, Meda fulgida, in Aravaipa Creek, Arizona"

Dr. John N. Rinne, USDA Forest Service, and Erich Kroeger, Arizona State University

"Trace Element Concentration in Striped Bass from the San Joaquin Valley and the San Francisco Estuary"

Michael K. Saiki, National Fisheries Contaminant Research Center, U.S. Fish and Wildlife Service

"Progress on Development of Carbon Filters for the Removal of Malachite Green from Treated Water"

Leif L. Marking, National Fisheries Research Center, U.S. Fish and Wildlife Service

Contributed Papers: Dr. Robert H. Gray, Battelle Pacific Northwest Laboratories, Richland, Washington, Moderator Cozumel Room

"Successful Use of Antimycin for Removal of an Introduced Population of Brook Trout from Arnica Creek, a Tributary of Yellowstone Lake"

Robert Gresswell, U.S. Fish and Wildlife Service

"Adult Summer Steelhead Trout Utilization of Summer Holding Pools, Middle Fork Eel River, California"

Michael B. Ward, Humboldt State University

"Recolonization of a Small Stream by Rainbow Trout Following a Flood Event"

Thomas R. Lambert, Pacific Gas and Electric Co., San Ramon, California

"Overview of a Comprehensive Environmental Monitoring and Surveillance Program: The Role of Fish and Wildlife"

Dr. Robert H. Gray, Battelle Pacific Northwest Laboratory, Richland, Washington

10:00-10:30 Coffee Break Cancun Room

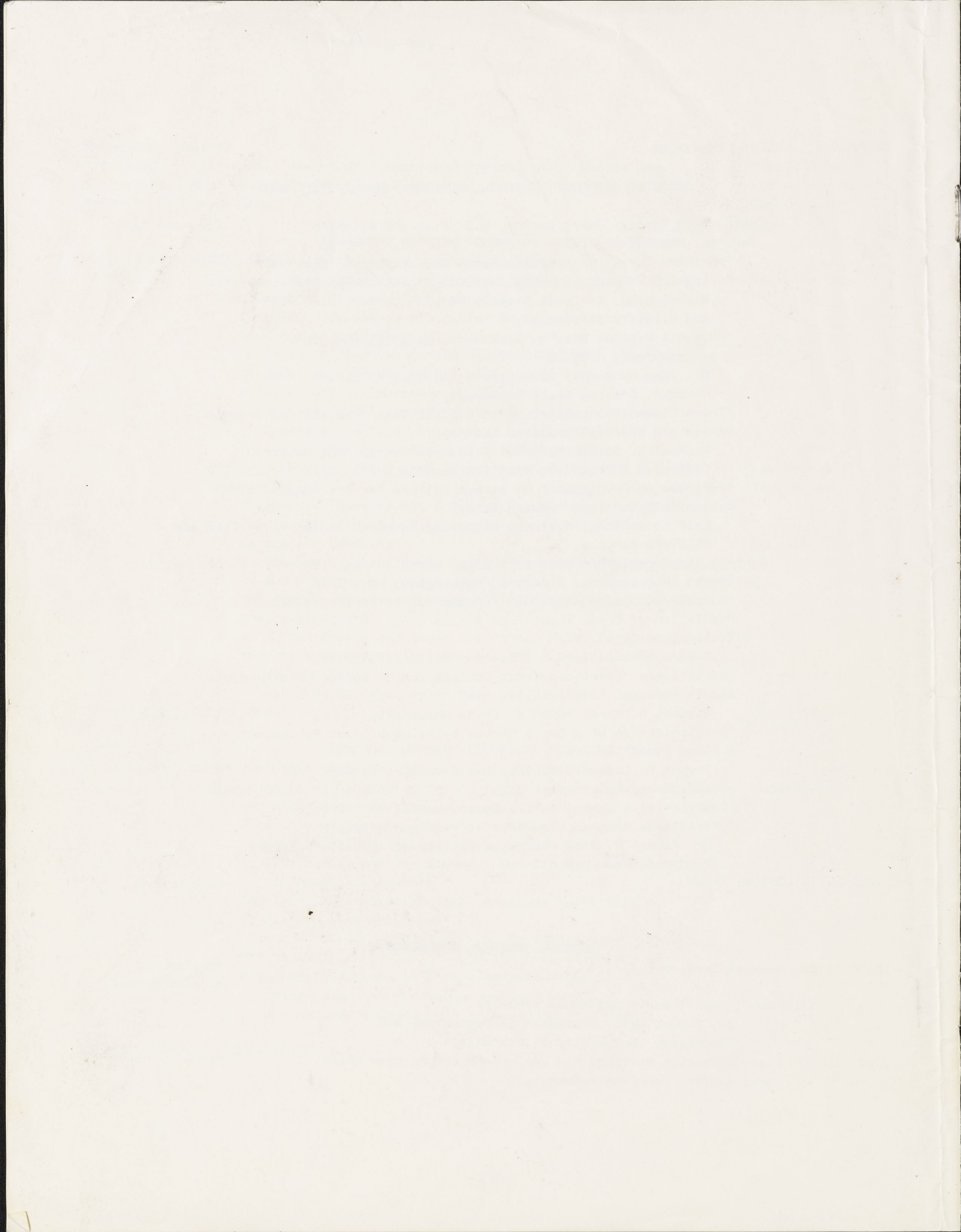
GENERAL SESSION, WAWFA/WDAFS

10:30-12:00 General Session Yucatan and Adjoining Rooms

"Why It Won't Work" (Workshop Wrap-up)

Dr. Samuel Roll, Professor of Psychology and Psychiatry, University of New Mexico

2:00-4:00 Post-Convention Meeting, New Mexico and future convention host states' representatives Marbella Room



OUTLINE FOR SUGGESTED FISHERIES-AQUATIC BIOLOGY
INFORMATION BASE COMPENDIUM FOR SALT RIVER ADJUDICATION

Robert Behnke

The major objective for the preparation of an information base is that it would serve as a ready reference for non-fishery personnel to perceive potential problems, better focus attention on real issues and concerns (separate wheat from chaff) and promote communications and better integration among various disciplines for a more unified effort.

Basically, the information package would be designed and developed to answer questions such as: what issues, concerns, and potential fishery-aquatic problems are likely to arise under various scenarios of change in the hydrologic regime in the drainage and reservoir operation? What types of studies or analyses are likely to be requested to resolve specific problems? What current methodologies are used for such studies and analyses? What are the limitations and efficacy of these methodologies for achieving desired results? That is, the information base should provide the background information necessary to keep the review and assessment process on track and not diverted into meaningless "studies" or "busy work". It should provide the basis for recognizing real from illusionary issues and concerns -- how to develop incisive questions to properly assess the quality and cost/benefits of any particular demand or proposal for "studies". For example, requests for instream flow analysis to determine flows for fisheries - habitat evaluation techniques for reservoir operation; and water quality monitoring using invertebrates or fishes.

An introductory section would consist of a brief review of the Salt River drainage and its native fish fauna. The changes that resulted in the general replacement of native fishes by non-native species would be described.

The significant species likely to raise concerns will be highlighted -- federal and state endangered and threatened species, important game species and possibly unique species such as the razorback sucker which has been reintroduced into the Salt and Verde rivers but is not officially listed as an endangered or threatened species.

Each of the "significant" species will be discussed in sufficient detail to provide information on current status and known distribution so that questions raised concerning any of these species in regards to specific areas in the drainage can be addressed and the real or illusory nature of any concerns expressed can be readily assessed.

In regards to problems and concerns related to the hydrologic regime -- water quantity, quality, timing of flows, etc. -- I would describe and discuss current methodologies for instream flow and habitat analyses and for biological monitoring. These methodologies would then be critiqued to demonstrate their limitations for successfully achieving a stated goal. This critique should help to distinguish useful from useless studies and to maximize cost/benefits and success of any studies that may be undertaken.

This outline will be distributed and discussed at our June 6 coordination meeting in Boulder and circulated to interested persons for comment and feedback to ensure that the proposed compendium will encompass all anticipated important issues.

Wetlands - new journal

SRP JULY - AUG. 88

I - good - adequate? -

> lra Economy
value of angler day?
dit method.
+ / -
gained lost

A7S meeting Sept. Toronto
session "Mathematical modeling in fisheries management: a tool of Transdisciplinary science"
Organized by E. A. Engwiler, Sci. & Technol. - EPRI

Classification and inventory of Great Lakes Aquatic habitat

"Fish habitat management - the need for a multidisciplinary approach"

West. A. Z. S.

ZWS - So, Platte - more intensive studies
re. depth, velocity, pref. = high, mid, low flow
re. # of IFM
of other rivers
Transferable? ?
between - within comparison

Regulated Streams 1987

John Z. Craig & J. Bryan Kemper (eds.)

T. A. Z. S. 88 - 116(6): 839-50
117(1): 22-28

McCormick reviews - ecology - methodology - sci. method.

Fishery & Wildlife Biology
15A Wager
CAMPUS MAIL

Thinking - 1. Holistic - systems understanding
2. Reductionist - limited view - focus
- repeat
- not done

17(8)

AVAILABLE GRANTS & CONTRACTS (cont.)

x + stream fish
comm. - book
if cot + dried?
why?

* Marine Mammal Su
tional Oceanic and Atmo
U.S. and foreign resear
Bering Sea. Survey per
curement Division, WC:
98115, Attn: Karen Br
proposals due May 16.

Doc
Thought you
Dr. Bergerson, or
Dr. Fausch might
be interested

biologists are sought by the Na-
to conduct sighting surveys on
s in the North Pacific Ocean and
our months. Contact: NOAA, Pro-
N.E., BIN C15700, Seattle, WA
Reference: Sol. 52BNF800104,

* California Sportfish. A 12-month economic survey of recreational salt-
water sportfishing participation in Southern California is needed by National
Oceanic and Atmospheric Administration. The survey is to be conducted in Los
Angeles, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa
Barbara and Ventura Counties. For solicitation copy, contact: NOAA, Procure-
ment Division, WC32, 7600 Sand Point Way, N.E., BIN C15700, Seattle, WA 98115,
Attn: Rosemary Trott, (206) 256-6380. Reference: Sol. 52ABNF800100,
proposals due May 24.

forgot
to mention
in May-June

* Trout in Arizona. U.S. Forest Service is seeking research to: (1) esti-
mate the density and biomass of wild trout populations in mountain streams in
Arizona and New Mexico; (2) estimate selected physical habitat factors of the
streams; (3) compare habitat to density and biomass of trout; and (4) delineate
what factors are most important for regulation of wild trout populations. For
solicitation copy, contact: U.S. Agriculture Department, USFS, Rocky Mountain
Experiment Station, 240 W. Prospect, Ft. Collins, CO 80526-2098, Attn: Susan
M. Janzen, Contracting Officer, (303) 224-1170. Reference: RFP 28-K8-458, bid
opening May 30.

* Population Biology. Proposals for research on ecological and evolution-
ary factors responsible for shaping adaptive responses of organisms to their
environment should be submitted to National Science Foundation by June 15. For
application guidelines and more information, contact: Martyn Caldwell, Divi-
sion of Biotic Systems and Resources, NSF, 1800 G St., N.W., Rm. 215,
Washington, DC 20550, (202) 357-9723.

* Benefit/Cost Analyses. Benefit/cost and risk analyses from the perspec-
tive of both humans and the environment are needed by U.S. Environmental Pro-
tection Agency. Possible program areas of interest include: (1) control of
fugitive air emissions; (2) effluent guidelines and pretreatment standards; (3)
marine, estuarine and ocean programs; (4) multimedia analysis, hazardous waste,
and/or solid waste; and (5) the tradeoff between human health and environmental
degradation. Performance period will be two years, with three additional one-
year options. Offerors should have background in both economic analysis and
statistics.

For solicitation copy, write: EPA, Contracts Management Division, Cincin-
nati, OH 45268, Attn: James M. Bzdusek. For more information only, call (513)
569-7867. Reference: RFP C8W402B1.

* * *

PENNSYLVANIA STATE UNIVERSITY, University Park, has received \$259,626 from U.S.
Army to study naturally derived microcosms for estimating stress effects in
aquatic ecosystems.

Thinking - 1. Holistic - systems understanding
2. Reductionist - limited only forms

17(8)

AVAILABLE GRANTS & CONTRACTS (cont.)

x + stream fish
comm. - book
if cut dried?
why?

* Marine Mammal Surveys. Marine mammal biologists are sought by the National Oceanic and Atmospheric Administration to conduct sighting surveys on U.S. and foreign research and commercial vessels in the North Pacific Ocean and Bering Sea. Survey periods may extend up to four months. Contact: NOAA, Procurement Division, WC33, 7600 Sand Point Way, N.E., BIN C15700, Seattle, WA 98115, Attn: Karen Bruce, (206) 526-6262. Reference: Sol. 52BNF800104, proposals due May 16.

* California Sportfish. A 12-month economic survey of recreational salt-water sportfishing participation in Southern California is needed by National Oceanic and Atmospheric Administration. The survey is to be conducted in Los Angeles, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara and Ventura Counties. For solicitation copy, contact: NOAA, Procurement Division, WC32, 7600 Sand Point Way, N.E., BIN C15700, Seattle, WA 98115, Attn: Rosemary Trott, (206) 256-6380. Reference: Sol. 52ABNF800100, proposals due May 24.

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* Population Biology. Proposals for research on ecological and evolutionary factors responsible for shaping adaptive responses of organisms to their environment should be submitted to National Science Foundation by June 15. For application guidelines and more information, contact: Martyn Caldwell, Division of Biotic Systems and Resources, NSF, 1800 G St., N.W., Rm. 215, Washington, DC 20550, (202) 357-9723.

* Benefit/Cost Analyses. Benefit/cost and risk analyses from the perspective of both humans and the environment are needed by U.S. Environmental Protection Agency. Possible program areas of interest include: (1) control of fugitive air emissions; (2) effluent guidelines and pretreatment standards; (3) marine, estuarine and ocean programs; (4) multimedia analysis, hazardous waste, and/or solid waste; and (5) the tradeoff between human health and environmental degradation. Performance period will be two years, with three additional one-year options. Offerors should have background in both economic analysis and statistics.

For solicitation copy, write: EPA, Contracts Management Division, Cincinnati, OH 45268, Attn: James M. Bzdusek. For more information only, call (513) 569-7867. Reference: RFP C8W402B1.

* * *

PENNSYLVANIA STATE UNIVERSITY, University Park, has received \$259,626 from U.S. Army to study naturally derived microcosms for estimating stress effects in aquatic ecosystems.

Matthews, W. J., and D. C. Heins^(eds.), 1987.
Community and evolutionary ecology of
North American stream fishes. Univ.
Okla. Press. Contains 32 papers on
communities ecology (predator-prey,
competition, habitat, flow, etc.) of stream
fishes, including paper on Arizona fishes
by Munkley and Meffe. A useful reference
for instream flow considerations.



May 16, 1988

SALT RIVER PROJECT

POST OFFICE BOX 52025
PHOENIX, ARIZONA
85072-2025
(602) 236-5900

Robert J. Behnke, Phd.
3429 East Prospect Road
For Collins, Colorado

SUBJECT: Gila River Adjudications

Dear Dr. Behnke:

Pursuant to Article VII, Compensation, of our Agreement for Consulting Services with you, Attachment B, entitled RATE SCHEDULE, should be updated annually. I would like to coordinate that update with our fiscal year and the TAD process. Therefore, please provide me with an updated rate schedule for the period of May 1988 through April 1989, reflecting the fee schedules shown in your TADs for this period.

Please submit these revised rates to:

Salt River Project
P.O. Box 52025
Phoenix, Arizona 85072-2025

ATTN: R. V. Comeau
53 Street, Bldg. B

If you have any questions, please call Rick (236-2086).

Sincerely yours,

William L. Warskow

William L. Warskow, Coordinator
Little Colorado and Gila River
Basin Water Rights Adjudications

dg

xc: D. Hawkins
B. Lewis
R. Silverman



SALT RIVER PROJECT

POST OFFICE BOX 52025
PHOENIX, ARIZONA
85072-2025
(602) 236-5900

May 16, 1988

Robert J. Behnke, Phd.
3429 East Prospect Road
Fort Collins, Colorado

Dear Dr. Behnke:

A review of our files indicates that we do not have a current copy of your certificate of insurance. Please submit a copy of same to:

Salt River Project
P.O. Box 52025
Phoenix, Arizona 85072-2025

ATTN: R. V. Comeau
53 Street, Bldg. B

Sincerely yours,

William L. Warskow

William L. Warskow, Coordinator
Little Colorado and Gila River
Basin Water Rights Adjudications

dg

xc: D. Hawkins
B. Lewis
R. Silverman



SALT RIVER PROJECT

POST OFFICE BOX 52025
PHOENIX, ARIZONA
85072-2025
(602) 236-5900

June 8, 1988

Mr. Robert J. Behnke, Ph.D.
3429 East Prospect Road
Fort Collins, Colorado 80525

Dear Dr. Behnke:

Your memory regarding the matter of insurance parallels mine. The problem with a "form" letter like the one I sent out is that it does not cover special situations such as yours.

I still want to complete an analyses of current coverage held by all of our consultants. In your case, the simplest way to do that would be for your to send me a Xerox copy of your general liability and automobile policies. After reviewing them, we can decide whether to amend your contract as you suggested, to look at other alternatives, or to leave things "as is." Whatever we do, it is not my intent to create unnecessary burdens for you or to unnecessarily and uselessly improve the financial well being of the insurance industry.

Thank you for the copy of Article VIII from your contract with Crowell and Moring. We will evaluate it as a possible creative solution.

In closing, I want to make sure there has been no misunderstanding regarding our requirements for what some people call "professional liability" or "errors and omissions" insurance. As you may remember, previous difficulties in finding underwriters that even covered the type of work some of you are doing led us to specifically exclude such coverage from our contract's insurance coverage requirements.

This matter of insurance can be frustrating to each of us. If you have any questions or want to discuss the matter further, please give me a call.

Sincerely yours,

William L. Warskow

William L. Warskow
Coordinator, Little Colorado
and Gila River Basin Water
Rights Adjudications

njs
xc: R. Comeau

Steedman, R.J. Modification and assessment of an index of biotic integrity to quantify stream quality in southern Ontario.

Hydro Review -- reviews current ^{problem} ~~fisher~~ ^{or} ~~problem~~ ^{the paper}
- criticism EPRI (instrument for index)

well organized
lobby
or perspective
common well kept

Gore, J.A. and J.M. Nestler 1988. Instream flow study in perspective. Reg. Riv. 2(2): 93-101.

J. Ariz - Nev. Acad. Sci. 23:15-16
23:1-20
"The implied relationship between WUA and fish biomass is the most serious misconception of the IFIM procedure" - ^{change = IFIM studies} prediction biomass for WUA exceeds

Green 1974
expect
reality
WUA = biomass
based on
control
if not
what
good

the current state of the art" - main purpose is to simulate changes in habitat w/ flow changes, not ecological interactions. - Doesn't detract from IFIM as tool to resolve water resource issues; but users must be aware of inherent strengths and weaknesses.
- Where misconception arise?

- perspective

- Bovee, K.P. 1978. The incremental method of assessing habitat potential for coolwater species, with management implications. Pages 340-46. In: R.L. Kendall (ed.). Selected coolwater fisheries of N.A. - A.F.S. Spec. Pub. 11.

"Although the incremental method was designed primarily to assess changes in standing crop (biomass) and species composition due to changes in flow regime, several other applications of the method have been identified."



Conflicting Needs

We live in a world of growing human populations with ever-expanding needs for food, shelter, water, and space. Yet we also are increasingly aware of how much we need and value wild places and the creatures that inhabit them. How do we satisfy our needs and share the land's limited resources with its wild inhabitants?

This is the monumental task of resource managers. To meet this challenge, they need ways to rapidly gather and analyze the mountains of resource information needed to make decisions in the best public interest.

Rapid Assessment Methods —What Are They?

One new way to gather and analyze resource information is called Rapid Assessment Methods, or RAM. This process was developed in response to managers' needs by the Western Energy and Land Use Team of the U.S. Fish and Wildlife Service. The RAM process is a general purpose land use planning tool that increases the manager's capacity to evaluate land for its value to fish and wildlife. RAM is designed for regional application to all wildlife species. It is "Rapid" because it uses computers and remote sensing to add to existing field data, completing a resource information base that managers can access and analyze quickly and repetitively.

The RAM process helps managers screen large tracts of land for valuable wildlife areas and suitable sites for resource development. This screening can be based on legal, socio-economic, ecological, and other factors. Knowledge of appropriate sites for each land use helps managers respond quickly to project proposals. Delays can be reduced in developing needed resources at less impact on the environment.

How Can RAM Help?

Rapid Assessment Methods have broad potential applications. They were designed to assist the Fish and Wildlife Service in recommending sites for surface coal mines in the West. But RAM is flexible—it can help us plan reclamation, grazing, habitat management, recreation, water projects, or timber harvests. Its most promising application is for developing and comparing alternatives in long-term, regional planning for multiple resource use. RAM can be used to show cumulative impacts of all projects in a region, a factor often difficult to assess. The manager receives complete, factual data for timely input to decisions, and documentation for those decisions.

What's involved in adopting RAM? The managers select sets of methods they can afford to apply through their own planning processes; RAM is not a planning process itself. Ideally, managers can apply the methods that automatically gather new, uniform data over the entire area, thereby minimizing expense and manpower needs for field inventories. But RAM also allows managers to use the data they already have, even if incomplete. RAM is a complex system, and requires an investment of effort, time and money. But it maximizes return on the investment, by helping managers provide for the nation's multiple needs while maintaining environmental quality.



Methods

The managers begin by developing a plan of action to tailor the RAM capability to their specific information needs. They analyze the problem, spell out data needs, and select the most efficient RAM tools to use.

Data collection tools:

- **Remote sensing**, through aerial photographs, gathers uniform data over large regions or specific sites.
- **Computerized mapping** helps technicians interpret remote sensing data and produces vegetation and land use maps. Field workers check maps and gather additional data on wildlife.
- **Computerized data bases**, such as the Plant Information Network, compile and store existing data from scientific literature, maps and organizations.

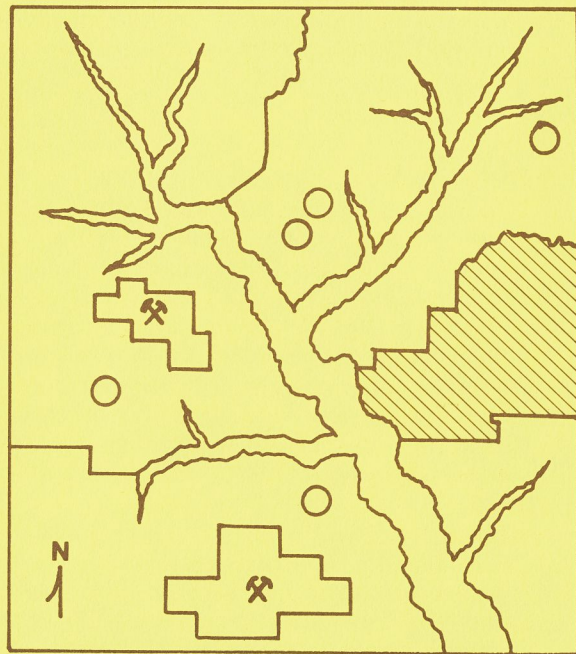
Data management tools: provide ways to rapidly enter, sort, store and retrieve data and maps.

Data analysis tools:

- **Statistical descriptions** of mapped resources measure areas, lengths, distances and percentages. Quantities, like meters of edge between sagebrush and pine forest or hectares of grassland, can be measured by computer and displayed in tables and graphs.
- **Composite map overlays** combine selected features, such as proposed highways and deer winter range, to create new maps automatically. These predict possible conflict areas.
- **Ranking by criteria** involves computer analysis of areas for specified features, such as proximity to a dam site. Such areas can be ranked by expected level of impact from potential projects.

Products

- **Maps**
 - numerous features, such as vegetation, soils, land use, water, and wildlife habitat
 - composites of several overlaid features
 - computer terminal display for paper copy
 - color or black and white
 - legends and symbols
 - selection of scales
 - accurate to USGS standards
- **Graphs**
 - map or data analyses
 - bar, histogram, or line
- **Tables**
 - data displays in numerous formats
 - comparisons of alternative resource uses
- **Text and Lists**
 - resource data base information, such as plants and animals found in a given area
- **Computed indices**
 - quantified indicators of wildlife habitat value, diversity or scarcity, vegetative interspersion, or potential project impacts
 - ranking of areas with these indices



Rapid Assessment Methods are a collection of tools that compose a new technological process for evaluating land for wildlife habitat and other land uses. The process provides better, more timely resource information. It helps us identify and preserve prime habitats that support valuable wildlife as well as designate sites for needed resource development.

For More Information

Contact the Team Leader, Western Energy and Land Use Team, (303) 226-9100 or FTS: 323-5100 for:

- **Slide-tape program**—
15 minutes, synchronized, accompanied by detailed information booklet; introduction to RAM concepts and applications
- **Demonstration**—
one day workshop by WELUT staff
- **RAM Demonstration Proceedings**—
91 pages, details of Methods and current applications

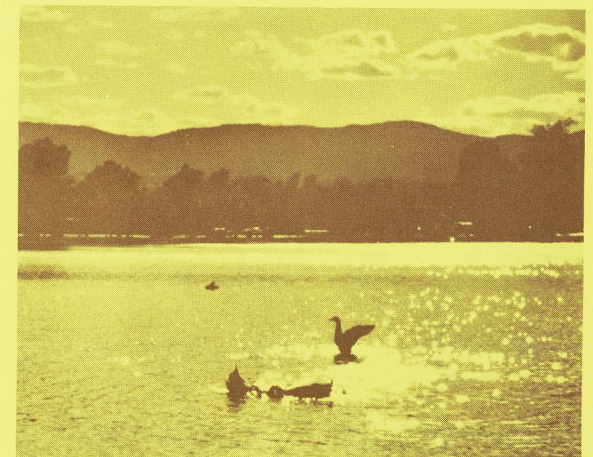
Western Energy and Land Use Team
U.S. Fish and Wildlife Service
Creekside Building One
2625 Redwing Road
Fort Collins, Colorado 80526



For sale by the Superintendent of Documents, U.S. Government
Printing Office, Washington, D.C. 20402

Rapid Assessment Methods

— for wildlife and
land use planning

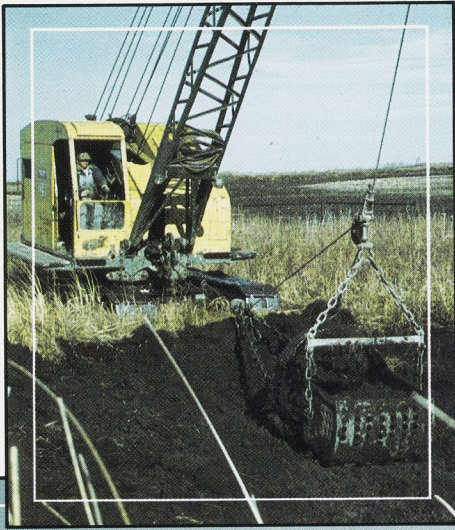


Have you ever been here?

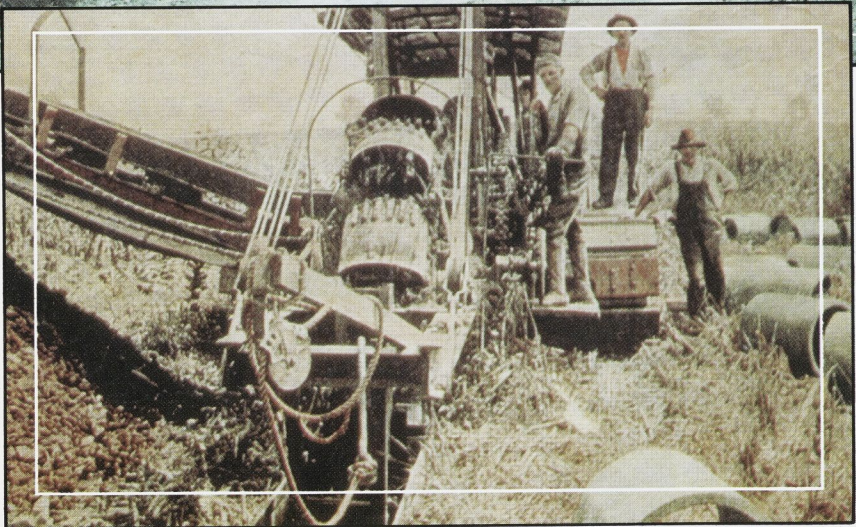


...or
here?

There is an alternative...

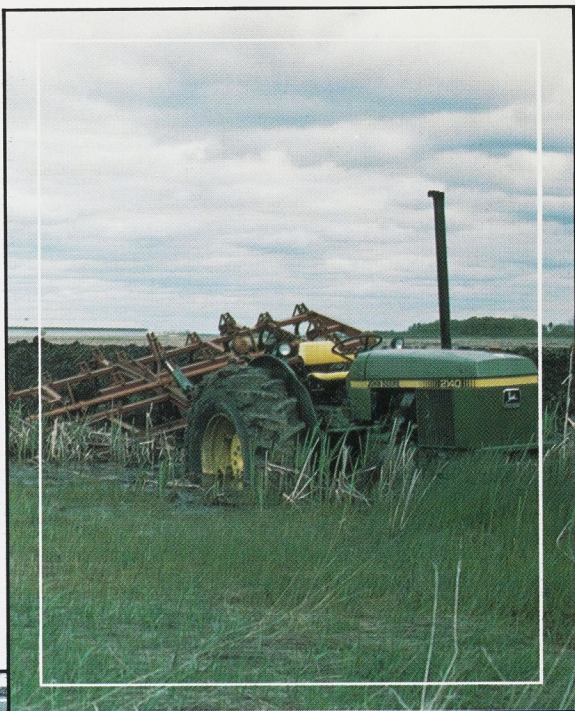


Over the years we have converted millions of acres of wetlands to cropland. Some of this drainage paid off and some did not. Many of the failed wetland drainage projects are best managed today by returning water to the empty wetlands. You cannot afford the continued risk to farm capital that comes from farming low, wet ground which is likely to drown out. The farm budget cannot stand the strain.



Where wetland drainage has not been effective, farming attempts are expensive...

If crops grown in drained wetlands flood-out one year in ten, profit is lost for all ten years.



A farm, like any other business, operates best when the losing parts are removed. Restoring hard to farm drained wetlands to conservation uses eliminates risks of farming these marginal lands.

Many
use of
poses.



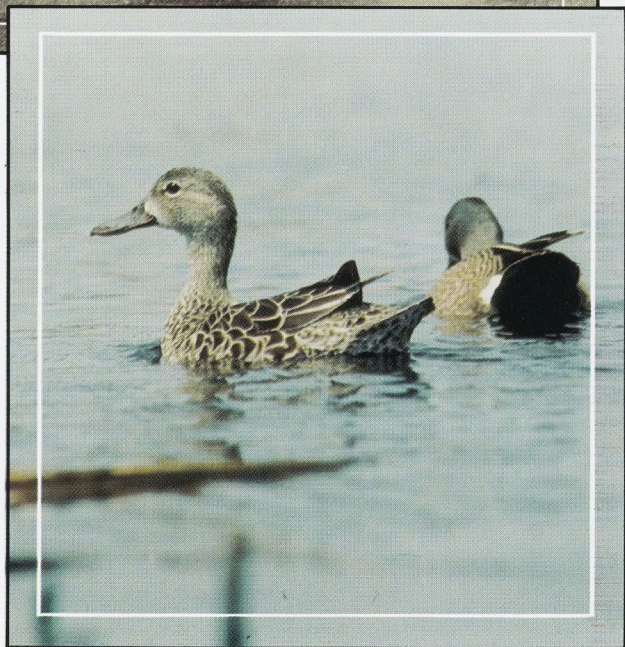
ny drained wetlands are too wet to farm efficiently. A better
of this land is to put water back on it for conservation pur-
es.

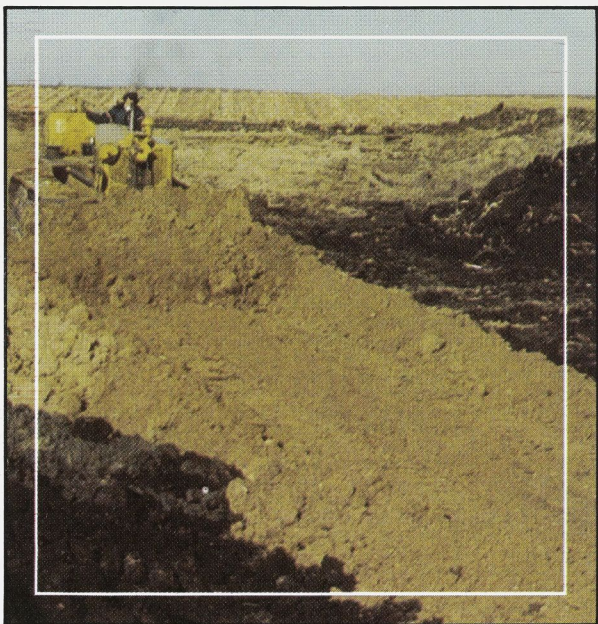
Drained wetlands, when restored, usually come back quickly.
Last years corn stalks stand in the water next to beneficial
aquatic plants.





Restoring drained
wetlands is good for
wildlife and helps keep
the raindrop where it
falls and run-off where
it belongs.





The same tools used to drain a wetland are used to restore it. Costs to restore a wetland are usually less than \$100.00 per acre. Financial help is available, and is as close as your telephone.





Wetland restoration is an opportunity for today. A landowner is only a phone call away from people who know the business of restoring wetlands and want to help.

Call the number nearest you. This call will start you out with the right information.

- MO (314) 875-5374
- IL (618) 997-5491
- IN (812) 334-4261
- OH (614) 469-6923
- MN (612) 253-4682
- IA (309) 793-5800
- WI (608) 264-5469
- MI (517) 337-6652



A Publication of the
U.S. Fish and Wildlife Service and
the NDSU Extension Service

Instream Flow Chronicle

A Training Announcement

June, 1988

Vol. V, No. 2

Conference Services

Technical Assistance Throughout North Carolina's Approach to Recommending Instream Flows

by
Steven E. Reed
and
James S. Mead¹

North Carolina has over 37,000 miles of rivers and streams. The State contains a variety of flowing water, from the whitewater streams of the Appalachian Mountains, to the broad turbid rivers of the Piedmont, to meandering blackwater streams of the Coastal Plain.

The State also has a variety of problems related to instream flow. Some hydroelectric projects located in the mountains divert water around miles of former trout streams without any minimum release. Numerous old mill dams in the Piedmont are being retrofitted for hydropower production. Many of these projects include diversions from the natural stream channel with some planned as run-of-river and others as peaking projects. Municipal water supply reservoirs create problems when little if any water is released downstream during dry periods. Many cities withdraw water directly from unimpounded streams. New wastewater treatment plants are being planned for small streams where the plant's discharge would be greater than the mean annual flow of the receiving stream. Instream flow recommendations are needed to reduce the impacts to instream uses by these and other types of water resource development projects.

The Division of Water Resources (DWR) has been involved in instream flow studies since 1977. We have conducted over 50 Wetted Perimeter studies and have been involved in 24 studies utilizing the Instream Flow Incremental Methodology (IFIM). Many other instream flow recommendations have been made using "desktop" techniques.

One strong point of instream flow protection efforts in North Carolina is the close coordination and cooperation between DWR, the North Carolina Wildlife Resources Commission (WRC), and the U.S. Fish and Wildlife Service (USFWS). These three key agencies work together on all aspects of instream flow problems. The DWR's approach to instream flow problems is involvement from start to finish. The first step in our process is for DWR to conduct a field visit to the site, either alone or with representatives of the WRC and USFWS if they will be involved in making the instream flow recommendations.

This field visit allows us to determine the magnitude of the instream flow program and the value of the resource to be protected. The agencies involved agree on an appropriate method to be used in developing the recommended flow regime.

There are a number of different methods to use to quantify instream flow needs. We consider a number of factors when determining which method to use in making a flow recommendation, including: value of the resource, magnitude of the potential impact, types of effects on the stream, and time frame and resources available.

For projects with impacts of small magnitude (e.g., a 200-ft diversion) or when a decision must be made quickly, we conduct an initial field investigation and use a desktop method to develop the flow recommendation. The project developer always has the option to not accept the desktop recommendation, but rather to conduct a site-specific study; and, in fact, is strongly encouraged to do so by the agencies.

Field methods are used when project impacts are of larger magnitude (e.g., thousands of feet of diversion or peaking hydroelectric projects), and time and resources are available to produce a more refined, site-specific flow recommendation. The field methods utilized include: Wetted Perimeter, regression model, Incremental Wetted Surface Area, and the Instream Flow Incremental Methodology.

The development of the study plan is usually the responsibility of DWR, with concurrence from the other two agencies and/or consultants. This plan defines the methodology to be employed, the number and location of study sites, the party responsible for each work element, and product deadlines.

Some instream flow problems are addressed by studies conducted completely in-house by DWR. The WRC may be involved directly in these studies or may be contacted for biological data or review of recommendations. Such in-house instream flow studies are most frequently conducted as part of DWR river basin planning activities, county water supply studies, or at the request of local governments.

Other instream flow studies are conducted by private consultants. The agencies do not have adequate resources to conduct detailed field studies on every project that may impact instream flow. A project developer may be requested to have an instream flow study conducted if the agencies feel that the project impacts are of significant magnitude. The project developer may also decide to conduct a study in lieu of accepting the agencies' desktop recommendation.

We have had a variety of experiences working with consultants on different types of instream flow studies. One consultant came prepared to survey and tie the cross-sections for an IFIM study with a hand

¹Aquatic Ecology Branch, Division of Water Resources, North Carolina Department of Natural Resources and Community Development, Raleigh, NC 27611.

level; another felt that ten verticals was more than adequate for a riffle transect in trout water; and a third used a sophisticated substrate code with the most frequent entry being "rocks." Based on this and similar experiences, the agencies now insist that the project developer hire only consultants trained in the methodology to be employed. We expect consultants conducting IFIM studies in North Carolina to have taken IF 200, 205, 210, and 215. Those involved in the modeling as well as data collection should receive this training or work under the supervision of a trained person.

The DWR has developed guidelines and procedures for working with consultants in conducting instream flow studies. These are specific for a given instream flow method and are provided to potential consultants by DWR.

The three agencies jointly select the study site, map the habitat in the impacted reach, and select multiple transects for each major habitat type. The developer and/or consultant are invited to participate in this phase of the study and do so in many cases. At least one representative from one of the three agencies is present at the study site during actual field data collection. This person serves as the "rod man" for transect surveying and therefore selects all of the verticals for each transect. Substrate/cover data collection is conducted by this agency person during the survey. If at all possible, an agency staff member will remain at the site for the remainder of the data collection. This hands-on involvement assumes good quality control during field data collection.

The WRC and USFWS are responsible for determining which fish species will be evaluated by an IFIM study. All three agencies review the available biological data and any habitat suitability indices (HSI) proposed by the consultant. The HSI's used in modeling must be approved by the three agencies.

When an IFIM study is being conducted, the DWR specifies the range of discharges to be measured and at which flow to collect velocity data. The consultant or agency personnel take photographs of all transects at each measured flow. Staff from DWR have taken the full range of IF courses, including 200-215, 310, 402, and 403, so we could take the lead in reviewing the modeling portions of studies conducted by others. Specific intermediate model products are requested from consultants to allow us to evaluate the quality of the calibration.

DWR determines the baseline flow record and performs times series analyses independently, using the flow vs. habitat relationship (Tape 8 or ZHAQF) provided by the consultant. The DWR has the primary responsibility for data analysis and interpretation. All three agencies review the results and jointly develop a consensus for the initial recommended flow regime. The agencies meet with the project developer and consultants one or more times to negotiate the recommended flow from the project.

We try to ensure good quality control for instream flow studies through agency involvement from start to finish. This process has, in most cases, resulted in agreement on all parts of the study, except the final interpretation of results. The resource investment by DWR and the other agencies produces high quality studies that all parties feel comfortable using in decision-making.

We are constantly attempting to improve the process. In the future, the agencies and consultants will agree on HSI's for species of interest prior to beginning field work. There is always a need to more clearly specify the objectives of the study in the work plan. We will be putting more effort into explaining to the consultant the types of time series analyses DWR will be conducting and the criteria to be used in developing the recommended flow regime. The question that we and others are currently trying to address is "What is a significant loss of habitat?" How much habitat can occur in a stream reach without impacting the fish population? We welcome your comments.

Microcomputer Corner

by
John Bartholow

Over the course of the last year, the Aquatic Systems Modeling Section has released several software products for microcomputers. Though there have been some rough edges, on the whole recipients have been pleased and the software seems to be doing the job. In fact, demand for materials has been so great that we can no longer support the manpower required to fill requests in a timely fashion. We have chosen to turn the tasks of software distribution over to the same government contractor we have been using to distribute magnetic tapes, effective immediately. They have a history of prompt response.

The catch is that there will now be a fee for the floppy disks and copying. Therefore, we will be bundling software in larger groups to reduce the per disk cost. Each set of disks may cost up to about \$100, depending on the number of diskettes copied. Costs may be reduced by ordering several sets at one time. As we continue to convert mainframe software to micros, the number of disks in each group (e.g., PHABSIM) will grow, so the cost may change slightly; there will no longer be a requirement to send preformatted diskettes. Please contact TGS Technology, P.O. Box 9076, Fort Collins, CO 80525, (303) 226-6183, to make arrangements for copies to be sent to you.

All of these programs are to be used on IBM-compatible microcomputers running MS-DOS or PC-DOS 2.x or later with at least 256K. Some programs may have additional requirements, such as DOS version 3, more memory or hard disk storage, 640 x 200 graphics, or math coprocessor. Changes to program organization and program names may be made in later versions. Please write the Aquatic Systems Branch for more detailed information on hardware and software requirements.

Groups currently available are:

Curve Maintenance Programs & Documentation

Includes RCKCRV, RCRV2LOT, REXCRVS, RGCURV, LPTCRV, RLSTH. (These will be included with PHABSIM when it is released in October.) Cost \$38.50.

IFG4 Related - Various Programs & Documentation

Includes RCKI4, RREVI4, RSL0P34, RLPTTHWE, RIFG4IN. (Will be included with PHABSIM in October.) Cost \$46.00.

Legal Institutional Analysis Model (LIAM) & Documentation

Includes MENU, QUERY, MAPUM, LOOKY. Cost \$31.00.

Temperature Models - Stream Network and Stream Segment Models & Documentation

Includes SNTMP (7 PROGRAMS), SHADE, SSTEMP, SRSHD, SRSOLAR. Cost \$31.00.

Time Series Library - TSLIB (V1) & Documentation

Includes RQIN, RMKHAQF, RDQIN, RAVDQHD, RMTSLST, RDAYFY, RQNAME, RHABTS, RHABTD, RGET1, RSELMTS, RCOMBHA, RTSMULT, RCHGFMT, RLPTTSN, RLPTDUR, RLPTDURA, RANNTS, RLPTDAN, RLSTDAYQ. Cost \$61.00.

Utilities - Useful Things for Running Our Programs

Includes CO, DOSEEDIT, KILL, LIST, MEMORY, RED, RUNTIME, SETUP, SD, TREED, WED, WHEREIS. Cost \$38.50.

WATSTORE Use Package & Documentation

Includes several retrieval programs and a shareware communications program (PC-TALK). Cost \$46.00.

Expected by October 1, 1988, will be:

Physical Habitat Simulation System - PHABSIM

Includes RIFG4IN, RIFG4, RWSP, RMANSQ, RWSEI4S, RADDDBEND, RAVDEPTH, RCHSTA4, RCKI4, RCWSPN, RENTSSD, RCOMHAQF, RCRVFIL, RHABINM, RHABINS, RHABINV, RHABSUM, RHABTAM, RHABTAT, RHABTAV, RADDCCV, RCKI4XT, RCMPTP13, RCMPSWL, RDELWSL, RHABSP, RHABOUTA, RI4TMSQ, RI4TEXT, RI4TWSL, RI4VAF, RLDIR, RLPHTAQF, RLSTTP3, RLSTTP4, RLSTVD, RMAK1VL, RMODN, RMODQARD, RSTGGSY, RSTRIPC, RSUBMOD, RSUBMODC, RWSEI4, RWSEI4H. Cost unknown.

Additional Time Series Programs - TSLIV (V2)

Includes RSCORTS, RHABT, RANEQTS, RLPTQM, RLPTQHA, RADJANI, RASANH, RASANH2, RMKEHD, RMKEHD2, REFFHAB, REFFHAB2. Cost unknown.

Instream Flow Training

IF 100 Introductory Workshop on IFIM

August 16-17, 1988 Albuquerque, New Mexico

This 16-hour workshop is designed for those who need a conceptual introduction to instream issues and the Instream Flow Incremental Methodology (IFIM) but do not plan to become proficient in use of the methodology. Topics include explanation of several methods, matching appropriate methods with water problems, proper role of the IFIM in water management decision-making, introduction to negotiations and appropriate considerations in applying instream flow technologies. The workshop is recommended for agency personnel in initial stages of evaluating potential use of IFIM. Class size: 20 minimum. Tuition: \$150.

IF 205 Field Techniques for Stream Habitat Analysis

August 8-12, 1988 Fort Collins, Colorado
September 12-16, 1988 Leetown, West Virginia

This 36-hour course provides training in field measurement techniques for collecting data required for use in the Physical Habitat Simulation System (PHABSIM) component of the Instream Flow Incremental Methodology (IFIM). Taught by experienced prac-

tioners of the IFIM, the course includes both classroom and field application. The course is designed for project leaders and others primarily responsible for collecting or reviewing field measurements. NOTE: Introductory concepts, project scoping, river segmentation, study reach and site selection, and the uses of IFIM are covered in IF 200. IF 205 concentrates on defining the bounds of study sites; locating transects for measurement of hydraulic and habitat variables; and data collection. The course includes: (1) conceptual linkages among field data, species criteria, hydrology, and hydraulic simulation within the PHABSIM system model, (2) field data needs, differences, compatibilities, and compliments of the various hydraulic models, (3) the basic concepts and training in locating and establishing single and multiple transect study sites, (4) the concepts of the field measurement process and training in the use of surveying and flow measurement instruments, (5) training in use of cover and substrate codes, (6) training in collecting data and compiling a complete set of field notes by measuring a multiple-cross-section stream reach, and (7) training in organizing, checking, and reducing field data for processing through the PHABSIM and temperature models. Materials provided include a field technique manual and numerous handouts. Prerequisite for this course: IF 200. Class size: 24 maximum. Tuition: \$425.

IF 210 Using the Computer Based Physical Habitat Simulation System (PHABSIM)

October 24-28, 1988 Fort Collins, Colorado

This 40-hour course provides "hands-on" training in use of the library of computer programs in the PHABSIM system. Activities are divided between morning lecture sessions and supervised afternoon exercises on the computer. This course is intended for: (1) persons responsible for processing field data through PHABSIM models; (2) project leaders and others primarily responsible for the field measurements required of a complete stream habitat analysis; and (3) those responsible for quality control, or those directly or indirectly responsible for analyzing, interpreting, and defending the results of a study. Introductory concepts and use of IFIM are not covered. Materials provided include the user's documentation to the PHABSIM system, a detailed problem example, and a primer on computer usage. Each class is limited to 20 students who are divided into groups to give everyone working experience with the computer. No prior computer experience is necessary. Prerequisite: IFG 200. Tuition: \$500.

IF 215 Problem Solving with the Instream Flow Incremental Methodology (IFIM)

Oct. 31-Nov. 4, 1988 Fort Collins, Colorado

This 40-hour course completes the series for those persons wishing to receive training in the full spectrum of the use of IFIM. Opportunities are provided for performing complete problem analyses using the tools of IFIM which have been learned in preliminary courses (specifically, this includes building on the skills of scoping, field data collection, computer analysis, and negotiation). The course revolves around the three primary uses of IFIM: (1) developing flow targets and windows; (2) project impact analysis; and (3) negotiated operating rules for water management projects. A variety of problem solving techniques related to water management and fisheries biology are presented. New concepts are introduced by lecture and reinforced by a structured problem and follow-up discussion.

Subjects include: problem identification; strategy-building using IFIM; interpretation of IFIM results; documentation of logic and assumptions; and the preparation and evaluation of data for recommendations and negotiations. The course is recommended for project leaders and others who are responsible for providing reports and recommendations resulting from application of IFIM. It is suggested that IF 310 be taken before IF 215. Class size: 30 maximum. Prerequisite: IF 200. Tuition: \$400.

IF 300 Water Law Short Course
November 16-17, 1988 Denver, Colorado

This course has been offered since 1977 as a general introduction to water law. In 1988 the course will continue to offer an overview of water law, but the focus will be on Section 404 of the Clean Water Act. The purpose of this course is to present Section 404 as a growing influence on water allocation law and to explore its ramifications for the future development of water allocation law and policy. The objective is to give personnel in federal, state, and local natural resource agencies the knowledge and perspective to enhance their work performance. Subjects covered in this course will include: introduction to the riparian doctrine, introduction to the appropriation doctrine, overview of the Clean Water Act, introduction to the history and development of Section 404, issues in the implementation of Section 404, instream flows in the Clean Water Act, and a seminar on state water allocation law in the face of growing federal activities. No prerequisites. Tuition: \$275.

IF 305 Expert Witness Seminar
November 18, 1988 Denver, Colorado

This 6-hour course is designed to teach environmental professionals how to work effectively with lawyers. Led by a trial attorney who has worked with experts in many subjects, the seminar presents an overview of litigation and discusses the expert's role in developing a "theory of the case."

Intended for people with little or no litigation experience, the seminar provides a road map of the process and offers suggestions for making the expert's participation more productive and enjoyable. No prerequisites. Tuition: \$100.

Training Calendar

IF 200	August 1-5	1988	Fort Collins, CO
IF 205	August 8-12	1988	Fort Collins, CO
IF 100	August 16-17	1988	Albuquerque, NM
IF 205	September 12-16	1988	Leetown, WV
IF 210	October 24-28	1988	Fort Collins, CO
IF 215	Oct. 31-Nov. 4	1988	Fort Collins, CO
IF 300	November 16-17	1988	Denver, CO
IF 305	November 18	1988	Denver, CO

To Register for courses contact:
Henrietta Cullinane
Office of Conference Services
Rockwell Hall
Colorado State University
Fort Collins, Colorado 80523
(303) 491-7767

**Office of Conference Services
Rockwell Hall
Colorado State University
Fort Collins, CO 80523**

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ROBERT BEHNKE
ASC PROF FISH BIOLOGY
COLORADO STATE UNIVERSITY
DEPT FISH AND WILDLIFE BIOL
FORT COLLINS, CO 80523

If addressee is no longer at your organization, please route this to addressee's replacement or director. Thank you.

standing crop of adults) determined by conditions occurring over a large spatial scale with single point in time values of habitat parameters that vary greatly through time and that represent conditions over a small spatial scale may present very little insight into how the variable does or does not affect the response.

A model test will not take all of the professional judgment, subjectivity, and possibility for error out of the answer to the question "How will this habitat change ultimately affect a species?" The REMS staff

can help prospective model users by providing references to the results of model validation studies and by helping plan validation studies. However, numerous habitat models are tested and developed independently by universities and State agencies. These sources must be contacted to help ensure that important theses or agency studies are not overlooked. Performance in past tests is no guarantee of future performance. The user, not the REMS staff, will determine the usability of the model relative to the predictions and judgments to be made and will answer the question "Is this model valid?"

HABITAT EVALUATION PROCEDURES TRAINING

NR 561 HEP

This is a 38-hour course designed to introduce, describe, and demonstrate the Habitat Evaluation Procedures (HEP), a state-of-the-art technique for impact assessment and resource management. Emphasis is placed on the use of Habitat Suitability Index models to assist in problem analysis, development of management plans, and decision-making. The course also includes an introduction to the Human Use and Economic Evaluation (HUEE) concepts. This course is intended for (1) project leaders and others responsible for field work and data interpretation of water resource projects, permits, license applications, and environmental assessments/environmental impact statements; (2) wildlife resource managers, refuge managers, and personnel involved with development and implementation of wildlife, forest, or overall habitat management plans; and (3) those involved with reviewing or making recommendations concerning environmental assessments, habitat management, and mitigation. This course can be taken for two semester hours of graduate credit through Colorado State University. Tuition: \$400 + \$56.00 for Colorado State University Credit.

HEP 150 Executive HEP Briefing

The executive HEP briefing is a 16-hour course. It covers the principles, concepts, and assumptions of HEP and their relation to the decision-making process. Emphasis is given to the use of HEP in the planning process and types of studies where it is applicable. It is intended for project, study, and program managers; field office supervisors; state conservationists; regional foresters; refuge managers; and district or regional staff responsible for making recommendations on decisions regarding natural resources (i.e., impact assessment or management). The class is limited to 25 participants. Tuition: \$200.

HEP 410 HEP Refresher

This 16-hour course is designed for those who have taken NR 561 but have not used their training or applied HEP in the past 2-3 years. The course will include a comprehensive summary of HEP; recent modifications and innovations in the area of modeling, software, and GIS's; case examples; and data analysis and interpretation. This course is recommended for biologists, resource specialists, and planners who will be involved in HEP studies in the near future or those who completed the HEP course in 1980-1983 and need an update. Prerequisite: NR 561 or permission of instructor. Tuition: \$150.

HEP 400 Advanced Recreation Economic Techniques

This is a 24-hour course designed to teach state-of-the-art techniques in recreation economics. This course is designed for economists, recreation planners, wildlife biologists, and other specialists responsible for participating in benefit-cost or other economic studies. The course includes a presentation of recreation valuations and demand estimating methods such as Travel Cost Method and Contingent Value Method. Workbook exercises allow participants to apply the two methods to typical projects. Case studies of small boat marinas, beach recreation, reservoir drawdown, and forest recreation are used to illustrate the widespread applicability of the methods. Tuition: \$300.

HEP 300 HEP and HSI Software

This is a 16-hour course designed to demonstrate and provide "hands-on" training in the use of the HEP and HSI software systems and to develop skills in data entry, file modification, and file management and analysis using microcomputers. The course is intended for those persons responsible for designing and processing field data from a HEP study, those responsible for building or modifying HSI models, and those directly or indirectly involved in analyzing, interpreting, using, or defending the results of a HEP study.

Class size is limited to 15. Prerequisite: NR 561 or permission of instructor. The course does not require computer background or a knowledge of programming. Tuition: \$250; includes copies of the software and users manuals.

HEP 200 Sampling Techniques and Sample Design

This is a 5-day course of which two days will be spent in the field. It is designed to cover the conceptual and practical bases for the design of field investigative studies. The major topics to be discussed will include cover-typing, criteria for selecting specific terrestrial and aquatic sampling techniques, equipment needs and sources, calibration requirements, statistical design for a field study, and data analysis following sampling. The primary focus is on developing the proper sample design to allow statistical validity and field sampling techniques. This course is designed for project leaders, biologists, foresters, range specialists, planners, and technicians responsible for conducting or managing field studies. Each class is limited to 20 participants. Tuition: \$350.

HEP TRAINING CALENDAR


NR 561	August 1-5	1988	Fort Collins, CO
HEP 300	August 8-9	1988	Fort Collins, CO
HEP 400	August 16-18	1988	Fort Collins, CO
HEP 200	August 22-26	1988	Fort Collins, CO
NR 561	October 17-21	1988	Harrisburg, PA
NR 561	Nov. 28-Dec. 2	1988	Ft. Worth, TX
HEP 300	January 18-19	1989	Fort Collins, CO
NR 561	March 13-17	1989	Pensacola, FL
HEP 400	March 21-23	1989	Orlando, FL
HEP 410	April 26-27	1989	Annapolis, MD
NR 561	May 15-19	1989	Memphis, TN
HEP 300	May 23,24	1989	Nashville, TN
NR 561	October 23-27	1989	Chicago, IL
HEP 150	November 8-9	1989	Washington, DC

To Register for Courses contact:
Henrietta Cullinane
Office of Conference Services
Rockwell Hall
Colorado State University
Fort Collins, Colorado 80523
(303) 491-7767

Office of Conference Services
Rockwell Hall
Colorado State University
Fort Collins, CO 80523

ROBERT BEHNKE
DEPT. OF FISHERY & WILDLIFE BIO.
COLORADO STATE UNIVERSITY
FORT COLLINS, CO 80523

Habitat Evaluation Notes



The purposes of this announcement are to describe and announce upcoming courses in HEP; provide users with updates and revisions regarding new products, such as habitat models, software, and courses; and provide the opportunity for users to read brief articles on the use of models or HEP by other users.

Articles published in the Notes are intended to provide information and promote discussion. Publication does not imply endorsement of the article.

To submit an article, please contact Pete Pedersen, Editor, CSU, Office of Conference Services, Rockwell Hall, Fort Collins, CO 80523.

Habitat Evaluation Notes



August 1988
Vol.1 No.3
Conference Services

USAGE OF HABITAT EVALUATION PROCEDURE IN ORANGE COUNTY, FL

by
Sherry Williams-Hooper
Principal Planner
Orange County Planning Department
201 South Rosalind Avenue
Orlando, FL 32801

In November 1987, the Orange County Commission adopted a new ordinance that regulates development within wetlands. This ordinance replaced an earlier version that had been in effect for 5 years. Orange County, Florida, is an area of rapid growth, and it experiences intense pressure to develop environmentally sensitive areas. In the past, emphasis was placed on the water quality and food storage functions provided by wetlands, and efforts to preserve wetlands often resulted in small patchy environments (often less than 1 acre) surrounded by urban development. The long-term wildlife habitat benefit provided by these habitat islands was not considered.

Orange County decided a more innovative approach was necessary to quantitatively establish the long-term habitat potential of environmentally sensitive lands and to evaluate the impacts of proposed development on these areas. Subsequently, in certain situations, the use of HEP was required in the new ordinance. The process works by establishing three classes of wetlands: Class I - large isolated wetlands or wetlands associated with natural water bodies; Class II - medium size isolated wetlands; and Class III - very small isolated or drained wetlands. The ordinance provides for varying degrees of protection, dependent on the class. Specific mitigation ratios are also contained within the ordinance. The ratios are based on the presumption that valuable habitat loss is temporally compensated for by providing more acres of habitat than were removed and on the presumption that certain types of wetlands are more difficult to recreate. For example, Class III wetlands are mitigated on a 1:1 ratio, while Class II hardwood swamps may be 2.5:1. Development within Class I wetlands is not permitted unless there is an overriding public benefit. The use of HEP is required when the developer disagrees with the wetland class determination or wishes to propose an alternative mitigation/compensation program. At that point, the burden of proof is on the developer to quantitatively demonstrate that the mitigation/compensation program provides for no loss of habitat units temporally or spatially.

Another innovative portion of the ordinance is the Conservation Trust Fund. Under certain circumstances, a developer may be allowed to compensate monetarily. This compensation, which is based on actual land costs and is determined by the amount of mitigation acreage required, is used to purchase environmentally sensitive lands. The developer may also elect to purchase the lands then transfer the deed to the County. The County has appointed an advisory board to select habitats within the County for purchase by the County using revenues from the Conservation Trust Fund or by a developer for off-site compensation. A recent example was the purchase and preservation of 200+ acres of wetlands and uplands by a developer along a riverine system in exchange for 9 acres (total) of small, isolated wetlands in the midst of an urbanized tourist commercial area.

Closely related to the purchase of environmentally sensitive lands is the use of HEP in the County's update of its comprehensive plan. As part of this update, Orange County will be identifying significant wildlife corridors and environmentally sensitive habitats. Not only will wetlands be identified but also sensitive upland areas. These upland areas, such as sand pine scrub, may be more endangered than wetlands in Florida. At present, there is little legislation to protect these areas from development, and they are highly suitable for development. HEP will be used to determine the quality of habitat and its ability to provide long-term habitat benefits given different development scenarios. Efforts will then be initiated to designate the most significant habitats for purchase and conservation.

continued on page 2

CALL FOR ARTICLES

We are interested in articles for future issues. Our basic guidelines are that they be related to HEP, HSI models, or other habitat issues and be a maximum of 800 words. Any photograph that enhances the article is encouraged. If interested in submitting an article, please contact Pete Pedersen, Editor, CSU, Office of Conference Services, Rockwell Hall, Fort Collins, CO 80523.

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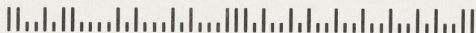
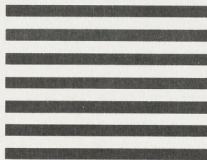
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[Jan - Feb 1992]

E.C. "NATURE" -
So. Platte Talk.

- K. Smith R
Ove Spring

rip. veg. 90% -

- Grand Canyon. 374 sp. birds

- Glen Canyon Dam - Trout
fishery

- great costs

- predictable results

might include xerox of Ark R. comments

Re. 'no impairment'

'no negative impact'

- very broad, unquantifiable issues -

- no way -

- global warming

- meteorological model -

- former sponsor - P.S.C.

- specified data - weather

min-max temp. snow precip. etc.

for city - could note

trends - 100 yrs. monitoring data

- tested on 100 yrs. w/ $\pm 10\%$ (90% ok)

min-max in certain ranges

- precip. for day = .03" - etc -

- coupled coupled system systems

interact sp. - that change in species etc.

translates into change in biomass -

of sp. -

- may xerox page - Other Calk.

for monogr.

contrast
w/ highly regular
patterns - sun rise

no
computer
meteorologist
would make
prediction



REGULATED RIVERS

Research & Management

Regional Editor
Professor J.V. Ward
Department of Zoology
Colorado State University
Fort Collins
Colorado 80523
USA
Telephone: (303) 491-5024
Telex: 910930 9000
ENGR CSU FTCN

27 February 1992

Dr. R. J. Behnke
Fish and Wildlife Biology
Wagar Bldg.
CAMPUS

Dear Dr. Behnke:

Thank you for your continued assistance as a reviewer for Regulated Rivers. The other reviewer finally returned the Englund and Modde paper on winter habitat use by cutthroat trout in the Green River. The second reviewer felt that the paper may be publishable if thoroughly revised.

In your review comments you indicate that the "time is most appropriate for a journal such as Regulated Rivers to publish a paper reviewing flow-habitat-fish methods and models with a critical look at their limitations and a realistic look to the future (including the role of professional judgement)." Would you be willing to undertake such an assignment? I would be delighted should you agree to do so. I envision such a paper being cast in a "Perspectives" context. You already have the information to write the paper. It would be a matter of formalizing what you have already stated in verbal or written form!

Shall I send you a written invitation to contribute your knowledge and insight to Regulated Rivers? Please let me know if you are amenable to something along these lines.

Sincerely,

J. V. Ward
Editor

/n

Dr. J.V. Ward
Biology Department
Colorado State University
Fort Collins, CO 80523, U.S.A.

270! 2 1/2
Wagar Bldg
Campus

Dr. R. J. Behnke
Fish and Wildlife Biology
Wagar Bldg.
CAMPUS

Water Rights, Human Rights,
and the Rights of Nature"

November 1, 1991

Lory Student Center, Colorado State University

re. fed. reserve
water rights on
not. forests 1990
ca 10 million \$
bottle

- 8:00 - 8:15 "If trees have standing, does water have rights"
Forum Introduction and Purpose
Dr. John D. Stednick and Dr. Richard L. Knight
Colorado State University
- 8:15 - 9:00 "Evolution of Western water law - The right to use
and abuse our water resources"
Dr. George Radosevich
Colorado State University, Ft. Collins, CO
- 9:00 - 9:45 "Federal reserved water rights: claims for
national forests in Colorado"
Ms. Carol Angel
Colorado Attorney General's Office
- 9:45 - 10:15 Break
- 10:15 - 11:00 "Application of science to the decision process in
the Colorado River below Glen Canyon dam"
Dr. David Wegner
Bureau of Reclamation, Flagstaff, Arizona
- 11:00 - 11:45 "Can the prior appropriation doctrine adapt to new
realities"
Ms. Sarah Bates
University of Colorado, School of Law, Boulder, Co
- 11:45 - 1:00 Catered lunch for speakers
- 1:00 - 1:45 "The Reopened Western Frontier"
Dr. Ed Marston
High Country News, Paonia, Colorado
- 1:45 - 2:30 "Indian tribes, water management and the Western
prior appropriation systems: implications of the
Wind River decision"
Dr. Catherine Vandemoer
Wind River Environmental Quality Commission
Washakie, Wyoming
- 2:30 - 3:00 Break
- 3:00 - 3:45 "Provision of electric power in the public
interest"
Ken Maxey, Deputy Area Manager
Western Area Power Admin., Salt Lake City, Utah
- 3:45 - 4:30 "Using Water Naturally"
Dr. Holmes Rolston III
Colorado State University, Ft. Collins, Colorado

Sponsored by College of Forestry and Natural Resources
College Student Council, Colorado State University;
Guest Scholars Committee, The Graduate School
Colorado State University

WATER RIGHTS, HUMAN RIGHTS, AND THE RIGHTS OF NATURE

**A forum addressing the changing priorities and uses
of water in the Interior American West**

**November 1, 1991 - Colorado State University
Rm 230, Lory Student Center, 8 am, Admission free**



featuring:

**CAROL ANGEL, SARAH BATES, ED MARSTON, GEORGE RADOSEVICH,
KEN MAXEY, HOLMES ROLSTON, CATHERINE VANDEMOER, DAVID WEGNER**

For further information contact:

Dr. John D. Stednick (303-491-7248) or

Dr. Richard L. Knight (303-491-6714)

**Sponsored by: The College of Forestry and Natural Resources, The CFNR
College Student Council, Colorado State Univ.; Guest Scholars Comm.,
The Graduate School, CSU; and The Bureau of Reclamation**

(SEE BACK SIDE FOR AGENDA)

- included fed -
60 minutes - TV

* - Crowell Moring - AFRA - strategy to
in legal basis "sound science" - + question
conclusion - necessary sufficient - "fox in pack"
(environmental 'extremists' - hunting, fishing,
recreation - ^{most} important of gen. public agree
w/ development

Water Symp

- Colo. - USFS - * Re. early
settlement - juggernaut snowbirds
began ^{Kanoga Johnson on}
1960s

mandate
of
USFS

- fish - wildlife - then channel maintenance
flood control
- couldn't stop - but terrible waste \$
- appeals - st. - Fed Supreme - 6 yrs.
- Much B.S. models - some streams, some dead
dit. conclusion - st. had ^{just} these ex. witness
(Shuman)

Shuman
Rule of
Theory

* Before "study" "research"
preconceived conclusion to be "proved"
then expect that, indeed, it will be proved
by selective use data - B.S. one side or other

- Wegner Bur Rec. 'Science' reports
(Langston EIS complete effects Oker says
esp. - Grand Canyon - beaver - ... etc -
* rip. zone - birds - mammals - reptiles - life -
money for
(biodiversity - great success) - but -
- Fact nothing really new will be known
after years & millions \$ re. trout fisheries
- end. sp. -
- diversify
- sand beaver

Romesburg, H.C. 1991. On improving the natural resource and environmental sciences. *J. Wildl. Mgt.*, 55(4): 744-756.

- N.R. & Env. Sci. have far more potential to understand the processes of nature than they have achieved, or will achieve on present course. - Can achieve by developing thinking skills & developing abilities to conjecture and test theories.

re. ^{N.R. Sci} commodity issues - wood, meat, wildlife, recreation

re. ^{Environ. Sci.} noncommodity - i.e. conservation biology, evol. biol.

- how to better understand processes of nature.

^{inference} credible possibilities & conclusive probabilities

constructs & isolates - Niche - measure ^{const.} some not ^{iss.} whole -

* Niche - impact flow - life history -

- Fields of science differ in how universal and regular are underlying laws. basic laws of ^{engineers} physics w. math, formal w. biol. - only broad generalizations based on natural selection

* engineers - plan-predict ^{design dom} flow, kw. -

^{deterministic} certain = ^{stochastic} uncertain ^{or} biology - size of an. pop. ^{7 y.} yrs. ahead. ^{pred.} - ^{unpred.}

* Coleridge - 2 types minds - tanks & springs

^{Asc.} * Applied sci (tank mind) - facts, figures, rules, methods, models. -

(15 years - not working) - ^{Basic-Appr} Spring mind - ^{concept} new idea - hypothesis - test

U.S. E.P.A News Notes (17) 1991. -

Dec 91

Snake R. Sockeye salmon - ex. ~~Elasmobranch~~ net - goals -
9221 * maintain biol. integrity of national waters.

Obvious salmon count per head - integrity not
vague - diff. - person - corrupt lower integrity

- N/P looking - increase ~~agrees~~ live - productivity - 'integrity'

'naturalness' - S, Plate told Grand Canyon rip veg - integrity

naturalness - ^{At. stars} Agree on definitions and implications

- Mont. - Forest Prod. Indust. - new publ. - BMP -

(know to harvest timber & be good environmentalist.) -

- Alternative - worst case scenario - Atlantic ~~agrees~~ - no cuts or
environmental flow suits - end. sp. fed. laws

environmental arguments - subsidized cuts etc. - polish image -
- sustainability
- best case -

- AFTA - also - John Duerksen
Sonoma - Duerksen

- bottomline - Mont.

'naturalness' ^{Grand Canyon} NPS Glacier - ~~pro~~ reduce value -

McDonald Crk. - ^{bold} eagle - Myer - L ↓ -

* model - other core finale
TAA growth

- Paralysis by analysis ^{is important} works both side of fence
- long term basic research - quantitative sort out effects of wild for ^{inter-} domestic ^{disruption}
- delay action - put off tough decisions before experts done
- knowledge of ^{under} Evol. Syst. - nice theory - n dimensions
- this truly bold - accurate guess if all miss ^{is} do
- biota & biotic - the ensemble in dynamic, biotic model - is
- devious or naive,

- Chinese
- excluded zones
- letters, over, paper
- book
- child book
- ARTS

- Aspen ^{or} ^{partly} ⁱⁿ ¹⁹⁹² ^{budget}
- AZ ST - in fit with ^{remained}
 - every time ^{reaching} ^{growth} ^{with}
 - 1970 - non-japan ^{- now in C.} ^{EDF} ^{giving}
 - 1990 gun - ^{15 miles} ^{when lastly} ^{lost} ^{Colo - to Utah}
 - first entry ^{Aspen Year club}
 - resolution - !
 - ATAT
 - Arks (3)

Original Invoice
Robert Behnke
3429 E. Prospect Rd.
Fort Collins, CO 80525

Oct. 31, 1991

To: Salt River Project
M. Byron Lewis
Jennings, Strouss, & Salmon
One Renaissance Square
Two North Central
Phoenix, AZ 85004-2393

Re: Gila River Adjudication
Task X
Critique of Arizona instream flow report for J. Cooper
6 hrs. x \$45/hr.....\$270.00
Task Z
Bimonthly report and bibliography
20 hrs x \$45/hr.....\$900.00
typing, xeroxing..... 15.00
TOTAL \$1185.00

Robert Behnke

[May - July, 1992]
Dif. free enterprise - competition vs
govt - social - no waste, pro
coll. R. - end.

demand for 'intrins
new -
me

new trend *
- change in
- place, how we
- water quality
- reflected in
- "improvement"
- or more
- evaluated by
- various
- no.

health - complex
physiol. changes
- disease

A.F.S. Symp. 8 (1990)

Biol. Indicators of Stress in fish

- status and use of Biol. indi
- evol. the effects of stress
- Molecular and biochemical in
fish + stressors and the
use in environmental
- Immunological indicator
protection and disease

- Fish communities as
of environmental

E.C. - EPA / ^{Biom.} / PCB ^{notably} / ^{Env.} / ^{Desi}
- use of fish

A.F.S. R. REPT.
DOW ex. E.C.
- peer review -

- Fisheries - May - June 92

- Conserv. Biol. -

- NAJFM
pgs. 40, 47, 55

can

[May - July, 1992]

blem - of corrections, 2 jobs to

is then race - more hatch -

- 1700 man to 'regulate'

- speak - now

- snake R. - survival (snails)

- 280% → 5 m!

5-70% - 30 m!

can be

a fish

your - f

in potential

monitoring

Dr. Emmann

at Brecken.

indicates

degradation (IBI)

new - fish

new health

stability Ariz

(heavy metal)

Albuquerque

- TX in the water

in Colo.

propositional standards of

.. Biodiversity issue (EPA)

about (BLM) bull.

- Trout Williams NW.

- Ariz. Tribal Grazing *

about is sp. 2

hire bill
Miller - money
171M

Animas / LaPlatz

(Platonis - what going on)

"more research", Trade - user group - 171M - "new org." was

- Why best progress not made - or 'illusory' - problems ->
agency "ros" - 'compartmentaliz.' - (encl. 4 M-Apr.) committee listings
new problems
- Opt. committee - Review of Col. R. paper

FWS

Jenny McGraw 171M video - "realistically - not predict - see
WVA w biomass - as negotiation tool.

Ed Wick -

- ^{copies} Tests - consulting work -
left Every year - education - courses -

up FWS Colo. R -
- Fish stocking policy
- no escape? - not mix of OR -
- no way - Colo - mill - Wray

QUART REP. 7/15/11. Aquat 8,111

SRP Fishery - Biodiversity Syng. - EPA - "goal" "mission"
 = monitoring fish - IBI (water qual. - how present diversity = prob. -
 - but - Denver region - Erika - Use Alternatives (EAS) - Index Fish Health
 in dif. by regions - st. - fed. -

- DOW: Ark. R. Rep. - E.C. : - polarized -

E.S.A. position
 Red wolf

NO / GPCB
 N₂ Path

Quart. rep. - Rev. - avoid prob. - need - - polariz. -
 informed, rational thinking - all steps - prob. - implement - st e
 fed. oper. dif. individual by region - EPA (Boston)
 EPA - BLM - Nev./AZ by district - Teller - Use attainability
 need publ. - return of water - BLM by district
 FWS 7.5

my Riv. - why govt - bureaucracy incapable + adequate resp + big, complex prob - spotted owl
 (Limit. gov't. budget) - ESA cases - anti environment - paralysis by anal. - lack credibility - Col. R. salmon
 - incremental of subject-matter, - noise talk in system - carry-over rules - hatcheries
 - focus on - USFS - new contract w/ leading ecol. (Weins, Don Hume, E.S. great ex.)
 - need whole system critique, new hab. kindly - (meet re my rap - 1 -
 - all over country? - how disseminate - implement? - Office Info.
 Transfer -
 driven by low suit
 razorback listing
 critical hab.
 12-yr -
 would continue
 by bribe \$
 for non-jury party

Jenny Mc Grow
 - Video -

- Enclosure
- ① - cc. Take home text (use for deposition)
 - ② - Clippings - Endicott Sp. Act. - reviewer - 2nd - Supreme Court - interest suit
 - ③ - 2 mil \$ - Colo. E.S. hatch. see
 - ④ - ⑤ Stocking statement? (Cover) - only positive action made

Oberdorff, T. and R. M. Hughes. 1992. Modification of an index of biotic integrity based on fish assemblages to characterize rivers of the Seine basin, France. *Hydrobiologia* 228 (2): 117-130

elegant
reference

Demarsis, B. D., T. E. Dowling, M. E. Douglas, W. L. Minckley and P. C. Marsh. 1992. The origin of *Gila seminuda* through introgressive hybridization: implications for evolution and conservation. *Proc. Nat. Acad. Sci. U.S.A.* 89 (7): 2747-51.

- Enclosures: Attacks on ESA - weaken -
major threat - change def. sp. - ("sp.") - but very
diff. (Rojas) -- no common agreement - (snail darter)
= legal sp. -- sp if hybrid? - protected by ESA?
- case-by-case - Utah sucker, Fla. panther, - *Gila seminuda*
- Red wolf - if natural vs. Apache trout & RB stocked -
evolutionary time - adaptation - 100 yrs. -
introgression vs. hybrid swarm - test of time survival - *

- Sunny Mc Grow - "official" WVA not = biomass -

ex. polarization -

Animas Co. Plate - ex. all 10+ yrs 'res' = no fish
- no real definitive results possible - new - new res. - Bill
Miller - IFM (pro) - (sub) - but cost/benefit - to members
Tribe Indian Tribe + keep in Colo. at all cost.

- Fish stocking policy - no escape - no control
- bit. Colo. - new raise - 2mil \$ - family - DeBevoise \$650,000

-



Judge acquits Mandarich



Frank Murray/Rocky Mountain News

Jurist dismisses charges against home builder in case involving election fraud scheme. **Page 66**

ALSO IN THE NEWS

■ Confetti dots the floor at victory celebration for Richmond chief. **Page 66**

■ Federal case collapsed under burden of proof in conspiracy trial. **Page 68**

■ Jury would have voted for acquittal, according to informal poll. **Page 69**

LEFT: Heavy-hitting fund-raisers Larry Mizel, left, and home builder David Mandarich celebrate Mandarich's victory.

Soviets admit jailing U.S. fliers in 1950s

Russian President Boris Yeltsin reveals USSR held 12 captives in prisons, psychiatric clinics after downing 9 planes. **Page 2**

Court endangers rare species act

In a 7-2 decision, the Supreme Court rules environmentalists must show injury to bring suit against a federal agency. **Page 2**

Bush: I'm tops on environment

The president says his record is 'second to none' at Earth Summit, seeks renewed effort against global warming. **Page 3**



George Kochanec Jr./Rocky Mountain News

Report of bias interrupts jury in King case

Claims that juror is tainted prompt three-hour hiatus; defense attorneys say they won't seek mistrial. **Page 6**

ALSO IN THE NEWS

■ Woman proclaimed objectivity, appeared eager to serve. **Page 6**

■ Defense lawyer famous for demanding mistrials passes up chance. **Page 6**

LEFT: Attorney Walter Gerash leaves a press conference after saying he won't seek a mistrial.

Bulls rip Blazers 119-106 for 3-2 series lead. Page 93

WORLD & NATION

John Davidson, National Editor ■ 892-2731

Charley Able, News Editor ■ 892-2728

Holger Jensen, International Editor ■ 892-2699

NATION WATCH

ALASKA

Valdez cleanup ends

The three-year cleanup of the nation's worst oil spill ended Friday even though oil is still on the beaches of Alaska's Prince William Sound. Federal and state officials agreed that no more effective cleanup work can be done to repair beaches damaged by the 11-million-gallon-spill, which occurred on March 24, 1989, after the Exxon Valdez super-tanker struck a reef in the sound.

CALIFORNIA

NRA raps song

The National Rifle Association, whose defense of gun ownership often puts it at odds with law enforcement agencies, Friday joined police in condemning a best-selling rap music album that contains the song *Cop Killer*. NRA executive vice president Wayne LaPierre urged members and concerned citizens to write to the record label, Warner Bros. Records, and the distributor, Time Warner Inc., asking them to withdraw the *Body Count* album, by Los Angeles rapper Ice-T.

CONNECTICUT

Mayor gets time

Waterbury's former mayor, who used his six years in office to enrich himself and his cronies and then boasted that he was too smart to get caught, was sentenced Friday to nine years in prison. Former Mayor Joseph J. Santopietro, promised an appeal. Santopietro was convicted of selling votes to approve real estate development permits in exchange for payoffs and of stealing federal job training funds to pay for dinner parties and vacations.

Also...

Two freight trains crashed head-on in northern Mississippi, injuring six people and derailling six engines and 14 rail cars, authorities said. . . . Police and federal agents in the Los Angeles area have seized 4½ tons of cocaine worth \$150 million in a series of raids over the last 10 months, a spokesman said Friday. . . . The Earth's shadow will slide over the full moon Saturday night at 10:57 p.m. during a partial lunar eclipse visible throughout the Americas.

Associated Press

■ Quayle takes shot at Ross Perot / 52

■ Justice probes 'Ivan the Terrible' case / 54

Soviets downed U.S. planes, held pilots

Boris Yeltsin reveals 12 Americans were kept in USSR's psychiatric facilities or in prisons

Rocky Mountain News Wire Services

WASHINGTON — The Soviet Union shot down nine U.S. planes in the early 1950s and held 12 American survivors in prisons or psychiatric clinics, Russian President Boris Yeltsin said in a letter hand-delivered to U.S. senators Friday.

The fate of the fliers is being investigated, he said.

Other than the shooting down of Francis Gary Powers' spy plane in

1960, neither U.S. nor Soviet officials had formally acknowledged that American planes had been downed over the Soviet Union in the Cold War.

"The U.S. government was aware of the losses, but this is the first time the Russians have admitted" there were survivors, said Susan Strednansky, a Defense Department spokeswoman.

Yeltsin, who will meet President Bush at a Washington summit next week, also said in his unprecedented acknowledgement that Soviet records show:

■ Several U.S. servicemen in World War II were held and detained "in isolation for a year or more" by the Stalin government.

■ Some American prisoners in

the Korean War were taken to China and held there and that 59 captured U.S. servicemen were interrogated by Soviet officials.

■ The only information found so far in Soviet archives about U.S. troops missing in the Vietnam War is that several defectors "were clandestinely moved from the territory of Japan to the territory of the USSR."

He said the records show that they remained in the Soviet Union only "for a short period of time and later went to various European countries."

The letter was delivered to Sens. John Kerry, D-Mass., and Bob Smith, R-N.H., chairman and vice chairman of the Senate POW-MIA Affairs Committee, by Gen.

Dmitri Volkogonov, a senior defense adviser to Yeltsin.

"It has been found out that during the 1950s, nine U.S. aircraft were shot down over the USSR territory," Yeltsin said. "The records show that as of Aug. 1, 1953, eight American citizens were held in Soviet prisons and prison camps and four others were held in special psychiatric hospitals."

Kerry said Volkogonov promised in a meeting Friday to pursue questions of what finally happened to the men with "the utmost urgency."

The Defense Department spokeswoman said American officials have yet to translate new Russian documents turned over Friday by Volkogonov.



Associated Press

Clinton woos undecided voters

Democratic hopeful Bill Clinton at a Washington news conference Friday said President Bush abdicated leadership at the Earth Summit in Rio de Janeiro. Clinton wooed undecided voters on prime time national television Friday night, promising to end Washington gridlock. **Page 52**

Court restricts suits by environmentalists

Individuals must prove injury by federal action abroad, majority rules; broad implications seen

By Mary Deibel

Scripps Howard News Service

WASHINGTON — The Supreme Court Friday restricted the rights of environmentalists to sue over federal support for overseas projects that may threaten endangered species.

The 7-2 decision, a victory for the Bush administration, also could make it tougher for environmentalists and others to file citizen suits challenging a range of government programs at home or abroad because individuals must show they were actually injured by the federal action.

The ruling came as President Bush joined the Earth Summit in Brazil. In advance of his arrival, U.S. officials sought to ease criticism of Bush's go-slow approach by trumpeting stepped-up federal aid to save the world's forests, monitor climate change and catalog plants and animals.

Dissenting justices Harry Blackmun and Sandra Day O'Connor scored the decision as a "slash and burn expedition" that could hurt environmental protection.

"Supreme Court to Earth Summit: Drop Dead," said lawyer Hardy Callcott, who wrote a friend-of-the-court brief for the nation's zoos and aquariums in support of the environmentalists.

The environmentalists questioned whether the Reagan administration followed the law in 1986, when it said federal agencies don't have to make sure that their overseas projects won't harm endangered or threatened species.

But Justice Antonin Scalia, writing for the Supreme Court majority, said it is not the job of federal

IN COLORADO

Fewer suits or fewer trees? Groups differ

Two Colorado representatives of groups involved in environmental issues disagree on the likely effects of the Supreme Court decision on lawsuits and conservation efforts.

William Perry Pendley, president of the non-profit Mountain States Legal Foundation, said the decision was a "tremendous victory for the economy."

"One of the biggest burdens on the U.S. economy is the cost of litigation," he said. "Every American understands that we have a litigious society. This is just pro-jobs and anti-litigation."

Tina Arapkiles, the Sierra Club's Southwest representative, said the court's ruling is a significant setback for efforts to protect the environment.

"I find it incredible that while in Brazil the rest of the world is saying that we have to do something to protect the environment, the Bush administration is arguing that we don't need to care," she said. "The . . . public wants to protect the environment."

— Richard Coe

courts to act on general claims by citizens — even when Congress specifies that citizen suits may be brought to enforce the law.

The case stems from Reagan administration regulations that freed federal agencies from having to consult the Interior Department about overseas projects that may affect endangered species.

U.S. sued over Endangered Species Act 'violations'

By Patrick O'Driscoll
Denver Post Staff Writer

National and Rocky Mountain conservation groups fired a double-barreled legal challenge yesterday at two federal agencies for allegedly neglecting endangered wildlife in Colorado and the West.

In separate actions, they sued the U.S. Fish and Wildlife Service and the Agriculture Department's Animal Damage Control program, claiming both violated the Endangered Species Act, which is supposed to keep rare animals and fishes from going extinct.

A lawsuit by seven groups in U.S. District Court in Denver claims that Fish and Wildlife has

dragged its feet in protecting "critical habitat" of the razorback sucker, a rare fish native to the Colorado River Basin. The suit, filed by the Sierra Club Legal Defense Fund, contends the service broke the law by not designating habitat last year when the razorback was declared endangered.

Predator kills targeted

The second action, filed by three groups and several individuals in U.S. District Court in Washington, D.C., seeks to halt predator-killing campaigns in known endangered-species habitat in the Western United States. It charges that an ADC trapper's steel-jawed trap

killed a bald eagle last December in Utah, that aerial ADC gunners recently killed a gray wolf they mistook for a coyote, and that California condors and San Joaquin kit foxes "have been killed by lethal devices intended for coyotes."

Bob Jacobsen, assistant regional director for Fish and Wildlife, said yesterday he hadn't seen the razorback suit and couldn't comment on it. But he said that, despite staffing shortages, the agency is hard at work on critical habitat for the fish.

"We knew the species was in trouble (and) where it occurred. But we did not know the specifics of where the habitat was," he said.

"We are doing the job. We're just probably not doing it as fast as the Sierra Club would like."

Native to Colorado and six other Western states, the razorback was a victim of habitat-destroying dams and extermination by state wildlife agents in favor of game fish such as trout and catfish. Critics say remnant populations are mostly older fish, indicating that young aren't reaching adulthood, further imperiling the species.

'Cavalier attitude'

Razorback plaintiffs include the Colorado Wildlife Federation, Colorado Environmental Coalition, Taxpayers for the Animas River,

Four Corners Action Coalition, Southern Utah Wilderness Alliance and the Sierra Club.

In the ADC case, the legal defense fund contends the Agriculture Department doesn't know how its multimillion-dollar program — aimed at wild predators that prey on domestic livestock — affects rare wildlife. "This cavalier attitude toward species so close to extinction is alarming, and it is illegal," said Fern Shepard, a Denver-based defense fund lawyer.

Other plaintiffs include the Southern Utah Wilderness Alliance, The Fund For Animals, and seven individuals.

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Sheriff accused of sex harassment

4 women in Fremont County department file complaints

By The Associated Press

Four women in the Fremont County sheriff's office say Sheriff Bob Cheek has repeatedly sexually harassed them since he took office in January 1991, and they have notified authorities.

Dispatchers Judy O'Conner, Tammie Johnson and Elizabeth York this week filed two separate actions against Cheek and Fremont County. Deputy Patti Caudill, the county's only female deputy, also has filed claims of discrimination and sexual harassment against Cheek.

Arnold Woods, a Denver lawyer representing the women, said the complaints were filed with the fed-

CAÑON CITY

ments almost on a daily basis," Woods said, but also allegedly includes touching of the women's breasts and buttocks. Cheek also is accused of grabbing and kissing the women.

"The women are charging that the sexual harassment has been going on virtually since Sheriff Cheek has been in office," Woods said.

"These women just decided they couldn't tolerate it any longer," he said.

Cheek said he had not been made aware of the allegations and had not received any paperwork

advertising X-rated movies and sexual aids, suggesting that they should order some items."

O'Connor, who has worked in the county office for 4½ years, said Cheek began sexually harassing her almost immediately after he took office.

"The first time he touched me on the rear end, I asked him never to touch me again, but it just got worse," O'Connor said. "We all have been afraid. Our biggest fear is of losing our jobs even if we verbally comment on his actions.

"He has called each of us from his home while we are still at work and told us he was watching a

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Feds waffle on protecting owl

Action would help bird, but weaken endangered species law

By Keith Schneider

The New York Times

WASHINGTON — The Bush administration issued a plan yesterday to restrict logging on 5.4 million acres of ancient forest that is home to the northern spotted owl, but at the same time it moved to narrow the protection for endangered animals and plants.

The complicated and contradictory actions came after years of scientific study and angry political struggles in the Pacific Northwest over the balance between economic development and the preservation of rare species on federal land.

Even as it moved to preserve the owl and comply with the Endangered Species Act by making its plan public in Portland, Ore., the administration moved on two more fronts in Washington yesterday to attack the 19-year-old law and allow logging in the Pacific Northwest.

By its actions, the administration is sending the clearest signals yet that it hopes to weaken the act's prohibition against considering economic factors when weighing the fate of endangered species.

Please see **OWL** on 13A



CENTER OF DISPUTE

The northern spotted owl makes its home in old-growth forests of the Pacific Northwest, which puts it directly in the path of regional logging interests.

Associated Press

killed someone, a woman who hasn't been beaten up, a woman who hasn't been beaten down." — Former "Charlie's Angels" star **Farrah Fawcett**, in the Orange County Register.

BORN TODAY

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- **EDDY ARNOLD** — Singer, 74.
- **ANNA MARIA ALBERGHETTI** — Actress-singer, 56.
- **TRINI LOPEZ** — Singer, 55.

Business
Knight-Ridder News Service

WASHINGTON — After days of agonizing over whether or how to fight it, Congress appears ready to live with a newly ratified 202-year-old constitutional amendment restricting the way members give themselves raises.

House Speaker Thomas Foley, who initially questioned whether two centuries was an unreasonable period for a proposed amendment to hang out there, threw in the towel yesterday and said it should become the 27th Amendment without a fight.

While the Senate is almost certain to debate the question of whether ratification took too long, no one expects a vote to reject the amendment.

In endorsing the amendment, Foley, D-Wash., pointed out that both the House and

Senate — at the time of their last pay raises — adopted rules that satisfy the intent of the amendment.

Proposed by James Madison in 1789, the amendment requires House members who vote themselves a pay raise to stand for re-election before they can get it.

Only seven states ratified the amendment over the next 84 years and it languished until recent years when many more states — angered by a succession of hefty congressional pay raises — began signing on. Last week, Michigan became the 38th state to ratify it, the number needed for approval.

In most cases, Congress sets a limit from seven to 10 years for states to ratify amendments. But the Madison amendment carried no time limit.

Rep. Don Edwards, D-Calif., chairman

of the Judiciary Subcommittee on Government and Constitutional Rights, said he intends to hold hearings on the timeliness of the ratification process. And Rep. John Boehner, R-Ohio, said he would still like a House vote, simply to dispel any doubts in case the matter ever arose in the courts.

No matter what the House does, the Senate wants the last word.

"Congress, not the courts and not the executive, has the final say over whether an amendment has received the required votes for ratification in a reasonable time," said Sen. Robert Byrd, D-W.Va.

Some scholars disagree with that. Under ratification procedures, they say, the head of the National Archives is authorized to certify approval of an amendment.

And that's just what archivist Don Wilson said he intends to do.

Bush seeks weaker species protection

OWL from Page 1A

The conflicting moves meant that the administration had put itself in the unusual position of complying with the strictest environmental law even as it sought to undermine it.

Yesterday's moves in Washington to allow logging were largely symbolic, at least in the short term, because federal judges have already barred logging in most of the ancient forests in the course of pending lawsuits filed by environmental groups.

Also, any effort to change the Endangered Species Act is likely to founder in Congress, where support for it is strong.

Yesterday's maneuvering began in Washington when a specially convened cabinet-level committee voted 5-2 to waive the usual requirements of the endangered species law and allow logging on 13 federally owned tracts of timberland in Oregon that total 1,700 acres.

It was only the second time since the Endangered Species Act was passed in 1973 that the committee had waived the requirements of the law, and the first time since 1979, when the panel approved the Greyrocks Dam in Wyoming after developing a plan to build an artificial wetland for the endangered whooping crane.

After the 5-2 vote yesterday, the

administration proposed an amendment to the Endangered Species Act that would offset the plan released in Portland and allow logging on 2 million acres.

In a report accompanying the proposed amendment, the Interior Department acknowledged that its enactment virtually ensured that the owl would eventually disappear across much of its range.

The amendment also proposed to alter the endangered species law by allowing economic considerations to be taken into account when loggers want to cut trees on land that is home to the owl.

Administration officials would not explain why they took all three actions at the same time, and what message they intended to send. The timing took supporters and critics alike by surprise.

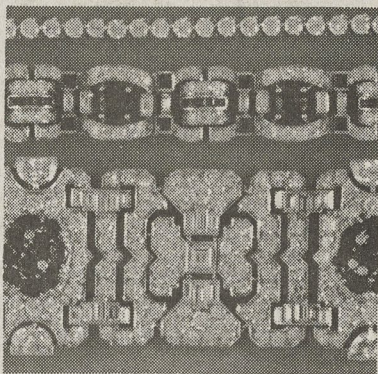
"The White House really wanted to hide the ball on this one, and they did a good job," said Andy Kerr, spokesman for the Oregon Natural Resources Council. "No matter what happened Thursday, there is still need for court action and congressional action."

Mark Rey, spokesman for a timber industry group in Washington, said: "What happened today is symbolic of why the act doesn't work. You have to go through all these byzantine procedures and processes to get to the point where you can make a decision which makes little difference."

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L.A. AFTERMATH

Gang truce called a 'cultural awakening'

By Beth Barrett
Los Angeles Daily News

LOS ANGELES — They put down their colors and they wept.

Several hundred Bloods and Crips hugged each other and then sat down on the hardwood floor of a gymnasium to vote on ending the bloodshed that for years has claimed thousands either for the prisons or the cemeteries.

"It occurred three weeks ago. Before the Rodney King verdict. Before the city burned.

"It was time to get together. The bullets had to stop," said Tricky, a 19-year-old Crips gang member.

"It was like a reunion," said Tricky, who like most gang members interviewed for this story refused to disclose his full name.

"Everyone came from different

neighborhoods," he said. "We sat on this court, on the floor. We were all tired of seeing our families die."

The meeting was one of perhaps dozens of inter-gang meetings held in the relative obscurity of housing projects over the past several months, as the warring gangs have moved toward a tenuous peace.

"In the wake of the Rodney King verdict and the bloody riots that followed, the truce was suddenly publicized as gang members turned their energy and their anger toward common foes — police and other authorities.

But leaders in the black community say the talks between gang members began several weeks before the verdict, and signal a commitment to end the violence.

"Overall, the project meetings and coming together of rival gangs represent a cultural and social awakening," said Ed Turley, an official with the nonprofit anti-gang Community Youth Gang Services Project.

"They're realizing they're not their own enemies," he said. "They're realizing there are other forces of evil that contribute to the perpetuation of violence among persons of their own race."

Police officials are skeptical about the "truce" and say gang members have threatened to unify by turning their violence toward officers.

The Los Angeles Police Department has notified officers that a printed call-to-arms is being circulated among gang members, urging

them to kill two police officers for every black person injured by authorities.

And the streets of south-central Los Angeles are littered with anti-police graffiti painted after the verdict in the King case.

The words "Police 187" are scrawled throughout the area — an apparent reference to Penal Code Section 187, which is the charge for murder.

Elsewhere are the words "Crips, Bloods and Mexicans together forever tonight, 4-30-92."

"We take those things seriously," said Police Chief Daryl Gates. "We do not ignore them. We are not ignoring them now. We have made extensive preparations to deal with potential violence against police officers."

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Leaders address L.A. riots

Bush, Bradley send different messages

By Barbara Vobejda
The Washington Post

WASHINGTON — In radio addresses broadcast yesterday, President Bush and Sen. Bill Bradley, D-N.J., delivered very different messages about the recent violence in Los Angeles, with the president focusing on what he said were causes for hope and Bradley citing the desperate conditions in the nation's cities and the unresolved problem of race.

A day after he toured the riot-torn city, Bush used his radio talk from the White House to offer what he acknowledges are urban solutions he has proposed in the past, including enterprise zones,

parental choice in education and resident ownership of public housing.

He referred to racial issues only once, when he praised the "extraordinary courage of ordinary people"

who braved looters, formed bucket brigades to put out fires and "reached across the barrier of color to save lives."

But Bradley returned again and again to the importance of race and the need to face the issue squarely as the nation attempts to rebuild its cities.

"Just as slavery was our original sin, race remains our unresolved dilemma," he said. The future of America is inextricably tied to the issue of race, he said, arguing that nearly half of new entries to the workforce will be foreign-born or minorities by the end of the decade.

In what is bound to become a familiar election-year debate, Bush and Bradley used the riots as a backdrop to put forth competing political visions. For Bush, it was the notion of "empowerment" and reforming welfare "to help people with individual initiative work and save."

"At every turn during my time in Los Angeles, I heard people talking about the principles that guide these initiatives: personal responsibility, opportunity, ownership, independence, dignity."

He pledged federal funds to help shop owners reopen their businesses and for those who lost their jobs because of the destruction.

"This I know: we have the strength and spirit in our government, in our communities and in ourselves to transform America into the nation we have dreamed of for generations," he said.

Bradley said he found "particularly depressing" the president's decision to blame the Great Society programs for the problems in Los Angeles.

"The Head Start program did not cause the Los Angeles riots. At a moment in history when we must talk about the problem, the president chooses to talk about the politics of the problems."

Bradley referred in stark terms to the state of American cities, which he said "are poorer, sicker, less educated and more violent than at any point in my lifetime."

Equally destructive, he said, was the "absence of meaning" in the lives of many city residents. "Fear covers the streets like a sheet of ice," he said. "We are too good and great a country to live like this."



Bush



Bradley

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Westerners target endangered species law

By Scott Thurm and Bert Robinson

Knight-Ridder News Service

For generations, the people of the American West have been building comfortable lifestyles on a tottering foundation of scarce water and fragile land. But now a potent force threatens to upset these ways of life: the Endangered Species Act.

From the ancient forests of the Pacific Northwest to the plains of Central Texas, from the whitewater streams of the Rocky Mountains to the marshes of San Francisco

Bay, the act is assailing cornerstones of the Western economy with a ferocity unmatched by any other environmental law.

Federal agencies and environmental groups, emboldened by recent court rulings, are using the act's broad powers to challenge longstanding practices that have driven hundreds of animals and plants to the brink of extinction.

These disputes could alter where Westerners live, how they work and how much water they use. The economic upheaval could cost

billions of dollars and tens of thousands of jobs.

For many, the risk is too great, and they are pressing Congress to weaken the act when it comes up for renewal this year, even if that means some species may vanish. The debate promises to shape the future of the West, where the choices between preserving the environment and preserving lifestyles are increasingly difficult:

Please see **ENDANGERED** on 10A

pid. I think almost immediately on coming effective, you can expect three or four or five lawsuits to drop," said Frank Ducheneaux, a lobbyist for the Minnesota Indian Gaming Association and several tribes.

Congress permitted tribes to begin casino-style gambling in 1988 in states that allow similar forms of gaming for non-Indians. However, lawmakers left it up to a new National Indian Gaming Commission to decide which games or devices would require state approval.

The commission's new rules angered Indian tribes by putting electronic machines and keno in the same category with games like blackjack and roulette.

Burch said.

"We have no definite opening date, but we're hoping for July or August," said Wilfred Madrid, executive director of the Ute Mountain Utes.

"We've had illegal class III (casino-style) gaming going on around the country, and it's been allowed because the regulations hadn't been in place," Kevin Schiefer, the U.S. attorney for South Dakota, said Friday.

U.S. attorneys are expected to immediately begin contacting tribes that are operating illegal games, said Mike Cox, the

Southwest-ern Colorado, 350 miles from Denver, gained state approval for the casinos when Colorado voters legalized small-stakes casinos in three mountain towns.

commission's general counsel. The Justice Department actions are expected to be concentrated in Oklahoma and California, Ducheneaux said.

Linda Akers, a U.S. attorney in Phoenix who heads a Justice Department task force on Indian gambling, refused through a spokesman Friday to comment on possible raids.

Sierra Club charges force new Animas-La Plata project study

ANIMAS from Page 1B

■ **Water quality.** The Sierra Club said the project will increase concentrations in the San Juan River basin of heavy metals and selenium, which can be toxic to wildlife.

A new federal study indicates that other nearby irrigation projects have "contributed to dangerously high levels" of those substances in the San Juan River basin, the Sierra Club said.

■ **Endangered species.** Since Animas-La Plata won its first environmental approvals 12 years ago, one fish, the razorback sucker, has been added to the federal

list of endangered species, and a small population of another endangered species, the Colorado squawfish, has been found living downstream of the project. The Bureau of Reclamation has worked with the U.S. Fish and Wildlife Service to strike a deal to reduce the project's effects on the fish.

■ **Wetlands.** The federal government's definition of a wetland has changed since 1980, which could effect the way the project would be built around these environmentally sensitive areas.

Finally, the Bureau of Reclamation said it would conduct studies on 15 different river sites where the project effects river flows.

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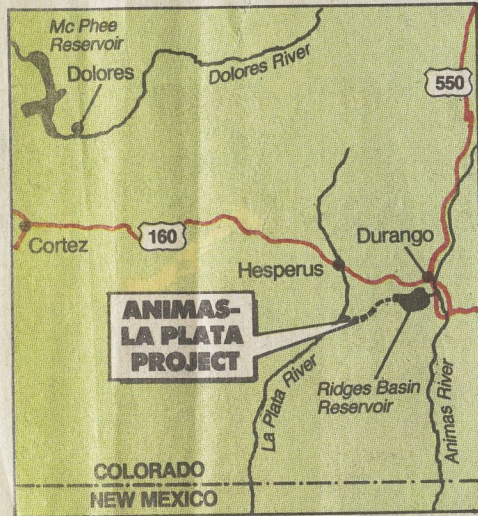
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New study planned on Animas-La Plata



The Denver Post

By Mark Obmascik

Denver Post Environment Writer

The U.S. Bureau of Reclamation, acknowledging charges filed against the agency in an environmental lawsuit, agreed yesterday to take extra time to perform more environmental studies on the long-delayed Animas-La Plata water project.

Federal officials said they likely will spend up to \$300,000 on a year-long study of the \$640.7 million project proposed for southwest Colorado and northwest New Mexico.

The announcement came in response to

a Sierra Club Legal Defense Fund lawsuit claiming that Animas-La Plata was being planned without a proper study of the project's effects on endangered animal species and river water quality.

"The Sierra Club has filed suit and raised some issues we want to address," said Bureau of Reclamation spokesman Rick Gold.

Gold said the decision will force the federal government to delay awarding a contract to excavate archaeological ruins that would be flooded by one of two project reservoirs.

He doubted the extra environmental

studies will force any major redesign of Animas-La Plata, the most expensive water project in Colorado history.

However, Lori Potter, the Sierra Club attorney who filed the lawsuit, said, "We won. We're celebrating."

She predicted the extra studies will force the Bureau of Reclamation to scale back Animas-La Plata to "a less costly and less damaging alternative."

As proposed, Animas-La Plata would irrigate 80,000 acres of farmland, supply drinking water to Durango and provide water to the Southern Ute, Ute Mountain Ute and Navajo tribes. It includes two res-

ervoirs, 240 miles of pipelines and canals, seven water-pumping plants and 34 miles of electric transmission lines.

U.S. Rep. Ben Nighthorse Campbell, a leading project supporter, said the Bureau of Reclamation's decision outraged him.

"The bureaucracy is out of control in Washington," Campbell said. "The government has again scalped the tribes with its most effective weapon — a promise it has broken."

The Bureau of Reclamation agreed to study how Animas-La Plata would affect:

Please see **ANIMAS** on 6B

Lujan was accused of pocketing money earmarked for elderly clients. She allegedly overpaid clients entitled to Old Age Pension Funds, then asked them to repay the excess. When the clients complied, Lujan allegedly kept the money for her personal use. She was fired from her job of 11 years.

Under yesterday's plea agreement, she will pay restitution of \$881.

■ DEADLINE MISSED — Denver Public Schools failed to meet yesterday's deadline for providing documentation about its school closing proposal to parents of students at Stevens Elementary School but agreed to release the information today.

Lawyer Robert Johnson, a Stevens parent who requested the information Monday, said if the district doesn't provide the information by today he'll file a lawsuit. The Stevens group wants documents detailing how much

similar rally is planned for Colorado Springs the next day, but details haven't been worked out, Slater said yesterday.

"It'll be back-to-back rallies this year," he said. "Grand Wizard Tom Robb is going to come out and speak, and those nights after the rallies we'll have cross lightings."

The burnings will be on private property in Douglas County, he added.

A group called the New Reich Skinheads has a permit to rally on the west steps of the state Capitol between noon and 3 p.m. this Monday, said Cindy Parmenter, an aide to Gov. Roy Romer. The permit application said the rally is to celebrate the birthday of Adolf Hitler and will include 30 to 40

Parmenter said they don't anticipate problems from the Monday rally, but McCann said days off have been canceled for certain units of the Denver police.

Aurora spokeswoman Sherry Patten confirmed that a rally permit has been issued in that city.

"It's very much a repeat of the event that he held here last year," she said.

"We are going to promote additional activities in the community in the hope that people will stay away from the park."

Linda Pitzer of the Colorado Spring Parks and Recreation Department said yesterday officials haven't received an application from Slater or the KKK to hold a rally there on July 18.

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Reassessing Animas-La Plata may yield a better alternative

IT MAY WELL be, as U.S. Rep. Ben Nighthorse Campbell asserted angrily last week, that a broken promise has always been Uncle Sam's most effective weapon against Native Americans. But at this point, it's hardly clear that any promise will be broken by the decision to put off construction of the Animas-La Plata water project for another year or so, to reassess its possible impacts on downstream water quality, wetlands and endangered species.

If anything, the updated environmental impact statement to be prepared by the U.S. Bureau of Reclamation might point to a cheaper, less damaging and more plausible way to supply the water guaranteed to the Southern Ute and Ute Mountain Ute tribes under an agreement reached in 1986.

The latest incarnation of Animas-La Plata, after all, would give the Indians of southwestern Colorado a reservoir in which to store water — but none of the pumps and pipelines needed to deliver the water to the reservations for use in irrigating croplands.

The distribution system would have to be built without help from the federal government, which has gotten out of the business of building big water diversion projects in in the West. That means the Indians themselves, along with state and local interests,

would have to come up with \$200 million or more for Phase 2 of the project — an unlikely prospect in view of today's economic realities.

In short, the latest delay — prompted by a lawsuit filed two months ago by the Sierra Club Legal Defense Fund — should be seen as an opportunity to re-evaluate the project and consider other means of meeting the government's obligation to the Indians.

Among the other possible options: buying irrigation water from existing farms or allowing the tribes to forgo agriculture and instead make money by selling or leasing their water to downstream users in Las Vegas or Los Angeles.

The latter scenario is one that unnerves many in Colorado's water establishment because it might undermine the state's legal claim to unused allotments of Colorado River water. But under the Animas-La Plata agreement, transfers of water from the reservations aren't specifically prohibited.

In any case, it makes sense to take another look at a project that, once built, would commit water users in the Durango area to shell out an estimated \$4 million per year in operating costs — mainly to run the electric pumps that would move the water 500 feet uphill from the Animas River to the reservoir site.

etc.

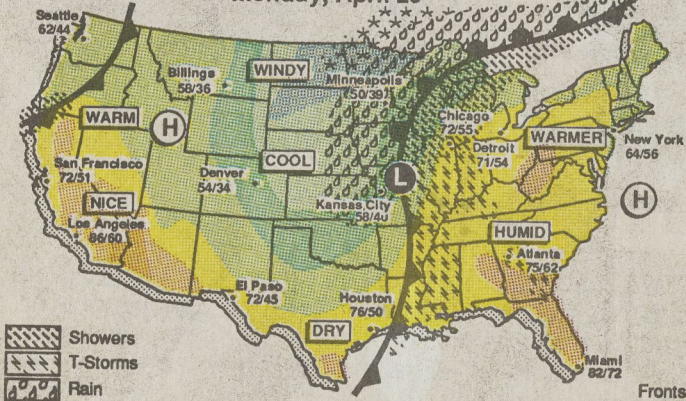
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NATIONAL FORECAST

Monday, April 20



- Showers
- T-Storms
- Rain
- Furries
- Snow
- Ice

Shown are noon positions of weather systems and precipitation. Temperature bands are highs for the day. Forecasted high/low temperatures are given for selected cities.

- Cold
- Warm
- Stationary



TRAVELERS' FORECAST for Monday

	Hi	Lo	Wea		Hi	Lo	Wea
Atlanta	75	62	t	Minneapolis	50	39	r
Chicago	72	55	t	New York	64	56	pc
Dallas	61	44	pc	Phoenix	88	62	s
Houston	76	50	pc	Salt Lake City	65	43	s
Kansas City	58	40	r	San Francisco	72	51	s
Las Vegas	85	57	s	Seattle	62	44	pc
Los Angeles	86	60	s	Washington	76	60	pc



INTERNATIONAL for Today

	Hi	Lo	Wea
Amsterdam	52	39	c
Athens	62	48	sh
Auckland	64	50	pc
Bangkok	102	84	pc
Barcelona	86	76	pc
Beijing	70	52	s
Beirut	71	50	pc
Berlin	70	53	c
Belgrade	53	43	pc
Berlin	54	37	c
Bermuda	72	64	pc
Bogota	70	55	t
Brisbane	80	68	pc
Brussels	55	40	c
Budapest	56	39	pc
Buenos Aires	68	48	r
Cairo	84	66	pc
Calgary	64	34	pc
Caracas	85	63	pc
Copenhagen	45	33	c
Dublin	53	42	sh
Frankfurt	56	38	pc
Geneva	57	35	s
Havana	82	72	pc
Helsinki	39	30	sn
Hong Kong	76	62	pc

3-DAY NATIONAL

	SUN			MON			TUE		
	Hi	Lo	Prc	Hi	Lo	Wea	Hi	Lo	Wea
Albany, N.Y.	56	41	0.01	72	50	pc	70	50	c
Amarillo	60	44	0.34	58	34	pc	65	36	pc
Anchorage	46	32	0.00	46	34	c	44	34	c
Asheville	69	60	0.00	74	59	sh	74	57	t
Atlanta	75	60	tr	75	62	t	78	62	t
Atlantic City	47	43	0.37	60	55	pc	76	59	pc
Austin	76	67	0.05	74	49	pc	76	42	pc
Baltimore	49	43	0.11	74	58	pc	81	57	c
Billings	49	40	tr	58	36	pc	62	39	pc
Birmingham	71	65	0.20	81	62	t	76	56	t
Bismarck	48	34	0.03	37	27	sn	50	32	c
Boise	65	28	0.00	69	43	pc	67	40	pc
Boston	48	39	0.09	64	52	pc	67	53	pc
Brownsville	88	72	0.00	85	61	pc	83	59	pc
Buffalo	76	40	0.00	72	53	c	70	51	t
Burlington, Vt.	63	32	0.00	69	51	c	65	49	c
Charleston, S.C.	77	63	0.07	78	65	pc	81	68	pc
Charleston, W.Va.	85	58	0.00	80	62	t	81	61	c
Charlotte, N.C.	80	62	0.00	76	61	c	79	63	c
Chicago	71	52	0.04	72	55	t	68	45	sh
Cincinnati	78	59	0.00	76	61	t	74	55	t
Cleveland	81	52	0.00	74	57	c	74	51	t
Columbia, S.C.	82	59	tr	79	62	sh	82	62	c
Columbus, Ohio	79	56	0.00	77	61	t	75	58	t
Concord, N.H.	52	35	0.01	69	49	pc	69	49	pc
Dallas	69	59	0.11	61	44	pc	67	40	pc
Dayton	78	57	0.00	75	57	t	72	53	t
Des Moines	58	54	0.74	54	41	r	55	32	r
Detroit	74	45	0.00	71	54	t	71	49	t
Duluth	50	43	0.53	41	34	r	45	33	r
El Paso	71	48	0.02	72	45	s	80	50	s
Evansville	75	64	0.22	76	59	t	69	52	t
Fairbanks	49	25	0.00	46	36	c	42	26	c
Fargo	57	46	tr	38	31	r	47	39	r
Flagstaff	55	27	0.00	62	30	s	66	37	s
Grand Rapids	77	48	0.15	71	55	t	67	48	sh
Houston	76	50	tr	58	36	pc	61	38	pc
Los Angeles	86	60	s	86	60	s	86	60	s

FRIDAY
Partly sunny,
pleasant.
70/42

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h-snow, i-ice.

ANN. BIBLIOG.
MAY - JULY 92

Ref.

IBI

Monitoring -
- new techniques
- EPA -
ex. Erikson -

1) Adams, S.M. 1990. - A 75 Symp 8
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2) Colo. Water June 92 - (Newsletter Co. West Res. Co. Inst)

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7A) Rojas - Conserv. Biol. 6(2) - sp. - problem (re. low soil / own papers)

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* Van Horne & Wiens } USFWS pub.

* Armour - send for - next quant. rep. ??

- * time top - timed ecol. Wiens - Odum - → Info transfer
- but adm. hierarchy - dumb -

De Marzio - (hybrid)

wolf-hybrid

ESA oppo. Wise Use Movement (limited - Frank - 255 - 21/2/92) - no protection for "non adaptive" sp. such as Colip. conder - = - or "sp. lacking vigor to spread in range"

Devin
1989
every year
p₂ 3 yr
drought m - rolled back

Relate sm exp. - anticipate patent problem in AZ - see -
- work for low time, then consult. m -
- end - sp -

Berkeley personal experiences Power Co Prob. -

polarized, in eq - but w/ my expertise - - - - -
① Neb. Pub. Ac - O₂ Temp. Prob. - Act. God vs
Act man - - - - - Bur Rec. - med to a lent p₂ 30
30 days - - - - - pre - - - - - what ends in C. M. Co -

Gen El. - Mining corp. * ex - only in MA - PCB - Use of litigation - Reg. dif -
ST. - EPA ⁷ (Boston) - only human - but

biological diversity EPA Fisheries
sportswomen group - - - - - if only PCB - - - - - would lose
best fisheries (now corp) - Historic - CT
(scams - no serious problem -) words pure

us. Power EPA - CROW Also BLM - AZ - 7000 - see site cit

- minding case - S. Dak. - Zn (heavy metal) - all
monitoring indices - diversity - insect, fish - use of indicator
no problem - not high value - but - Erikson (mid
level bureaucrat) - Fish health assess.
(see a B. Adams) - - - - - keep trying to

support pre conceived idea - eventually hit
something - Physiol. indices, seasonally -
entogenetic, something seem to be "abnormal".
(some person fountain crk. - invent - fish in

effluent canal - 0.15 yr - oriented small - would select -
see Environ. Conv - CROW Ark.

Ethics publ. - if consultant tried every method - + merit - all except one - stretch imagination
looks bad - claim - no problem! - CROW Ark.

pre conceived E/C - flow - trout - outrageous
assumpt - 94 mi - - - - - sample - (conclude - ?
USGS growth

- Submit peer-review journal - "Ethical" - if
consult. tried to show low flow better - - - - - how to
do such statistical stringencies of legerdemain - - - - - prostitution
- IFM - where put transect - but
bottom line is Avg \bar{x} = 800 cts -

own history
Sovix Tribe
S.D.
if ST. & Tribe - early
begin discussion - but
attorneys - consult

I-10-86

To: Joseph Bergquist
PRC Engineering

Fm: Bob Behnke

Re: Flow releases from six proposed dams

I can not be specific because of lack of detailed information concerning the proposed dams. I can only point out that concerns regarding regulated flows or converting stream sections into reservoirs can be grouped into the following categories: 1. Federally endangered or threatened species present 2. Sport fishery 3. Native fish assemblage.

The only endangered and threatened species legally protected under the Endangered Species Act in the Salt River basin are: Apache trout, loach minnow, and spike dace. Hybrid Apache trout occur in Black River in vicinity of dam no. 1 (Lower Black River). I doubt hybrid trout will be raised as an issue except in regards to replacing a stream trout fishery with a reservoir (sport fishery consideration). Dams 2 - 6 (Black R. Pumps, Carrizo, Knob, Walnut Canyon, and Gleason Flat) would have same sport fishery (warm water fishery) consideration, but new reservoir sport fisheries would be vastly superior to present stunted smallmouth bass fishery in lower Black and Salt rivers. The Spike dace and loach minnow were formally proposed for threatened status under ESA in June, 1985. To date, a final rulemaking on these species has not been made to my knowledge. Although in the "proposed" category of E.S.A., the spikedace and loach minnow are given protection under E.S.A. In particular, this protection relates to "critical habitat" and the injunction for federal agencies to take any action that would jeopardize the species (such as preliminary permits for dam construction). The only "critical habitat" proposed for the spikedace in the Salt R. drainage is : "35 miles of Verde R. below Sullivan L. and Sycamore Creek." No critical habitat was originally proposed for loach minnow in the Salt drainage, but this species was found in June, 1985 in the E. Fk. White River and a short section of the White River below the confluence of N. Fk. and E. Fk. (on Indian Reservation). In any event, it is likely that intensive surveys and fish collections would be required as part of environmental assessment for proposed dams.

Squawfish, razorback sucker, and woundfin, three endangered species, have been stocked into the Salt and Verde drainages under a provision of the Endangered Species Act as "nonessential experimental populations." As such, they are not protected by E.S.A. Concern might be expressed to maintain certain segments of the basin as "native fish assemblages". Except in headwater areas, non-native species dominate the fish fauna of the basin, and this is especially true in reservoirs.

Regarding recommended flow releases from the proposed reservoirs, this depends on what species are to be favored as target species. Native species of minnows and suckers evolved in a highly fluctuating environment and appear to be favored over non-native species in areas subjected to great annual flow fluctuations. Non-native sport fishes

such as rainbow trout and smallmouth bass would greatly benefit from a more-or-less constant flow regime that eliminates peak flows by reservoir storage and increases the natural low summer and autumn flows due to reservoir releases. Until you receive some indication from federal and/or state people regarding their concerns for certain designated fish species to be affected by a new flow regime, I can only suggest that you design a proposed flow release from each reservoir in accordance with the primary purpose of the reservoir. Federal agencies (Bur. Rec. Corps Engineers) who are involved with licensing procedures have been alerted to the spike dace and loach minnow and will be aware of problems of "jeopardy". The proposed flow regime can be given to the Arizona Game and Fish Department and the U.S.F.W.S. for their comments. I would point out that, in general, the best habitat conditions for most fish species are maintained at flow of 50% or more of the long-term average flow. Except in canyon areas, with large, deep pools, most habitat for large gamefishes, is lost when low flows approach about 10% of the average flow.

Bob -
FYE
Please return
K.
(I ordered a reprint).

Regulated Flushing in a Gravel-Bed River for Channel Habitat Maintenance: A Trinity River Fisheries Case Study

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WENDY E. GREENBERG

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ABSTRACT / The operation of Trinity and Lewiston Dams on the Trinity River in northern California in the United States, combined with severe watershed erosion, has jeopardized the existence of prime salmonid fisheries. Extreme streamflow depletion and stream sedimentation below Lewiston have resulted in heavy accumulation of coarse sediment on riffle gravel and filling of streambed pools, causing the destruction of spawning, nursery, and overwintering habitat for prized chinook salmon (*Salmo gairdnerii*) and steelhead trout (*Oncorhynchus tshawytscha*). Proposals to restore and maintain

the degraded habitat include controlled one-time remedial peak flows or annual maintenance peak flows designed to flush the spawning gravel and scour the banks, deltas, and pools. The criteria for effective channel restoration or maintenance by streambed flushing and scouring are examined here, as well as the mechanics involved.

The liabilities of releasing mammoth scouring-flushing flows approximating the magnitude that preceded reservoir construction make this option unviable. The resulting damage to fish habitat established under the postproject streamflow regime, as well as damage to human settlements in the floodplain, would be unacceptable, as would the opportunity costs to hydroelectric and irrigation water users. The technical feasibility of annual maintenance flushing flows depends upon associated mechanical and structural measures, particularly instream maintenance dredging of deep pools and construction of a sediment control dam on a tributary where watershed erosion is extreme. The cost effectiveness of a sediment dam with a limited useful economic life, combined with perpetual maintenance dredging, is questionable.

The once outstanding salmon and trout fisheries of the Trinity River declined after the completion of the Trinity River Division of California's Central Valley Project, which created a major new supply of irrigation water and hydroelectric power. The federal Bureau of Reclamation and the US Fish and Wildlife Service, together with many California agencies, have intensively researched the options for restoring these fisheries. This rich documentation, once it is screened and integrated with research findings elsewhere, presents a comprehensive basis for a definitive case study.

The large potential resource benefits from mitigating the adverse effects of substantial streamflow depletion and severe watershed erosion also make this case ideal for assessing all aspects of managing gravel-bed streams by flushing accumulated sand and silt with controlled reservoir releases. Alternative or

complementary management measures, particularly channel maintenance dredging, and sediment impoundment on tributaries affected by heavy erosion, also are examined here.

Federal and state water resource management agencies are trying to determine the need for flushing flows below many dams, both new and old. Although flushing flows are the focus of the case study, they are only one of many measures available for the comprehensive management of instream sediment.

Project History

The Trinity River drainage lies in the Klamath Mountains of northwestern California in the United States, west of Redding and Shasta Lake and east of Eureka and Redwood National Park. The mainstem river is approximately 275 km (170 miles) long and drains a 7640-km² (2950-mi²) watershed, originating at the 2400-m (8000-ft) elevation in northern Trinity County. It is the largest tributary to the Klamath River, joining the Klamath 65 km (40 mi) from the Pacific Ocean at a 90-m (300-ft) elevation.

Before 1960, the Trinity was typical of most unreg-

KEY WORDS: Flushing; Scouring; Channel maintenance; Fisheries; Trinity River

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