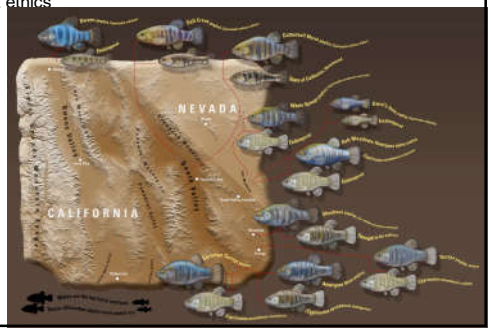
Conservation

- Moral vs. legal issues
- What is the goal of conservation?
- At what level do you try and conserve?
- Legal framework, national vs. international issues
- Economics vs. ethics



Legal Framework

- Endangered Species Act (1973)
  - Identify species at risk
    - Endangered
    - Threatened
    - Candidate species
  - Species petitioned for listing (candidate)
  - Study and assessment
  - Recommendation from USFWS
  - Period of public comment
  - Recovery plan, definition of vital habitat
  - Periodic review

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R4–ES–2016–0037; 4500030113]

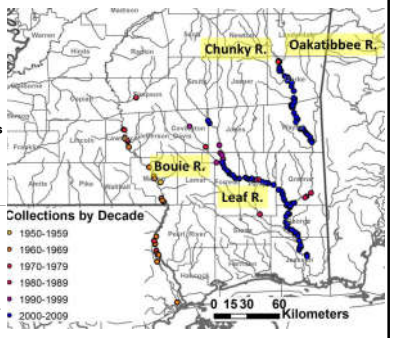
RIN 1018–BB55

Endangered and Threatened Wildlife and Plants; Threatened Species Status for Pearl Darter

AGENCY: Fish and Wildlife Service, Interior.

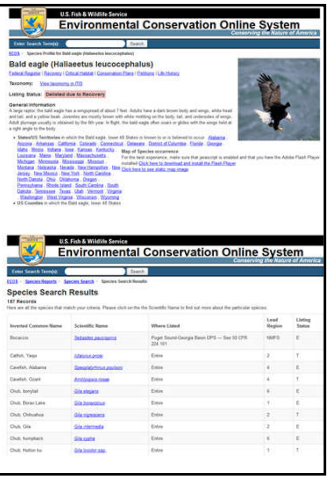
ACTION: Proposed rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), propose to list the Pearl darter (*Percina aurora*), a fish from Mississippi, as a threatened species under the Endangered Species Act (Act). If we finalize this rule as proposed, it would extend the Act's protections to this species. The effect of this proposed regulation will be to add this species to the List of Endangered and Threatened Wildlife.



Recovery Plans

- Endangered Specie Act mandates the Department of Interior develop a recovery plan for any species that is listed.
- Plans must establish the current status, reasons for decline, and a plan for recovery and eventual delisting of the species.
- http://www.fws.gov/endangered/species/



CENTER for BIOLOGICAL DIVERSITY — Because life is good.

For Immediate Release, April 21, 2011

Contact: Noah Greenwald, (503) 484-7495

E-mail this page
More press releases

Lawsuit Launched to Protect 400-plus Freshwater Species in Southeast Under Endangered Species Act

ATLANTA— The Center for Biological Diversity and five southeastern conservation groups filed a formal notice of intent to sue the U.S. Fish and Wildlife Service today for failing to respond to an April 2010 petition seeking Endangered Species Act protection for 403 species dependent on the region's troubled waterways. Among the fish, crayfish, mussels, birds and others included in the petition are the Florida sandhill crane, hellbender and Black Warrior waterdog salamanders, Alabama map turtle and burrowing bog crayfish.

"Unfortunately, the Southeast's rivers are the extinction capital of North America," said Noah Greenwald, endangered species program director at the Center. "Dams, pollution, growing demand for water and global climate change mean these 403 species need Endangered Species Act protection to have any chance at survival."

Under the Endangered Species Act, the Fish and Wildlife Service was required to determine whether the petition presented sufficient information to warrant further consideration within 90 days and determine if the species warranted protection within one year. The agency has now missed both deadlines.

"These species are on the brink of disappearing forever, and the Obama administration seems intent only on delay and inaction," said Greenwald. "It's dangerous foot-dragging — yet another result of an endangered species program that's been broken for more than a decade and badly needs reform."

To date, President Barack Obama's Fish and Wildlife Service has only protected 55 species, for a rate of 27 species per year. This is better than under the last Bush administration, when only seven species per year were protected by the agency, but far worse than under the Clinton administration, when 62 species were listed per year for a total of 498 species. Of the 55 species protected under President Obama, 48 live on the Hawaiian island of Kauai and were protected in a single decision.

"These 403 species are an integral part of what makes the Southeast unique," said Greenwald. "Saving them would improve the health of southeastern rivers and help ensure a high quality of life for people now and in the future."

The Southeast's rivers and streams are a hotspot of biological diversity, harboring 493 fishes (62 percent of U.S. fish species) and at least 269 mussels (91 percent of U.S. mussel species). The combined threat of dams, urban and agricultural sprawl, logging, mining, livestock grazing, pollution, invasive species, climate change and other factors are a massive assault on the health and integrity of Southeast rivers and are resulting in an extinction crisis. For example, the Coosa River in Alabama and Georgia is the site of the greatest modern extinction event in North America: the loss of 36 species following construction of a series of dams. Overall, the Mobile Basin is home to half of all North American species that have gone extinct since European settlement.

Groups joining the Center include The Clinch Coalition, Dogwood Alliance, Gulf Restoration Network, Tennessee Forests Council and West Virginia Highlands Conservancy.

Learn more about the campaign:
http://www.biologicaldiversity.org/programs/biodiversity/1000_species/the_southeast_freshwater_extinction_crisis/index.html
See an interactive map showing a list of the species by state:
http://www.biologicaldiversity.org/programs/biodiversity/1000_species/the_southeast_freshwater_extinction_crisis/map.html
Watch a slide show of focal species in the petition:
http://www.biologicaldiversity.org/programs/biodiversity/1000_species/the_southeast_freshwater_extinction_crisis/slide_show.html

Arizona . California . Colorado . Florida . N. Carolina . Nevada . New Mexico . New York . Oregon . Washington, D.C. . La Paz, Mexico
BiologicalDiversity.org

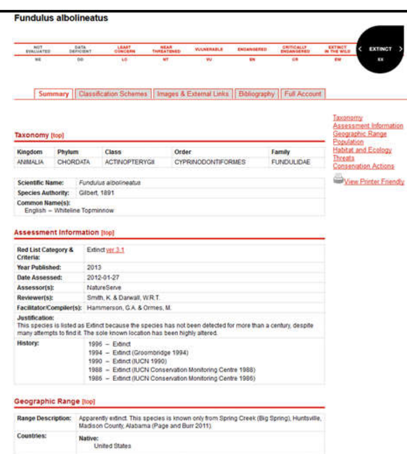
Go back

Conservation Status of Fishes

- Pressures on fishes
  - Habitat loss
  - Fisheries
  - Impoundments
  - Introduced species

Order	Data Deficient	Near Threatened	Vulnerable	Critically Endangered	Endangered	Extinct in Wild	Extinct	Grand Total
ACIPENSERIFORMES		2	4	17	2			25
ALBULIFORMES	7	1	1					9
ANGUILLIFORMES	29	6	3	1	1			40
ATHERINIFORMES	29	12	48	10	11			110
AULOPIFORMES	5							5
BATRACHOIDIFORMES	3		9					12
BELONIFORMES	12	1	8	2	4			27
BERYCIFORMES	4		2					6
CHARACIFORMES	38	5	18	3	9			73
CLUPEIFORMES	15		13	3	2			33
CYPRINIFORMES	615	105	306	140	240		24	1436
CYPRINODONTIFORMES	58	22	83	32	58	5	14	272
ELOPIFORMES	5		1					6
ESOCIFORMES			1					1
GADIFORMES	23		2	1				26
GASTEROSTEIFORMES	4		2	1			1	8
GOBIESOCIFORMES	8		8		1			17
GONORYNCHIFORMES	12		4	1				17
GYMNOTIFORMES	2							2
LOPHIIFORMES	5	1		1				7
MUGILIFORMES	4				1			5
OPHIDIIFORMES	7	1	10					18
OSMERIFORMES	20	4	11	4	2		1	42
OSTEOGLOSSIFORMES	40	6	16		5			67
PERCIFORMES	649	98	362	144	114		8	1379
PERCOPSIFORMES			3	1				4
PLEURONECTIFORMES	27		2		1			30
POLYPTERIFORMES	1	1						2
SALMONIFORMES	18	2	34	15	11	1	13	94
SCORPAENIFORMES	39	1	10	3	2		1	56
SILURIFORMES	337	39	74	20	48		3	521
STOMIIFORMES	2							2
SYNBRANCHIFORMES	19	2	6		4			31
SYNGNATHIFORMES	41	3	12	1	1			58
TETRAODONTIFORMES	15		5					20
ZEIFORMES	1							1
Grand Total	2094	312	1058	400	517	6	65	4462

- www.iucnredlist.org



Fundulus albolineatus

NOT EVALUATED NE | DATA DEFICIENT DD | LEAST CONCERN LC | NEAR THREATENED NT | VULNERABLE VU | ENDANGERED EN | CRITICALLY ENDANGERED CR | EXTINCT IN THE WILD EW | EXTINCT EX

Summary | Classification Schemes | Images & External Links | Bibliography | Full Account

Taxonomy
Assessment Information
Geographic Range
Population
Habitat and Ecology
Threats
Conservation Actions
View Printer Friendly

Taxonomy [top]

Kingdom	Phylum	Class	Order	Family
ANIMALIA	CHORDATA	ACTINOPTERYGII	CYPRINODONTIFORMES	FUNDULIDAE

Scientific Name:	*Fundulus albolineatus*
Species Authority:	Gilbert, 1891
Common Name(s): English – Whiteline Topminnow	

Assessment Information [top]

Red List Category & Criteria:	Extinct ver 3.1
Year Published:	2013
Date Assessed:	2012-01-27
Assessor(s):	NatureServe
Reviewer(s):	Smith, K. & Darwall, W.R.T.
Facilitator/Compiler(s):	Hammerson, G.A. & Ormes, M.
Justification: This species is listed as Extinct because the species has not been detected for more than a century, despite many attempts to find it. The sole known location has been highly altered.	
History:	1996 – Extinct 1994 – Extinct (Groombridge 1994) 1990 – Extinct (IUCN 1990) 1988 – Extinct (IUCN Conservation Monitoring Centre 1988) 1986 – Extinct (IUCN Conservation Monitoring Centre 1986)

Geographic Range [top]

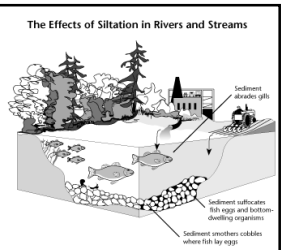
Range Description:	Apparently extinct. This species is known only from Spring Creek (Big Spring), Huntsville, Madison County, Alabama (Page and Burr 2011).
Countries:	Native: United States
Range Map:	Click here to open the map viewer and explore range.

North American Fish Extinctions

- *Chasmistes muriei* (Snake River Sucker) [3]
- *Coregonus alpenae* (Longjaw Cisco) [1,2]
- *Coregonus johannae* (Deepwater Cisco) [1,2]
- *Coregonus nigripinnis* (Blackfin Cisco) [1,2]
- *Cottus echinatus* (Utah Lake Sculpin) [3,4]
- *Empetrichthys merriami* (Ash Meadows Poolfish) [3,1]
- *Etheostoma sellare* (Maryland Darter) [3]
- *Fundulus albolineatus* (Whiteline Topminnow) [3]
- *Gambusia amistadensis* (Amistad Gambusia) [3]
- *Gambusia georgei* (San Marcos Gambusia) [3]
- *Gila crassicauda* (Thicktail Chub) [3]
- *Lepidomeda altivelis* (Pahranagat Spinedace) [3]
- *Moxostoma lacerum* (Harelip Sucker) [3]
- *Notropis orca* (Phantom Shiner) [3]
- *Pogonichthys ciscoides* (Clear Lake Splittail) [1]
- *Rhinichthys deaconi* (Las Vegas Dace) [3]
- *Salvelinus agassizii* (Silver Trout) [3]
  - 1 – invasive species
  - 2 – overfishing
  - 3 – habitat loss
  - 4 - pollution

Pressures on Fishes

- Habitat loss
  - Substrate modification
  - Channelization
  - Watershed disturbance
  - Urbanization and water competition
  - Point source pollutants



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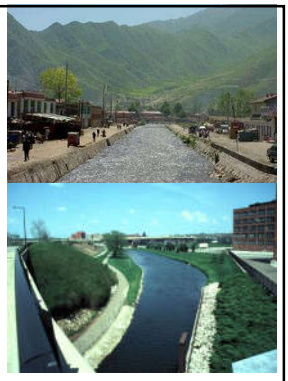

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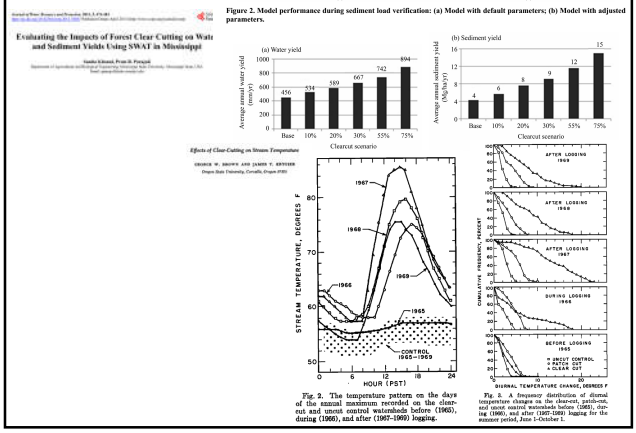
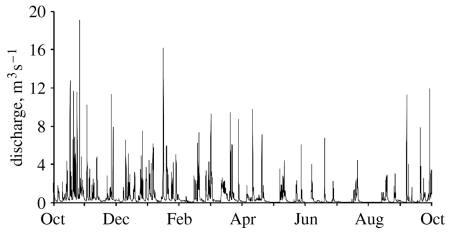
- Clear cutting impacts
  - Increased sediment input, bank erosion
  - Increased solar input, temperature
  - Increase variability in hydrograph (faster, higher floods and more frequent droughts)

Clear Cutting and Water Quality



Clear Cutting and Water Quality



Pressures on Fishes

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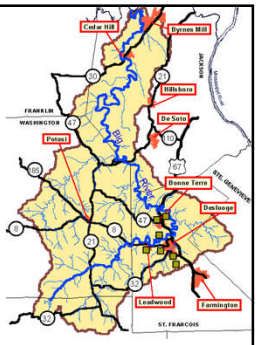


Lead Advisory

The DHSS is continuing its advisory for **all species of sunfish (locally known as bream or perch), carp, redhorse, and other suckers found in the Big River in St. Francois and Jefferson counties, the Flat River in St. Francois County from Highway "B", six miles downstream to where it enters the Big River, and sunfish from Big Creek near the town of Glover in Iron County, Missouri.** These fish have been found to contain lead at levels of significant health concern and **should not be eaten.**

Lead-mine waste piles in the area have contaminated the rivers with lead at levels of health concern. **Since 1980, DHSS has recommended people not eat carp, redhorse, or suckers from the Big River downstream from Desloge to the mouth of the river where it enters the Meramec River.** For a few years in the late 1980s, we also found catfish contaminated with lead at levels of health concern. Sampling since 1992, however, indicates that **catfish no longer pose a health risk.** Sunfish were captured and analyzed for the first time in 1993 and were also found to be contaminated. The MDC is continuing to sample fish from these waters and that sampling indicates that sunfish, carp, redhorse, and other suckers in the Big River and Flat River are still contaminated with lead at levels of

Integrating Organismal and Population Responses of Estuarine Fishes in Macondo Spill Research

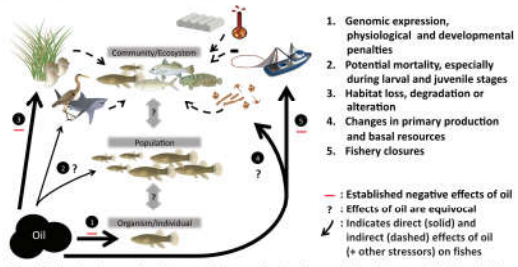


Figure 1. Schematic of presumed and documented effects resulting from large-scale oil pollution at multiple hierarchical organization levels (i.e., organism, population, community) for fishes occupying estuarine environments. The symbols are courtesy of the Integration and Application Network, University of Maryland Center for Environmental Science (http://ian.umces.edu/symbols).

Pressures on Fishes - Fishing

- Select fisheries have already collapsed
- Predictions are that all will collapse within 50 years
- Why?

All seafood will run out in 2050, say scientists

By Charles Clover, Environment Editor

Last Updated: 1:11am GMT 04/11/2006

- Comment: Fishermen have lost the plot
- Audio: How the Romans fished North Sea flamingos to extinction
- Scores of historic species now extinct
- In pictures: Threatened fish

The world's stocks of seafood will have collapsed by 2050 at present rates of destruction by fishing, scientists said yesterday.

A four-year study of 7,800 marine species around the world's ecosystems has concluded that the long-term trend is clear and predictable.

By 2048, to be exact, catches of all the presently fished seafoods will have declined on average by more than 90 per cent since 1950.

The study, by an international group of ecologists and economists, says the loss of biodiversity impairs the ability of oceans to feed the world's growing human population – expected to rise by 50 per cent to nine billion in 2050.

If the rate of over-fishing continues, the world's currently fished seafoods will have reached what is defined as collapse by 2048

Over-fishing also sabotages the stability of marine environments, profoundly reducing the ocean's ability to produce seafood, resist diseases, filter pollutants and rebound from stresses such as climate change.

Every species matters when it comes to the ocean's ability to repair itself, says the study, published in this week's Science magazine.

Pressures on Fishes - Fishing

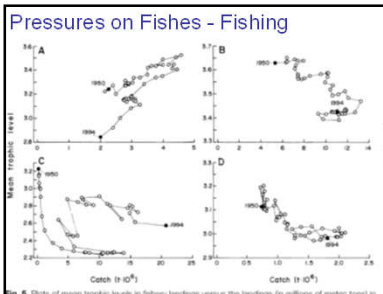


Fig. 5. Plots of mean trophic levels in fishery landings versus the landings (in millions of metric tons) in four marine regions, illustrating typical backward-bending signatures (note variable ordinate and abscissa scales). (**A**) Northwest Atlantic (FAO area 21); (**B**) Northeast Atlantic (FAO area 27); (**C**) Southeast Pacific (FAO area 87); (**D**) Mediterranean (FAO area 37).

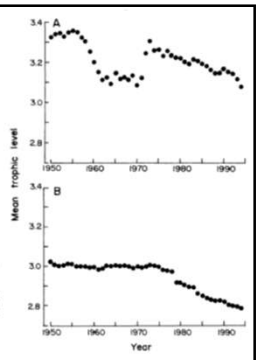


Fig. 1. Global trends of mean trophic level of fisheries landings, 1950 to 1994. (**A**) Marine areas; (**B**) inland areas.

- **Fishing Down Marine Food Webs. 1998.** Daniel Pauly; Villy Christensen; Johanne Dalsgaard; Rainer Froese; Francisco Torres Jr. *Science*, Vol. 279, No. 5352., 860-863.

Endangered Megafauna

Of the worlds 20 largest freshwater fishes, 17 (18) are endangered due in part to overharvest.

COMMON NAME	SCIENTIFIC NAME	MAXIMUM SIZE	FOCAL RIVER SYSTEM	IUCN RED LIST (2006) CATEGORY	MAJOR THREATS†
Chinese paddlefish	*Psephurus gladius*	700 cm, 500 kg	Yangtze River Basin	Critically endangered	Harvest, habitat loss
Giant freshwater stingray	*Himantura chaophraya*	500 cm, 600 kg	Mekong River Basin	Vulnerable	Harvest, pollution
Wels catfish	*Silurus glanis*	500 cm, 306 kg	Widespread in Europe and Asia	Least concern	NA
Arapaima (pirarucu, paiche)	*Arapaima gigas*	450 cm, 200 kg	Amazon River Basin	Data deficient	Harvest
Soldatov's catfish	*Silurus soldatovi*	400 cm	Amur River Basin	Not evaluated	Harvest, habitat, pollution
Piraiba (Sardine, tachorro)	*Brachiplatystoma filamentosum*	360 cm, 200 kg	Amazon River Basin	Not evaluated	Harvest
Alligator gar	*Atractosteus spatula*	305 cm, 137 kg	Mississippi River Basin	Not evaluated	Unknown
Mekong giant catfish	*Pangasianodon gigas*	300 cm, 300 kg	Mekong River Basin	Critically endangered	Harvest, habitat loss
Giant barb	*Catlocarpio siamensis*	300 cm, 300 kg	Mekong River Basin	Not evaluated	Harvest, habitat loss
Giant pangasius (dog-eating catfish)	*Pangasius sanitwongsei*	300 cm, 300 kg	Mekong River Basin	Data deficient	Harvest, habitat loss, pollution
Pottitor mahseer	*Tor putitora*	275 cm	Brahmaputra River Basin	Not evaluated	Harvest, habitat loss
Lake sturgeon	*Acipenser fulvescens*	274 cm, 125 kg	St. Lawrence, Great Lakes	Not evaluated	Harvest, habitat loss, pollution
Wallago (giant sheatfish)	*Wallago attu*	240 cm	Mekong River Basin	Not evaluated	Harvest
Mangar	*Barbus sharpeyi*	230 cm, 134 kg	Tigris River Basin	Not evaluated	Unknown
Mississippi paddlefish	*Polyodon spathula*	221 cm (including paddle)	Mississippi River Basin	Vulnerable	Harvest, habitat loss, pollution
Nile perch	*Lates niloticus*	200 cm, 200 kg	Nile River Basin	Not evaluated	Harvest
Pallid sturgeon	*Scaphirhynchus albus*	200 cm, 130 kg	Mississippi River Basin	Endangered	Harvest, habitat loss
Murray cod	*Maccullochella peelii peelii*	200 cm, 113.5 kg	Murray River Basin	Not evaluated†	Harvest, habitat loss
Tanganyika lates (giant perch)	*Lates angustifrons*	200 cm, 100 kg	Lake Tanganyika	Endangered	Harvest
Taimen	*Hucho taimen*	200 cm, 100 kg	Selenge River Basin, Lake Baikal, Amur River Basin	Not evaluated	Harvest, habitat loss, pollution

Fishery Pressure – Black Sea Example

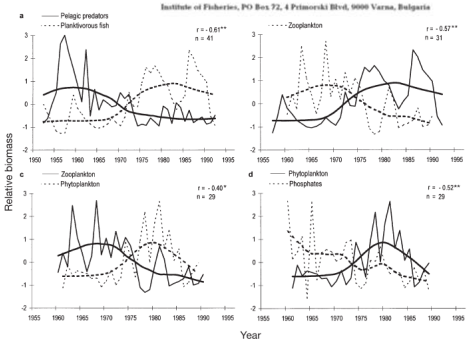


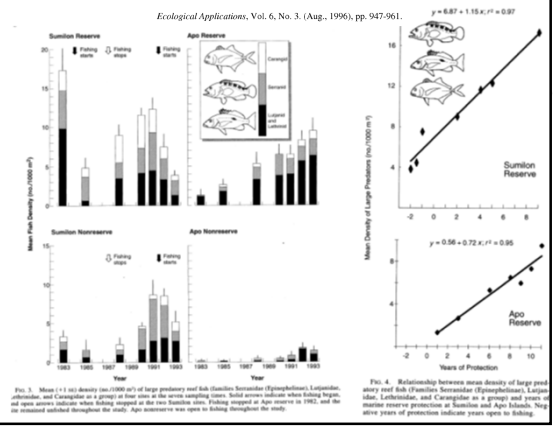
Fig. 1. Inverse trends across consecutive trophic levels. Light curves give original data (subtracting the mean and dividing by the variance), bold curves give non-linear trends smoothed by locally weighted regression (loess). (a) Pelagic predatory fish (bonito, mackerel, bluefish) catch versus planktivorous fish (sprat, horse mackerel) biomass, (b) planktivorous fish biomass versus zooplankton biomass, (c) zooplankton biomass versus phytoplankton biomass, (d) phytoplankton biomass versus phosphate content in surface water. Spearman rank correlation is estimated for pairs of log-transformed original series given on each panel. Correlation coefficients (r) are significant at $^{**}p < 0.01$ and $^{*}p < 0.05$

Fishery Reserves

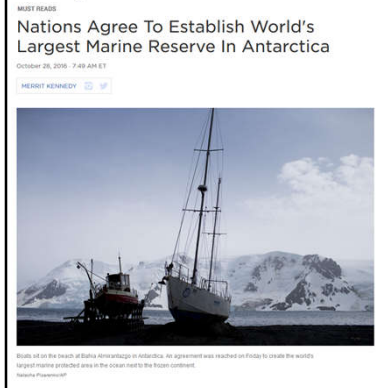
Marine Reserves: Rates and Patterns of Recovery and Decline of Large Predatory Fish

Garry R. Russ; Angel C. Alcala

Ecological Applications, Vol. 6, No. 3. (Aug., 1996), pp. 947-961.



Fishery Reserves



MUST READS

Nations Agree To Establish World's Largest Marine Reserve In Antarctica

October 28, 2016 · 7:49 AM ET

MERRIT KENNEDY

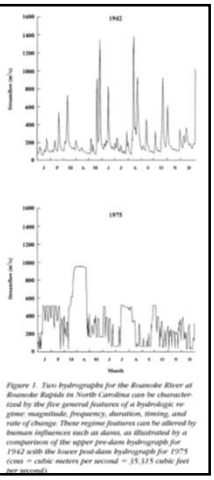
Boats sit on the beach at Bahia Almirantazgo in Antarctica. An agreement was reached on Friday to create the world's largest marine protected area in the ocean next to the frozen continent.

After years of negotiations, nations have reached an agreement to establish the world's

The agreement will come into force in December. Seventy-two percent of the sanctuary "will be a 'no-take zone, which forbids all fishing, while other sections will permit some harvesting of fish and krill for scientific research," the CCAMLR says.

Pressures on Fishes

- Impoundments
  - Habitat loss
  - Habitat alteration
  - Hydrograph alterations



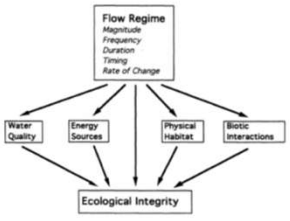


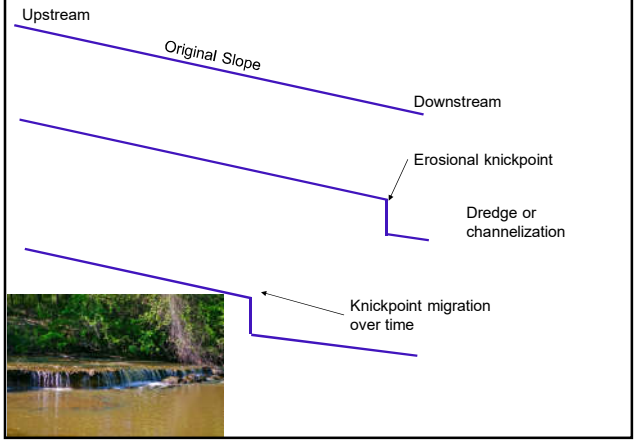
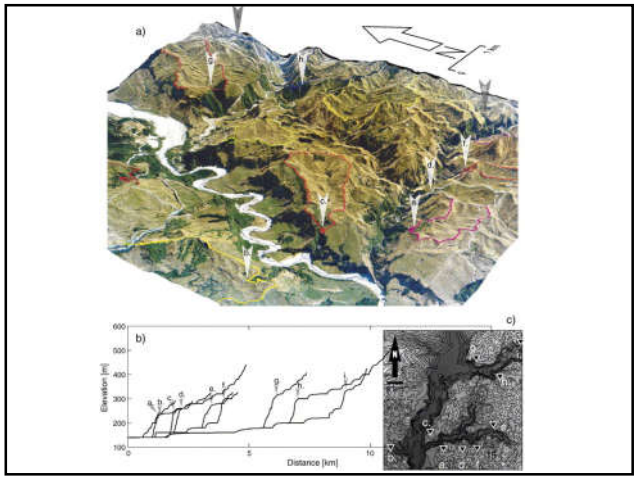
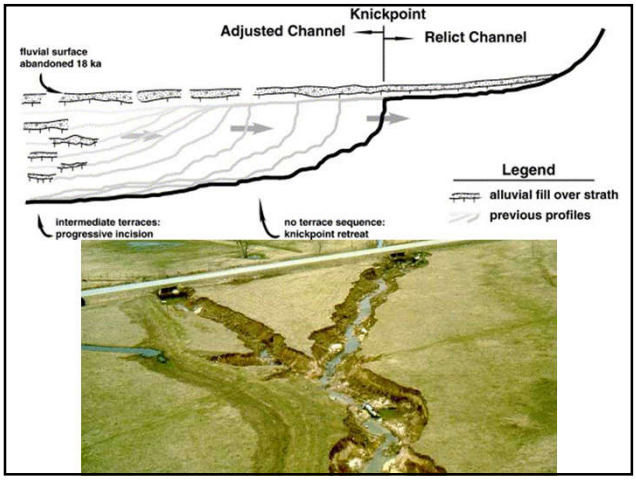
Figure 1. Flow regime is of central importance in sustaining the ecological integrity of flowing water systems. The five components of the flow regime—magnitude, frequency, duration, timing, and rate of change—influence integrity both directly and indirectly, through their effects on other primary regulators of integrity. Modification of flow thus has cascading effects on the ecological integrity of rivers. After Karr 1991.

Figure 1. Two hydrographs for the Roanoke River at Roanoke Rapids in North Carolina can be characterized by the five general features of a hydrologic regime: magnitude, frequency, duration, timing, and rate of change. These regime features can be altered by human influences such as dams, as illustrated by a comparison of the upper pre-dam hydrograph for 1942 with the lower post-dam hydrograph for 1975 (cms = cubic meters per second = 35.315 cubic feet per second).

Table 1. Physical responses to altered flow regimes.

Source(s) of alteration	Hydrologic change(s)	Geomorphic response(s)	Reference(s)
Dam	Capture sediment moving downstream	Downstream channel erosion and tributary headcutting	Chien 1985, Petts 1984, 1985, Williams and Wolman 1984
		Bed armoring (coarsening)	Chien 1985
Dam, diversion	Reduce magnitude and frequency of high flows	Deposition of fines in gravel	Sear 1995, Stevens et al. 1995
		Channel stabilization and narrowing	Johnson 1994, Williams and Wolman 1984
		Reduced formation of point bars, secondary channels, oxbows, and changes in channel planform	Chien 1985, Copp 1989, Fenner et al. 1985
Urbanization, tiling, drainage	Increase magnitude and frequency of high flows	Bank erosion and channel widening	Hammer 1972
		Downward incision and floodplain disconnection	Prestegaard 1988
	Reduced infiltration into soil	Reduced baseflows	Leopold 1968
Levees and channelization	Reduce overbank flows	Channel restriction causing downcutting	Daniels 1960, Prestegaard et al. 1994
		Floodplain deposition and erosion prevented	Sparks 1992
		Reduced channel migration and formation of secondary channels	Shankman and Drake 1990
Groundwater pumping	Lowered water table levels	Streambank erosion and channel downcutting after loss of vegetation stability	Kondolf and Curry 1986

Table 2. Ecological responses to alterations in components of natural flow regime.[a]

Flow component	Specific alteration	Ecological response	Reference(s)
Magnitude and frequency	Increased variation	Wash-out and/or stranding Loss of sensitive species	Cushman 1985, Petts 1984 Gehrke et al. 1995, Kingsolving and Bain 1993, Travnichek et al. 1995
		Increased algal scour and wash-out of organic matter	Petts 1984
		Life cycle disruption	Scheidegger and Bain 1995
	Flow stabilization	Altered energy flow Invasion or establishment of exotic species, leading to: Local extinction Threat to native commercial species Altered communities	Valentin et al. 1995 Kupferberg 1996, Meffe 1984 Stanford et al. 1996 Busch and Smith 1995, Moyle 1986, Ward and Stanford 1979
		Reduced water and nutrients to floodplain plant species, causing: Seedling desiccation Ineffective seed dispersal Loss of scoured habitat patches and secondary channels needed for plant establishment Encroachment of vegetation into channels	Duncan 1993 Nilsson 1982 Fenner et al. 1985, Rood et al. 1995, Scott et al. 1997, Shankman and Drake 1990 Johnson 1994, Nilsson 1982
Timing	Loss of seasonal flow peaks	Disrupt cues for fish: Spawning	Fausch and Bestgen 1997, Montgomery et al. 1993, Nesler et al. 1988
		Egg hatching Migration	Nanjor et al. 1995 Williams 1996
		Loss of fish access to wetlands or backwaters Modification of aquatic food web structure Reduction or elimination of riparian plant recruitment Invasion of exotic riparian species Reduced plant growth rates	Junk et al. 1989, Sparks 1995 Power 1992, Wootton et al. 1996 Fenner et al. 1985 Horton 1977 Reily and Johnson 1982
Duration	Prolonged low flows	Concentration of aquatic organisms Reduction or elimination of plant cover Diminished plant species diversity Desertification of riparian species composition Physiological stress leading to reduced plant growth rate, morphological change, or mortality	Cushman 1985, Petts 1984 Taylor 1982 Taylor 1982 Busch and Smith 1995, Stromberg et al. 1996 Kondolf and Curry 1986, Perkins et al. 1984, Reily and Johnson 1982, Rood et al. 1995, Stromberg et al. 1992
	Prolonged baseflow "spikes"	Downstream loss of floating eggs	Robertson 1997
	Altered inundation duration	Altered plant cover types	Auble et al. 1994
	Prolonged inundation	Change in vegetation functional type Tree mortality Loss of riffle habitat for aquatic species	Bren 1992, Connor et al. 1981 Harms et al. 1980 Bogan 1993
Rate of change	Rapid changes in river stage	Wash-out and stranding of aquatic species	Cushman 1985, Petts 1984
	Accelerated flood recession	Failure of seedling establishment	Rood et al. 1995

Pressures on Fishes