

# **Banks Lake Drawdown**

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## **Final Environmental Impact Statement**



**U.S. Department of the Interior  
Bureau of Reclamation  
Pacific Northwest Region  
Boise, Idaho**

**Upper Columbia Area Office  
Ephrata Field Office  
Ephrata, Washington**

**May 2004**



## MISSION STATEMENTS

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian tribes and our commitments to island communities.

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The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

**Final Environmental Impact Statement  
Banks Lake Drawdown  
Douglas and Grant Counties, Washington**

Lead Agency: U.S. Department of the Interior  
Bureau of Reclamation

For further information contact: Jim Blanchard  
Special Projects Officer  
Ephrata Field Office  
Bureau of Reclamation  
Box 815  
Ephrata, WA 98823  
(509) 754-0226

The Action Alternative describes the resource conditions that would occur with Banks Lake water surface elevations between 1570 feet and 1560 feet, while the No Action Alternative describes the conditions that would occur without the action, with water surface elevation between 1570 feet and 1565 feet. Both the No Action and Action Alternatives include four potential operational scenarios that could occur annually within their respective ranges, depending upon the hydrology of any given year. Both alternatives include refilling the reservoir to elevation 1570 feet by September 22. The No Action Alternative is the preferred alternative.

The **draft** environmental impact statement provided Reclamation's determination that the Action Alternative "may affect but is not likely to adversely affect" the federally listed bald eagle (*Haliaeetus leucocephalus*) and would have no effect on the federally listed pygmy rabbit (*Brachylagus idahoensis*) or Ute ladies'-tresses (*Spiranthes diluvialis*). The U.S. Department of the Interior's Fish and Wildlife Service concurred with this assessment in a letter dated April 3, 2003, as part of the consultation process in compliance with section 7(a)(2) of the Endangered Species Act of 1973 as amended and codified in 50 CFR 402.

This analysis was done in compliance with Action 31 of the Reasonable and Prudent Alternative under the December 2000 Biological Opinion issued by the National Marine Fisheries Service (NMFS) (currently National Oceanic Atmospheric Administration [NOAA] Fisheries) for operation of the Federal Columbia River Power System. Therefore, additional ESA consultation with NOAA Fisheries is not necessary.



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# Acronyms and Abbreviations

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ADA	Americans with Disabilities Act
ACHP	Advisory Council on Historic Preservation
ARPA	Archeological Resources Protection Act
BASS	Bass Anglers Sportsman Society
BiOp	Biological Opinion
BLM	Bureau of Land Management
BPA	Bonneville Power Administration
CAR	Coordination Act Report
CBP	Columbia Basin Project
CBWA	Columbia Basin Wildlife Area
CCT	Confederated Tribes of the Colville Reservation
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	Cubic feet per second
Corps	U.S. Army Corps of Engineers
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FCRPS	Federal Columbia River Power System
FDR	Franklin D. Roosevelt
FONSI	Finding of no significant impact
Service	U.S. Fish and Wildlife Service
GCPHA	Grand Coulee Project Hydroelectric Authority
HLH	Heavy load hours
Implan	Impact Analysis for Planning
ITA	Indian Trust Asset
kaf	Thousand acre-feet
kV	Kilovolt
kW	Kilowatt
kWh	Kilowatthour
LLH	Light load hours
MCL	Maximum contaminant levels
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MW	Megawatt
MWh	Megawatthour

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NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NRCS	Natural Resources Conservation Service
NOI	Notice of Intent
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
O&M	Operation and maintenance
ORV	Off-road vehicle
PCPI	Per capita personal income
P/G	Pump/generator
PUD	Public Utility District
PWC	Personal water craft
Reclamation	Bureau of Reclamation
RMP	Resource Management Plan
RPA	Reasonable and Prudent Alternative
RV	Recreational vehicle
Spokane Tribe	Spokane Tribe of Indians
SPRC	Washington State Parks and Recreation Commission
SRSP	Steamboat Rock State Park
TCP	Traditional Cultural Property
USC	U.S. Code
USFS	U.S. Department of Agriculture, Forest Service
USGS	U.S. Geological Survey
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WDOE	Washington Department of Ecology
WSIGWC	Washington State Interagency Ground Water Committee
Yakama Nation	Confederated Tribes and Bands of the Yakama Nation

Note: The National Marine Fisheries Service (NMFS) issued a Biological Opinion (BiOp) in 2000. After that time, they became known as the National Oceanic and Atmospheric Administration (NOAA) Fisheries. For activities in 2000, they are referred to as NMFS. For later and current activities, they are referred to as NOAA Fisheries.

# Distribution List

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The draft environmental impact statement was sent to about 375 agencies, groups, and individuals for their information and review. The final EIS or its summary is being sent to the distribution list, shown below. All groups and individuals who submitted written comments or who made comments at the public hearings also receive a copy, unless they indicated otherwise on a self-addressed postage paid reply card.

## **Federal Agencies (Headquarters Offices)**

Advisory Council on Historic Preservation  
Department of Energy  
    Bonneville Power Administration  
Department of the Interior  
    Bureau of Indian Affairs  
    Bureau of Land Management  
    Fish and Wildlife Service  
    Geological Survey  
    Minerals Management Services  
    National Park Service  
    Natural Resources Library  
    Office of Environmental Policy and Compliance  
Environmental Protection Agency

## **U.S. Congressional Delegation**

United States Senate  
    State of Washington  
        Honorable Maria Cantwell  
        Honorable Patty Murray  
House of Representatives  
    State of Washington  
        Honorable Doc Hastings, 4th District  
All locations below are in the State of Washington, unless otherwise noted.

## **Indian Tribes**

Burns Paiute Tribe, Burns, Oregon  
Coeur D'Alene Tribe, Plummer, Idaho  
Confederated Salish and Kootenai Tribes, Pablo, Montana  
Confederated Tribes of the Colville Reservation  
Confederated Tribes of the Umatilla Indian Reservation, Pendleton, Oregon  
Confederated Tribes of the Warm Springs Reservation, Warm Springs, Oregon  
Kalispel Tribe, Usk  
Kootenai Tribes of Idaho, Bonners Ferry, Idaho  
Nez Perce Tribe, Orofino, Idaho  
Shoshone-Bannock Tribes of Fort Hall, Fort Hall, Idaho  
Shoshone-Paiute Tribes of the Duck Valley Reservation, Owyhee, Nevada  
Spokane Tribe of Indians, Wellpinit  
Yakama Nation, Toppenish

## **Washington State Legislature**

Representative Mike Armstrong, 12th District, Olympia  
Representative Cary Condotta, 12th District, Olympia, Wenatchee  
Senator Linda Evans Parlette, 12th District, Olympia  
Representative Bill Hinkle, 13th District, Olympia  
Representative, Janéa Holmquist, 13th District, Olympia  
Representative Joyce Mulliken, 13th District, Ephrata, Olympia

## **Federal Agencies—Regional and Local Levels**

Department of the Army  
    U.S. Army Corps of Engineers, Portland, Oregon  
Department of Commerce  
    NOAA Fisheries Service, Portland, Oregon, Seattle  
Department of Energy  
    Bonneville Power Administration, Portland, Oregon, Seattle  
    Federal Energy Regulatory Commission, Portland, Oregon  
Department of the Interior  
    Bureau of Indian Affairs, Portland, Oregon, Toppenish  
    Bureau of Land Management, Wenatchee  
    Fish and Wildlife Service, Boise, Idaho, Portland, Spokane,  
    Wenatchee, Vancouver  
    National Park Service, Coulee Dam  
Environmental Protection Agency, Portland, Oregon, Seattle

## **State and Local Government Agencies**

### State of Alaska

Department of Fish and Game, Juneau, Alaska

### State of Idaho

Department of Fish and Game, Boise, Idaho

Idaho Power Council, Boise, Idaho

### State of Montana

Department of Natural Resources, Helena

### State of Oregon

Department of Environmental Quality, Portland

Department of Fish And Wildlife, Portland

Governor, Salem

Portland State University, Portland

Public Power Commission, Portland

### State of Washington

Department of Ecology, Olympia, Spokane

Department Fish And Wildlife, Ephrata, Olympia

Department of Natural Resources, Ellensburg, Olympia

Department of Transportation, Wenatchee

Governor, Olympia

Office of Archaeology and Historic Preservation, Olympia

Parks and Recreation Commission, Electric City, Wenatchee

Potato Commission, Moses Lake

### Chelan County

Public Utility District, Wenatchee

### City of Warden

Mayor, Warden

Port District No. 8, Warden

### Douglas County

Board of Commissioners, Waterville

Transportation & Land Services, East Wenatchee

Public Utility District #1, East Wenatchee

### Ferry County

Natural Resource Board, Republic

### Franklin County

Board of Commissioners, Pasco

### Grand Coulee Project Hydroelectric Authority, Ephrata

### Grant County

Board of Commissioners, Ephrata

Department of Health, Ephrata

Port District No 4, Coulee City

Public Utility District No. 2, Ephrata

Tourism Commission, Ephrata

### South Banks Lake Mosquito Control District #3, Coulee City

Town of Coulee City, Coulee City  
Council, Coulee City  
Mayor, Coulee City  
Port District #4, Coulee City

### **Irrigation Districts**

Black Sands Irrigation District, Ephrata  
East Columbia Basin Irrigation District, Othello  
Quincy Columbia Basin Irrigation District, Ephrata, Soap Lake, Quincy  
South Columbia Basin Irrigation District, Pasco

### **Libraries**

Bridgeport Community Library, Douglas County, Bridgeport  
Coulee City Community Library, Coulee City  
Des Moines Library, Des Moines  
East Wenatchee Community Library, Douglas County, East Wenatchee  
Ephrata Public Library, Ephrata  
Grand Coulee Community Library, Grand Coulee  
Moses Lake Public Library, Moses Lake  
Quincy Community Library, Quincy  
Royal City Community Library, Royal City  
Seattle Public Library, Seattle  
Soap Lake Community Library, Soap Lake  
Warden Community Library, Warden  
Wenatchee Public Library, Chelan County, Wenatchee

### **Interested Organizations**

American Rivers, Seattle  
American Rivers, et al, Portland, Oregon  
Big Bend Bass Masters, Moses Lake  
Big Bend Economic Development Council, Moses Lake  
Central Basin Audubon Society, Moses Lake  
Central Washington Bass Club, Wenatchee  
Columbia Basin Environmental Council, Soap Lake  
Columbia Basin Fish and Wildlife Authority, Portland  
Columbia Basin Walleye Club, Union Gap  
Columbia River Inter-Tribal Fish Commission, Portland, Oregon  
Coulee City Chamber of Commerce, Coulee City  
Grand Coulee Dam Area Chamber of Commerce, Grand Coulee  
Grant County Economic Development Council, Moses Lake  
Idaho Rivers United, Boise, Idaho  
Idaho Water Users Association, Inc., Boise, Idaho  
Moses Lake Area Chamber of Commerce, Moses Lake

National Wildlife Federation, Seattle  
Natural Resources Defense Council Inc, New York, New York  
Northwest Council of Governments & Associates, Soap Lake  
Northwest Power and Conservation Council, Helena, Montana; Olympia;  
Portland, Oregon; Spokane  
Northwest Sportfishing Industry Association, Oregon City, Oregon  
Pacific Northwest Waterways Association, Portland, Oregon  
Promoters of Wildlife and Environmental Resources, Electric City  
Quincy Valley Chamber of Commerce, Quincy  
Saint Andrews Grange No. 832, Coulee City  
Save Our Wild Salmon, Portland, Oregon  
Soap Lake Conservancy, Soap Lake  
Upper Columbia United Tribes, Cheney  
Washington Farmers Union, Coulee City  
Washington State Bass Federation, Banks Lake Enhancement Project, Wilbur

**Interested Entities**

Ala Cozy Motel, Coulee City  
All Seasons Enterprises, Coulee Dam  
Banks Lake Net and Charter, Coulee City  
Basic American Foods, Moses Lake  
Dick Cason Consulting, Inc., East Wenatchee  
Cash Hardware, Coulee City  
Central Bean Company, Inc., Quincy  
Coulee Playland Resort, Electric City  
Coulee City Builders Supply, Coulee City  
Davis Farms, Warden  
EDAW, Inc, Seattle  
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Idaho Power Company, Boise, Idaho  
Jet Farms, Inc., Royal City  
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Lamb-Weston, Inc., Tri-Cities  
Lemargie & Whitaker, Ephrata  
Litchfield Consulting Group, Portland, Oregon  
Mc Lean Ranches, Coulee City  
Mid-Columbia PUD, Fox Island  
Montgomery Water Group, Kirkland  
PacifiCorp, Portland, Oregon  
PNGC Power, Portland, Oregon  
Prather's Welding & Fabrication, Inc., Coulee City  
D. Rohr & Associates, Portland, Oregon  
Seattle City Light, Seattle  
Sun Banks Resort, Grand Coulee  
Al Wright Consulting, Portland, Oregon

## **Interested Individuals**

Anding, Maurice, Coeur D'Alene, Idaho  
Argo, Daniel and Angie, Royal City  
Austin, Janet and Jake, East Wenatchee  
Baird, John, Ephrata  
Bell, Keith, Ephrata  
Bellah, Glen C. and Roselon, Coulee City  
Benoschek, Ken, Soap Lake  
Bodenman, Donald, Moses Lake  
Bott, Muriel, Pomeroy  
Boyer, Julie, Lanette Boyer, Moses Lake  
Braun, Blaine, Royal City  
Burdick, Pat, Ephrata  
Carter, Anne, Ephrata  
Certa, Paul, Richland  
Chamberlain, Tammi, Ted Ayers, Ephrata  
Child, Lynn, Quincy  
Coates, Arlene, Coulee City  
Copenhaver, Phil and Chris, Moses Lake  
Corey, R. L. and J. E., Ellensburg  
Crook, Clay, Moses Lake  
Crook, Karen Ann, Moses Lake  
Dase, Julius, Des Moines  
Dick, John R., Othello  
Dickinson, Charles F., Soap Lake  
Dormaier, Lourence C., Moses Lake  
Dormaier, Ruth, Moses Lake  
Eilers, Gerald, Royal City  
Engelhardt, Sam, Moses Lake  
Evans, Brian S., Moses Lake  
Evans, Harold, Coulee City  
Fitch, Rob and Kathy and Family, Wenatchee  
Flint, Tom, Ephrata  
Francis, Myrna J., Electric City  
Friehe, Berend, Carla, Derek, and Katharina, Moses Lake  
Fuller, Kim, Coulee City  
Gee, Glendon W, Richland  
Gee, Glendon and Shirley, Richland  
Gerber, Sue, Moses Lake  
Gimmestad, Heath, Moses Lake  
Graedel, Bill, Odessa  
Graff, Dorothy, Coulee City  
Gross, Holly, Othello  
Guptill, Joan, Electric City  
Hagen, Maynard, Soap Lake  
Hastings, Terry, Mattawa



Heiberg, Rich and Wendy, Coulee City  
Hemore, Dick, Moses Lake  
Hendrickson, Darin, Moses Lake  
Hesse, Christopher W., Moses Lake  
Holm, Ken, Ephrata  
Hopkins, David D., Moses Lake  
Howard, Fred "Fritz," Soap Lake  
Isaak, Phil, Coulee City  
Janett, Craig, Royal City  
Jenkins, Jack, Soap Lake  
Jones, Karen, Spokane  
Jones, V. Joyce, Coulee City  
Jorgensen, Keith, Coulee City  
Kallenberger, Ken, Royal City  
Lake, Susan, Ronan, Montana  
Larsen, Mark, Richland  
Lefler, W G., Royal City  
Lemon, Doug, Port Orchard  
Lewis, Kathy and Mark, Wenatchee  
Lindholdt, Paul J., Cheney  
Marohl, Dale and Cheryl, Coulee City  
Martell, Dan, Ephrata  
Mast, Ralph R. and Darsilla, Coulee City  
Meiners, Brian, Moses Lake  
Mianecki, Rick, Royal City  
Mills, Hubert P., Spokane  
Moody, John Robert, Ephrata  
Murray, Sherry L., Moses Lake  
Olsen, Lynn, Othello  
Padilla, Daniel, Moses Lake  
Palko, Mike, Tenino  
Paulsson, Alta, Coulee City  
Pemmington, Jerry, East Wenatchee  
Pitts, Bill and Joann, Coulee City  
Poulson, Barbara, Connell  
Ramiraz, Juan, Moses Lake  
Randall, Jim and Gloria, Coulee City  
Rice, Clarence and Phyllis, Coulee City  
Riley, M. P., Cedarburg, Wisconsin  
Roberts, Wesley J., Coulee City  
Sanders, Lynn, Ephrata  
Scheibner, Mildred, Coulee City  
Schwab, Alene, Stratford  
Secrest, Joan, Almira  
Sieg, William R., Hartline  
Smith, Lisa G., Ellensburg

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---

Sortomme, Thomas W., Ephrata  
Sparks, Lloyd, Royal City  
Spartveit, Paul, Othello  
Steinmetz, Gordon, Coulee City  
Theisen, Arnold J., Irrigon, Oregon  
Throneberry, Adam, Moses Lake  
Tope, Donna and Clarence, Otis Orchards  
Umberger, John and Ruth, Methow  
Van Dyke, Darrell, Quincy  
Webster, Rod, Coulee City  
Wesner, Wayne, Almira  
West, June M., Anacortes  
White, Donald R, Coulee City  
Williams, Susan, Coulee City  
Wollard, Wayne, Monroe

**Media**

Columbia Basin Herald, Ephrata  
News Standard, Coulee City

## List of Preparers

---

This EIS was prepared by employees in the Pacific Northwest Regional Office, Boise, Idaho; the Upper Columbia Area Office, Yakima, Washington; and in the Technical Service Center, Denver, Colorado. A list of persons who prepared various sections of the statement or participated to a significant degree in preparing the statement is presented below in alphabetical order.

Name	Title	Contribution
Lola Abshire	Regional NEPA Coordinator	NEPA guidance and review
Susan Black	Social Science Analyst	Resource Manager, social environment, environmental justice, public involvement, and scoping process
Jim Blanchard	Special Projects Officer	Overall EIS coordination and descriptions; irrigated agriculture, visual quality, air quality, and soils
Susan Broderick	Fisheries Biologist	Vegetation, fish, and wildlife; and threatened and endangered species
Mark DeLeon	Archaeologist	Historic resources, traditional cultural properties, Native American Sacred Sites, and Indian trust assets
Jim Fodrea	ESA Hydro Coordinator	Guidance and review
Robert George	Technical Specialist in Water Quality	Water quality analysis
Patty Gillespie	Technical Writer-Editor	EIS writer
Dave Kaumheimer	Area Office Environmental Programs Manager	Guidance and review
Rich Lichtkoppler	Natural Resource Economist	Regional/local economic analysis
Joe Lyons	Hydraulic Engineer	Review of hydrology
Ken Manglesen	Technical Specialist in Water Quality	Water quality analysis
Mark Nelson	Research Aquatic Biologist	Public health (mosquitoes)
Tony Norris	Hydrologist	Hydrologic modeling
Lori Postlethwait	Hydraulic Engineer	Review of hydrology and hydropower operations
Stephanie Utter	Land Resource Division Manager	Recreation
Rick Vinton	Economist	Hydropower economic analysis



# Glossary

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## A

**acre-foot:** A volume of water that would cover 1 acre to a depth of 1 foot (325,850 gallons, 43,560 cubic feet).

**affected environment:** Existing biological, physical, social, and economic conditions of an area subject to change, both directly and indirectly, as the result of a proposed human action. Also, the chapter in an environmental impact statement describing current environmental conditions.

**alternatives:** Courses of action which may meet the objectives of a proposal at varying levels of accomplishment, including the most likely future conditions without the proposed action.

**analysis:** Examination of existing and/or recommended management needs and their relationships to discover and display the outputs, benefits, effects, and consequences of initiating a proposed action.

**aquatic:** Living or growing in or on the water.

**artifact:** A human-made object.

**authorization:** An act by the Congress of the United States that authorizes use of public funds to carry out a prescribed action.

## B

**backwater:** A small, generally shallow body of water attached to the main canal, with little or no current of its own.

**baseline:** Condition that would prevail if no action were taken. However, “baseline” is not a term used in NEPA compliance documentation. NEPA analysis is based on future with and without the project. The “No Action Alternative” is considered to be the action most likely to occur in the future without any action alternative being implemented.

**benthic:** Bottom of lakes or oceans; organisms that live on the bottom of water bodies.

**benthos:** Organisms living in or on the bottom of a lake, pond, ocean, stream, etc.

**biological diversity:** Number and kinds of organisms per unit area or volume; the composition of species in a given area at the given time.

**biological opinion:** Document which states the opinion of the U.S. Fish and Wildlife Service about whether a Federal action is likely to jeopardize the continued existence of a threatened or endangered species or result in the destruction or adverse modification of critical habitat.

*Critical habitat* - Specific areas with physical or biological features essential to the conservation of a listed species and which may require special management considerations or protection. These areas have been legally designated via Federal Register notices.

*Jeopardy opinion* - U.S. Fish and Wildlife Service or National Marine Fisheries Service opinion that an action is likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat. The opinion includes reasonable and prudent alternatives, if any.

*No jeopardy opinion* - U.S. Fish and Wildlife Service or National Marine Fisheries Service opinion that an action is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat.

**biology:** The scientific study of life.

**biota:** The plant (flora) and animal life (fauna) of a region or ecosystem, as in a stream or other body of water.

## **C**

**candidate species:** Plant or animal species that are candidates for designation as endangered (in danger of becoming extinct) or threatened (likely to become endangered).

**climate:** Average conditions of the weather over a number of years.

**community:** A group of one or more interacting populations of plants and animals in a common spatial arrangement at a particular point in time.

**corridor:** Narrow strip of land reserved for location of transmission lines, pipelines, and service roads.

**cubic feet per second (cfs):** A rate of streamflow; the number of cubic feet of water passing a reference point in 1 second.

**cultural resource(s):** Any building, site, district, structure, or object significant in history, architecture, archeology, culture, or science.

**colonial nesting:** Species of birds that nest together in proximity.

**colonization:** The successful establishment of a new habitat by a species.

**concentration:** Relative quantities of physicochemical parameters. The density or amount of a substance in a solution.

**coulee:** Long winding channel cut through lava formations. A term primarily used in the northwestern United States.

## **D**

**dam:** Structure for impounding water.

**deposition:** Material settling out of the water onto the streambed or lake bed. Occurs when the energy of the flowing water is unable to support the load of suspended sediment.

**diversion:** A structure in a river or canal that diverts water from the river or canal to another watercourse.

**drainage basin:** The area of land that drains water, sediment, and dissolved materials to a common outlet at some point along a stream channel. Also see watershed.

## **E**

**economic analysis:** A procedure that includes both tangible and intangible factors to evaluate various alternatives.

**economic evaluation:** A procedure or process used to verify good business decisions are being made based on sound economic principles.

**ecosystem:** Complex system composed of a community of animals and plants as well as the chemical and physical environment.

**endemic:** Something peculiar to a particular people or locality, such as a disease which is always present in the population.

**emergent vegetation:** Aquatic plants having most of the vegetation parts growing above water.

**endangered species:** A species or subspecies whose survival is in danger of extinction throughout all or a significant portion of its range. The ESA supports the recovery of endangered species by mandating conservation of the ecosystems upon which they depend.

**entrainment:** Process by which aquatic organisms, suspended in water, are moved by water motion involuntarily.

**environment:** All biological, chemical, and physical factors to which organisms are exposed.

**environmental analysis:** Systematic process for consideration of environment factors in land management actions.

**environmental justice:** The fair treatment of people of all races and incomes with respect to actions affecting the environment.

**exceedence (water quality):** The violation of the pollutant levels permitted by environmental protection standards.

**exceedence interval:** The average number of years between the occurrence of an event of a given magnitude and one that is more extreme.

**exotic species:** A non-native species that is introduced into an area.

## **F**

**facilities:** Structures associated with Reclamation irrigation projects, municipal and industrial water systems, power generation facilities, including all storage, conveyance, distribution, and drainage systems.

**facultative wetland species:** A plant species that can grow both in and out of wetlands.

**flood or flooding:** A general condition of partial or complete inundation of normally dry land areas from the overflow of inland and/or tidal water, or unusual and rapid accumulation of surface waters from any source.

**flood plain:** Land areas adjoining a river or other water course including that area subject to a 1 percent or greater chance of flooding in any given year. The base flood plain shall be used to designate the 100-year plain (1 percent chance flood plain).

**flow:** Volume of water passing a given point per unit of time.

**fry:** Life stage of fish between the egg and fingerling stages. Depending on the species of fish, fry can measure from a fraction of an inch to a few inches.



**full pool:** Volume of water in a reservoir at maximum design elevation.

## **G**

**groundwater:** (1) Water that flows or seeps downward and saturates soil or rock, supplying springs and wells. The upper level of the saturated zone is called the water table. (2) Water stored underground in rock crevices and in the pores of geologic materials that make up the earth's crust. That part of the subsurface water which is in the zone of saturation; phreatic water.

## **H**

**habitat:** Area or type of environment where a plant or animal lives.

**head:** Differential of pressure causing flow in a fluid system, usually expressed in terms of the height of a liquid column (or the vertical distance in feet) that pressure will support.

**headwater:** The source and upper part of a stream; water upstream of a dam or powerhouse.

**hydrology:** Scientific study of water in nature—its properties, distribution, and behavior.

## **I**

**Indian trust assets:** Legal interests in property held in trust by the United States for Indian Tribes or individuals.

**indicator:** Organism, species, or community that indicates certain environmental conditions.

**indigenous:** Native to a given area.

**indirect impacts:** A condition caused by an action through intermediary causal agents. An effect for which the causal linkages to the action are not readily apparent.

**irretrievable:** Commitments that are lost for a period of time.

**irreversible:** Commitments that cannot be reversed, except perhaps in the extreme long term.

## **J, K, L**

**life cycle:** Various stages through which an animal passes through from egg fertilization to death.

**life history:** Life cycles through which organisms pass, with emphasis on reproduction and survival mechanisms.

**littoral zone:** Pertains to the shallow water area along the edge of a body of water—shore.

## **M**

**macrophytes:** Aquatic macrophytes by definition are the macroscopic (that is large enough to be seen with the unaided eye) forms of aquatic and wetlands plants found in the shorelines of lakes or slow-moving reaches of rivers.

**maintenance:** All routine and extraordinary work necessary to keep the facilities in good repair and reliable working order to fulfill the intended designed purposes.

**mitigation (NEPA Measures):** Action taken to avoid, reduce the severity of, or eliminate an adverse impact. Mitigation can include one or more of the following:

1. avoiding impacts
2. minimizing impacts by limiting the degree or magnitude of an action
3. rectifying impacts by restoration, rehabilitation, or repair of the affected environment
4. reducing or eliminating impacts over time
5. compensating for the impact by replacing or providing substitute resources or environments to offset the loss

**modeling:** Use of mathematical equations to simulate and predict real events and processes.

**monitoring:** Measuring concentrations of substances in environmental media or in human or other biological tissues.

**mortality:** Death.

## **N, O**

**The National Register of Historic Places:** A federally maintained register of districts, sites, buildings, structures, architecture, archeology, and culture.

**Native American Sacred Site:** A location on Federal land that an Indian Tribe or individual identifies as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion, provided that the Federal agency managing the

land is informed of the existence of the site. Executive Order 13007 (May 24, 1996) provides for access to and protection of these sites.

**No Action Alternative:** The expected future condition if the proposed action is not taken—not necessarily the same as the present condition. The effects of the Action Alternatives are measured against the No Action Alternative.

**obligate wetland species:** A plant species that almost always grows in wetlands and deep water habitats.

**operation and maintenance costs:** The ongoing, repetitive costs of operating a water system; for example, employee wages and costs for treatment chemicals and periodic equipment repairs.

## **P, Q, R**

**predation:** The consumption of one organism (the prey) by another (predator).

**publics:** Any interested group or individual, including Federal, State and local agencies, interest groups, ad hoc groups, and the general public.

**public involvement:** Process of obtaining citizen input into each stage of development of planning documents. Required as a major input into any EIS.

**qualitative:** Descriptive of kind, type, or direction, as opposed to size, magnitude, or degree.

**quantitative:** Descriptive of size, magnitude, or degree.

**raptors:** Birds of prey.

**recruitment:** Survival of young plants and animals from birth to a life stage less vulnerable to environmental change.

**reservoir:** Artificially impounded body of water; also, an extra supply of anything, as a reservoir of infection, etc.

**riparian:** Living on or adjacent to a water supply such as a riverbank, lake, or pond.

## **S**

**sand:** Soil particles between 0.05 and 2.0 mm in diameter.

**scenario:** An outline of a natural or expected course of events. In this document, the alternatives can reach the various water elevations by different scenarios, depending upon the hydrology of a particular year.

**scour:** Removing debris and sediments from a channel by the force of water.

**sediment:** Unconsolidated solid material that comes from weathering of rock and is carried by, suspended in, or deposited by water or wind.

**sedimentation:** A water treatment process in which solid particles settle out of the water being treated in a large clarifier or sedimentation basin.

**sensitive species:** Species not yet officially listed but undergoing status review for listing on the U.S. Fish and Wildlife Service's official threatened and endangered list; species whose populations are small and widely dispersed or restricted to a few localities; and species whose numbers are declining so rapidly that official listing may be necessary.

**silt:** Soil particles between 0.05 and 0.002 millimeter in approximate diameter.

**slope:** Change in elevation per unit of horizontal distance.

**species:** Basic category of biological classification intended to designate a single kind of animal or plant.

**snag:** A standing dead tree.

**special status species:** For this EIS, those Fish and Wildlife Service Species of Concern that may occur within the study area.

**stratification:** Vertical grouping within a community. Arrangement in layers of a body of water, as a lake, into two or more horizontal layers with different characteristics.

**substrate:** Surface on which a plant or animal grows or is attached.

## **T**

**terrestrial:** Living or growing on land.

**threatened species:** Any species that has the potential of becoming endangered in the near future. The ESA supports the recovery of threatened species by mandating conservation of the ecosystems upon which they depend.

**traditional cultural property:** A site or resource that is eligible for inclusion in the National Register of Historic Places because of its association with cultural practices or beliefs of a living community.

**tributary:** River or stream flowing into a larger river or stream.

**U, V, W, X, Y, Z**

**upland:** The higher ground of a region, in contrast to a valley or plain, or other low-lying land.

**user day:** The participation in a recreation activity at a given resource during a 24-hour period by one person.

**velocity:** Rate of flow of water or water-sediment mixture; expressed in feet per second or miles per hour.

**visitor use:** Visitor use of wilderness resource for inspiration, stimulation, solitude, relaxation, education, pleasure, or satisfaction.

**warm water fishery:** Generally, water or water system that has an environment suitable for species of fish other than salmonids.

**watershed:** The land that drains into a stream or a river.

**water user:** Any individual, district, association, government agency, or other entity that uses water supplied from a Reclamation project.

**wetlands:** Lands including swamps, marshes, bogs, and similar areas such as wet meadows, river overflows, mud flats, and natural ponds. Habitat provided by shallow or deep water (but less than 6-feet deep), with or without emergent and aquatic vegetation in wetlands.



## Bibliography

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- Aggus, L.R. 1979. "Effects of weather on freshwater fish predator-prey dynamics." Pages 47-56 in R.H. Stroud and H. Clepper, eds. Predator-prey systems in fisheries management. Sport Fishing Institute, Washington, D.C.
- \_\_\_\_\_, and G.V. Elliott. 1975. "Effects of cover and food on year-class strength of largemouth bass." Pages 317-322 in H. Clepper, ed., Black Bass Biology and Management. Sport Fishing Institute, Wash. D.C.
- Andelman, S.J. and A. Stock. 1994. Management, Research and Monitoring Priorities for the Conservation of Neotropical Migratory Landbirds that Breed in Washington State. Washington Natural Heritage Program. Washington Dept. of Natural Resources, Olympia, Washington.
- Anderson, O. 1984. "Optimal foraging by largemouth bass in structured environments." *Ecology*: 65:851-861.
- Beauchamp, D.A., B.C. Allen, R.C. Richards, W.A. Wurtzbaugh, and C.R. Goldman. 1992. "Lake trout spawning in Lake Tahoe: egg incubation in deepwater macrophyte beds." *N. Amer. J. Fish. Manage.* 12:442-449.
- Benson, N.G. and B.C. Cowell. 1967. "The environment and plankton density in Missouri River reservoirs." Pages 358-373 in Reservoir Committee, eds. Reservoir Fishery Resources Symposium. Amer. Fish. Soc. Southern Div., Bethesda, Maryland.
- Bentrup, G. and J. C. Hoag. 1998. The practical streambank bioengineering guide. User's guide for natural streambank stabilization techniques in the arid and semi-arid Great Basin and Intermountain West. Interagency Riparian/Wetland Plant Development Project, USDA—Natural Resources Conservation Service Plant Materials Center. Aberdeen, Idaho.
- Betts, B.J. 1990. "Geographic distribution and habitat preferences of Washington ground squirrels (*Spermophilus washingtoni*)." *Northwestern Naturalist*. 71:27-37.

- Bilby, Robert, et al. 2002. Review of Giorgi et al. Report, "Mainstem Passage Strategies in the Columbia River System: Transportation, Spill, and Flow Augmentation." Independent Scientific Advisory Board document 2002-1. [www.nwcouncil.org/library/isab/isab2002-1.pdf](http://www.nwcouncil.org/library/isab/isab2002-1.pdf).
- Bonneville Power Administration. 2000. 2002 Final Power Rate Proposal Marginal Cost Analysis Study. Power Business Line. WP-02-FS-BPA-04 (May).
- Bradley, C. and D. Smith. 1986. "Plains cottonwood recruitment and survival on a prairie meandering river floodplain, Milk River, southern Alberta and northern Montana." *Canadian J. Botany* 64:1433-1442.
- Buehler, D.A. 2000. "Bald Eagle (*Haliaeetus leucocephalus*)." *Birds of North America* No. 506. The Birds of North America, Inc., Philadelphia, Pennsylvania. 40 pp.
- Bureau of Economic Analysis
- \_\_\_\_\_. a. Bearfacts Washington 1989-99. 2001. Accessed July 17, 2001. <http://www.bea.doc.gov/bea/regional/bearfacts/bf10/53/b1053000.htm> (May).
- \_\_\_\_\_. b. Bearfacts Grant, Washington 1998-99. Accessed July 17, 2001. <http://www.bea.doc.gov/bea/regional/bearfacts/bf10/53/b1053025.htm>.
- \_\_\_\_\_. c. Personal income by major source and earnings by industry—Grant County, Washington, 1999. 2001. Accessed July 25, 2001 <http://www.bea.doc.gov/bea/regional/reis/action.cfm> (updated June 25).
- \_\_\_\_\_. d. Total full-time and part-time employment by industry—Grant County, Washington 1999. 2001. Accessed July 25, 2001. <http://www.bea.doc.gov/bea/regional/reis/action.cfm> (updated June 25).
- Bureau of Labor Statistics. 2000. Labor force data by county, 2000 annual average. Grant County, Washington. Accessed August 14, 2001. <ftp://146.142.4.23/pub/special.requests/la/laucounty.txt>
- Bureau of Reclamation. 2001. Banks Lake Resource Management Plan, Grant County, Washington. Upper Columbia Area Office, Ephrata, Washington (July).
- \_\_\_\_\_. 2001. Banks Lake Resource Management Plan Final Environmental Assessment, Grant County, Washington. Upper Columbia Area Office, Ephrata, Washington (March).
- \_\_\_\_\_. 2001. Scoping Summary, Banks Lake Drawdown Environmental Impact Statement, Columbia Basin Project, Washington. Pacific Northwest Region, Ephrata Field Office, Ephrata, Washington.



- \_\_\_\_\_. 2001. "Vegetation Observed within the Banks Lake Study Area." Appendix B. Banks Lake Resource Management Plan Final Environmental Assessment, Grant County, Washington. Upper Columbia Area Office, Ephrata, Washington (March).
- Cadwell, L.L., M.A. Simmons, J.L. Downs, and C.M. Sveum. 1994. Sage grouse on the Yakima Training Center: A summary of studies conducted during 1991 and 1992. Pac. Northwest Lab., Richmond, Washington.
- Campbell, G.L., A.A. Marfin, R.S. Lanciotti, and D.J. Gubler. 2002. West Nile virus. *The Lancet Infectious Diseases* 2:519-529.
- Carmack, Corey P. 2001. "Nca?qawa"; a critical look at traditional cultural properties. Unpublished MS thesis, Central Washington University, Ellensburg.
- CDC. 2001. Epidemic/epizootic West Nile virus in the United States: revised guidelines for surveillance, prevention and control. Available at URL: <http://www.cdc.gov/ncidod/dvbid/westnile/publications.htm>.
- CDC. 2002. Provisional surveillance summary of the West Nile Virus epidemic--- United States, January—November 2002. *MMWR* 2002;51:1129-1133.
- Chelan County Public Utility District. Rock Island Hydro Project. Accessed May 22, 2002. <http://www.chelanpud.org/hydro/ri/ROCKISLE.htm>
- \_\_\_\_\_. Rocky Reach Hydro Project. Accessed May 22, 2002. <http://www.chelanpud.org/hydro/rr/ROCKY.htm>
- Collee , D.E. and J.V. Shireman. 1980. "Coefficients of condition for largemouth bass, bluegill, and redear sunfish in hydrilla-infested lakes." *Trans. Amer. Fish. Soc.* 109:521-531.
- Cook, Kirk. 1996. A Report on Nitrate Concentration of Ground Water in the Mid-Columbian Basin. Washington State Department of Ecology Report 96-017, 15 pages.
- Connor, W.P., H.L. Burge, and D.H. Bennett. 1998. Detection of PIT-Tagged subyearling chinook salmon at a Snake River dam: Implications for summer flow augmentation. *N. Amer. J. of Fish Mgmt.* 18:530-536.
- Connor, W.P., R.K Steinhorst, and H.L.Burge. 2000. Forecasting survival and passage of migratory juvenile salmonids. *N. Amer. J. Fish. Mgmt.* 20:650-659.
- Connor, W.P., H.L. Burge, R. Waitt, and T.C. Bjornn. 2002. Juvenile life history of wild fall chinook salmon in the Snake and Clearwater Rivers. *N. Amer. J. Fish. Mgmt.* 22:703-712.

- Connor, W.P., R.K. Steinhorst, and H.L. Burge. 2003a. Migrational behavior and seaward movement of wild subyearling fall chinook salmon in the Snake River. *N. Amer. J. Fish. Mgmt.* 23:413-430.
- Connor, W. P., H.L. Burge, J.R. Yearsley, and T.C. Bjornn. 2003b. The influence of flow and temperature on survival wild subyearling fall chinook salmon in the Snake River. *N. Amer. J. Fish. Mgmt.* 23:362-375.
- Cooney, J.C. 1976. Impoundments. *Mosquito News* 36(4):413-414.
- Corn, P.S. 1994. "What we know and don't know about amphibian declines in the West." Pp. 59-7 in *Sustainable Ecological Systems: Implementing an Ecological Approach to Land Management*. W.W. Covington and L.F. DeBano Tech. Coord., USDA Forest Service, Gen. Tech. Rept. RM-247, Ft. Collins, Colorado. 363 pp.
- Council on Environmental Quality. 1997. *Environmental Justice Guidance under the National Environmental Policy Act*.  
<http://ceq.eh.doe.gov/nepa/regs/ej/justice.pdf>.
- Crane, J.K. 2003. Here comes West Nile virus—again. *The Clinical Advisor*, July 2003:11-12.
- Crowder, L.B. and W.E. Cooper. 1982. "Habitat structural complexity and the interaction between bluegill and their prey." *Ecology* 63:1802-1813.
- Dibble, E.D. 1993. A patch dynamics study of habitat use by juvenile centrarchids in an Ozark reservoir. Doctoral dissertation. Univ. Arkansas, Fayetteville.
- \_\_\_\_\_, G.O. Dick and K.J. Killgore. 1996. "Measurement of plant architecture in seven aquatic plants." *J. Freshwater Ecology* 11:311-318.
- Dionne, M., and C.L. Folt. 1991. "An experimental analysis of macrophyte growth forms as fish foraging habitat." *Can. J. Fish. and Aquatic Sciences* 48:123-131.
- Douglas County Public Utility District. DCPUD—The Power Place. Accessed May 22, 2002. <http://www.douglaspud.org/pud-web/powerplace.htm>
- Drucker, Phillip. 1948. *Appraisal of Archaeological Resources of Equalizing, Long Lake and Potholes Reservoirs in East Central Washington*. Report prepared by Columbia Basin Project, River Basin Surveys, Smithsonian Institution, Washington, D.C. On file, Upper Columbia Area Office, Bureau of Reclamation, Yakima.
- Duff, R.L. 1973. 1971-72 Banks Lake Creek Census. Washington Department of Game, Region 2 (unpubl.).

- Engle, S. 1985. Aquatic community interactions of submerged macrophytes. Wisconsin Dept. of Natural Resources Tech. Bulletin 156.
- Engseth, Martin. 2003. Class III Archaeological, Historical and Traditional Cultural Properties Inventory of the Banks Lake. Fall 2002. Drawdown Zone, Douglas and Grant Counties, Washington. Report prepared by the History/Archaeology Department, Confederated Tribes of the Colville Reservation for the Upper Columbia Area Office, Bureau of Reclamation, Yakima, Washington.
- Federal Register. 1999. Vol. 64, No. 206. pp 57620-57623.
- \_\_\_\_\_. 2001. Vol. 66, No. 231. pp 59734 59749.
- Gartrell, F.E., W.W. Barnes, G.S. Christopher. 1972. Environmental impact and mosquito control water resource management projects. Mosquito News 32(3):337-343.
- Giorgi, Albert, Mark Miller, and John Stevenson. 2002. Mainstem Passage Strategies In the Columbia River System: Transportation, Spill, and Flow Augmentation. Northwest Power Planning Council document 2002-3. [www.nwcouncil.org/library/2002/2002-3.pdf](http://www.nwcouncil.org/library/2002/2002-3.pdf).
- Goddard, L.B., A.E. Roth, W.K. Reisen, and T.W. Scott. 2002. Vector competence of California mosquitoes for West Nile virus. Emerging Infectious Diseases 8(12):1385-1391.
- Goldman, C.R., and A.J. Horne. 1983. Limnology. McGraw-Hill, Inc. New York.
- Grant County Public Utility District. 2002. Who Are We? Accessed May 22, 2002.
- Hamilton Stephen C. and Brent A. Hicks. 2000. Class III Archaeological and Historical Inventory of the Banks Lake Project Area. Draft report prepared by the History/Archaeology Department, Confederated Tribes of the Colville Reservation, for the Upper Columbia Area Office, Bureau of Reclamation, Yakima, Washington.
- Hamilton Stephen C. and Brent A. Hicks. 2002. Class III Archaeological and Historical Inventory of the Banks Lake Project Area, Phase II. Draft report prepared by the History/Archaeology Department, Confederated Tribes of the Colville Reservation, for the Upper Columbia Area Office, Bureau of Reclamation, Yakima.
- Harris, R. 1998. Personal communication, Jonathan M. Beck, of Dames and Moore, with Randy Harris, Geologist, USDI Bureau of Recreation, Grand Coulee Office. August 13, 1998.

- Hassler, T.J. 1970. "Environmental influences on early development and year-class strength of northern pike in Lakes Oahe and Sharpe, South Dakota." *Trans. Amer. Fish. Soc.* 99:369-380.
- Hays, D.W., M.J. Tirhi, M.J. and D.W. Stinson. 1998. Washington State status report for the sage grouse. Wash. Dept. Fish and Wildl., Olympia. 62 pp.
- Hayse, J.W. and T.E. Wissing. 1996. "Effects of stem density of artificial vegetation on abundance and growth of age-0 bluegills and predation by largemouth bass." *Transactions of the American Fisheries Society* 125:422-433.
- Hecky, R.E., and R.H. Hesslein. 1995. "Contributions of benthic algae to lake food webs as revealed by stable isotope analysis." *J. N. Amer. Benthol. Soc.* 14:631-653.
- Hess, A.D. and C.C. Kiker. 1943. Water level management for malaria control on impounded waters. *J. Natl. Malar. Soc.* 3:181-196.
- Hitchcock, C.L. and A. Cronquist. 1973. *Flora of the Pacific Northwest an Illustrated Manual*. University of Washington Press, Seattle, Washington.
- Hoyer, M.V., B. Gu, and C. Schelske. 1997. "Sources of organic carbon in the food webs of two Florida lakes indicated by stable isotopes." In Jeppesen, E., M. Sondergaard, M. Sondergaard, K. Christoffersen, eds. *The Role of Macrophytes in Structuring the Biological Community and Biogeochemical dynamics in Lakes*. New York, Springer-Verlag.
- \_\_\_\_\_, and D.E. Canfield, Jr. 1997. *Aquatic Plant Management in Lakes and Reservoirs*. Prepared by the North American Lake Management Society and the Aquatic Plant Management Society for the U.S. Environmental Protection Agency, Washington, D.C. Republished on the Internet November 1997.
- Independent Scientific Advisory Board. 1997. Ecological impacts of the flow provisions of the Biological Opinion for endangered Snake River salmon on resident fishes in the Hungry Horse and Libby systems in Montana, Idaho and British Columbia. ISAB Fish Report. Northwest Power Planning Council, ISAB 97-3. Portland Oregon.
- Irwin, E.R., and R.L. Noble. 1996. "Effects of reservoir drawdown on littoral habitat: assessment with onsite measures and geographic information systems." Pages 324-331 in L.E. Miranda and D.R. DeVries, eds. *Multidimensional Approaches to Reservoir Fisheries Management*. Amer. Fish. Society. Symposium 16, Bethesda, Maryland.
- Jenkins, R.M. 1970. "Reservoir fish management." Pages 173-182 in N.G. Benson, editor. *A century of fisheries in North America*. Special publication 7, Amer. Fish. Soc., Bethesda, Maryland.

- Johnson, R., C. McKinstry, C. Simmons, R. LeCaire, M. Simmons, C. Cook, S. Thorsten and S. Francis. 2003. *Chief Joseph Kokanee Enhancement Project, Strobe light deterrent efficacy test and fish behavior determination at Grand Coulee Dam third powerplant forebay*. Pacific North National Laboratory. Prepared for Bonneville Power Administration, Contract DE-AC06-6RL01830, January 2003.
- Jones, J.R. and R.W. Bachmann. 1978. "Prediction of phosphorus and chlorophyll a in lakes." *J. of Water Pollution Control Federation* 48:2176-2181.
- \_\_\_\_\_. 1978. "Trophic status of Iowa lakes in relation to origin and glacial geology." *Hydrobiologia* 57:267-273.
- Keast, A. 1984. "The introduced aquatic macrophyte, *Myriophyllum spicatum*, as habitat for fish and their invertebrate prey." *Can. J. Zool.* 62:1289-1303.
- Knutzen, J.A. 1977. Operational Effects of Irrigation and Pumped Storage on the Limnology of Banks Lake, Washington. M.S. thesis, Univ. of Washington, Seattle. 120 pp.
- Komar, N., S. Langevin, S. Hinten, N. Nemeth, E. Edwards, D. Hettler, B. Davis, R. Bowen, and M. Bunning. 2003. Experimental infection of North American birds with the New York 1999 strain of West Nile virus. *Emerging Infectious Diseases* 9(3):311-322.
- Kulasekera, V.L., L. Kramer, R.S. Nasci, F. Mostashari, B. Cherry, S.C. Trock, C. Glaser, and J.R. Miller. 2001. West Nile virus infection in mosquitoes, birds, horses, and humans, Staten Island, New York, 2000. *Emerging Infectious Diseases* 7(4):
- LeCaire, Richard. 1999. "Chief Joseph kokanee enhancement project." Draft 1999 annual report and final report on entrainment. Confederated Tribes of the Colville Indian Reservation, BPA Project No. 9501100.
- Lillie, R.A., and J. Budd. 1992. "Habitat architecture of *Myriophyllum spicatum* L. as an index to habitat quality for fish and macroinvertebrates." *J. Freshwater Ecol.* 4:113-121.
- Madder, D.J., G.A. Surgeoner, and B.V. Helson. 1983. Number of generations, egg production, and developmental time of *Culex pipiens* and *Culex restuans* (Diptera:Culicidae) in southern Ontario. *J. Med. Entomol.* 20(3):275-287.
- Mahoney, J.M. and S.B. Rood. 1991. "A device for studying the influence of declining water table on poplar growth and survival." *Tree Physiol.* 8:305-314.

- Miller, A.C., D.C. Beckett, C.M. Way and E.J. Bacon. 1989. The habitat value of aquatic macrophytes for macroinvertebrates. Tech. Rept. A-89-3, U.S. Army Corps of Engineers, Washington, D.C. 66 pp.
- Minnesota IMPLAN Group, Inc.
- \_\_\_\_\_ a. 2000. IMPLAN Professional TM Version 2.0 Social Accounting and Impact Analysis Software. 2nd Edition, Stillwater, Minnesota (June).
- \_\_\_\_\_ b. IMPLAN Professional 2.0 (software) Stillwater, Minnesota, Copyright 1999 MIG, Inc. Data for Grant County, Washington.
- \_\_\_\_\_ c. 1998 IMPLAN Data—Grant County, Washington. Affected Area (software) Stillwater, Minnesota, Copyright 1999 MIG, Inc.
- National Marine Fisheries Service. 1999. Biological Opinion, Washington Conservation Reserve Enhancement Program. NMFS Log # WSB-99-462, USFWS Log # 1-3-F-0064.
- National Marine Fisheries Service. 2000. Biological Opinion—Reinitiation of Consultation on Operation of the Federal Columbia River Power System, Including the Juvenile Fish Transportation Program, and 19 Bureau of Reclamation Projects in the Columbia Basin,
- <http://www.nwr.noaa.gov/1hydrop/hydroweb/docs/Final/2000Biop.html>
- Natural Resource Conservation Service. 2000. Riparian/Wetland Project Information Series No. 16. Riparian Planting Zones in the Intermountain West. <http://plant-materials.nrcs.usda.gov/pubs/idpmcarwproj16.pdf>
- Nichols, S.A. and J.G. Vennie. 1991. Attributes of Wisconsin lake plants. Inf. Cir. 73. Wis. Geol. Nat. Hist. Survey., Madison. 19 pp.
- Northwest Fisheries Science Center. 2000. Salmonid Travel Time and Reservoir Survival Related to Flow in the Columbia River.
- Pardue, G.B. 1973. "Production response of the bluegill sunfish *Lepomis macrochirus* to added attachment surface for fish-food organisms." Trans. Amer. Fish. Soc. 102:622-626.
- Pelikan, J., J. Svoboda, and J. Kvet. 1971. "Relationship between the population of muskrats (*Ondatra zibethica*) and the primary production of cattail (*Typha latifolia*)." *Hydrobiologia* 12:177-180.
- Perry, R., M. Farley, T. Darland, G. Hansen, D. Feil, D. Rondorf and R. LeCaire. 2003. *Feasibility of using 3D acoustic telemetry to assess the response of resident salmonids to strobe lights in Lake Roosevelt, Washington*. Pacific North National

- Laboratory. Annual Report for 2001. Prepared for Bonneville Power Administration, Project. No. 1995-011-02.
- Pflieger, W.L. 1997. The Fishes of Missouri. Missouri Department of Conservation, Jefferson City, MO.
- Ploskey, G.R. 1986. "Effects of water-level changes on reservoir ecosystems with implications for fisheries management." Pages 86-97 in G.E. Hall and M.J. Van Den Avyle, eds. Reservoir Fisheries Management: Strategies for the 80's. Reservoir Committee, Amer. Fish. Soc., Bethesda, Maryland.
- Pratt, H.D. and C.G. Moore. 1993. Mosquitoes of Public Health Importance and their Control. Self-Study Course 3013-G, Vector-Borne Disease Control. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.
- Reclamation. See Bureau of Reclamation.
- Savino, J.F. and R.A. Stein. 1989. "Behavioral interactions between fish predators and their prey: Effects of plant density." *Animal Behavior* 37:311-321.
- Schmierer, J. 2000. Purdue Forage Information: Reed Canarygrass. Purdue University Agronomy Extension. Online at [http://www.agry.purdue.edu/ext/forages/publications/grasses/reed\\_canary.htm](http://www.agry.purdue.edu/ext/forages/publications/grasses/reed_canary.htm)
- Scott, W.B. and E.J. Crossman. 1973. Freshwater Fishes of Canada. Bulletin 184. Fisheries Research Board of Canada, Ottawa.
- Service. See U.S. Fish and Wildlife Service.
- Simpson, J. and R. Wallace. 1982. Fishes of Idaho. University Press of Idaho. Moscow, Idaho.
- Smart, R.M. and G.O. Dick. 1999. Propagation and establishment of aquatic plants: A handbook for ecosystem restoration projects. APCRP Technical Notes Collection (Tec. Report A-99-4). US. Army Corps of Engineers Waterways Experiment Station. Vicksburg, MS. 26 pp.
- Smith, L.M. and J.A. Kadlec. 1985. "Fire and herbivory in a Great Salt Lake marsh." *Ecology* 66:259-265.
- Snow, W.E. 1956. Production and control of floodwater mosquitoes incidental to water level operations on reservoirs of the Tennessee Valley Authority. Proceedings Tenth International Congress of Entomology 3:745-750.
- Sojda, R.S. 1993. Management and Control of Cattails. *In* Waterfowl Management Handbook. U.S. Fish and Wildlife Service, Fort Collins, Colorado, online at: [http://www.nwrc.usgs.gov/wdb/pub/wmh/13\\_4\\_13.pdf](http://www.nwrc.usgs.gov/wdb/pub/wmh/13_4_13.pdf)

- Stalmaster, M.V. 1987. *The Bald Eagle*. Universe Books. New York. 227 pp.
- Steinkampf, W.C. 1989. Water-quality characteristics of the Columbia Plateau regional aquifer system in parts of Washington, Oregon, and Idaho. U.S. Geological Survey, Water-Resources Investigations Report 87-4242, 37 p.
- Steinmetz, Gordon. 1998. Personal communication.
- Stevens, Rebecca A. 1999. An Archaeological and Historical Overview of the Upper Grand Coulee, Douglas and Grant Counties, Washington. Eastern Washington University Reports in Archaeology and History 100-101, Cheney.
- Stinson, D.W., J.W. Watson, and K.R. McAllister. 2001. Washington State status report for the bald eagle. Wash. Dept. Fish and Wildlife. Olympia. 92 pp.
- Stober, Q.J., R.W. Tyler, G.L. Thomas, L. Jensen, J.A. Knutzen, D.L. Smith and R.E. Nakatani. 1976. Operation Effects of Irrigation and Pumped Storage on the Ecology of Banks Lake Washington. Third Ann. Prog. Rep., June 1, 1976. FRI-UW-7610, August 1976. Univ. of Washington. 313 pp.
- Stromberg, J. 1994. Riparian Protection Program, Legislative Report. Vol. B. Arizona Dept. Water Resources, Phoenix, Arizona.
- Stromberg, J. 1992. "Instream flow models for mixed deciduous riparian vegetation within a semiarid region." Cited in McKee, J.P., G. Patton, K. Willie and J. Carlson. The Animas-La Plata Project: Assessment of project impacts to riparian corridor vegetation communities. Tech. Memo. No. 8260-95-10. Sept. 1995.
- Sveum, C.M., W.D. Edge, and J.A. Crawford. 1998. "Nesting habitat selection by sage grouse in south-central Washington." *J. Range Manage.* 51:265-269.
- Tadzhieva, V.S., Z.M. Khaidarova, S.A. Zainiev, Z.A. Galina, V.V. Atarskaya, and M.S. Muminov. 1979. Formation of a focus of mass mosquito breeding in Arnasaisk lowering of the Uzbek SSR. Communication I. *Med. Parasitol. Parasit. Bolezn.* 48(2):46-50. (in Russian with English abstract).
- Thomas, G.L. 1978. The Comparative Responses of Kokanee, Lake Whitefish and Yellow Perch to Hydrological Perturbations in Banks Lake, Grant County, Eastern Washington. PhD Dissertation, Univ. of Washington, Seattle. 160 pp.
- Turner, F.B. 1960. "Population structure and dynamics of the western spotted frog, *Rana p. pretiosa* Baird and Girard, in Yellowstone National Park, Wyoming." *Ecol. Monogr.* 30(3):251-278.
- U.S. Census Bureau. 1990 and 2000. Census.



- \_\_\_\_\_ a. American Fact Finder. DP-1. Profile of General Demographic Characteristics: 2000. Coulee City town, Washington. Accessed July 19, 2001.  
[http://factfinder.census.gov/servlet/QTTa...15080&qr\\_name=DEC\\_2000\\_SF1\\_U\\_DP1&\\_lang=en](http://factfinder.census.gov/servlet/QTTa...15080&qr_name=DEC_2000_SF1_U_DP1&_lang=en)
- \_\_\_\_\_ b. American Fact Finder. DP-1. Profile of General Demographic Characteristics: 2000. Electric City town, Washington. Accessed July 19, 2001.  
[http://factfinder.census.gov/servlet/QTTa...21030&qr\\_name=DEC\\_2000\\_SF1\\_U\\_DP1&\\_lang=en](http://factfinder.census.gov/servlet/QTTa...21030&qr_name=DEC_2000_SF1_U_DP1&_lang=en)
- \_\_\_\_\_ c. American Fact Finder. DP-1. Profile of General Demographic Characteristics: 2000. Ephrata city, Washington. Accessed July 19, 2001.  
[http://factfinder.census.gov/servlet/QTTa...22080&qr\\_name=DEC\\_2000\\_SF1\\_U\\_DP1&\\_lang=en](http://factfinder.census.gov/servlet/QTTa...22080&qr_name=DEC_2000_SF1_U_DP1&_lang=en)
- \_\_\_\_\_ d. American Fact Finder. DP-1. Profile of General Demographic Characteristics: 2000. Moses Lake city, Washington. Accessed July 19, 2001.  
[http://factfinder.census.gov/servlet/QTTa...47245&qr\\_name=DEC\\_2000\\_SF1\\_U\\_DP1&\\_lang=en](http://factfinder.census.gov/servlet/QTTa...47245&qr_name=DEC_2000_SF1_U_DP1&_lang=en)
- \_\_\_\_\_ e. Model-Based Income and Poverty Estimates for Grant County, Washington in 1997. Revised November 28, 2000. Accessed July 19, 2001  
<http://www.census.gov/hhes/www/saife/estimate/cty/cty53025.htm>
- \_\_\_\_\_ f. Model-Based Income and Poverty Estimates for Washington in 1997. Revised November 28, 2000. Accessed July 19, 2001  
<http://www.census.gov/hhes/www/saife/estimate/cty/cty53000.htm>
- \_\_\_\_\_ g. State and County Quick Facts, Grant County, Washington. Revised July 3, 2001. Accessed July 17, 2001.  
<http://quickfacts.census.gov/qfd/states/53/53025.html>
- \_\_\_\_\_ h. State and County Quick Facts, Washington. Revised July 3, 2001. Accessed July 17, 2001. <http://quickfacts.census.gov/qfd/states/53000.html>
- \_\_\_\_\_ i. USA Counties 1998. Grant, Washington, General Profile. Accessed July 19, 2001. <http://www.census.gov/statab/USA98/53/025.txt>
- U.S. Department of Agriculture 1984. *Soil Survey of Grant County, Washington. United States Department of Agriculture, Soil Conservation Service in Cooperation with Washington State University, Agricultural Research Center.* January 1984.
- U.S. Department of Agriculture 1981. *Soil Survey of Douglas County, Washington. United States Department of Agriculture, Soil Conservation Service in Cooperation with Washington State University, Agricultural Research Center.* November 1981.

- U.S. Forest Service. 2000. Forest Service plant database.  
[www.fs.fed.us/database/feis/plants.html](http://www.fs.fed.us/database/feis/plants.html).
- \_\_\_\_\_. 2000. Umatilla National Forest native plant species database.  
[www.fs.fed.us/r6/uma/native/ts38.htm](http://www.fs.fed.us/r6/uma/native/ts38.htm).
- U.S. Fish and Wildlife Service. 1998. Planning Aid Memorandum for the Banks Lake Resource Management Plan. Moses Lake and Spokane, Washington. 56 pp.
- \_\_\_\_\_. 1999. Planning Aid Memorandum for the Banks Lake Resource Management Plan. Moses Lake and Spokane, Washington 8 pp.
- \_\_\_\_\_. 2000. Final Fish and Wildlife Coordination Act Report for the Bureau of Reclamation's Banks Lake Resource Management Plan. Upper Columbia River Basin Sub-Office, Ephrata, Washington.
- \_\_\_\_\_. 2002. Banks Lake 10-foot Drawdown Draft Coordination Act Report (CAR). FWS Reference: 01-sp-E0335 (January 17).
- Walburg, C.H. 1976. Changes in the fish population of Lewis and Clark Lake, 1956-74, and their relation to water management and the environment. Research Report 79, U.S. Fish and Wildlife Service, Washington, D.C.
- Washington Cooperative Fish and Wildlife Research Unit. 2001.  
[http://www.fish.washington.edu/naturemapping/wagap/public\\_html/](http://www.fish.washington.edu/naturemapping/wagap/public_html/)
- Washington Dept. Fish and Wildlife. 1995. Washington State Recovery Plan for the Pygmy Rabbit. Olympia, Washington. 50 pp.
- Washington State Department of Health. 2002. Washington State Mosquito-borne Disease Response Plan. Available in electronic format on the Internet at:  
[www.doh.wa.gov/chp/ts/zoo/wnv/wnv.html](http://www.doh.wa.gov/chp/ts/zoo/wnv/wnv.html).
- Washington Dept. Natural Resources. 2001.  
<http://www.wa.gov/dnr/htdocs/fr/nhp/refdesk/fguide/hm/4phletxt.htm>
- Western Region Climate Center, 2002. Climate of Washington available online at:  
<http://www.wrcc.dri.edu/narratives/WASHINGTON.htm>
- WHO. 2000. Human health and dams. WHO/SDE/WSH/00.01.
- Williams, D.D., A. Tavares-Cromar, D.J. Kushner, and J.R. Coleman. 1993. Colonization patterns and life-history dynamics of *Culex* mosquitoes in artificial ponds of different character. *Can. J. Zool.* 71:568-578.

Willis, M.J., G.P. Keister, D.A. Immell, D.M. Jones, R.M. Powell and K.R. Durbin.  
1993. Sage grouse in Oregon. Oreg. Dept. Fish and Wildl., Wildl. Res. Sect.,  
Wildl. Res. Rep. 15.

Wydoski, R.S. and R.R. Whitney. 1979. Inland Fishes of Washington. University of  
Washington Press. Seattle, Washington.



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