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THE CONFEDERATED TRIBES of THE COLVILLE RESERVATION
POST OFFICE BOX 150-NESPELEM WASHINGTON 99155 PHONE (509) 634-4711

Ron Freiz Fish + wildlife
509 754-4624

Dennis Beach 509 456 2926
or Doug
DOE (Ecdogy)

Ron 754 6093 County Planner
Grant County

January 27, 1998

Carl D. Adamson
Knudsen Land Surveying
16 Basin Street SW
Ephrata, WA 98823

Re: Rocky Point Preliminary Short Plat

Dear Mr. Adamson:

There are many places of interest to the Colville Confederated Tribes (CCT) near, and possibly upon, the property in question. However, splitting an existing joint property ownership as you have described in your letter of January 21, 1998, would not appear to have potential for adverse effects to these places.

This office has no objection to the Rocky Point Preliminary Short Plat as you have described it.

Thank you for considering cultural resources in your planning.

Sincerely,

Harvey S. Rice

Harvey S. (Pete) Rice, Ph.D.
Tribal Archaeologist

cc. Adeline Fredin, Tribal Preservation Officer

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Skip to site navigation (Press enter)

Rotenone ban

Dellmer Coppock Wed, 14 Mar 2001 10:03:27 -0800

Some of you may or may not be aware of the decision of the Washington Dept. of Fish and Wildlife to no longer use rotenone to rehabilitate lakes that have become infested with exotic species.
The reasons are based on studies of results on lab animals that shows injections of concentrated amounts of it causes symptoms of Parkinson's disease. Rotenone has been used for a great number years in North America, Europe, South America and elsewhere with no known effects in people who work with it.
The Washington State Office of Financial Management eliminated the funds in the WDFW budget for treating lakes.
My club, Inland Empire Flyfishing Club, prepared a mass mailing to our Senators and Representatives opposing these moves and I would urge all interested fishermen to do the same.
Thanks for hearing me out.
Dell Coppock

- Previous message
- View by thread
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Reply via email to

Dellmer Coppock

- 009101c0acb3$63c5ba40$0101a8c0@pavilion

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See Page 5 on Piperonyl Butoxide

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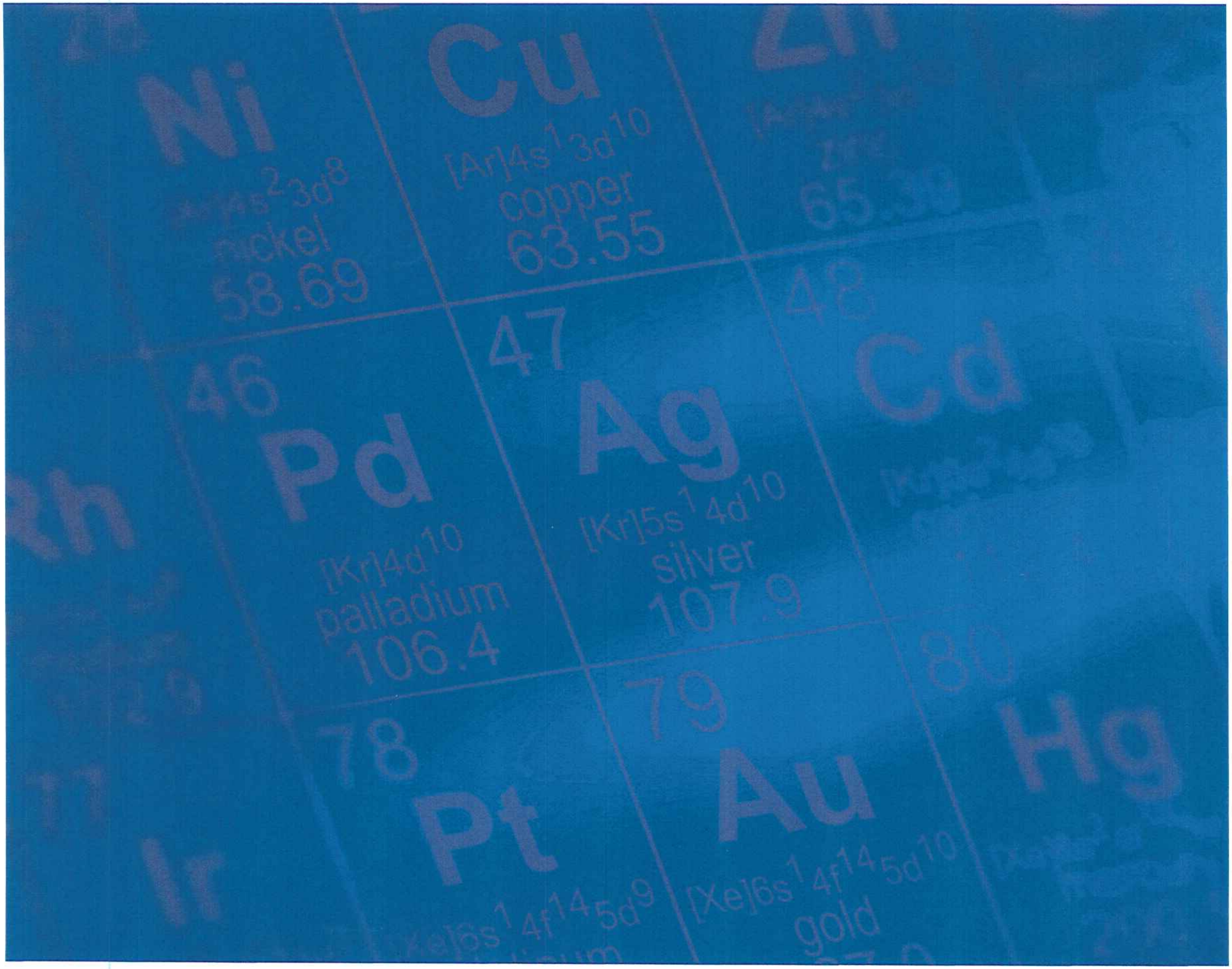
Ni
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Pd
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palladium
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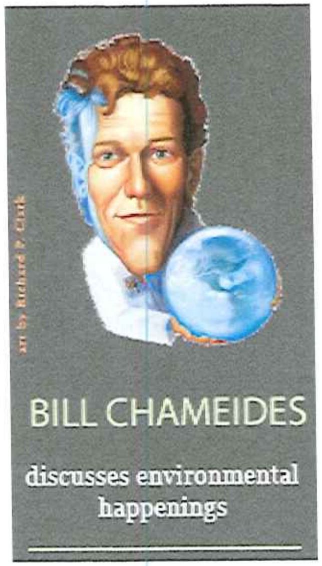

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Piperonyl Butoxide: The Trojan Horse of Pesticides

by Bill Chameides | July 11th, 2011
posted by Erica Rowell (Editor)

Permalink | Comments Off on Piperonyl Butoxide: The Trojan Horse of Pesticides

More than 80,000 chemicals are produced, used, and present in the United States. This is one of their stories.

When it comes to pesticides, it's not just the pesticides you should be concerned about.

Our subject today is a common ingredient in insecticides: piperonyl butoxide, affectionately known as PBO. Interestingly, it comes from some of the same stuff we used to make root beer out of. Also interestingly, it does not actually kill bugs.

The Chemical Marketplace

A series that looks at chemicals in everyday consumer products

PBO [pdf] is a colorless, sometimes yellowish, oily combustible liquid, first synthesized in the late 1940s. It's typically derived from sassafras oil (also called safrole), formerly a key ingredient in root beer. (Safrole was banned for food and drug use in 1960 when it was linked to cancer in animals. Today root beer is generally made with artificial sassafras or sassafras extracts that do not contain the oil.)

PBO's primary commercial use is as an additive to insecticides such as prytheroids — insecticides that dominate the home market and are used to kill everything from cockroaches to bedbugs and are even used as a bug repellent in impregnated clothing. Suffice it to say, these prytheroids are not without their own risks to the health of folks who come into contact with them. But it could turn out the PBO may be far more dangerous than the prytheroids and it isn't even an insecticide.

If PBO Doesn't Kill Bugs, Why Is It Used in Insecticides?

PBO acts as a synergist, meaning it makes the killing ingredients in insecticides more effective. Think of a battlefield with attacks and counterattacks and you begin to get the picture. With insecticides on one side and bugs on the other, the insecticide charges with the goal of decimating its opposition. But the insects have their own natural defenses — they can produce enzymes that block the insecticide's toxicity, thus sending the attacking brigade into retreat. PBOs are the insecticide's reinforcements, a veritable counter-defense against the insects' defense. How? By blocking the bugs' ability to form those enzymes. In short, with PBOs the poor little buggers are rendered defenseless.

Our yellow, oily liquid born of sassafras must be doing a really great job of disarming insects because it's now used in a panoply of insecticides. As of 2006, it was registered as an active ingredient in more than 1,500 products [pdf] for use in a variety of settings (from agricultural and commercial to industrial to residential) for public health reasons (e.g., mosquito abatement).

If PBO Doesn't Kill Bugs, No Prob for Us, Right? Maybe Not.

Because PBO is added to a host of home insecticides, it's almost certain that people are exposed to the stuff. Is that a problem? A study published in February in the journal *Pediatrics* by Megan Horton of Columbia University and colleagues suggests it very well could be, at least for prenatals.

Horton and her colleagues measured PBO (and the insecticide permethrin) in personal air samples collected in low-income homes in New York City. They followed a cohort of pregnant mothers and their newborns through their first 36 months. At the end of this period, they tested the children for cognitive and psychomotor development.

The authors found a significant association between PBO concentrations and delayed cognitive development at 36 months similar to problems posed by other prenatal neurotoxicants such as lead. (Little or no association was found for permethrin.*) Given that PBO is thought to have low systemic toxicity for people, the authors speculated that the developmental effects were caused by inhibiting enzyme activity in the prenatal and neo-natal children thereby limiting their bodies' natural ability to breakdown other toxic compounds they were exposed to. Irony of ironies, if true, it means that PBOs are doing in children exactly what they're doing in bugs.

However, that's just speculation and it runs counter to a 2006 assessment by the Environmental Protection Agency which implied this wasn't a concern: "enzyme inhibition in mammals [based on small mammal studies] is transient and occurs at high doses." That same EPA assessment also noted
, however, that "the kinetics of PBO inhibition and/or stimulation of … enzymes in humans … [had] not been established."

Of the entire Horton study, the National Pest Management Association notes that it is preliminary [pdf] — an appropriate characterization I think. The trade group recommends that concerned consumers should consult with "a qualified and licensed pest professional to discuss these concerns as well as the proactive and preventative measures they can take to minimize risks, including risks posed by pests."

Yeah, I guess that's one thing you could do. You might also look for products without PBO, products that may be increasingly easier to find. Over the last couple of years a number of PBO pesticide formulations have already been voluntarily canceled (though not necessarily because of PBO).

PBO or not, you can rest assured that the human-bug battle will continue as we keep developing new pesticides to zap bugs that continue to evolve new defense mechanisms. But, as is the case in most battles, you'd better beware of friendly fire — you could be among the casualties of the pesticide barrage.

End Note

* Horton et al note that a lack of association for permethrins may in part reflect the difficulty in measuring them. They are not volatile and so are difficult to track in personal air samples and they breakdown quickly in our bodies often to nonspecific metabolites and so are difficult to track there as well.

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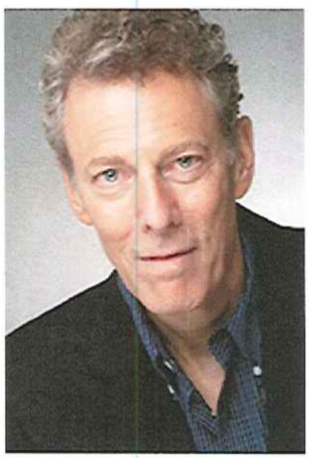

Bill Chameides served as dean of Duke's Nicholas School of the Environment from 2007 to 2014 and is currently Professor Emeritus at Duke.

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[Walte]r Arlt

[From]:	John Arlt [jarlt@elltel.net]
[Se]nt:	Wednesday, July 15, 2015 11:04 AM
To:	'Walter Arlt'
Subject:	FW: They may be able to help

-----Original Message-----
From: John Arlt [mailto:jarlt@elltel.net]
Sent: Saturday, July 11, 2015 2:23 PM
To: 'Spike Arlt'; 'Walter Arlt'
Subject: They may be able to help

Here is the link to there website: http://www.westernlaw.org/article/poisoning-pristine-wilderness-stream-halted-press-release

Poisoning of Pristine Wilderness Stream Halted (press release)

9/13/2011

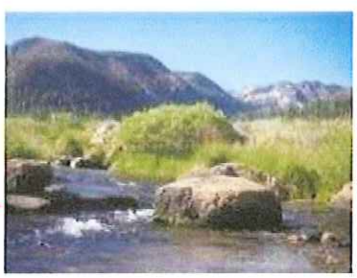
SUCCESSES OUR WORK CALIFORNIA WILDLANDS WILDLIFE CLEAN FREE-FLOWING RIVERS PRESERVING WILDERNESS SIERRA AMPHIBIANS

We are pleased to share the good news that we have stopped the state of California from poisoning a pristine stream in the Carson-Iceberg Wilderness on the east slopes of the Sierra Nevada mountains.

This is the second time we have successfully challenged California Department of Fish & Game's plan to dump rotenone - a toxic chemical that kills all oxygen-breathing organisms - along an 11-mile stretch of Silver King Creek.

The agency planned to kill all aquatic life in this portion of the wilderness stream to restore Paiute cutthroat trout, which are in decline due to the agency planting non-native fish that out-compete and interbreed with the native fish.

While we support and encourage efforts to restore threatened species, we will not stand by when such an extreme measure is proposed without sound STUDIES of all the effects.



In his ruling, federal judge Frank C. Damrell wrote that we "demonstrated that rotenone treatment will kill sensitive macro-invertebrate species and that re-colonization will not occur for some species because they cannot adapt to the project area." Further, he noted that the agency OFFERED no evidence that the native trout is at imminent risk of extinction, and that "the public interest favors preservation of the unimpaired wilderness."

If the agency proposes this reckless project a third time, WELC will return to court to prevent this poisoning and PROTECT wilderness.

Photo of Silver King Creek from www.phlyphish.com

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Staff:
Pete Frost

Partners:
Californians for Alternatives to Toxics
Friends of Silver King Creek

Poisoning a Sierra stream to save the world's rarest

Officials pour poison into Silver King Creek, killing nonnative trout species, in c make a home for the Paiute cutthroat trout.

September 02, 2013 | By Louis Sahagun

WALKER, Calif. — State fisheries biologist Dave Lentz poured poison into a remote High Sierra stream and watched quietly as every rainbow and golden trout in the water turned belly up.


Rachel Van Horne, a biologist with the U.S lugs a bucket... (Louis Sahagun, Los Angel

After the rotenone spread along 11 miles of Silver King Creek last Wednesday, other biologists poured in a neutralizing agent, making the river again habitable — and a suitable home for the rarest trout in the world.

Kneeling beside a small brass spigot that dripped the milky white toxin into a pool edged with alders, Lentz, a conservation coordinator for native trout with the California Department of Fish and Wildlife, smiled and said, "Looks like everything is worki intended. The Paiute cutthroat trout belongs in this stream, not the nonnatives in here now.'

The Paiute trout is native to the Alpine County stream in the Eastern Sierra's Carson-Iceberg of the Humboldt-Toiyabe National Forest. But it had been squeezed out by rainbow and gold which are not native to this portion of Silver King Creek.

The plan to restore the Paiute trout had been held up in federal court for more than a decade opponents who believe that poisoning a stream is about the worst thing that could happen ir designated wilderness. They also question the safety of rotenone and worry about its possibl

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effects on wildlife and regional water supplies.

Biologists say rotenone is a natural poison derived from peas that breaks down rapidly and p
threat to water supplies.

After the poisoning, biologists in waders sloshed in knee-deep water, using nets to scoop up
place them in buckets. The remains were to be tossed into the forest as an unexpected banqu
insects, birds and mammals.

Alpine County Supervisor Don Jardine is among the critics of this recovery effort by the stat
Department of Fish and Wildlife, the U.S. Forest Service and the U.S. Fish and Wildlife Serv
first fished this wilderness with his father more than half a century ago.

"I have a basic philosophical objection to anyone polluting a natural waterway," Jardine said
that, these agencies are taking the easy way out. They could have used less obtrusive alternat
electroshock, but that would have required more time, money and manpower."

Jardine also pointed out that rotenone is banned for use in U.S. coastal waters and banned e
Europe. Also, some rotenone treatments have flopped.

In 1992, an estimated 1,000 trout were accidentally killed along a different stretch of Silver I
when state wildlife biologists mistakenly used excessive amounts of potassium permanganat
neutralize rotenone.

In the late 1990s, state wildlife authorities laced the Sierra reservoir of Lake Davis with roter
of an effort to eradicate northern pike, an invasive saw-toothed fish that had been ravaging t
trophy-size trout. The pike returned in 18 months.

In May, however, a U.S. District Court judge green-lighted the Silver King Creek project. It is
create a self-sustaining population of about 2,500 Paiute cutthroat in seven to 10 years, mak
species eligible to become the first fish ever removed from protection under the Endangered

"Rotenone is as close to a silver bullet as anything we have in that it hardly impacts anything
said Dan Duffield, a U.S. Forest Service fish biologist. "In this case, we're using it to restore a
rare fish in an area where it evolved with other creatures such as mountain yellow-legged fro

Since the 1960s, mountain yellow-legged frogs have been decimated in the Sierra Nevada by including nonnative fish.

The historic range of the Paiute cutthroat is thought to have been limited to about 9 miles in Creek. By the early 1900s, the species was in danger of extinction through interbreeding witl nonnative trout.

The Paiute cutthroat's range was extended into the upper reaches of Silver King Creek — ina nonnative trout — via unofficial transplantation of the fish by Basque sheepherders in 1912. ' descendants are the only known pure strain of the iridescent purplish trout.

Because the Paiute cutthroats readily take a lure or a fly, Silver King Creek was closed to fish

If the recovery effort is successful, the creek could be reopened to angling for native trout in years.

"One reason it may take that long is that there aren't many pure Paiute trout left to draw sto Jim Harvey, forest fisheries biologist for the U.S. Forest Service. "Once this stream is ready, stock 50 to 100 Paiute trout at a time.

"In the meantime, we have to make sure that there isn't a single nonnative trout, or even the alive in this stream," he added, scanning the eddies for dead fish.

louis.sahagun@latimes.com

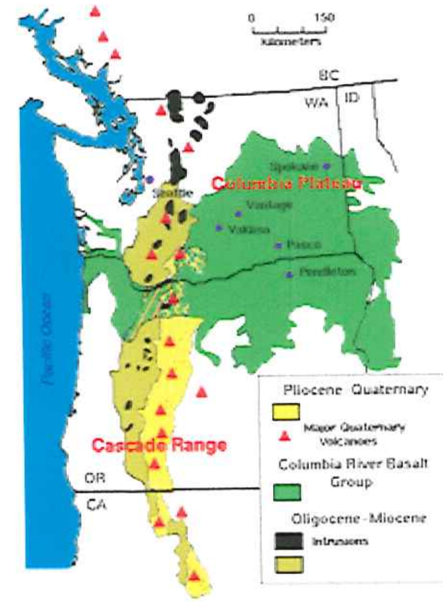
FEATURED

Coordinates: 45°59′58″N 119°00′05″W

Columbia Plateau

From Wikipedia, the free encyclopedia

The **Columbia Plateau** is a geologic and geographic region that lies across parts of the U.S. states of Washington, Oregon, and Idaho.[1] It is a wide flood basalt plateau between the Cascade Range and the Rocky Mountains, cut through by the Columbia River. In one of various usages, the term "Columbia Basin" refers to more or less the same area as the Columbia Plateau.[2]



The Columbia Plateau covers much of the Columbia River Basalt Group, shown in green on this map. The Washington cities of Spokane, Yakima and Pasco, and the Oregon city of Pendleton, lie on the Columbia Plateau.

Contents

Geology

During late Miocene and early Pliocene times, one of the largest flood basalts ever to appear on the earth's surface engulfed about 63,000 square miles (160,000 km^2) of the Pacific Northwest, forming a large igneous province.[3] Over a period of perhaps 10 to 15 million years, lava flow after lava flow poured out, ultimately accumulating to a thickness of more than 6,000 feet (1.8 km).[3] As the molten rock came to the surface, the Earth's crust gradually sank into the space left by the rising lava.[3]

The subsidence of the crust produced the large plateau—a large, slightly depressed lava plain sometimes also known as the Columbia Basin.[3] The ancient Columbia River was forced into its present course by the northwesterly advancing lava. The lava, as it flowed over the area, first filled the stream valleys, forming dams that in turn caused impoundments or lakes.[3] Entities found in these lake beds include fossil leaf impressions, petrified wood, fossil insects, and bones of vertebrate animals.[3]

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Flora

Part of the Columbia Plateau is associated with the Columbia Plateau ecoregion, part of the 'Nearctic temperate and subtropical grasslands, savannas, and shrublands' ecoregion of the Temperate grasslands, savannas, and shrublands Biome.

Geography

Washington cities in the Columbia Plateau include:

- Davenport
- Reardan
- Kennewick
- Moses Lake
- Pasco
- Pullman
- Richland
- Spokane
- Walla Walla
- Yakima*
- Goldendale
- Deer park

Oregon cities in the Columbia Plateau include:

- Hermiston
- Hood River
- Pendleton
- The Dalles

See also

- Grand Coulee
- Channeled scablands
- Interior Plateau

References

1. U.S. Geological Survey Geographic Names Information System: Columbia Plateau (http://geonames.usgs.gov/apex/f?p=gnispq:3:::NO::P3_FID:1159062)
2. Floyd, Ben, et al. "Glossary (http://www.co.benton.wa.us/pl/iap/html/body_glossary.htm)". (1998) Hanford Reach Protection and Management

Program Interim Action Plan (http://www.co.benton.wa.us/pl/iap/iapindex.htm). Prosser, Washington: Benton County Planning Department.
3. Description: Columbia Plateau Columbia River Basalt. (http://vulcan.wr.usgs.gov/Volcanoes/ColumbiaPlateau/description_columbia_plateau.html) United States Geological Survey, accessed October 9, 2007.

External links

- USGS Page on Columbia Plateau (http://vulcan.wr.usgs.gov/Volcanoes/ColumbiaPlateau/framework.html)
- Geology of Lake Roosevelt National Recreation Area (source of much of this page) (http://www.nps.gov/laro/webdirectory/geology.htm)
- Guide to digital documents and photographs about the Columbia River area. (http://harvester.lib.utah.edu/wwdl/index.php/browse/guide/columbia)
- Columbia River Basin Ethnic History Archive (http://www.vancouver.wsu.edu/crbeha/)

Categories: Columbia River | Physiographic provinces | Large igneous provinces | Volcanism of Washington (state) | Miocene volcanism | Pliocene volcanism | Plateaus of the United States | Landforms of Idaho | Landforms of Oregon | Landforms of Washington (state) | Regions of Oregon | Regions of Washington (state) | Landforms of Umatilla County, Oregon | Landforms of Hood River County, Oregon | Landforms of Wasco County, Oregon

Coordinates: 47°37′12″N 119°18′27″W

Grand Coulee

From Wikipedia, the free encyclopedia

The **Grand Coulee** is an ancient river bed in the U.S. state of Washington. This National Natural Landmark[1] stretches for about 60 miles (100 km) southwest from Grand Coulee Dam to Soap Lake, being bisected by Dry Falls into the Upper and Lower Grand Coulee.

Grand Coulee

Grand Coulee, below Dry Falls. The layering effect of periodic basalt lava flows is visible.

Map of Washington state

Location	Washington state
Coordinates	47°37′12″N 119°18′27″W

Contents

Geological history

The Grand Coulee is part of the Columbia River Plateau. This area has underlying granite bedrock, formed deep in the Earth's crust 40 to 60 Ma (million years ago). The land periodically uplifted and subsided over millions of years giving rise to some small mountains and, eventually, an inland sea.

From about 10 to 18 Million years ago, a series of volcanic eruptions from the Grand Ronde Rift, near the Idaho/Oregon/Washington/Montana border began to fill the inland sea with lava. In some places the volcanic basalt is 2,000 metres (6,600 ft) thick. In other areas granite from the earlier mountains is still exposed. Many animals roamed the area including camel, horse and rhinoceros.

Between two million years ago the Pleistocene epoch, glaciation took place in the area. Large parts of northern North America were repeatedly covered with glacial ice sheets,

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at times reaching over 10,000 feet in thickness. Periodic climate changes resulted in corresponding advances and retreats of ice.

U.S. National Natural Landmark	
Designated	1965

About 18,000 years ago a large finger of ice advanced into present-day Idaho, forming an ice dam at what is now Lake Pend Oreille. It blocked the Clark Fork River drainage, thus creating an enormous lake reaching far back into mountain valleys of western Montana. As the lake deepened, the ice began to float. Leaks likely developed and enlarged, causing the dam to fail. Suddenly 500 cubic miles of Lake Missoula, 10 times the combined flow of all the rivers in the world, were released in 48 hours.

Looking northward in the Grand Coulee.

This mass of water and ice, towering 2,000 feet (610 m) thick near the ice dam before release, flowed across the Columbia Basin, moving at speeds of up to 65 miles per hour. The deluge stripped away soil, cut deep canyons and carved out 50 cubic miles (210 km^3) of earth, leaving behind areas of stark scabland.

Steamboat Rock in the Grand Coulee.

Over nearly 2500 years the cycle was repeated many times. Most of the displaced soil created new landforms, but some was carried far out into the Pacific Ocean. In Oregon's Willamette Valley, as far south as Eugene, the cataclysmic flood waters deposited fertile soil and icebergs left numerous boulders from as far away as Montana and Canada. At present day Portland, the water measured 400 feet (120 m) deep. A canyon 200 feet (61 m) deep is carved into the far edge of the continental shelf. The web-like formation can be seen from space. Mountains of gravel as tall as 40-story buildings were left behind; boulders the size of small houses and weighing many tons were strewn about the landscape.

Grooves in the exposed granite bedrock are still visible in the area from the movement of glaciers, and numerous erratics are found in the elevated areas to the northwest of the coulee.

Early theories suggested that glaciers diverted the Columbia River into what became the Grand Coulee and that normal flows caused the erosion observed. In 1910 Joseph T. Pardee described a great Ice Age lake, "Glacial Lake Missoula", a glacier dammed lake with water up to 600 metres (2,000 ft) deep, in northwest Montana and in 1940 he reported his discovery that giant ripple marks 50 feet (15 m) high and 200–500 feet apart had formed the lake bed. In the 1920s J Harlen Bretz looked deeper into the landscape and put forth his theory of the dam breaches and massive glacial floods from Lake Missoula.

Of the Channeled Scablands, Dry Falls, one of the largest waterfalls ever known, is an excellent example (south of Banks Lake and visible in the image below).[2][3][4][5]


Part of the Grand Coulee has been dammed and filled with water as part of the Columbia Basin Project.

It is probable that humans were witnesses, and victims, of the immense power of the Ice Age Floods. Archeological records date human presence back to nearly the end of the Ice Age, but the raging torrents erased the land of clear evidence, leaving us to question who, if anyone, may have survived. With the end of the last glacial advance, the Columbia settled into its present course. The river bed is about 200 metres (660 ft) below the Grand Coulee. Walls of the coulee reach 400 metres (1,300 ft) in height.

Modern uses

The area surrounding the Grand Coulee is shrub-steppe habitat, with an average annual rainfall of less than twelve inches (305 mm). The Lower Grand Coulee contains Park, Blue, Alkali, Lenore, and Soap lakes. Until recently, the Upper Coulee was dry.

The Columbia Basin Project changed this in 1952, using the ancient river bed as an irrigation distribution network. The Upper Grand Coulee was dammed and turned into Banks Lake. The lake is filled by pumps from the Grand Coulee Dam and forms the first leg of a hundred-mile (160 km) irrigation system. Canals, siphons, and more dams are used throughout the Columbia Basin, supplying over 600,000 acres (240,000 ha) of farm land.

Water has turned the Upper Coulee and surrounding region into a haven for wildlife, including bald eagles. Recreation is a side benefit and includes several lakes, mineral springs, hunting and fishing, and water sports of all kinds. Sun Lakes and Steamboat Rock state parks are both found in the Grand Coulee. However, the lake has also flooded a large area of natural habitat and native hunting grounds, permanently displacing the indigenous people.

See also

- Dry Falls Dam

References

1. "Grand Coulee" (http://www.nature.nps.gov/nnl/site.cfm?Site=GRCO-WA). *nps.gov*. National Park Service.
2. Alt, David (2001). *Glacial Lake Missoula & its Humongous Floods*. Mountain Press Publishing Company. ISBN 0-87842-415-6.
3. Bjornstad, Bruce (2006). *On the Trail of the Ice Age Floods: A Geological Guide to the Mid-Columbia Basin*. Keokee Books; San Point, Idaho. ISBN 978-1-879628-27-4.
4. J Harlen Bretz, (1923), The Channeled Scabland of the Columbia Plateau. *Journal of Geology*, v.31, p.617-649
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External links

- The Geologic Story of the Columbia Basin, BPA site (http://www.bpa.gov/Power/pl/columbia/4-geology.htm)
- 3D images of the Grand Coulee, USGS site (http://3dparks.wr.usgs.gov/grandcoulee/html/gc670.htm)
- WDFW - Wildlife of Eastside Shrubland and Grassland Habitats (http://wdfw.wa.gov/wlm/research/papers/shrub/wildlife_of_shrubsteppe.htm)
- University of Washington Libraries Digital Collections – Lawrence Denny Lindsley Photographs (http://content.lib.washington.edu/llweb/index.html) Includes 146 images (ca. 1938–1958) of the Columbia River, Eastern Washington and the Grand Coulee region.
- JSTOR - Geographical Review (http://www.jstor.org/stable/208027)

Wikimedia Commons has media related to ***Grand Coulee***.

Categories: Geology of Washington (state) | Columbia River | Geography of Douglas County, Washington | Geography of Grant County, Washington | National Natural Landmarks in Washington (state) | Landforms of Douglas County, Washington | Landforms of Grant County, Washington | Canyons and gorges of Washington (state)

Coordinates: 47.5622°N 119.5395°W

Channeled Scablands

From Wikipedia, the free encyclopedia

The **Channeled Scablands** are a barren, relatively soil-free landscape in eastern Washington, scoured clean by a flood unleashed when a large glacial lake drained.[1] They are a geologically unique erosional feature in the U.S. state of Washington. They were created by the cataclysmic Missoula Floods that swept periodically across eastern Washington and down the Columbia River Plateau during the Pleistocene epoch. Geologist J Harlen Bretz coined the term in a series of papers in the 1920s. Debate over the origin of the Scablands raged for four decades and is one of the great debates in the history of earth science. The Scablands are also important to planetary scientists as perhaps the best terrestrial analog for the Martian outflow channels.[2]

Drumheller Channels

Contents

History

Bretz conducted research and published many papers during the 1920s describing the Channeled Scablands. His theories of how they were formed required short but immense floods (500 cubic miles of water), for which Bretz had no explanation. Bretz's theories met with vehement opposition from geologists of the day, who tried to explain the features with uniformitarian theories.

J.T. Pardee first suggested in 1925 to Bretz that the draining of a glacial lake could account for flows of the magnitude needed. Pardee continued his research over the next 30 years, collecting and analyzing evidence that eventually identified Lake Missoula as the source of the Missoula Floods and creator of the Channeled Scablands.

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Pardee's and Bretz's theories were accepted only after decades of painstaking work and fierce scientific debate. Research on open channel hydraulics in the 1970s put Bretz's theories on solid scientific ground. In 1979 Bretz received the highest medal of the Geological Society of America, the Penrose Medal, to recognize that he had developed one of the great ideas in the earth sciences.

Geology

The term scabland refers to an area that has experienced fluvial erosion resulting in the loss of loess and other soils, leaving the land barren.[3] River valleys formed by erosional downcutting of rivers create V-shaped valleys, while glaciers carve out U-shaped valleys. The Channeled Scablands have a rectangular cross section, with flat plateaus and steep canyon sides, and are spread over immense areas of eastern Washington. The morphology of the scablands is butte-and-basin.[3] The area that encompasses the Scablands has been estimated between 1,500 and 2,000 square miles (3,900 and 5,200 km^2), though those estimates still may be too conservative.[4]

They exhibit a unique drainage pattern that appears to have an entrance in the northeast and an exit in the southwest. The Cordilleran Ice Sheet dammed up Glacial Lake Missoula at the Purcell Trench Lobe.[4] A series of floods occurring over the period of 18,000 and 13,000 years ago swept over the landscape when the ice dam broke. The eroded channels also show an anastomosing, or braided, appearance.

There are also immense potholes and ripple marks, much larger than those found on ordinary rivers. When first studied, no known theories could explain the origin of these features. The giant current ripples are between 3.3 and 49.2 feet (1 and 15 m) high and are regularly spaced, relatively uniform hills.[3] Vast volumes of flowing water would be required to produce ripple marks of this magnitude, as they are larger-scale versions of the ripple marks found on streambeds that are typically only centimeters high. Large potholes were formed by swirling vortexes of water called kolks scouring and plucking out the bedrock.[4]

The Scablands are littered with large boulders called glacial erratics that rafted on glaciers and were deposited by the glacial outburst flooding. The lithology of erratics usually does not match the rock type that surrounds it, as they are often carried very far from their origin.[4]

See also

- Coulee
- Glacial lake outburst flood
- Drumheller Channels National Natural Landmark
- Dry Falls
- Giant current ripples
- Diluvium

- Outflow channels
- Altai flood

Notes

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External links

- United States Geological Survey The Channeled Scablands of Eastern Washington (http://www.nps.gov/history/history/online_books/geology/publications/inf/72-2/contents.htm)
- Steven Dutch, University of Wisconsin - Green Bay, Channeled Scablands: Overview (http://www.uwsp.edu/geo/projects/geoweb/participants/dutch/vtrips/Scablands0.HTM)

- Historical Discussion (http://www.geo.ucalgary.ca/~macrae/t_origins/bretz_re.html)
- PBS's *NOVA*: *Mystery of the Megaflood* (http://www.pbs.org/wgbh/nova/megaflood/)
- Scablands in Google Maps (http://maps.google.com/maps?f=q&hl=en&sll=47.577221,-119.401646&sspn=0.041283,0.080509&q=scablands,+washington&t=h&om=1&ll=47.562164,-119.53949&spn=0.330361,0.644073)
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- Sun Lakes-Dry Falls State Park (http://www.parks.wa.gov/parkpage.asp?selectedpark=Sun%20Lakes) in the Channeled Scablands
- Columbia Plateau Trail StatePark (http://parks.wa.gov/parkpage.asp?selectedpark=Columbia+Plateau+Trail) in the Channeled Scablands
- The Seattle Times' *Pacific NW* magazine (http://seattletimes.nwsource.com/html/pacificnw09302007/2003905120_pacificpice30.html) - "Trailing an Apocalypse" - 30-Sep-2007
- The channeled scabland (http://purl.galileo.usg.edu/ugafax/J84xNASx1x18xCx36): a guide to the geomorphology of the Columbia Basin, Washington : prepared for the Comparative Planetary Geology Field Conference held in the Columbia Basin, June 5–8, 1978 / sponsored by Planetary Geology Program, Office of Space Science, National Aeronautics and Space Administration ; edited by Victor R. Baker and Dag Nummedal.
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Retrieved from "https://en.wikipedia.org/w/index.php?title=Channeled_Scablands&oldid=659003596"

Categories: Geology of Washington (state) | Deserts of the United States | Megafloods | Landforms of Washington (state)

Coulee

From Wikipedia, the free encyclopedia

Coulee (or **coulée**) is applied rather loosely to different landforms, all of which refer to a kind of valley or drainage zone.

An upwards view of section of the wall protruding to the canyon. There is a marsh in the foreground.

The word *coulee* comes from the Canadian French *coulée*, from French word *couler* meaning "to flow".

The term is often used interchangeably in the Great Plains for any number of water features, from ponds to creeks.

In southern Louisiana the word *coulée* (also spelled *coolie*) originally meant a gully or ravine usually dry or intermittent but becoming sizable during rainy weather. As stream channels were dredged or canalized, the term was increasingly applied to perennial streams, generally smaller than bayous. The term is also used for small ditches or canals in the swamp.[1]

A view through a coulee, with steep but lower sides, and water in the bottom.

Contents

Types and examples

1. The dry, braided channels formed by glacial drainage of the Scablands of eastern Washington, such as Grand Coulee and Moses Coulee.
2. The furrowed moraines channeling rain runoff in the area east of the Coteau du Missouri in the western United States and western Canada at the base of the Rocky Mountains.
3. In the western United States, tongue-like protrusions of solidified lava, forming a sort of canyon.

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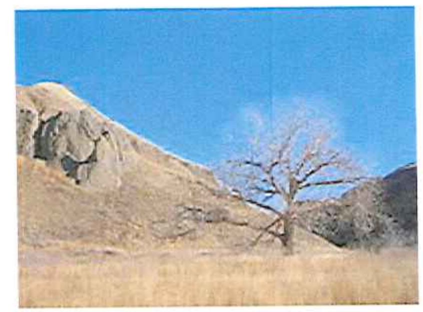
4. In Wisconsin, it is applied to valleys. These valleys tend to have high, steep walls. "Hollow" is used as a synonym, often for the smallest of such valleys. The term is also applied to the greater La Crosse, Wisconsin metropolitan area (i.e. the "Coulee Region"[2]), rather much like "Twin Cities" is applied to Minneapolis-Saint Paul.
5. The Gassman Coulee Trestle [3]supports commercial and Amtrak (Empire Builder) trains, SW of Minot ND. The coulee may have been a contributing factor to the flooding of the Souris River in June 2011.

Drumheller Channels in the Columbia Basin of Washington

In some parts of Louisiana coulees are not concreted but rather sheer sided large ditches that collect smaller ditch runoff.

Geomorphology



A view upward into a coulee in the Oldman River valley in Lethbridge, Alberta

Aside from those formed by volcanic eruptions, they are commonly canyons characterized by steep walls that have been shaped by erosion. These types of coulees are generally found in the northwestern United States and southwestern Canada. In the American west, rapid melting of glaciers at the end of the last ice age caused catastrophic flooding which removed bedrock by massive down-cutting erosion, forming deep canyons. Some coulees may be seasonally dry or contain small streams, however these small streams do not have the magnitude of force necessary to form such expansive erosion.

In Wisconsin, they are the product of nearly a half million years of erosion, unmodified by glaciation (see Driftless Area[4]). The loose rocks at the base of the wall form what are called scree slopes. These are formed when chunks of the canyon wall give way in a rockslide. Left alone, the valleys are often woodland, with the ridgetops transitioning into tallgrass prairie when not turned into pasture or used for row crops.

Coulees provide shelter from wind and concentrated water supplies to plants which would otherwise struggle to survive in the xeric sagebrush steppe. Trees are often found in riparian habitats along streams in coulees and at the base of their walls.[5]

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See also

- Grand Coulee
- Channeled scablands

Categories: Fluvial landforms | Erosion landforms

Coordinates: 46°58′30″N 119°11′47″W

Drumheller Channels National Natural Landmark

From Wikipedia, the free encyclopedia

Drumheller Channels National Natural Landmark showcases the **Drumheller Channels**, which are the most significant example in the Columbia Plateau of basalt butte-and-basin channeled scablands. This National Natural Landmark is an extensively eroded landscape, located in south central Washington state characterized by hundreds of isolated, steep-sided hills (buttes) surrounded by a braided network of numerous channels, all but one of which are currently dry. It is a classic example of the tremendous erosive powers of extremely large floods such as those that reformed the Columbia Plateau volcanic terrain during the late Pleistocene glacial Missoula Floods.[1][2][3][4]

In 1986, the U.S. National Park Service recognized the significance and natural beauty of Drumheller Channels by designating them a National Natural Landmark. The geologist who initially recognized and documented the evidence for the Ice-Age floods, J Harlen Bretz, wrote:

> "Drumheller is the most spectacular tract of butte-and basin scabland on the plateau. It is an almost unbelievable labyrinth of anastamosing channels, rock basins, and small abandoned cataracts".[3]

Drumheller Channels

Drumheller Channels

Map of Washington state

Location	south central Washington state
Coordinates	46°58′30″N 119°11′47″W
Designated	1986

Drumheller Channels connects the Quincy Basin, which lies to north, with the Othello Basin on the south. It can be reached most easily from Othello, Washington approximately 8 km (5.0 mi) northwest on McManamon Road, then north on Morgan Lake Road which passes through the Drumheller Channels region. The north/south Morgan Lake Road (gravel) passes through the heart of the channels following Crab Creek. Hikes can be taken, including an interpretive trail, from the wetlands along Crab Creek to the views from an isolated butte, that allow the hiker to gain a sense of this unique landscape. The Drumheller Channels can also be seen from the paved State Route 262 which runs to the north of the area along the top of the Potholes Reservoir dam (which has inundated part of the scablands) and from the west side from the heights of the Frenchman Hills.[4]

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Contents

Route of the ancient Columbia River

Ice Age Floods Institute tour of the Drumheller Channels - note the 2 people in the foreground and the group in the background that provide perspective in the large-scale erosion here.

The Okanogan lobe of the Cordilleran Glacier moved down the Okanogan River valley and blocked the ancient route of the Columbia River, backing up water to create Lake Spokane. Initially water discharged from Lake Spokane by running up through the head of Grand Coulee and down through Foster Coulee to rejoin the Columbia River. As the glacier moved further south, Foster Coulee was cut off and the Columbia River then discharged through Moses Coulee, which runs southward slightly to the east of the ancient and current course of the Columbia. As the Okanogan lobe grew, it blocked Moses Coulee as well; the Columbia found the next lowest route through the region which was eroded to become the modern Grand Coulee. Flowing across the current Grand Coulee & Dry Falls regions, the ice age Columbia then entered the Quincy Basin & joined Crab Creek, following Crab Creek's course southward past the Frenchman Hills and turning west to run along the north face of the Saddle Mountains & rejoin the previous and modern course of the Columbia River just above the main water gap in the Saddle Mountains, Sentinel Gap.[4]

Formation of the Drumheller Channels

The Missoula Floods discharged into Lake Spokane, through the Grand Coulee, greatly enlarging it, passed over Dry Falls and then ponded in and inundated the Quincy Basin, covering over 1500 km^2 (585 mi^2) and creating the Ephrata Fan (a deposit of boulders, cobbles, and pebbles where the flood waters discharged into the basin). The discharge volume was so great that water overflowed Lake

Spokane in multiple places & also reached the Quincy Basin via the Telford-Crab Creek scablands and Lind Coulee (both entering the basin from the east). When floodwaters encountered the Frenchman Hills, their level was high enough that, although the bulk of the water passed through the Crab Creek drainage, some water spilled west over the low points of three divides along Evergreen and Babcock ridges to reach the Columbia river channel at Frenchman Coulee to the southwest, Potholes Coulee to the north central and Crater Coulee to the northwest. The bulk of the floodwaters took the easiest path, straight south through the Drumheller Channels stretch of Crab Creek.[4][5]

The elevation drop of the floodwaters as they passed through the Drumheller Channels was greater than 50 meters (160 ft) over a distance of 20 km (12 mi) with gradiants locally ranging from 2–12 m/km). This hydraulic head combined with a flow depth of from 60 to 120 meters (200 – 400 ft) provided the energy to achieve flood flow velocities as high as 30 m/s (65 mph), which eroded the topsoil and underlying basalt, gouging the complex network of channels, basins, potholes and buttes that are found there even today. Examples of scabland features, such as large kolk-excavated potholes provide evidence of the tremendous powers of the floods.[5]

There is a unique character to the Drumheller Channels; unlike most other Channeled Scabland zones, no single centralized channel or major cataracts were formed. In the Drumheller Channels the floodwaters passing through in a broad cascade of 13 – 20 km (8 to 12 miles) in width. Bretz recorded 150 distinct channels and over 180 rock basins in this region. Many of the low areas, including Upper Goose Lake, are filled by water seeping in through cracks in the basalt bedrock, which are connected with Potholes Reservoir to the north.[5]

Impacts of early settlement

The impact of settlement was severe; in the 1860s overgrazing depleted most of the few native grasses. Government surveys of the 1880s identified much of the region as badlands.[6]

Bureau of Reclamation actions

In 1934, the U.S. Bureau of Reclamation initiated construction on the Grand Coulee Dam on the Columbia River about 100 miles (200 km) north of the Drumheller Channels. Grand Coulee was only one part of the Columbia Basin Project, which included four major storage reservoirs, hundreds of pumping plants, 2,300 miles (3,700 km) of canals and laterals to irrigate the region. Irrigation began in 1951, raising the water table. By 1980, when the last stage of the project was completed, the area of wetlands in the Columbia Basin was at least 20 times larger than it had been earlier as a result of seepage and a raised water table. Migrating waterfowl were drawn to the region by the water and by greatly increased food supplies from the adjacent farmlands.[6]

Columbia National Wildlife Refuge

The Columbia National Wildlife Refuge is collocated with the Drumheller Channels. Adjacent areas are included in the Seep Lakes Wildlife Area. More than 200 species of mammals and birds can be found in the cliffs, marshes, grasslands, lakes, seeps, and other riparian areas.[4][7]

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6. Columbia National Wildlife Refuge (http://www.historylink.org/essays/output.cfm?file_id=7459) by the Online Encyclopedia of Washington State History
7. Columbia National Wildlife Refuge (http://www.fws.gov/refuges/profiles/recEdMore.cfm?ID=13510).

External links

- NNL Summary (http://www.nature.nps.gov/nnl/site.cfm?Site=DRCH-WA) National Park Service
- National Park Service article on Ice Age Floods (http://www.nps.gov/iceagefloods/g.htm)
- Site of the Ice-Age Floods Institute (IAFI). The IAFI is a non-profit organization educating the public about geologic events that shaped the Pacific Northwest. (http://www.iceagefloodsinstitute.org/)
- Columbia National Wildlife Refuge (http://www.fws.gov/refuges/profiles/recEdMore.cfm?ID=13510)

Categories: Protected areas of Adams County, Washington | Geology of Washington (state) | Protected areas of Grant County, Washington | National Natural Landmarks in Washington (state)

Coordinates: 47°36′0″N 119°21′25″W

Dry Falls

From Wikipedia, the free encyclopedia

Dry Falls is a 3.5 mile long scalloped precipice in central Washington, on the opposite side of the Upper Grand Coulee from the Columbia River, and at the head of the Lower Grand Coulee. At five times the width of Niagara,[1]:116 Dry Falls is thought by some to be the greatest known waterfall that ever existed, but the refilling of the Mediterranean 5 million years ago probably dwarfed it. According to the current geological model, catastrophic flooding channeled water at 65 miles per hour through the Upper Grand Coulee and over this 400-foot (120 m) rock face at the end of the last ice age. At this time, it is estimated that the flow of the falls was ten times the current flow of all the rivers in the world combined.

Dry Falls

Location	Grant County, Washington, North America
Type	Block
Elevation	1510 feet (460 m)
Total height	400 feet (121 m)
Total width	3.5 miles (5.63 km)
Average flow rate	None

Nearly twenty thousand years ago, as glaciers moved south through North America, an ice sheet dammed the Clark Fork River near Sandpoint, Idaho. Consequently, a significant portion of western Montana flooded, forming the gigantic Lake Missoula. About the same time, Glacial Lake Columbia was formed on the ice-dammed Columbia River behind the Okanogan lobe of the Cordilleran Ice Sheet. Lake Columbia's overflow – the diverted Columbia River – drained first through Moses Coulee and as the ice dam grew, later through the Grand Coulee.

Eventually, water in lake Missoula rose high enough to float the ice dam until it gave way, and a portion of this cataclysmic flood spilled into Glacial Lake Columbia, and then down the Grand Coulee. It is generally accepted that this process of ice-damming of the Clark Fork, refilling of Lake Missoula and subsequent cataclysmic flooding happened dozens of times over the years of the last Ice Age.[1] [2]

This sudden flood put parts of Idaho, Washington, and Oregon under hundreds of feet of water in just a few days. These extraordinary floods greatly enlarged the Grand Coulee and Dry Falls in a short period. The large plunge pools at the base of Dry Falls were created by these floods.

Once the ice sheet that obstructed the Columbia melted, the river returned to its normal course, leaving the Grand Coulee and the falls dry. Today, this massive cliff can be viewed from the Dry Falls Interpretive Center, part of Sun Lakes-Dry Falls State Park, and located on Route 17 near the town of Coulee City. Admission is free although a Discover Pass is required for parking.

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See also

- Channeled scablands

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- Allen, John Eliot; Burns, Majorie; and Sargent, Sam C. (1986). *Cataclysms on the Columbia*. Portland: Timber Press. ISBN 0-88192-215-3.

External links

- *National Park Service* online book about ice age floods and the Dry Falls (http://www.nps.gov/iceagefloods/d.htm)
- Dry Falls Floodscape YouTube Video (https://www.youtube.com/watch?v=RopVmgqbt20)

Wikimedia Commons has media related to ***Dry Falls***.

Retrieved from "https://en.wikipedia.org/w/index.php?title=Dry_Falls&oldid=669276580"

Categories: Geology of Washington (state) | Waterfalls of Washington (state) | Landforms of Grant County, Washington | Visitor attractions in Grant County, Washington

- This page was last modified on 30 June 2015, at 02:59.
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STATE OF WASHINGTON
DEPARTMENT OF FISH AND WILDLIFE
1550 Alder Street NW • Ephrata, Washington 98823 • (509) 754-4624 FAX (509) 754-5257

March 5, 1998

Ron Sell
Grant County Planning Department
Post Office Box 37
Ephrata, WA 98823

Dear Mr. Sell:

SUBJECT: WILDLIFE HABITAT EVALUATION - ROCKY POINT SHORT PLAT, PARK LAKE, SE1/4 SEC. 10, T24N., R27E.

To comply with Grant County's Resource Land and Critical Area Development Ordinance, Carl Adamson of K.S. Knudsen Land Surveying contacted the Washington Department of Fish and Wildlife (WDFW) and requested a wildlife habitat evaluation for a parcel of land in the SE1/4, Section 10 T24N, R27E. The site is along the west side of Park Lake just south of Sun Lakes State Park boundary.

We understand the purpose of the proposed action is to better describe the legal ownership and to correct county records. We further understand no new construction or habitat alteration is proposed as part of this action.

After reviewing the Priority Habitats and Species (PHS) data maps, discussing the project with the owners, Mr. Walter Arlt and Mr. Bob Gregson, and visiting the site, we have the following comments:

- The area supports a rich combination of fish and wildlife habitats identified under the PHS designations for open water (lake), islands, wetlands, shrub steppe, cliffs and talus slopes. These habitats support a diverse community of wildlife including chukars, mule deer, waterfowl concentrations (both nesting and migratory) loggerhead shrike, bald eagles and many species of more common wildlife. Plus, the lake supports a productive rainbow trout fishery.

- As noted above, the proposed action is mainly to clarify county and ownership records. No new construction or alteration of existing habitat is planned through this action. <u>Therefore, no potential impacts should be expected</u>.

- However, due to the high quality of the habitat in the project area, we take this opportunity to encourage the owners to practice good stewardship to protect the habitats and associated fish and wildlife populations. Among other things this could include strict control of pets to minimize disturbance to nesting or resting wildlife.

We appreciate this opportunity to comment. Please call if you have any questions.

Sincerely,

Ron Friesz
Area Habitat Biologist

cc: Tracy Lloyd, WDFW, Ephrata
Neil Rickard, WDFW, Olympia
Dennis Beich, DOE, Spokane
Mr. Bob Gregson, 912 E. 2nd, Ellensburg, WA 98926
Carl Adamson, K.S. Knudsen Land Surveying, Box 505, Ephrata

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Int J Immunopathol Pharmacol. 2011 Apr-Jun;24(2):313-22.

Paraquat- and rotenone-induced models of Parkinson's disease.

Nisticò R, Mehdawy B, Piccirilli S, Mercuri N.

Abstract

Parkinson's disease (PD) is a neurodegenerative disorder mainly characterized by a loss of dopaminergic (DA) neurons in the substantia nigra pars compacta. In recent years, several new genes and environmental factors have been implicated in PD, and their impact on DA neuronal cell death is slowly emerging. However, PD etiology remains unknown, whereas its pathogenesis begins to be clarified as a multifactorial cascade of deleterious factors. Recent epidemiological studies have linked exposure to environmental agents, including pesticides, with an increased risk of developing the disease. As a result, over the last two decades the "environmental hypothesis" of PD has gained considerable interest. This speculates that agricultural chemicals in the environment, by producing selective dopaminergic cell death, can contribute to the development of the disease. However, a causal role for pesticides in the etiology of PD has yet to be definitively established. Importantly, most insights into PD pathogenesis came from investigations performed in experimental models of PD, especially those produced by neurotoxins. This review presents data obtained in our laboratories along with current views on the neurotoxic actions induced by the two most popular parkinsonian pesticide neurotoxins, namely paraquat and rotenone. Although confined to these two chemicals, mechanistic studies underlying dopaminergic cell death are of the utmost importance to identify new drug targets for the treatment of PD.

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21658306
[PubMed - indexed for MEDLINE]

Crit Rev Toxicol. 2012 Aug;42(7):613-32. doi: 10.3109/10408444.2012.680431. Epub 2012 May 11.

Mitochondrial complex I inhibitor rotenone-induced toxicity and its potential mechanisms in Parkinson's disease models.

Xiong N[1], Long X, Xiong J, Jia M, Chen C, Huang J, Ghoorah D, Kong X, Lin Z, Wang T.

Author information

Abstract

The etiology of Parkinson's disease (PD) is attributed to both environmental and genetic factors. The development of PD reportedly involves mitochondrial impairment, oxidative stress, α-synuclein aggregation, dysfunctional protein degradation, glutamate toxicity, calcium overloading, inflammation and loss of neurotrophic factors. Based on a link between mitochondrial dysfunction and pesticide exposure, many laboratories, including ours, have recently developed parkinsonian models by utilization of rotenone, a well-known mitochondrial complex I inhibitor. Rotenone models for PD appear to mimic most clinical features of idiopathic PD and recapitulate the slow and progressive loss of dopaminergic (DA) neurons and the Lewy body formation in the nigral-striatal system. Notably, potential human parkinsonian pathogenetic and pathophysiological mechanisms have been revealed through these models. In this review, we summarized various rotenone-based models for PD and discussed the implied etiology of and treatment for PD.

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22574684
[PubMed - indexed for MEDLINE]

Neurotox Res. 2012 Nov;22(4):355-64. Epub 2012 Apr 20.

Evidence for synergism between cell death mechanisms in a cellular model of neurodegeneration in Parkinson's disease.

Yong-Kee CJ[1], Warre R, Monnier PP, Lozano AM, Nash JE.

Author information

Abstract

Delineation of how cell death mechanisms associated with Parkinson's disease (PD) interact and whether they converge would help identify targets for neuroprotective therapies. The purpose of this study was to use a cellular model to address these issues. Catecholaminergic SH-SY5Y neuroblastoma cells were exposed to a range of compounds (dopamine, rotenone, 5,8-dihydroxy-1,4-naphtho-107 quinone [naphthazarin], and Z-Ile-

Glu(OBut)-Ala-Leu-al [PSI]) that are neurotoxic when applied to these cells for extended periods of times at specific concentrations. At the concentrations used, these compounds cause cellular stress via mechanisms that mimic those associated with causing neurodegeneration in PD, namely oxidative stress (dopamine), mitochondrial dysfunction (rotenone), lysosomal dysfunction (naphthazarin), and proteasomal dysfunction (PSI). The compounds were applied to the SH-SY5Y cells either alone or in pairs. When applied separately, the compounds produced a significant decrease in cell viability confirming that oxidative stress, mitochondrial, proteosomal, or lysosomal dysfunction can individually result in catecholaminergic cell death. When the compounds were applied in pairs, some of the combinations produced synergistic effects. Analysis of these interactions indicates that proteasomal, lysosomal, and mitochondrial dysfunction is exacerbated by dopamine-induced oxidative stress. Furthermore, inhibition of the proteasome or lysosome or increasing oxidative stress has a synergistic effect on cell viability when combined with mitochondrial dysfunction, suggesting that all cell death mechanisms impair mitochondrial function. Finally, we show that there are reciprocal relationships between oxidative stress, proteasomal dysfunction, and mitochondrial dysfunction, whereas lysosome dysfunction appears to mediate cell death via an independent pathway. Given the highly interactive nature of the various cell death mechanisms linked with PD, we predict that effective neuroprotective strategies should target multiple sites in these pathways, for example oxidative stress and mitochondria.

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22528248

[PubMed - indexed for MEDLINE]

Neurotox Res. 2012 Feb;21(2):185-94. doi: 10.1007/s12640-011-9259-6. Epub 2011 Jul 20.

Mitochondrial dysfunction precedes other sub-cellular abnormalities in an in vitro model linked with cell death in Parkinson's disease.

Yong-Kee CJ[1], Sidorova E, Hanif A, Perera G, Nash JE.

Author information

Abstract

Dysfunction of mitochondria, the ubiquitin proteasome system (UPS), and lysosomes are believed to contribute to the pathogenesis of Parkinson's disease (PD). If it were possible to rescue functionally compromised, but still viable neurons early in the disease process, this would slow the rate of neurodegeneration. Here, we used a catecholaminergic neuroblastoma cell line (SH-SY5Y) as a model of susceptible neurons in PD. To identify a target early in the cell death process that was common to all neurodegenerative processes linked with PD, cells were exposed to toxins that mimic cell death mechanisms associated with PD. The sub-cellular abnormalities that occur shortly after toxin exposure were determined. 3 h of exposure to either naphthazarin, to inhibit lysosomal function, Z-Ile-Glu(OBu(t))-Ala-Leu-H (PSI), to inhibit the UPS, or rotenone, to inhibit mitochondrial complex I, caused depolarisation of the mitochondrial membrane potential (2.5-fold, twofold, and 4.6-fold change, respectively compared to vehicle), suggesting impaired mitochondrial function. Following 24 h exposure to the same toxins, UPS and lysosomal function were also impaired, and ubiquitin levels were increased. Thus, following exposure to toxins that mimic three important, but disparate cell death mechanisms associated with PD, catecholaminergic cells initially experience mitochondrial dysfunction, which is then followed by abnormalities in UPS and lysosomal function. Thus, mitochondrial dysfunction is an early event in cell stress. We suggest that, in patients with PD, the surviving cells of the substantia nigra pars compacta are most susceptible to mitochondrial impairment. Thus, targeting the mitochondria may be useful for slowing the progression of neurodegeneration in PD.

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21773851
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Environ Toxicol Chem. 2014 Jul;33(7):1650-5. doi: 10.1002/etc.2608. Epub 2014 May 27.

Fate and behavior of rotenone in Diamond Lake, Oregon, USA following invasive tui chub eradication.

Finlayson BJ[1], Eilers JM, Huchko HA.

Author information

Abstract

In September 2006, Diamond Lake (OR, USA) was treated by the Oregon Department of Fish and Wildlife with a mixture of powdered and liquid rotenone in the successful eradication of invasive tui chub Gila bicolor. During treatment, the lake was in the middle of a phytoplankton (including cyanobacteria Anabaena sp.) bloom, resulting in an elevated pH of 9.7. Dissipation of rotenone and its major metabolite rotenolone from water, sediment, and macrophytes was monitored. Rotenone dissipated quickly from Diamond Lake water; approximately 75% was gone within 2 d, and the average half-life (t½) value, estimated by using first-order kinetics, was 4.5 d. Rotenolone persisted longer (>46 d) with a short-term t½ value of 16.2 d. Neither compound was found in groundwater, sediments, or macrophytes. The dissipation of rotenone and rotenolone appeared to occur in 2 stages, which was possibly the result of a release of both compounds from decaying phytoplankton following their initial dissipation. Fisheries managers applying rotenone for fish eradication in lentic environments should consider the following to maximize efficacy and regulatory compliance: 1) treat at a minimum of twice the minimum dose demonstrated for complete mortality of the target species and possibly higher depending on the site's water pH and algae abundance, and 2) implement a program that closely monitors rotenone concentrations in the posttreatment management of a treated water body.

KEYWORDS:

Environmental fate; Phytoplankton bloom; Rotenone

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24733691
[PubMed - indexed for MEDLINE]

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MeSH Terms, Substances

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Mutagenesis. 2014 May;29(3):215-9. doi: 10.1093/mutage/geu005. Epub 2014 Mar 11.

FISH in micronucleus test demonstrates aneugenic action of rotenone in a common freshwater fish species, Nile tilapia (Oreochromis niloticus).

Melo KM[1], Grisolia CK, Pieczarka JC, de Souza LR, Filho Jde S, Nagamachi CY.

Author information

Abstract

Aneuploidies are numerical genetic alterations that lead to changes in the normal number of chromosomes due to abnormal segregation during cell division. This type of alteration can occur spontaneously or as a result of exposure to mutagenic agents. The presence of these agents in the environment has increased concern about potential damage to human health. Rotenone, derived from plants of the genera Derris and Lonchocarpus, is a product that is used all over the world as a pesticide and piscicide. Before establishing its potential and efficiency for these purposes, it is essential to know more about the possible adverse effects that it may cause. The current work aimed to evaluate the mutagenic potential of rotenone using fish from the species Oreochromis niloticus, as well as to help in understanding its action mechanism. Our results showed the mutagenic potential of rotenone evidenced by increased formation of micronuclei and nuclear buds at low doses of exposure. The use of fluorescence in situ hybridisation technique made it possible to measure the aneugenic potential of the substance, probably due to its impairment of mitotic spindle formation.

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24618992
[PubMed - indexed for MEDLINE]

Discussion (from above article)

Exposure levels of rotenone were based on the work of Mascaro et al. (16), which determined the LC50 of the substance for this fish species. However, in our study, even at concentrations above the LC50, there was no evidence of toxicity in exposed individuals; only one death was observed at the highest concentration. This disagreement in the results can be attributed to the action of other substances present in the product used by the authors. The rotenone used by Mascaro et al. (16) consisted of a powder obtained from the roots of *Derris* spp., which had a 5% rotenone content. In the current work, commercial rotenone was used, with a 95% degree of purity. It may be that other compounds influenced higher toxicity, and the harmful effect observed in the aforementioned study may be attributed not only to the active effect of the compound, but to the formulation of the product as a whole, since it contains solvents and adjuvants. The mixture of different compounds may result in a biological response that is different to the one expected from the action of the contaminants alone (24).

As regards investigation of rotenone's mutagenic potential, some studies have already been carried out using the MN test. However, all of them were done in cell culture. This is the first *in vivo* work using fish as test organism with the FISH technique combined with the conventional MN test, using probes that mark centromeric regions. The results

paper by the Greenamyre group in 2000 (Betarbet et al., 2000). This paper reported for the first time that systemic rotenone was able to reproduce the two pathological hallmarks of PD as well as certain parkinsonian motor deficits. Since 2000, many research groups have actively used the rotenone model worldwide. This paper will review rotenone models, focusing upon their ability to reproduce the two pathological hallmarks of PD, motor deficits, extranigral pathology and non-motor symptoms. We will also summarize the recent advances in neuroprotective therapies, focusing on those that investigated non-motor symptoms and review rotenone models used in combination with PD genetic models to investigate gene-environment interactions.

KEYWORDS:

Animal model; Gene–environment interactions; Non-motor symptoms; Parkinson's disease; Rotenone

PMID:
25514659
[PubMed - in process]

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CNS Neurol Disord Drug Targets. 2012 Dec;11(8):976-83.

Environmental toxicants as extrinsic epigenetic factors for parkinsonism: studies employing transgenic C. elegans model.

Jadiya P[1], Nazir A.

Author information

Abstract

Various human diseases are known to occur as a result of gene-environment interactions. Amongst such diseases, neurodegenerative Parkinson's disease (PD) is a complex disorder in which genetics and exposure to toxins constitute the main determinants in the onset of the disease. Many studies have reported on a link between pesticide exposure and increased risk of PD, however the role of different classes of pesticides vis-à-vis Parkinsonism has not been well elucidated. We carried out the present study to explore the role of six groups of pesticides viz botanicals, herbicides, fungicides, organophosphates, carbamates and pyrethroids on PD and and associated neurotoxic effects. These pesticides were studied using transgenic Caenorhabditis elegans model expressing human alpha synuclein protein tagged with yellow fluorescent protein [NL5901; (Punc-54::alphasynuclein::YFP+unc-119)] in the body wall muscle. Amongst all the classes of pesticides examined, botanical rotenone showed severe effects on PD pathogenesis. It significantly increased alpha synuclein aggregation and oxidative stress. Furthermore, it reduced mitochondrial and lipid content in the worms. Pesticides from other classes were observed to exert marginal effects as compared to rotenone thus suggesting that there is a class or structure specific effect of environmental chemicals vis-à-vis Parkinsonism. Hence it may be deduced that all classes of toxicants do not induce similar effects on neurodegeneration and associated events.

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F-16

STATE OF WASHINGTON

DEPARTMENT OF FISH AND WILDLIFE

1550 Alder St. N.W. Ephrata, Washington 98823 * (509) 754-4624 FAX (509) 754-5257*

April 26, 2007

Dear Walter,

Post-rehabilitation sampling methodology is delineated in the National Pollutant Discharge Elimination System (NPDES) permit, Waste Discharge Individual Permit No. WA0041009 provided to the Washington Department of Fish and Wildlife (DFW) dated June 5, 2002. Section 2 of the permit sets forth the monitoring requirements WDFW is required to implement. Parameters and sampling methods for treated waters such as Park Lake are summarized in Table 1. Monitoring is required for four parameters: 1) rotenone toxicity, to be tested by trout bioassay (live box test) 2) the carriers for liquid rotenone formulations, 3) basic water quality parameters (pH, temperature), and 4) zooplankton diversity.

I monitored rotenone toxicity by conducting the live box test with trout on several occasions. If all fish survive for 48 hours in this test, rotenone is below testable limits. The last test was completed at Park Lake along the mid-western shoreline on January 9, 2007. Trout survived for two days indicating that rotenone levels were well below 0.0015 ppm, which is the detectable limit after only three hours survival.

I collected water samples on several occasions to determine the concentrations of volatile and semi-volatile carriers found in the liquid rotenone formulations used during the treatments. These samples were processed at an independent laboratory. The last sample was taken from Park Lake at the State Park on March 21, 2007. No volatile or semi-volatile carriers were detected in that sample.

Zooplankton samples have been taken pre- and post-treatment. Further sampling is required later this month and next fall. Temperature and pH were recorded pre- and post-treatment.

Requirements for monitoring downstream from treated waters are summarized in Table 2 of the NPDES permit. All waters from Vic Meyers Lake to Alkali Lake were considered treated. No outflow occurred from Alkali Lake, thus the monitoring requirements in Table 2 were not applicable.

I have forwarded your request for hard copies of all test analysis and or reports DFW has conducted or received concerning the rotenone application to Vic Meyers, Park, Blue, and Alkali lakes to Olympia staff for processing under public disclosure rules. The final post-treatment report is due to Washington Department of Ecology on May 31, 2007 and will not be available before that date.

Sincerely,

Jeff Korth
DFW District 5 Fisheries Biologist