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The Atmosphere Tasted Like Turnips

The Pacific Northwest Dust Storm of 1931

Paul C. Pitzer

The great glaciers of the Pleistocene age inexorably ground to fine powder the lava flows of the Columbia plateau. During periods when the glaciers withdrew, the dust they deposited was picked up by the wind and carried to the south and east, settling—in places more than 100 feet deep—to form the rich loess soils of the Palouse. Ice lobes created spectacular dams behind which formed the glacial lake Spokane and the even larger glacial lake Missoula. When the ice dams collapsed, Lake Missoula caused a flood unmatched in geologic records. It flowed across what is today southeastern Washington, took with it some of the loess, and left the barren channeled scablands. But large areas of rich volcanic soil remained.¹

Although loess is among the finest of agricultural soils, the land in eastern Washington and Oregon is arid. Early pioneers spurned the area known as the Great Columbia Desert and favored the moister lands of the Willamette Valley and Puget Sound basin. Then, in the 1880s the railroads came, accompanied by an increasing number of settlers. First they raised livestock, but later they turned to wheat. Most took advantage of dry-farming methods and the inherent moisture-retaining ability of the soil. When there was enough water, the yields were bountiful and the settlers extolled the “inexhaustible fertility” of their land. By 1890, wheat was king. Farming extended into rainfall areas considered outside the safe limits for agriculture, but an innovative technique generally outmaneuvered disaster: biennial planting. During the fallow year, farmers plowed shallowly to retard evaporation and increase absorption of the scanty rainfall into the lower levels of the topsoil.²

The system had drawbacks. Plowing, and overgrazing by cattle, exacerbated the potential for dust storms in an area already prone to that phenomenon. Both activities removed the complex cover of grasses that had helped hold the dirt in place for millennia. So fine as to be microscopic, the tiny particles of soil fell easy prey to the wind common in the area. Almost always coming from the west, the gentle breeze that brings relief from the summer heat is generally followed by a dark cloud, first seen on the horizon, that approaches rapidly, bearing

the ubiquitous dust. At other times of the year, the dust is picked up by a west wind that has been preceded by a chinook. Because the loess dries quickly, “blows” can spring up even a short time after heavy rains. In the mid-Columbia basin, an estimated 175,000 acres of land are subject to wind erosion; the lost material generally settles somewhere to the east. It is not without cause that a small eastern Washington town just west of Colfax was named Dusty.³

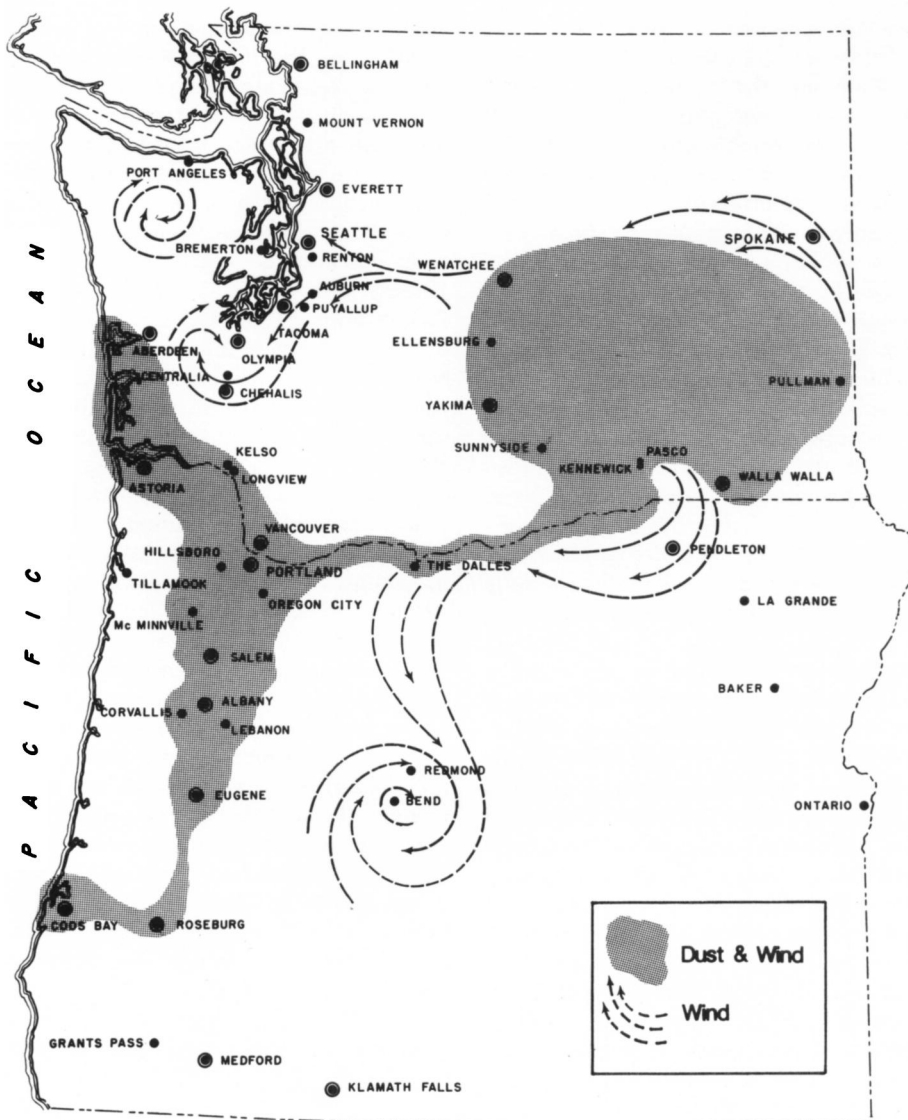
On the west side of the Cascades, storms of unusual intensity generally come off the Pacific and affect limited areas. Hurricanes, though rare, have blown up the coast, and on Columbus Day 1962, one traveled through the Willamette Valley. The historian Lancaster Pollard documented exceptional storms that occurred in 1880, 1888, 1920, and 1962, but he maintained that storms in the area seldom bring winds in excess of 50 to 60 miles per hour. The important fact is that these Pacific storms—like the dust storms east of the Cascades—are generally localized, although there are occasional exceptions to the rules. On April 21, 1931, the elements conspired to produce just such an exception.⁴

1. Bates McKee, *Cascadia: The Geologic Evolution of the Pacific Northwest* (New York, 1972), 278, 281-89; also see John Eliot Allen, Marjorie Burns, Sam C. Sargent, *Cataclysms on the Columbia* (Portland, Oreg., 1986); U.S. Department of the Interior, Geological Survey, *The Channeled Scablands of Eastern Washington: The Geologic Story of the Spokane Flood* (Washington, D.C., 1973; rpt. 1982), 3-13.

2. D. W. Meinig, *The Great Columbia Plain: A Historical Geography, 1805-1910* (Seattle, 1968), 185, 313, 318 (qtn.), 320, 415; Arthur King, “Wind Erosion and Dust Storms in Oregon,” *Commonwealth Review: A Journal of Public Policy and Practice*, Vol. 20 (1938), 400-405.

3. Dexter K. Strong, “Beef Cattle Industry in Oregon: 1890-1938,” *OHQ*, Vol. 41 (1940), 275; King, 400-403; James C. Malin, “Dust Storms,” *Kansas Historical Quarterly*, Vol. 14 (1946), 129-44, 265-96, 391-413.

4. For Lancaster Pollard, see *Portland Oregonian*, Aug. 21, 1955, Nov. 25, 1962. One exception to the rule about Pacific storms was the January 29, 1920, hurricane off the mouth of the Columbia River, which had winds estimated at 160 miles per hour.



*Course of the Pacific Northwest dust storm of 1931. Source: Richard M. Highsmith, Jr., ed., *Atlas of the Pacific Northwest* ([1953]); adaptation by April Ryan, Instructional Media Services, University of Washington.*

spread to cover most of northern California and adjacent areas of the Pacific. By this time the low was unusually large and well developed. Simultaneously, a high-pressure cell formed over Saskatchewan, moved south and west, and stabilized over Montana. The pressure difference was substantial, and the result was a strong wind that blew out of the northeast. On Tuesday, April 21, warm and exceptionally dry winds suddenly swept the western United States from Everett, Washington, in the north to Sacramento in the south. The humidity in Portland dropped to 16 percent. Ryderwood, Washington, near Longview, recorded humidity of 7 percent, one of the lowest readings known in the Northwest. No weather bureaus had predicted the phenomenon, and everyone was caught off guard.⁷

When the wind began to blow in eastern Washington, conditions were perfect for a dust storm. The first dust hit Wenatchee early that afternoon. By 4 o'clock, people had turned on their car and house lights, the sun was an obscured reddish orb, and the wind was tearing through town in gusts up to 60 miles an hour. From the Kittitas, from the Palouse, from farms around Walla Walla, Arlington, and Pasco, and from wheat lands just south of the Oregon state line, the fine dust swirled and rose, filling the sky, forming a cloud that stood 4,000 to 5,000 feet high and even higher. A Wenatchee merchant and pioneer set-

The last days of March had brought an end to heavy rainfall on the east and west sides of the mountains. There had been floods in Walla Walla, a few Portland roads had washed out, and Pendleton had received almost an inch of rain in two days. Then a dry, warming trend heralded the start of spring. The third week of April saw weather unusually warm for the Pacific Northwest that early in the season. East of the mountains, the nights were clear and cold; there was fear of frosts, especially in Wenatchee, which was preparing for its annual apple blossom festival. Seattle had sunny skies; temperatures in Portland rose into the low 70s and kept climbing. The air seemed unusually dry.⁵

Wheat farmers east of the Cascades took advantage of the improved weather to till both the land that was to be seeded and that which would lie fallow, pleased that the latter would hold a high amount of moisture for the following season. In addition to fields cultivated in the past, farmers plowed large parcels of previously unworked ground as part of the Kittitas reclamation project, located in an area just east of Ellensburg.⁶

Starting around April 18, 1931, in the Gulf of Alaska, a low-pressure cell, born where the warm Japanese current touches the Aleutian Islands, moved south and intensified. It swerved inland, finally lodging over Sacramento, and

5. Pendleton *East Oregonian*, March 31, 1931; Wenatchee *Daily World*, April 24, 1931 (hereafter cited as *World* with appropriate date); Seattle *Times*, April 20, 1931; Oregon *Journal* (Portland), April 21, 1931.

6. *World*, April 22, 1931; Seattle *Post-Intelligencer*, April 22, 1931 (hereafter cited as *P-I* with appropriate date).

7. San Francisco *Chronicle*, April 23, 1931; Oregon *Journal*, April 22, 23, 1931; Oregonian, April 24, 1931.

tlar, Al Morris, observed that "the wind wasn't so bad, but never was the dust so bad." Tumbleweeds blew into and around the city, accumulating in front of buildings, making driving hazardous. Trees, knocked down by wind in the Cascades, cut the telephone lines between Wenatchee and Seattle. At the Rock Island Dam project south of Wenatchee on the Columbia River, men stopped work and fled to their homes. The dust got into everything and reduced visibility to just a few feet.⁸

In Pendleton, the wind downed power lines and left the city in darkness. Although Pendleton received the full effect of the frightening wind, the main dust cloud skirted it, and only a small amount of grit drifted in. Such was not the case in The Dalles, where the dust hit late in the afternoon. By 5 o'clock, few businesses remained open, and the town had been dark for almost half an hour. The Dalles *Optimist* described the drama: "By six P.M. the air was so filled with sand that a pall like unto that caused by an eclipse of the sun was spread over the land. Chickens sought their roosts." After the first gusts, the wind diminished to around 30 miles an hour, but it blew steadily for three days. The Dalles reported little damage, but residents complained of "sand in their craws." Cars driven around the city left tracks in the dust, as if it were snow. The enterprising owner of the Central Pharmacy ran an advertisement on Thursday promising quick relief from the discomforts of the "storm plague" if customers would only purchase and use a product called Squibbs Epheds. He guaranteed that it would remedy hay fever and the irritations brought on by the "dust-laden atmosphere." Old-timers in town huddled together and reminisced about the great sandstorm of 1906 that lasted two weeks. This was nothing like that, they maintained. That was a lot worse.⁹

Most of the dust missed Bend, as it had Pendleton. What there was hung over the city like a fine haze and remained to tint a light snow that fell on Thursday. Redmond, Oregon, also escaped. The large dust cloud hovered over the Tri-Cities area in Washington and was sucked, as if by an airborne whirlpool, west through the Columbia gorge. Dewey Larson saw it coming from Crown Point, which over-

looks the river on the Oregon side. He was courting Dorothy Smith that day, and they were out for a drive in his car. As they left the Vista House, Dewey noticed the sinister mass to the east. It rapidly overtook them. He fought the wind to keep his car on the old scenic highway, so picturesque in good weather but now full of treacherous twists and turns. When the dust hit, it was all he could do to stay on the road; many around him failed in the attempt. He got Dorothy to her job as night nurse in a Vancouver hospital, and managed to get himself home, but the experience unnerved him. All the way he wondered if the car would keep running with so much dust around. Dorothy remembered that night even more vividly. The patients were upset, many distraught by the dust that seemed to penetrate the walls and by the wind that refused to quit.¹⁰

Margaret Galley remembered it too. It was a warm day, like summer, she recalled, and she was outside with her parents when the wind came up so suddenly. While they were fixing dinner, the dust descended and crept into their house, despite all their efforts to stop it. It was the same all over Portland that Tuesday night. First the sky took on a yellow-red tinge; then, abruptly, winds of around 50 miles an hour began to blow. Witnesses described a huge coppery cloud that swept out of the gorge and down on the city, spreading like a giant fan. The wind knocked out electric power all over the urban area. When the lights went off at the Multnomah Amateur Athletic Club, the women's tap-dancing class had to continue in the dark. At 9 o'clock, the Fox Hollywood Theater lost its power in the middle of the main feature, and the manager had to refund his patrons' money. All over the city, telephones went dead as main lines went down, and Portland was temporarily cut off from the rest of the world.¹¹

The Portland Fire Department got a workout that night and the next few days. That early in the year, temperatures still dropped into the 30s after the sun went down. Because of the power failures, people built fires in their homes to keep warm. This activity, combined with the high winds and low humidity,

led to an inordinate number of chimney and minor house fires. Between 5 and 10 o'clock in the evening, firemen responded to 21 calls for assistance. There were brush fires around town, too. On the north side of Rocky Butte, just above the Servite Monastery near the Grotto, on the northeast edge of the city, a blaze burned up the steep slope through the trees and undergrowth.¹²

First reports on the radio said that the dust came from sandbars in the Columbia River near Portland, but the mistake was quickly corrected. As the dust and wind continued into Wednesday and Thursday, the Inland Empire got full credit as the source of the novel nuisance. The dark mass poured south into the Willamette Valley. It was 74 degrees in Salem when the cloud hit. "One of the worst windstorms in the history of the Northwest," the *Capital Journal* called it. There were fires too, and 50-mile-an-hour winds full of debris and cinders. Eighty-one-year-old Mrs. Rebecca Jones, who lived nearby, declared that it was the first such storm she had ever seen, and she insisted that nothing like it had ever happened in that area before. Nobody argued with her. Inevitably accompanying natural disasters is the phenomenon of longtime residents who proclaim the occurrence the worst in memory or who recall one that was far more devastating. Sometimes the newspapers locate and quote people on both sides.¹³

8. *World*, April 22, 1931; *Oregon Journal*, April 22, 1931; *P-I*, April 22, 1931.

9. *East Oregonian*, April 22, 1931; The Dalles *Optimist*, April 24, 1931 (qtns.); *Oregon Journal*, April 23, 1931.

10. *Albany Democrat-Herald*, April 23, 1931; *Oregon Journal*, April 23, 1931; interview with Dorothy and Dewey Larson, Portland, Jan. 17, 1988.

11. Interview with Margaret S. Galley, Portland, Jan. 18, 1988; *Oregon Journal*, April 22, 1931; *Oregonian*, April 22, 1931; *Democrat-Herald*, April 22, 1931.

12. *Democrat-Herald*, April 22, 1931; *Capital Journal* (Salem), April 22, 1931; *Eugene Register-Guard*, April 22, 1931.

13. *Oregon Journal*, April 22, 1931; *Capital Journal*, April 27, 1931.

In Albany the dust arrived late Tuesday night and got worse on Wednesday. Most of it came down the valley, although the local newspaper insisted that much had blown over the Cascades and directly into town from the east. Wind and dust whirled into Corvallis, and three houses caught fire on Tuesday night. A professor at Oregon State College searched the available records and reported to the *Gazette-Times* that he could find no accounts of dust storms in recent years. Rebecca Jones's memory was apparently accurate. In Eugene, the dust was less troublesome than wind damage and forest fires that flared up in the Cascades. At 11 o'clock Tuesday night, power went out at the University of Oregon. Winds in the city were recorded at 30 to 32 miles an hour until Thursday morning, when they finally slowed. By Friday, the dust was almost gone from the air, and only a haze remained on the horizon. In McMinnville, a Linfield College student calculated that 48,400 pounds of dust had fallen on every square mile of land in the vicinity each day for three days.¹⁴

In Roseburg, the wind gusted to only about 25 miles an hour, but the dust, which hit at about 1 a.m. Wednesday, was every bit as annoying as it was in more northerly places. Later, the wind died down, but it picked up again and by 8 o'clock, it was back to 22 miles an hour. Three houses there burned that morning, and falling trees accounted for a few injuries.¹⁵

The dust seems to have stopped at Roseburg, for no newspapers from cities farther south mention it. But it clearly went west. The main cloud, of course, continued to follow the Columbia River and pushed on out to sea. Coos Bay reported that the sand and dust that covered everything had blown in over the Coast Range. After two days of hot weather, with temperatures in the 70s—unusual for the Oregon coast at any time of the year—the wind came up suddenly from the east, and the dust quickly followed, arriving early Wednesday morning. Although the dust itself soon dissipated, the smoke from forest fires replaced it, and that lingered for days.¹⁶

Far more serious was the problem in Astoria. Late Tuesday night a cloud that

seemed at first like the somber precursor of a forest fire dropped onto the city. With it came the wind, and Wednesday's *Evening Astorian Budget* reported, "One of the worst wind storms in the history of the northwest which raged all night and abated somewhat this morning continued with renewed vigor this afternoon." Telephone lines went down. More dust came on Thursday. When smoke from brush fires combined with the dust, rumors spread that all of Vernonia, 35 miles to the southeast, had burned. Vernonia, it turned out, was safe, but Astorians were no less uneasy.¹⁷

At its height, the dust cloud that brought grit to Astoria stretched for nearly 1,000 miles, from more than 300 miles east of Portland to well over 500 miles out above the Pacific Ocean. J. T. Livermore of Varney Air Lines attempted to fly his regular weekly route from Pasco to Portland on Wednesday but missed the Portland airport at Swan Island because he could not see through the dark brown cloud. He finally landed on the beach at Seaside. Livermore reported that he flew the 250 miles at an altitude of over 10,000 feet, and still the cockpit of his plane filled with dust!¹⁸

More amazed than Livermore, though, was Captain Henry Speller of the Matson Line freighter *Maui*. On its return trip from Hawaii to San Francisco, the *Maui* ran into the dust cloud about 500 miles off the coast. "It was worse than any fog," the captain complained. Both the *Maui* and its companion, the *Manukai*, were in the dust for about 24 hours on Thursday, and the baffled Speller could only conclude that some nearby volcano had erupted. The Nelson Line steamship *Sacramento* sailed into Gray's Harbor, Washington, Friday night, April 24, looking as if it had crossed the Sahara. Her captain, C. P. Peterson, noted that the dust had got into everything and, when it mixed with oil in the engine room, left a "sweet mess." In Portland, Captain M. A. Jurkops of the *Walker A. Luckenback* reported dust 22 miles off the Oregon coast. He added that it grew thicker as he approached the mouth of the Columbia River.¹⁹

Clearly both a novelty and a nuisance, the dust plagued western Oregon for about three days, then it settled and dis-

appeared. But the storm brought more than just the dust. There was damage from the wind, and there were forest fires, aggravated by the extremely low humidity. As the wind moved from east to west, it started at about 60 to 65 miles an hour east of the Cascades. Through mountain passes, it accelerated, then it slowed to between 35 and 50 miles an hour on most of the west side. In Portland, for example, the strongest gusts were recorded at about 55 miles an hour. By the time it reached the coast, the wind had decreased even more.

Trees were toppled or uprooted around Mount Hood, where old-timers marveled at both the dust and the fierceness of the storm. The highway was littered with debris and blocked by downed Douglas firs. Between 75 and 100 cabins in the area around Government Camp were damaged by trees or the wind itself. They called it a tornado, and whether it was or not, it certainly seemed like one. A fire east of Bull Run Lake burned unchecked for over a day. A second blaze destroyed 300 acres in the Mount Hood National Forest before it was stopped.²⁰

In Washington, Albert Neilson died when a fire, one of many that burned in Spokane, destroyed his home. His was the first of four deaths related to the storm. Wind pushed the steamship *Pacific Pine* away from her moorings and crashed her into a dock at the Port of Tacoma. In Seattle, the wind blew at about 25 miles an hour with gusts somewhat

14. Albany *Democrat-Herald*, April 22, 1931; Corvallis *Gazette-Times*, April 22, 24, 1931; Oregon *Journal*, April 22, 1931; Oregonian, April 24, 1931.

15. Roseburg *News-Review*, April 22, 23, 1931.

16. Coos Bay *Times* (Marshfield), April 22, 23, 1931.

17. *Evening Astorian Budget*, April 22, 1931.

18. Ibid., April 24, 1931; Bend *Bulletin*, April 24, 1931.

19. San Francisco *Chronicle*, April 25, 1931 (qtns.); Oregon *Journal*, April 24, 1931.

20. Oregon *Journal*, April 22, 23, 1931; Oregonian, April 24, 25, 1931.

higher. Ship traffic ceased on Elliott Bay, and throughout the city, phone service was disrupted. From vantage points around Seattle, two fires burning across Puget Sound in the Olympic National Forest were clearly visible. Seattle's fire department answered between 30 and 40 calls each of the three days the wind blew. As in most areas, except mountain passes, it was not so much the wind as the lethal combination of wind and low humidity that promoted the fires. In the vicinity of Mount Rainier, 400 acres of timber blew down, and a large fire blazed near Mount Baker. The winds damaged thousands of trees throughout the various Cascade Range forests. Chehalis, Castle Rock, and other cities reported heavy smoke and fires nearby. In the Yacolt Forest in southern Washington, however, damage was minimal; the new growth trees that had come up since the disastrous 1902 Yacolt burn were still small and not easily harmed by the wind.²¹

In Oregon, the worst damage was near Bend, along the Metolius River. Winds of near cyclone force ravaged hundreds of summer homes, and the *Bend Bulletin* remarked that no lives were lost since it was early in the season and the area was still largely uninhabited. Residents of the town of Sisters heard rumors that a tornado was approaching. Schools in Sisters and Tumalo were dismissed; the teachers sent the children home and warned them to seek safety. A large fire burned on Elk Creek in the Siuslaw National Forest, and its smoke combined with the dust in Eugene. Coos Bay, Portland, Salem, Gervais, Dayton, Silverton, Roseburg, and other Oregon cities reported smoke all around and fires in nearby forests.²²

To the south and east, Salt Lake City experienced its worst windstorm since 1874. Winds of 60 to 70 miles an hour hit much of central Utah and southwestern Wyoming Wednesday night, April 22. Work was halted at the Hoover Dam construction site when strong winds wrecked most of the temporary tents that were used to house the laborers in Boulder City. The gales blew through parts of Nevada and most of northern California, although the *San Francisco Chronicle* reported little damage in that state.²³

By the weekend, the storm had passed. Smoke hung around some cities for a few

days, but a rise in the humidity and scattered showers ended that problem too. On Saturday, the *Oregonian* announced: "Like a drunken giant who has smashed all the furniture and then crawled off into a corner for a sodden, alcoholic sleep, the wind storm is over." Not since Krakatoa had erupted nearly 50 years before, the writer went on, had so much dust hung in western Oregon skies; the sunsets were beautiful. An editorial on Sunday summed it all up. Over 3 million pounds of dust had fallen on the city, enough to fill 33 freight cars. The wind had reportedly blown away wheat seed and crops in the Inland Empire, and Portlanders maintained that "the very palpable atmosphere even tasted like turnips" (though on this last point, the Portlanders' "sincerity is gravely in question"). It could have been worse, the editorial concluded: it could have rained frogs or eels or fishes. A few days later, a light drizzle fell, and the city's residents returned to such matters as the Dollar Days sale at the Olds, Worthman and King department store and the selection of the year's first Rose Festival princess. The dust storm, which in the final analysis did minimal damage, quickly disappeared from the newspapers.²⁴

In eastern Washington, where it all started, there was little concern. There, where such blows are common, the *Wenatchee Daily World* showed far more anxiety about frost damage and its threat to the apple blossom festival. One group, however, did attempt to capitalize on the incident. Around Wenatchee, proponents of Grand Coulee Dam construction seized on the storm to support their cause. A local county agent wrote to James O'Sullivan of the Columbia River Development League: "The greatest reason for pushing the development and irrigating of the Columbia Basin has been almost entirely overlooked, and that is the conservation of this rich, fertile top soil which is being scattered from the Rocky Mountains to the depths of the Pacific Ocean." An Ephrata resident added, "Irrigation is the only salvation for the Big Bend country."²⁵

Water provided by government-financed projects has often been farmers' panacea for the problems of aridity. John Wesley Powell's 1878 report on the nation's dry

lands predicted the ecological problems that would arise if the sod in those areas was thoughtlessly plowed. Irrigation, Donald Worster confirms in *Dust Bowl*, will not by itself end the threat of blowing dust and soil erosion. In the case of the 1931 Pacific Northwest dust storm, heavy rain had fallen just two weeks earlier. Yet the ground dried quickly, and it easily gave way to the warm east winds. As James Malin pointed out over 40 years

21. *Bend Bulletin*, April 22, 1931; *P-I*, April 22, 23, 1931; *Seattle Times*, April 22, 1931; *Oregon Journal*, April 23, 29, 1931; *East Oregonian*, April 27, 1931.

22. *Redmond (Oreg.) Spokesman*, April 23, 1931; *Bend Bulletin*, April 22, 1931; *Eugene Register-Guard*, April 22, 1931; *Capital Journal*, April 23, 1931.

23. *Coos Bay Times*, April 23, 1931; *Oregon Journal*, April 23, 1931; *Roseburg News-Review*, April 23, 1931; *World*, April 25, 1931; *Ashland Daily Tidings*, April 22, 23, 1931; *San Francisco Chronicle*, April 23, 1931.

24. *Oregonian*, April 25 (qtn.), 26, May 1, 1931. Often storm coverage for a city was less complete in its newspapers than in papers elsewhere. For example, Portland papers made events in Seattle sound worse than Seattle papers did; Portland newspapers did not mention the local Rocky Butte fire, but Eugene and Salem papers did. Seattle dailies did not mention the port closure or Tacoma wind problems, but Grants Pass newspapers did. Wenatchee, which minimized its own dust problem, reported wind damage at Hoover Dam. Of the several possible explanations for this phenomenon, the likeliest is that wire or news service reports focused on the dramatic events; newspapermen on the scene corrected, downplayed, or withdrew such coverage of their own area.

25. *World*, April 24, 1931; quoted in George Sundborg, *Hail Columbia: The Thirty-Year Struggle for Grand Coulee Dam* (New York, 1954), 146, 147. For a detailed history of irrigation in eastern Washington, see Bruce Mitchell, *Flowing Wealth: The Story of Water Resource Development in North Central Washington, 1870-1950* (Wenatchee, 1967; rpt. 1980).

26. Donald Worster, *The Dust Bowl: The Southern Plains in the 1930s* (New York, 1979), 39, 66, 74; Malin, 129; John Wesley Powell, *Report on the Lands of the Arid Region of the United States*, ed. Wallace Stegner (Cambridge, Mass., 1962), 93-106.

27. Worster, 220-23, 226; Malin, 413 (qtn.).

28. *Oregonian*, Sept. 29, 1961; *Oregon Journal*, Sept. 29, 1961.

ago, the problem of dust storms is complex and not easily solved.²⁶

Wise and thoughtful use, which does not wantonly strip ground cover, can diminish dust storms on semihumid soils of fine texture. This became clear on the Great Plains after the 1930s depression: shelterbelts together with carefully planned plowing patterns reduced erosion. Even so, as Worster laments, the lesson of the Dust Bowl has been forgotten. Today, resentful of space taken up by shelterbelt trees, farmers are moving again onto marginal land. Dust storms

cannot be eliminated; they "were frequent and severe prior to white settlement and the plowing of the sod, but the damage incident to agricultural operations should and can be minimized by careful soil management."²⁷

Since 1931, there have been other notable dust storms in the Pacific Northwest. One in 1961 closed highways and sprinkled Ritzville, Pendleton, Prosser, and most of the eastern half of Washington State with fine blowing soil. (In all cases, however, the wind acted as it should and blew the dust to the east.) But the 1931

phenomenon presaged the larger national tragedy of the Dust Bowl. In microcosm it clearly demonstrated the whim of weather and the folly of irresponsible land use and ecological ignorance.²⁸ □

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Water Power in the "Wilderness": The History of Bonneville Lock and Dam. [By WILLIAM F. WILLINGHAM.] ([Portland: U.S. Army Corps of Engineers, 1987.] 73 pp. Illustrations, notes, bibliography. \$4)

This volume is a 50th-anniversary celebration of the Bonneville Lock and Dam on the Columbia River. William Willingham, whose name does not appear on the title page, holds that Bonneville has more than justified its existence by its contributions to employment, the region's electric power supply, recreation and tourism, river freight traffic, and fisheries development.

The thesis is scarcely surprising given the facts that the Portland District of the Army Corps of Engineers published Willingham's study, and that Willingham is the Portland District corps historian. The book contains 60 pages of text, each of which includes at least one photograph or line drawing and often two or more. The lavish illustration reduces the potential text space of the oversized 8½-by-11-inch format.

All this is noted to indicate the sort of book *Water Power in the "Wilderness"* is. Within its brief compass, it is a careful, well-written, and fair examination of the formidable political, design, construction, and ecological problems involved in the huge project. Bonneville was, and is, vast. With its 18 gates fully opened, the dam could release a mind-boggling 1.6 million cubic feet of water every second.

Willingham lays out Bonneville's complexities of site, economics, and politics. He credits Senator Charles McNary of Oregon and Congressman Charles Martin with moving President Franklin D. Roosevelt to a commitment. That done, political issues shifted to the questions which agency would sell Bonneville power and whether an adequate market existed for the "juice." Demands on the independent Bonneville Power Administration outran capacity during World War II. Growing power and river traffic led to a second powerhouse and to a new lock scheduled for completion in 1992.

The problems of allowing mature salmon upriver and juveniles downriver continue. The corps assumed that if the old fish could ascend the river, their offspring could readily descend. Not so. The blades of Bonneville's whirring turbines decimated the piscine pilgrims. The corps is attempting to overcome this and other difficulties with the seaward migration.

Perhaps contemporary northwesterners caught up in the dilemmas of the Columbia's enormous power, flood control, and navigation system have forgotten that Bonneville Dam helped to win World War II, to provide an industrial base for the Northwest, and to light the region's homes. Willingham's study is a strong reminder of those realities. □

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Water Power in the "Wilderness"