

HOT WATER, DRY STREAMS: A TALE OF TWO TROUT

Jack R. Tuholske[†]

INTRODUCTION

Norman Maclean's timeless memoir *A River Runs Through It* begins with the reflection that in his household, "there was no clear line between religion and fly fishing."¹ That zeal remains today; over 30 million Americans call themselves fishermen.² Fishermen devoted an aggregate of 517 million user days pursuing their passion and spent billions of dollars to support it.³ Fishing in the Western United States holds a special place in fishing lore the world over and for good reason. From the great trout waters of Montana, to the salmon laden rivers of the west coast, to the sparkling wilderness waters of the Colorado Rockies, fishing in the American West is special.

Native trout and salmon in the West are also on the verge of collapse. Many salmonid species are already listed under the Endangered Species Act (ESA), signaling that the federal government believes those fish are now threatened with, or in danger of extinction, throughout a significant portion of their range.⁴ Other native western salmonids that are not listed under the ESA have been the subject of losing legal efforts to have them listed.⁵ While state and federal agencies have taken positive steps to restore native salmonids,⁶ human interference with aquatic ecosystems continues to adversely affect salmonids, pushing some species closer to extinction and preventing the recovery of others.⁷ While many human activities such as dams, logging, mining and urbanization hasten the demise of salmonids,

*. Visiting Professor, Vermont Law School.

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1. Maclean, Norman, *A River Runs Through It*, p. 1

2. United States Fish and Wildlife Service 2006 National Survey of Fishing, Hunting and Wildlife Based Recreation at p. 4.

3. *Id.*

4. A total of 121 species of trout and salmon are listed as threatened or endangered under the ESA. The chart attached as Appendix 1 depicts the listed species, and their date of listing.

5. See e.g. *American Wildlands v. Kempthorne*, 530 F.3d 991 (D.C. Cir 2008) (denying petition to list westslope cutthroat trout).

6. Cite state recovery plans

7. See e.g., Columbia hydropower 9th Circuit cases, *Rock Creek Alliance v. U.S. Fish and Wildlife Service*, 390 F. Supp. 2d 993 (D. Mont. 2005) (Service failed to adequately assess cumulative impacts to ESA-protected bull trout in determining that proposed new massive copper/silver mine discharging waste water into important fish habitat would not jeopardize the continued existence of the species.).

competition for scarce water resources in the West is often at the heart of the problem.⁸

The problems that western salmonids face will get worse - far worse - as climate disruption dries and warms the West over the next century.⁹ Even more conservative projections for temperature increases in much of the West will have disastrous effects on fish. More dire scenarios portend collapse and extinction.

The basic legal regime for water management in the West, based on the prior appropriations doctrine and federal government water subsidies for agriculture, has been ill-suited to protect fisheries and aquatic ecosystems. As discussed below, the legal regime is a significant contributor to their demise. This legal regime is even less suited to protect aquatic resources in a world altered by climate disruption.

This paper will explore the potential effects of climate disruption on two species of trout, bull trout and Bonneville cutthroat, as emblematic of the larger crisis facing western fisheries. It will highlight why the prior appropriation, and government subsidization of water use in concert with prior appropriation, has historically been ill-suited to protect aquatic resources, and why that legal regime is ill-equipped to address the effects of climate disruption. Because warming in the West will occur slowly, we have time to develop adaptive strategies to save our fish. To do that we must change our nineteenth-century resource management paradigm to fit twenty-first century realities.

I. HISTORICAL AND CURRENT DISTRIBUTION AND ABUNDANCE OF BULL TROUT AND BONNEVILLE CUTTHROAT TROUT.

Bull trout (*salvelinus confluentus*) were once widely distributed throughout the northern Rockies and the Pacific Northwest. Bull trout are not actually trout; rather they are a species of char, cold-water salmonids

8. See e.g. *American Rivers v. NOAA Fisheries and U.S. Bureau of Reclamation*, 2006 U.S. Dist. LEXIS 69442 (D. Or. 2006) (enjoining flow-augmentation plans on the Snake River based on an inadequate Biological Opinion on several listed salmonids, in violation the ESA); *Pacific Coast Federation of Fisherman's Associations et al v. U.S. Bureau of Reclamation*, 426 F.3d 1082 (9th Cir. 2005) (federal government failed to adequately assess impacts of irrigation project in Klamath Basin on coho salmon).

9. In addition to the studies discussed herein for bull trout and Bonneville cutthroat, scientists have been alerting the public and government agencies to the fisheries crisis in the American West. Dr. Peter Moyle, a nationally renowned fisheries and conservation biology expert, published a study in 2008 where he determined that most of California's native salmon, steelhead and trout species face extinction by the end of the century without prompt measures to protect their habitat. Dr. Moyle found the increased pressure posed by climate change to be a new and devastating stressor in addition to the well-known problems by decades of water mismanagement.

more prevalent in Arctic climes. Bull trout historically ranged from northern California to Puget Sound, and east to the continental divide in Montana. Bull trout occupy main stem rivers like the Columbia and the Snake, smaller mountain stream and lakes, and their tributaries, with smaller populations east of the divide in northern Montana. Bull trout are migratory, ranging up to 300 km. Born and reared in the coldest high mountain streams, bull trout move to lakes and large rivers during adulthood and return to mountain headwaters to spawn.¹⁰ Scientists believe that migratory bull trout evolved with stochastic events of the ice ages, and their migratory life history is critical to survival. Bull trout require the coldest water temperatures of all U.S. salmonids.¹¹ Water temperatures above 59 degrees Fahrenheit are believed to limit their distribution within a watershed.¹²

Bull trout were listed under the Endangered Species Act in 1998.¹³ They have been extirpated from over half of their historic range. Remaining populations are in trouble. The United States Fish and Wildlife Service (FWS) concluded that most remaining populations of bull trout have lost their ability to migrate, and most remaining populations are isolated remnants, highly vulnerable to extinction.¹⁴ Most migratory populations have been lost. Dams, irrigation, mining, logging, introduction of non-native fish, road building and urbanization caused the decline. According to the U.S. District Court for Oregon, “virtually every bull trout population within the coterminous U.S. is threatened by a variety of water

10. See generally 67 Fed. Reg. 71236-7 (Draft rule designating critical habitat for bull trout). According to U.S. Fish and Wildlife Service scientists, Bull trout exhibit a number of life-history strategies. Stream-resident bull trout complete their entire life cycle in the tributary streams where they spawn and rear. Some bull trout are migratory, spawning in tributary streams before migrating to either a larger river (fluvial) or lake (adfluvial) where they spend their adult life, returning to the tributary stream to spawn. Bull trout in the Coastal-Puget Sound area are believed to include an anadromous form which migrates to saltwater to mature, returning to streams to spawn.

11. For example, water temperatures of 1.2 to 5.4[degrees]C (34.2 to 41.7[degrees]F) have been reported for incubation, with an optimum (best embryo survivorship) temperature reported to be from 2 to 4[degrees]C (36 to 39[degrees]F) (Fraley and Shepard 1989; McPhail and Baxter 1996). Reiman describes the optimal temperatures for bull trout as “substantially lower than those for other salmonids.” Reiman article at 1553.

12. 67 Fed. Reg. 71237.

13. Fed. Reg.

14. In its 1994 review of the petition to list bull trout under the ESA, FWS found that “Most river systems now contain only isolated, remnant populations of resident fish restricted to the headwater areas of a few remaining suitable tributaries. These remnant populations have lost their migratory life-history forms, exist in isolation, and are likely to be at extreme risk of extinction.” In overturning the FWS decision not to list the species, Court found that this scientific conclusion undercut the agency’s failure to list, and remanding the Petition, leading to bull trout’s listing in 1998 as a threatened species under the ESA. *Friends of the Wild Swan v. U.S. Fish and Wildlife Service* 945 F. Supp.1388, 1392 (D. Or. 1995).

and land management practices.”¹⁵

Bonneville cutthroat, (*Oncorhynchus clarkii utah*) one of 14 subspecies of cutthroat trout that inhabit the West, are native to parts of the Green and upper Colorado River basin in Utah, Nevada, Wyoming and Idaho. Like bull trout, cutthroat trout have declined from human-caused habitat destruction. Most subspecies of cutthroat remain in mostly small, isolated fragments, and occupy only 10-40% of their historic range, primarily in high elevation headwater streams.¹⁶ Remnant populations of cutthroat are especially vulnerable to extinction because of “genetic variability, loss of resilience, demographic and environmental stochasticity, and natural and human-caused catastrophe.”¹⁷

Bonneville cutthroats are found mostly in Utah; they are nearly extirpated from Wyoming and Idaho, though small remnants remain in both states.¹⁸ Though some subspecies of cutthroat have been listed under the ESA,¹⁹ Bonneville Cutthroat are not; in 2008 FWS rejected a petition to list Bonneville trout as a threatened species under the ESA.²⁰ Despite finding the species not threatened with extinction FWS found that the species has been extirpated from 65% of its historic habitat.²¹

II. PRIOR APPROPRIATION: THE RACE TO THE BOTTOM OF THE CREEK.

The decline of western salmonids is due to numerous, disparate causes, most of which are beyond the scope of this paper. However, water management is at the heart of many of the causes of decline, and is the focus of this paper. Water management includes both diverting water from streams for irrigation and other uses, and damming streams for water storage, electrical generation, recreation and flood control. The later have been sanctioned, subsidized and institutionalized by the U.S. government,²² though state also facilitate water storage.

Underlying many aspects of water management in the West is the prior appropriation doctrine. “First in time, first in right” has been settled law in most of the West since the 1860s. While prior appropriation is still the

15. *Friends of the Wild Swan*, supra, 945 F. Supp. at 1392.

16. See generally Dunham et al 2003, Neveill et al 2006a, Young 1995)

17. Williams 2007

18. 73 Fed. Reg. 52238.

19. Greenback and Paiute Cutthroat are both listed as “Threatened Species” under the ESA.

20. On September 9, 2008, FWS declined to list Bonneville Cutthroat under the ESA. 73 Fed. Reg. 52236 (Sept. 9, 2008). FWS determined that the existing threats to the species did not warrant listing, finding that populations had increased over the last three decades, and much of the remaining habitat was in good to excellent condition.

21. 73 Fed. Reg. 52238.

22. Bureau of Reclamation and Army Corps of Engineers

mainstay of western water law, modern permit systems, the role of the federal government, water claims of Indian tribes and intrusion of federal environmental laws complicate attempts to define western water management as simply prior appropriations.

The earliest western settlers viewed water as a common resource. Brigham Young declared, upon arriving in the Salt Lake Valley, that the precious water coming from the Wasatch Canyons “belongs to the people: all the people.”²³ Such an egalitarian view was short-lived; private control of water resources quickly took hold in the days of the California Gold Rush, and prior appropriations quickly became the rule of law – the greatest change that water law in the U.S. has undergone until the advent of modern environmental law.²⁴ Colorado emblazoned prior appropriation as a textual right in its 1876 Constitution²⁵ and permanently squelched riparianism soon thereafter.²⁶ The race to the bottom of the creek was on.

The hallmarks of traditional appropriation doctrine include: (1) “first in time, first in right,” the notion that the first appropriator has the senior right; (2) that an appropriator can put as much water to beneficial use as his land will allow and will receive a right; and (3) while waste is not condoned, complete efficiency in water deliver or use is not required. These tenants insured that available surface waters would be quickly appropriated.²⁷ A conservation-minded irrigator who decided to leaving water instream for fish just meant that water would be grabbed by a thirsty junior appropriator. In addition, the appropriation doctrine usually demands a diversion of water from a stream,²⁸ which insures that streams are both riddled with fish-obstructing diversion structures and that water is removed from the stream and put to a beneficial (i.e. consumptive) use.

That prior appropriation has created an inefficient, wasteful water management regime cannot be seriously debated. The inevitable result is

23. Sax et al *Legal Control of Water Resources*, 4th ed, Thomson West at p. 328. Professor Sax notes that both Native Americans and the early Spanish settlers in the American Southwest also developed an egalitarian view of water resources.

24. Sax at p. 325.

25. Col. Const. Art. XVI section 6, which reads: “The right to divert unappropriated waters of any natural stream to beneficial uses shall *never* be denied. Priority of appropriations shall give the better right to as between those using the water for the same purposes....”

26. Coffin v. Left Hand Ditch Co. 6 Colo. 443 (1882).

27. See generally Sax, *supra.*, at pp. 124-126, 139-143.

28. See generally *In re Adjudication of the Existing Rights to Use All of the Water*, 311 Mont. 327, 55 P.3d 396 (2002). Montana irrigators argued that because Prior Appropriations requires a diversion, instream flow rights to protect fisheries were *per se* illegal. Fortunately the Montana Supreme Court held to the contrary, thus opening the door for the Department of Fish Wildlife and Parks to begin claiming instream flow rights for fish, a century after many streams had been fully appropriated.

that thousands of miles of western streams are either seriously impacted or completely dewatered each year. Fish don't thrive in dry creek beds.

The federal government has compounded the problems created by prior appropriation by encouraging and subsidizing the over-use and waste of water in the American West. As the authors of an extensive study on western water marketing concluded, the "federal government's agricultural marketing loan and price support programs subsidize the production of crops and encourage the use of water for marginal crops that would not be grown but for the subsidies. We think that the same thing might be said about subsidies for water infrastructure, low-cost hydroelectric energy, and federal crop insurance."²⁹

Because the appropriation doctrine encourages the complete consumptive use of surface waters, it is not surprising that many streams today are "fully appropriated" – all of the flow is allocated to water users whether they are private farmers, municipalities or government agencies.³⁰ The result of fully appropriated streams is they are often sucked dry (dewatered, in agency parlance) during the irrigation season spanning summer months. Bear in mind that unlike Eastern climes, much of the West is devoid of rainfall during the summer.³¹ Western rivers are largely dependent on mountain snow melt; their natural hydrographs peak in late spring and early summer and steadily decline to baseflow in late summer, when flows may be only ten percent of early summer peaks. Irrigation begins in late spring and lasts until the fall. The result of these practices is that many western Rivers have been historically dewatered by mid or late summer. Prior appropriation fosters complete appropriation of all flows; water is abundant during peak flow, and scarce by mid summer. The "use it or lose it" requirement of the legal regime demands that irrigators take their appropriation. The fact that a host of western fish are either threatened with, or in danger of extinction is hardly surprising. Fish need water.

Examples of how prior appropriation fosters stream dewatering

29. Brewer et al., SYMPOSIUM THE GREAT LAKES: REFLECTING THE LANDSCAPE OF ENVIRONMENTAL LAW: ESSAY: TRANSFERRING WATER IN THE AMERICAN WEST: 1987-2005, 40 U. Mich. J. L. Reform 1021, 1032.

30. Emblematic of the complete appropriation of western rivers is the Colorado. One of the greatest rivers in the world, the Colorado often carries no water to its mouth in the Gulf of California, though by treaty the U.S. must insure a small fraction of the river's flow reaches the border. The rest of the flow of the Colorado River is 100% appropriated, divided among competing states, with a few reserved rights to Indian Tribes and federal lands thrown in for good measure. This arrangement, known as "The Law of The River," comes complete with the blessing of the United States Supreme Court. See generally Sax, n. 13 at pp. 799-835; *Arizona v. Colorado*, 373 U.S. 546 (1963).

31. A sample of average August precipitation across the West reveals just how dry this region is during the summer: Grand Junction Colorado, 0.81 inches; Stockton California, 0.07 inches; Pocatello Idaho, 0.67 inches. www.met.utah.edu/jhorel/html/wx/climate/normrain/html.

abound. The Montana Department of Fish Wildlife and Parks catalogues 4,000 miles of streams that are either chronically or periodically dewatered.³² Fabled blue-ribbon trout streams like the Big Hole and Bitterroot Rivers are nothing but a series of puddles in sections. In Colorado, stream dewatering for appropriated uses seriously affects 571 different streams, with rivers such as the Cache de la Poudre, San Miguel, La Plata and South Arkansas nearly dry during the summer.³³ The mighty Rio Grande - the “Great River” – is but a trickle through Albuquerque.

This legacy of prior appropriation - dewatered streams and the disappearance of native fisheries – is apparent in the demise of bull trout and Bonneville cutthroat. Though bull trout are spread across five western states, including the relatively wet Pacific Northwest, stream dewatering has been a major cause of their decline and habitat fragmentation.³⁴ Dams and water diversion are a principle cause in FWS’s decision to list bull trout under the ESA.³⁵ Even when irrigation does not dewater streams, irrigation ditches trap and kill fish.³⁶

FWS is less candid about the role of water management in the decline of Bonneville cutthroat. FWS decided not to list the species under the ESA, and in so doing, had to find that the existing regulatory scheme was adequate.³⁷ Yet the fact remains that of the 10,876 km of historic habitat, only 3,830 km is currently occupied.³⁸ In the heavily irrigation-dependent

32. Montana FWP “Dewatering Concerns” Revised May 2003 (on file with the author).

33. *Dry Legacy*, Colorado Water Project, Trout Unlimited (2002) (on file with the author).

34. In Montana, for example, many of the dewatered streams (like the Clark Fork River basin) are important bull trout habitat. *See n. 25, supra*. In the Pacific Northwest, “in the 1990s nearly every stream in Washington had chinook, steelhead or bull trout listed as threatened or endangered was primarily attributed to low stream flows.” *Buy That Fish a Drink*, PERC Reports, Volume 25 No. 2 June 2007.

35. 64 Fed. Reg. 58912 (November 1, 1999).

36. For example, in *Idaho Watersheds Project v. Jones*, 127 Fed. Appx. 976 (9th Cir. 2005) conservationists sued irrigators under Section 9 of the Endangered Species Act for failing to use a fish screen and a headgate on an irrigation ditch, because bull trout. In the Court’s words, “the Joneses should be enjoined to use a fish screen and a head gate in their diversion if there is a reasonably certain imminent threat.... that the lack of a fish screen or a head gate will kill or injure bull trout or will modify habitat in a way that kills and injures bull trout...” Traditional irrigation ditches lack fish screens. Researchers have demonstrated that using fish screens on irrigation ditches can diminish mortality. Harnish, “*Fish Screen Efficiency and Effects of Screened and Unscreened Irrigation Canals on the Downstream Movement of Westslope Cutthroat Trout Juveniles in Skalkaho Creek, Montana.*” (Masters Thesis, Montana State University, October 2007, located at : <http://etd.lib.montana.edu/etd/2007/harnish/HarnishR1207.pdf>).

37. *See n. 9, supra*. Rather than address the fact that the species has lost 70% of its historic range, FWS instead lauded the fact that both Utah and Wyoming had recently passed in-stream flow laws. 73 Fed. Reg. 52247. As discussed in Section V, the existence of laws that allow for in-stream flow protection does not mean that adequate water is actually left in place for fish.

38. 73 Fed. Reg. 52238 (September 9, 2008).

states of Utah, Idaho and Wyoming where the most of the species' former habitat is vacant, it is reasonable to assume that habitat degradation caused by stream dewatering is responsible for a large part of the decline, though the other "usual suspects" of mining, grazing, logging, road construction and urbanization are undoubtedly factors.

Prior appropriation remains at the heart of irrigated agriculture to this day, a social economic mainstay of the West. Irrigated agriculture remains a driving force in the western economy and a significant contributor to our nation's food sources.³⁹ It is not surprising that the appropriation doctrine remains firmly entrenched in the legal regime governing water allocation and use, despite the fact its consequences to western fisheries.

While government agencies and private organizations laud recent changes to prior appropriations that make the system more fish-friendly, the regime is still firmly entrenched as the dominant paradigm in western water law. For example, in Idaho, prior appropriations doctrine remains the law of the land, albeit in a form augmented by modern permitting schemes and statutory overlays.⁴⁰ State courts and administrators continue to validate the baseline concepts of "first in time, first in right" limited only by beneficial and reasonable [for irrigators] use.⁴¹ Recent Idaho Supreme Court decisions evidence continued operation under the assumption that this background water law principle is controlling,⁴² and the federal district court recently held that dewatering under the current scheme has functioned to inexcusably preclude both the survival and recovery of the Snake River Basin steelhead.⁴³ Similarly, the Idaho Department of Water Resources

39. Irrigation is critical to agriculture in the United States: nearly half of the value of all crops sold comes from the 16 percent of harvested cropland that is irrigated. In the process, agriculture accounts for over 80 percent of all water used for consumptive purposes. <http://www.ers.usda.gov/Data/WesternIrrigation>.

40. ID Const. Art. XV, § 3 ("Priority of appropriations shall give the better right as between those using the water" of the state.); Idaho Code § 42-106 ("As between appropriators, the first in time is first in right." Idaho Code § 42-226 ("[W]hile the doctrine of 'first in time is first in right' [applies to ground water rights] a reasonable exercise of this right shall not block full economic development of underground water resources."); *Am. Falls Reservoir Dist. No. 2 v. Idaho Dep't of Water Res.*, 143 Idaho 862, 873 (explaining that "the IDWR points out [. . .] that: '[T]hese rules acknowledge all elements of the *prior appropriation doctrine* as established by Idaho law.' 'Idaho law,' [. . .] means "[T]he constitution, statutes, administrative rules and case law of Idaho." Thus, the Rules incorporate Idaho law by reference [. . .] to the extent the Constitution, statutes and case law have identified the proper presumptions, burdens of proof, evidentiary standards and time parameters.").

41. *Am. Falls Reservoir Dist. No. 2 v. Idaho Dep't of Water Res.*, 143 Idaho 862, 867 (quoting the Director's Relief Order at stating that "Resolution of the conjunctive administration issue lies in the application of two well established principles of the *prior appropriation doctrine*: (1) the principle of "first in time is first in right" and (2) the principle of optimum use of Idaho's water. Both of these principles are subject to the requirement of reasonable use.").

42. *See id.*

43. *Nez Perce Tribe v. NOAA Fisheries*, 2008 U.S. Dist. LEXIS 28107 (finding minimum

(IDWR) relies upon the notion of prior appropriations in its perpetually ongoing efforts to procure completion of the Snake River Basin Adjudication (SRBA) by quantifying the nature and extent of all validly executed water rights.⁴⁴ Some of the most alarming, and oftentimes irreversible, consequences of prior appropriations doctrine's inflexibility have come in the form of fisheries mismanagement for endemic and even endangered species.⁴⁵ Both bull trout and Bonneville cutthroat have important remnant populations in Idaho, and their future survival rests in part on Idaho's outmoded legal regime for water.

Idaho, of course, is not alone in continuing to embrace prior appropriations. Utah, home of most remaining Bonneville cutthroat trout, also retains a commensurately vital permutation of the traditional strictures of prior appropriations doctrine in its current water distribution scheme, despite changes under statutory and regulatory permitting rubric.⁴⁶ Utah statutes control distribution based on the underlying premise of "first in time, first in right."⁴⁷ Courts in Utah continue to apply the traditional boilerplate principles of prior appropriation doctrine in defining the extent of a user's right.⁴⁸ It follows logically that the Utah system is susceptible to the same abuses and potential mismanagement as other states employing the archaic and, in times of low water, draconian law of appropriations. Consistent with outcomes and patterns in other prior appropriation states, Utah has borne its share of shortages, disputes, and dry stream beds due to

flows insufficient to assure the survival and recovery of the steelhead where continued withdrawals degrade critical habitat by reducing flows during spawning season and drying up creek beds during summer months).

44. See Idaho Department of Water Resources Water Management Adjudication Bureau, available at <http://www.idwr.idaho.gov/WaterManagement/WaterRights/default.htm> (last visited Oct. 18, 2009) (describing generally the basis and mode of the adjudication); Idaho Department of Water Resources Water Management Water Rights, General Information, available at <http://www.idwr.idaho.gov/WaterManagement/AdjudicationBureau/default.htm> (last visited Oct. 18, 2009) (setting forth the policy that "When a private right to the use of public waters is established by appropriation, a water right is established that is a real property right much like property rights in land. The constitution and statutes of the state of Idaho protect private property rights, including water rights. The right to divert the public waters of the state of Idaho and put them to a beneficial use, in accordance with one's priority date.").

45. See generally *Am. Falls Reservoir Dist. No. 2 v. Idaho Dep't of Water Res.*, 143 Idaho 862 (relating the decline of native steelhead populations to harsh handling and poor management under prior appropriations doctrine).

46. See generally *Strawberry Water Users Ass'n v. Bureau of Reclamation*, 2006 UT 19, 133 P.3d 410 (discussing appropriations in Utah as part of its determination of jurisdiction).

47. See Utah Code Ann. § 73-3-17, (affording certificates of appropriation as prima facie evidence of the owner's right to the use of the water).

48. See *Strawberry Water Users Ass'n v. Bureau of Reclamation*, 2006 UT 19, 35, 133 P.3d 410, 421 (citing *United States v. District Court of Fourth Judicial District in and for Utah County*, 121 Utah 1, 238 P.2d 1132, 1134 (Utah 1951)).

the doctrine's patent inflexibilities.⁴⁹

Though Montana constitutionally protects all water resources in the public trust⁵⁰ Montana also retains fundamental vestiges of prior appropriation. Pre-1973 water rights are constitutionally protected.⁵¹ and the Water Use Act codifies "first in time, first in right principles." No limits are placed on new appropriations, though the Legislature has closed a number of major river basins like the Missouri and Clark Fork because they are over-appropriated and state-wide adjudications of old and new rights has not occurred. It was not until 2000 that the Montana Supreme Court ruled that in-stream flows for fish could even be a beneficial use; irrigators argued that because no water was diverted from the stream, a water right could not issue to the Department of Fish Wildlife and Parks for instream fishery protection.⁵² The Department of Natural Resources and Conservation, the state agency in charge of protecting water resources, refused to recognize the basic principles of ground-surface water inter-connectivity, granting large groundwater withdrawals that threatened flows in the Smith River⁵³. The Montana Supreme Court reversed the agency's archaic views; the fact that incorporating long-recognized principles of hydro-geology was fought by the agency entrusted with managing water resources shows that traditional views of water use remain entrenched.

The examples provided by Idaho and Utah are repeated throughout much of the West, though with some variation.⁵⁴ Nineteen western states embrace significant aspects of the appropriations doctrine, and nine states adopted the "Colorado Doctrine" or pure prior appropriation states.⁵⁵ As discussed above, the predominance of prior appropriation, even under "modern" permit systems, still governs the use and allocation of water. The heavy toll prior appropriation has taken on bull trout and Bonneville cutthroat won't change any time soon, given the entrenched nature of the system.

49. See generally *Orderville Irrigation Co. v. Glendale Irrigation Co.*, 17 Utah 2d 282, 409 P.2d 616 (Utah 1965); *East Jordan Irrigation Co. v. Morgan*, 860 P.2d 310, 218 Utah Adv. Rep. 62 (Utah 1993); *Green River Canal Co. v. Thayne* 2003 UT 50, 84 P.3d 1134 (Utah 2003); *Western Water, LLC v. Olds*, 2008 UT 18, 184 P.3d 578 (Utah 2008).

50. Mont. Const. Art. IX, sec. 3 (3); *Coalition for Stream Access v. Curran*,

51. Mont. Const. Article IX, sec. 3 (4).

52. In re; *General Adjudication of All of the Existing Rights to Use All of the Waters Both Surface and Underground of the Missouri River Drainage*, 2002 MT 216; 311 Mont. 327; 55 P.3d 396.

53. *Trout Unlimited v. Department of Natural Resources and Conservation*, 2006 MT 72; 331 Mont. 483; 133 P.3d 224.

54. California, for example, still retains a modified riparian/prior appropriation system.

55. The Colorado Doctrine states include Alaska, Utah, Montana, Idaho, Colorado, Wyoming, New Mexico, Arizona and Nevada. Six states originally recognized riparian uses but switched to appropriation: Washington, Oregon, North and South Dakota and Texas.

Professor J.B. Ruhl in analyzing how the Endangered Species Act might fare in the face of climate disruption, described it as a “no analog future.”⁵⁶ The term is apt for western water law as well. A system with its feet intractably rooted in the nineteenth century is about to confront twenty-first century problems of a magnitude our forefathers never envisioned.

III. CLIMATE DISRUPTION, FISH, AND WATER AMERICAN WEST

Climate disruption has already affected parts of the West. Ambient air temperatures in the West have increased over the last five decades. These changes coincide with climatological trends throughout the world attributed to increases in greenhouse gases (GHG) from anthropogenic sources.⁵⁷ These changes will continue and perhaps accelerate during the twenty-first century. Because GHG are slow to deteriorate, even radical reductions in GHG today will not forestall the disruptive effects of GHG already “in the pipeline.” And if behavior of the recent past in terms of attempts to reduce GHG is any indication of future behavior, significant reductions in atmospheric concentrations of GHG are unlikely.

Climate modeling forecasts for the Western United States include projections of increased air temperature, which correlates directly to increased stream temperature. One study predicts 1.0-2.5 or greater increase in temperature by 2050 for the Columbia River Basin in the northwestern U.S.⁵⁸ Another study estimates a 3.0 C increase as the most likely scenario for the western U.S. in the twenty-first century.⁵⁹

Increased air temperature from climate disruption has two consequences for trout. First, because of the correlation between air temperature and water temperature, streams will warm as temperatures rise. Increased water temperature can be lethal for trout. As cold water species, western trout have water temperature tolerances that limit their abundance and distribution. Bull trout in particular have the most demanding cold water requirements of all American salmonids.⁶⁰ Bonneville cutthroat also are sensitive to temperature, though less so than bull trout. Modest increases in temperature will restrict available trout habitat.

56. 9; J.B. Ruhl, *Climate Change and the Endangered Species Act: Building Bridges to the No-Analog Future*, 88 B.U. L. REV. 1, 26 (2008).

57. The 2007 IPCC Report concluded that GHG caused a 0.6C increase in global temperatures during the 20th Century. (IPCC 2007).

58. Leung et al 2004 and Mote (2005b)

59. Climate Impacts Group (2004)

60. Rieman et al, *Anticipated Climate Effects on Bull Trout Habitats and Populations Across the Interior Columbia Basin*, Transactions of the American Fisheries Society, 136: 1552-1565 (2007) (hereafter Rieman).

Another effect of increasing temperatures is their affect on hydrological cycle by altering the timing of spring run-off.⁶¹ Think of western mountains as one large reservoir. Annual winter snow fills the reservoir; mountain snow fall accounts for 50-80 percent of all of the precipitation in the West.⁶² The mountain “reservoir” stores the water as snow, and then drains slowly during spring and early summer melt, insuring that valley rivers are nourished during the summer months, when little rain falls. The timing of peak spring run-off from snow melt, a critical factor in western stream hydrology, already occurs from one to four weeks earlier than historic averages.⁶³ One study suggests future changes in peak spring snow melt may occur as much as 30-40 days earlier.⁶⁴ This change is profound. Snow historically lingered well into the summer months, insuring a steady flow. Earlier spring-run-off means that river levels will drop much sooner that they did historically. Warmer summer temperatures coupled with lower summer flows will further increase water temperature, especially in late summer.

Projected changes in the amount of Western precipitation are less certain, but may also hurt fish. In general, the IPCC predicts that precipitation events will be of greater intensity, with longer, drier periods in between.⁶⁵ Site specific studies for the western U.S. are consistent with these overall predictions.⁶⁶ Less summer precipitation will add to low-flow problems that already exist in dewatered streams. In addition, if increased precipitation in the winter and spring falls as rain in areas traditionally covered by snow, increased winter flooding events will be harmful to fish habitat.⁶⁷

Yet another consequence of these climatological changes is a likely increase in forest fire frequency and intensity. Fire plays an integral, natural role in western forest ecology⁶⁸. However increased air temperature and earlier snow melt leads to conditions that make catastrophic wildfire more likely. Rather than historic low-intensity wildfire that nourished ecological processes by creating a vegetative mosaic of lightly, moderately

61.

62. Stewart et a., “*Changes in Snowmelt Runoff Timing in Western North America Under a ‘Business as Usual’ Climate Change Scenario*,” Scripps Institution of Oceanography (2005). This widely cited publication used a projected temperature increase of 2-3 degree C for modeled projections.

63. *Id.*

64. *Id.*

65. IPCC 2007 p. 15.

66. GBRAC 2007 p. A1 14-15 cited in 72 Fed. Reg. 52248.

67. Williams et al, *Potential Consequences of Climate Change to Persistence of Cutthroat Trout Populations*, North American Journal of Fisheries Management 29:533-548 (2009) (hereafter Williams).

68. Coburn L.R.

and heavily burned areas, catastrophic wildfire can denude vast acreages, scarify the soil and make regeneration a slow process.⁶⁹ Landslides and erosion are more likely in heavily burned areas. Western forest fires have been demonstrably more severe; since the mid 1980s there has been a 60% increase in large wildfires in the Northern Rockies. Increased catastrophic risk of wildfire is bad for fish for two reasons. First, fires can cause direct mortality. Second, catastrophic wildfire can render habitat unsuitable for years, as riparian vegetation is gone, and steep hillsides are more prone to erosion.⁷⁰ Climate change models in the western U.S. predict longer fire seasons, hotter fires and larger areas subject to intense burning than in the past.⁷¹

What does the effects of climate change in the West mean for bull trout and Bonneville cutthroat? Two recent studies predict dire consequences from climate change for these species. A team of mostly government scientists led by Dr. Bruce Reiman of the U.S. Forest Service analyzed extensive temperature data across bull trout habitat, and correlated water temperature with occupied bull trout habitat. Various climate change scenarios were modeled. The researchers then quantified the loss of habitat caused by increased temperature. The second study focused on several subspecies of cutthroat trout. These researchers examined not only water temperature changes, but also the effects of increased wildfire, and the effects of increased winter flooding caused by rain-on-snow events and earlier snow melt. These studies are discussed below.

Because bull trout are so temperature sensitive, relatively small incremental increases in temperature will limit available habitat. In practical terms, bull trout will have to seek higher elevation (colder) waters – they will retreat farther into isolated mountain habitats, diminishing the species' already reduced ability to migrate and connect with other populations. Dr. Reiman estimates that the loss of thermally suitable bull trout habitat from 18-92%, depending on the extent of temperature increase.⁷²

The threat of substantial habitat loss for a species already threatened by extinction may be fatal, notwithstanding millions of dollars spent by state and federal agencies to improve other habitat problems like sedimentation

69.

70. Williams, *supra* n. 48.

71. *Id.*

72. Reiman, *supra*, n. 42 at p.1559. Reiman used projected temperature increases of 0.6, 1.6, and 5.0 C for three model runs, resulting in the range of 18-92% of habitat loss, the later reflecting the 5.0C increase in temperature, a rise that is at the upper end of many current predictions.

from logging.⁷³ One might counter that the habitat loss at the low end of the temperature changes, 18%, is not so bad. However, Dr. Rieman found that habitat loss would be more pronounced in the largest and most robust remaining habitat patches. Thus, “even limited warming may produce dramatic increases in the extirpation of local bull trout populations in some areas.”⁷⁴ Given that the U.S. Fish and Wildlife Service concluded that most remaining isolated, remnant bull trout populations already face a great risk of extinction,⁷⁵ further fragmentation and loss of the most robust remaining patches could be devastating.

Rieman’s study is based on temperature change. It does not account for changes in stream flow timing and run-off, increased demand for water from new appropriators, and habitat loss and fish mortality from increased wildfire and catastrophic flooding. The combined effects of shrinking patch size and increasing frequency of stream channel disturbance (from increased winter flooding) “could even accelerate the rate of local extinctions beyond that driven by temperature alone.”⁷⁶

Bonneville cutthroat will also suffer from climate change. A recent study of climate change and cutthroat trout looked not only at the effects of warmer water, but also attempted to quantify predicted increases in spring and winter flooding, and more intense wildfire, both of which have strong negative implications for fish. The authors of this study conclude that “although Bonneville trout include several large, interconnected populations, our analysis suggest they are at relatively high risk from climate change.”⁷⁷

The primary risk for Bonneville trout was increased winter flooding, as habitats normally blanketed by snow will warm to increase winter melt and rain on snow events, causing huge floods that trout cannot adapt to. The combination of warmer temperatures, winter flooding and wildfire resulted in 73% of current habitat being ranked at a high risk from one or more of those factors.⁷⁸ Fish in two of four Bonneville trout habitat units “are at high risk of extinction.”⁷⁹

While a study of the effects of climate change on fish throughout the West is beyond the scope of this article, the problems highlighted herein will pervade fisheries throughout the region.

73.

74. *Id.* at p. 1560

75. Cite listing rule

76. Rieman at 1562.

77. Williams, *supra* n. 48 at p. 539-540.

78. *Id.*, at p. 540.

79. *Id.*

If prior appropriations is ill-suited for today's world, its problems will only intensify as climate change will result in even less water to appropriate. There is a strong consensus that climate change will leave the American West hotter and drier. Earlier run-off and hotter, drier summers (both of which are already occurring) will mean that currently dewatered streams remain that way. More streams will be periodically or chronically dewatered in the future. Earlier run-off means that streams will go dry weeks or months earlier. Fish already in danger of extinction from habitat loss will have even fewer places to go. Competition among junior and senior appropriators will intensify, making it even more difficult, and expensive, to lease water for instream flows for fish.

IV. A WAY FORWARD

The tone of this paper is pessimistic, and for good reason. Anthropogenic climate change will affect western weather, which in turn will affect stream flows and water temperature. We don't know the extent of these changes, only that they are highly likely to occur in an accelerated manner over the 21st century. We know that the West will be hotter and drier, snow pack will be diminished, and spring run-off will occur earlier and quicker. We also know (but rarely admit for fear of offending prevailing mores) that the prior appropriation doctrine has been devastating for fish. We know that many salmonids are already threatened with extinction.

However, the most severe human-induced climate changes are decades away, providing an opportunity for adaptive strategies to be implemented. But two hurdles must be overcome. The prior appropriation doctrine must be opened to genuine modification, and where possible, wholesale reform. Second, the inevitable effects of climate disruption on water resources must be more than fodder for academic debate and scientific study; they must be understood and appreciated by those with the power and resources at the state level to address the problem. If those obstacles can be overcome, then the slow march into the "no analog future" provides opportunities for adaptive management in watersheds where trout have the greatest chance for survival.

Market-based solutions are not the key to saving fish from the double whammy of climate change and prior appropriation. The grip that prior appropriation retains on western water law is so great that states struggle just to pass legislation to **allow water to be legally left in a stream.**⁸⁰

80. New Mexico has yet to even recognize in-stream uses as beneficial. Wyoming has passed

Even where in-stream flow rights are recognized, and water leasing programs are sanctioned by the legislature, success is slow. Purchasing water rights is expensive, assuming willing sellers can be found.⁸¹ Farmers fear any non-use may cause a loss of water rights or a change in priority dates. Moreover, the amount of water actually leased to date specifically for instream flows to protect fish appears to be, literally, a drop in the bucket.

While the FWS pointed to the success of water leasing for instream uses as a reason to not protect Bonneville trout under the ESA, the agency could point to only a handful of actual instream flow rights that had actually been purchased.⁸² In Montana, the same is true; market forces have not moved strongly in the direction of protecting fish.⁸³ While public agencies (like state fish and game departments) and private organizations (such as water trusts) do work diligently to secure in-stream flows, water leasing alone will not eradicate the dewatering of streams nor will it postpone future tragedy wrought by climate change.

Water is becoming too valuable of a commodity to expect that market forces will work to protect fish. For example, a comprehensive study on western water leasing found that thirsty cities and developers will pay up to hundreds of times more than current (admittedly subsidized rates) to purchase water supplies to sustain development.⁸⁴ While water leasing based on market rates may help stymie that unconscionable waste of water

an instream law that Trout Unlimited finds nearly unworkable. Utah did not pass in-stream flow legislation until 2007 (? HB 117). Montana finally recognized the right of the state to reserve an instream water right for fish in 2002, but only as the result of a Supreme Court decision. See *In re Adjudication of the Missouri River*, n __, *supra*.

81.

82. 73 Fed. Reg. 52247 (September 9, 2008). The only statistic that FWS provides to support its conclusion the existing legal regime for water resources is not a threat to the Bonneville cutthroat is the following: “[W]yoming has approved instream flow rights on 17 stream segments encompassing 66 km (41 mi) of BCT habitat.” No information is provided as to how much water was actually leased in these 41 miles of streams in Wyoming. The 41 miles of streams with leased in-stream water cannot possibly be a significant contributing factor to a species that occupies 2,380 miles of habitat. See 73 Fed. Reg. 72246 Table 2.

83. Trout Unlimited has been a leader in water leasing for instream flows in Montana. While the author congratulates their bold efforts, the results have been limited at best. According to the organization’s data from 1995-2005, water leases on 20 streams protected a minuscule portion of necessary flows. Remember that in Montana, there are over 4,000 miles of dewatered streams. http://www.tu.org/atf/cf/%7B0D18ECB7-7347-445B-A38E-65B282BBBD8A%7D/MT_WaterReport.pdf.

84. Brewer et al., SYMPOSIUM THE GREAT LAKES: REFLECTING THE LANDSCAPE OF ENVIRONMENTAL LAW: ESSAY: TRANSFERRING WATER IN THE AMERICAN WEST: 1987-2005, 40 U. Mich. J. L. Reform 1021. The authors of the study demonstrated just how much thirsty cities and developers will pay for water; San Diego offered \$258 per acre-foot for water that farmers in the Imperial Irrigation District paid fifteen or twenty dollars. A development near the South Rim of Grand Canyon National Park was prepared to spend \$ 20,000 per acre-foot for Colorado River water. *Id.* at notes 12-14.

caused by prior appropriation and government water policies subsidizing irrigated agriculture in the West, it is unlikely that conservation groups can compete with the billion dollar budgets of municipal water agencies when it comes to purchasing water on the open market.⁸⁵

The way forward is also not through command and control environmental laws. These laws have been highly successful in protecting fish. Indeed the first ESA blockbuster, *T.V.A. v. Hill*⁸⁶ was a fish protection case, and spurred measures to secure the protection for the snail darter. Throughout the West, ESA-driven court orders have provided substantive protection for fish in the face of recalcitrant bureaucracies and angry farmers.⁸⁷

But the ESA is not a panacea for the long-term problems posed by an inadequate legal regime on a collision course with a hotter and drier West. The ESA is reviled by in many parts of the West.⁸⁸ The ESA has been, and remains a “whipping boy” for Western politicians.⁸⁹ The law itself seemed headed for extinction in recent years. Representative Pombo, a Western politician with ties to water users led the charge to “reform”⁹⁰ the ESA. While unsuccessful, anti-ESA sentiment should be a major concern for those that seek to reform water policy solely through litigation. The ESA backlash is always lurking around the corner of the next court decision.

In addition, a recent DC Circuit decision found that ESA-driven water allocation for fish constitutes a physical taking of property.⁹¹ Whether the *Casitas* decision comports with established takings jurisprudence will be subject to debate. However, the specter of takings litigation when the government acts to protect fish will be a damper on future use of the ESA or other litigation tools to force appropriated water back into streams to benefit fish.

Finally, as Professor Ruhl noted, the ESA is ill-suited to address the

85. The budget of the Southern Nevada Water Authority is —. The annual budget of the non-profit Montana Water Trust is — (need a better comparison).

86. Cite (I’d like to add sentence that the snail darter is alive and well today).

87. Klamath, Columbia hydro power cases.

88. See e.g., <http://www.americanpolicy.org/prop/tyranny.htm> (“The ESA is the worst, most destructive and most powerful law to ever come out of Congress (with the possible exception of the federal income tax law.”); <http://www.mtmultipleuse.org/ENDANGERED/esareform.htm>; (“we are stuck with a bloated bureaucracy and distorted legislation that is harmful to America...”).

89. See e.g. <http://govdave.com/new/issues/docs/wolves-riverton.aspx> (Wyoming Governor Freudenthal speaking at a Wyoming Farm Bureau “wolf seminar.”).

90. “The term ESA reform” is a misnomer for legislative efforts led by former Representative Pombo aimed at eviscerating key parts of the ESA, such as deleting the requirement for critical habitat. See e.g. <http://www.fishsniffer.com/dbachere/051010pombo.html> (Need a better source).

91. *Casitas Municipal Water District v. United States*, 543 F.3d 1276 (Fed. Cir. 2008).

complex issues pertaining to climate change.⁹² The ESA is a powerful tool to force government and private entities to alter or drop specific projects. It provide a critical safety net to protect trout and salmon.⁹³ But the ESA alone is not an effective means to address long-term, policy driven solutions to both reforming water law and adapting to climate change.

This author believes that the Public Trust Doctrine is an important legal paradigm well-suited to imbue water management with criteria necessary to protect fish and aquatic ecosystems. The landmark *Mono Lake*⁹⁴ decision demonstrates that public trust principles are a strong match for vested prior appropriation water rights. The doctrine remains a creature of state law, a considerable road block for protecting fish resources for two reasons. First, watersheds transcend state boundaries but the public trust doctrine does not. States adopt different permutations of the public trust and it is applied unevenly in only a few western states. Second, no state has adopted the reasoning in *Mono Lake* to protect aquatic resources.

Revamping prior appropriation on a state-by-state basis to give fish their due is a daunting task, even with or without public trust principles. The difficulty of enacting fundamental change to western water law is revealed by problems associated with implementing something as simple as recognizing in-stream protection as a beneficial use.⁹⁵

Given the legal and political realities discussed above, a better approach is to utilize the resources of the federal government without bringing along the heavy, often revised hand of federal regulation and oversight.

Protection of aquatic resources from For example, the Australian government is engaged in a major federal effort to permanently shore up instream flows in the Murray-Darling River system. This river basin suffers the same basic problem of many western U.S. rivers: over-appropriation for consumptive uses left little water for riverine ecosystems, with entrenched vested interests refusing to share. Consumptive entitlements were reenforced by provincial law. However, the federal government stepped in to provide a federal overlay that will require “environmental water” for instream flows, even at the risk of curtailing consumptive uses. At the same time the federal government has committed

92. Rulh, *supra*. n --

93. See n. 9, *supra*.

94.

95. See notes – *supra*. See also McKinney, *Water for Wildlife: Integrating Science and Politics in Wildlife Conservation*, *Policy Studies Journal* Volume 19 No. 3-4 (1991) pp. 534-541 (noting that “efforts to formulate instream flow policies in the West have been either sidetracked or significantly delayed because of opposition by agriculture and other traditional users.”).

funds to purchase water rights to augment instream flows. These legislative changes at the national level provide now offer opportunities to address current problems caused by consumptive entitlement and allow the government to address future impacts from climate change.⁹⁶

Federal water management legislation mandating instream flows would be unpopular in the West, to put it mildly. But to leave prior appropriation as a “sacred cow” in light of the future disruptions caused by climate change is irresponsible. The doctrine has already proven nearly worthless to protect native fish, and is even less suited for the inevitable warmer and drier future.

The heavy hand of the federal government has already appeared in state water management. ESA-driven court mandates override state water management throughout the West. Witness the Klamath Basin water wars, and the disastrous result from mandating in-stream flows through court order on an ad hoc basis.⁹⁷ ESA listings can only increase as climate disruption leaves more habitat unsuitable, and irrigators fight over dwindling water supplies. Doesn’t it make more sense to approach water shortages on a comprehensive watershed-wide basis?

Federal financing of water right purchases for permanent instream flow protection is also another option that must be considered. A long term (20-30 year) buy-out program based on a watershed approach, with defined goals and objectives, rather than the piecemeal attempts under current water leasing and water trust programs would yield real protection for fish, before the worst impacts of warming and drying are felt in the West. While private market-based solutions should remain part of the mix, there is little evidence that such programs, standing alone, can effectively compete with the problems of a legal regime driven by consumptive uses and further stresses caused by climate change.

Professor Charles Wilkinson described prior appropriation as one of the “Lords of Yesterday,” nineteenth century resource management schemes ill-suited for the modern West and urged reform for the needs of the twentieth century.⁹⁸ The realities of climate change drive the need to reform this lord of water management for the twenty-first century. Bull trout and Bonneville cutthroat trout won’t make it without such reform.

96. Foerster, *Progress on Environmental Flows in Southeastern Australia in Light of Climate Change*, 39 E.L.R. 10426 (5-2009).

97. As one farm-related publication described it, “when farms, townspeople and agribusinesses slammed down the gauntlet against the federal government, it signaled a new, highly charged era in the water wars and for the Endangered Species Act.” http://westernfarmpress.com/mag/farming_klamath_basin_water/ (last visited October 19, 2009).

98. Wilkinson, “Crossing the Next Meridian” (1993).

Neither will the salmon, steelhead, and other trout that are ESA-listed. The old adage “whiskey is for drinking, water is for fighting” will remain true.