Public Land & Resources Law Review

Volume 21 Article 4

June 2000

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# Articles

## Aquifer Storage and Recovery In The Columbia Basin: The Need For Legislative Action*

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## I. INTRODUCTION

The Columbia River Basin's growing population needs more water to satisfy its burgeoning demands. However, the natural system is severely strained by existing demands. In parts of the basin the demand for water already exceeds available supplies.[1] Historically, whenever the demand for water threatened to outpace available supplies, dams were built to store additional water. Today, however, new dam construction is unlikely because dams are expensive and often cause severe environmental damage.[2] Moreover, most of the suitable dam sites in the basin are already developed.[3] Consequently, water users and

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1. *See generally* Reed D. Benson, *Maintaining the Status Quo: Protecting Established Water Uses in the Pacific Northwest, Despite the Rules of Prior Appropriation*, 28 ENVTL. L. 881 (1999); *see also* Joy Ellis, *Drafting from an Overdrawn Account: Continuing Water Diversions from the Mainstem Columbia and Snake Rivers*, 26 ENVTL. L. 229 (1996) The problem of dewatered streams in the Columbia Basin is particularly acute in the late summer months when natural flows are low and demands for irrigation flows are high.

2. A leading expert in the underground storage of water attributes interest in groundwater recharge programs in the United States over the past twenty years or so to the increasingly unacceptable environmental cost of dams and other water conveyance systems. R.D.G. PYNE, GROUNDWATER RECHARGE AND WELLS: A GUIDE TO AQUIFER STORAGE AND RECOVERY 15 (1995) [hereinafter PYNE]. Environmental cost is one reason Congress is unlikely to provide the Bureau of Reclamation or the U.S. Army Corps of Engineers with monies to undertake major new dam construction. According to one recent report, the budget for building new dams is shrinking and has been for years. WESTERN WATER POLICY REVIEW ADVISORY COMM'N, WATER IN THE WEST: CHALLENGE FOR THE NEXT CENTURY 2-35 to 2-36 (1998) [hereinafter WATER IN THE WEST].

3. WATER IN THE WEST, *supra* note 2, at 2-12 to 13, 2-35. Because the best sites for dam projects have already been used and because dams are expensive and create significant environmental damage, Professor Neuman argues that "[s]ignificant augmentation of the western water supply is not likely in the near future." Janet C. Neuman, *Beneficial Use, Waste, and Forfeiture: The Inefficient Search for Efficiency in Western Water Use*, 28 ENVTL. L. 919, 921 n.4 (1999). Specifically, Professor Neuman discounts weather modification and desalinization as cost-effective sources of water, and cites the Bureau of Reclamation's own conclusion that "there is no 'new water' to develop, no new dams to store water for the dry season, and little new groundwater resources to pump from the earth." *Id.* (quoting BUREAU OF RECLAMATION, STRATEGIC PLAN 1997-2002, at 4 (Apr. 14, 1997)).

However, Aquifer Storage and Recovery developers believe that underground storage can provide significant amounts of water for consumptive use. To illustrate the potential scope of Aquifer Storage and Recovery development, consider Orange County, California's salinity intrusion barrier project, a single project which injects up to 50,000 acre-feet (16.3 billion gallons) per year and has been in operation since 1956. According to studies, about 85% of the injected water recharges the local aquifer system and the balance flows seaward. PYNE, *supra* note 2, at 15 (Assuming an average daily consumption of 190 gallons

resource managers are looking for other ways to store water for new uses, and are focusing their attention on groundwater and underground storage.[4]

Naturally occurring groundwater is found in aquifers—geologic formations that store usable quantities of water.[5] The use of groundwater, though widespread, is limited by availability. Even where groundwater is available, its suitability for human use is often limited by water quality. As a further limitation, most aquifers recharge (recover water) more slowly than water users withdraw water, resulting in groundwater mining, thus further reducing available groundwater supplies.[6] Resource managers recognized long ago that accelerating the rate of aquifer recharge by adding water from outside sources could increase the available groundwater supply.[7]

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per person per day, the Orange County project injects enough water to meet the daily water needs of nearly 200,000 people).

4. Fundamentally, there are two ways of making water available for new uses: (1) the conservation and transfer of existing supplies, or (2) the creation of new supplies. This article focuses on the second alternative. For information about conservation and the application of conserved water to new uses see Neuman, *supra* note 3; *see also* Lawrence J. MacDonnell et al., *Using Water Banks to Promote More Flexible Water Use: Final Project Report*, Univ. of Colo. Natural Resources Law Center, (Aug. 31, 1994).

5. WEBSTER'S THIRD NEW INT'L DICTIONARY 108 (unabridged ed. 1993).

6. Aquifer recharge occurs in several ways. Natural recharge occurs when precipitation, or water from a natural water body, infiltrates the ground and percolates downward to the aquifer. Incidental recharge is similar but occurs as an indirect consequence of human activities (i.e., irrigation or the impoundment of water for storage or flood control). Intentional recharge occurs when water is added directly to the aquifer, either by planned infiltration or injection, for the purpose of augmenting the volume of ground water. FLETCHER G. DRISCOLL, GROUNDWATER AND WELLS 761-73, (2d ed. 1986) [hereinafter GROUNDWATER AND WELLS]

Groundwater mining occurs when water is withdrawn from an aquifer faster than it recharges, resulting in declining water levels. TOM TIETENBERG, ENVIRONMENTAL AND NATURAL RESOURCE ECONOMICS 228-29 (3d ed. 1992). Groundwater mining is unsustainable and can lead to serious problems such as subsidence and compaction (thus preventing recharge even when mining stops), reduced spring and stream flows, diminished lakes and wetlands, degraded water quality, saltwater intrusion, and increased pumping and treatment costs. THOMAS DUNNE & LUNA B. LEOPOLD, WATER IN ENVIRONMENTAL PLANNING 223-29 (1978) [hereinafter ENVIRONMENTAL PLANNING].

7. For many years groundwater users have appropriated excess irrigation water that percolates into the aquifer after it is applied to crops. Without such incidental recharge, many groundwater rights would not be satisfied. In the Snake River Plain, it is estimated that sixty percent of recharge is infiltrating surface water, applied for irrigation. BOOKMAN-EDMONSTON, EASTERN SNAKE PLAIN AQUIFER MANAGED RECHARGE PROJECT: INTERIM REPORT 2-5 (Draft, Nov. 13, 1998) [hereinafter ESPA RECHARGE PROJECT]. In the years following World War II incidental recharge from surface irrigation caused the water table to rise an average of fifty feet on the eastern plain with a corresponding 24 million acre-feet increase in aquifer storage. S.A. Goodell, *Water Use on the Snake River Plain, Idaho and Eastern Oregon*, U.S. Geological Survey Professional Paper 1408-E, E48 (1988). However, more efficient irrigation systems and increased reliance on groundwater as an irrigation source caused groundwater supplies to decline about seven million acre-feet at a rate of 350,000 acre-feet per year between 1975 and 1995. ESPA RECHARGE PROJECT, *supra*, at 2-6. Consequently, spring flows, once enhanced by high incidental recharge rates, are now dropping, leading Idaho to propose an aggressive groundwater recharge program for the region. *See infra* Part III.A.3.c. (analogizing potential problems from Idaho's proposed Snake River Plain Aquifer Recharge Project to the possible cumulative effect of future ASR development).

The idea of artificially recharging aquifers has gained momentum over the last few decades, due, in part, to advances in injection technology.[8] With these technological advances came the realization that opportunities to store water underground are not limited to the high-quality aquifers already depleted by excessive withdrawals. Water can also be injected into, and recovered from, any formation capable of storing usable quantities of water, including low quality aquifers and overburden—formations overlying naturally occurring aquifers.[9] As a result, many groundwater projects now operate around the country, fulfilling a variety of purposes.[10]

A common purpose for groundwater projects is the storage of water for consumptive use. For the purpose of this study, such projects are divided into two categories based on their intended beneficiary. First, there is the traditional "recharge project," which adds water to an aquifer for use by groundwater appropriators. Second, there is the more recent approach, referred to here as an aquifer storage and recovery (ASR) project, which adds water to the aquifer for the exclusive or primary use of the recharging entity.[11]

The promise of an exclusive right to store large volumes of high-quality water makes ASR an extremely attractive option for urban planners faced with inadequate water supplies. This attractiveness is enhanced by developers, who market ASR as a low cost alternative to building new surface impoundments or treatment facilities.[12] Further, developers emphasize that ASR projects are

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8. PYNE, *supra* note 2, at 16. For a brief discussion of technical problems associated with aquifer recharge by injection, see Earl F. Murphy, *Economics and Groundwater Interconnections*, in 3 WATERS AND WATER RIGHTS § 19.02 (Robert E. Beck ed., 1991).

9. Marginal aquifers can be made useful by diluting the available groundwater with higher quality water. *See* PYNE, *supra* note 2, at 7. Alternatively, under certain conditions high quality water can be stored in otherwise unusable aquifers. For example, freshwater injected into saline aquifers tends not to mix with the native groundwater, allowing recovery of the stored freshwater for various applications, including domestic use. Telephone Interview with Mark Cunnane, Geologist (Jan. 20, 1999) (proposing the development of a municipal ASR project in a saline aquifer in Havre, Montana).

10. Recharge projects are designed, among other purposes, to meet consumptive needs, restore depleted aquifers, reduce subsidence, treat contamination, improve ambient water quality, prevent saltwater intrusion, enhance oil field production, treat soil, and contain contamination plumes. PYNE, *supra* note 2, at 18-20.

11. The definition of ASR varies. For example, some practitioners distinguish ASR projects from other recharge projects by the use of dual purpose wells, capable of both injecting and recovering water. PYNE, *supra* note 2, at 6. Oregon distinguishes ASR projects from other recharge projects by the quality of source water, defining ASR as "the storage of water from a separate source that meets drinking water standards in a suitable aquifer for later recovery". OR. REV. STAT. 537.531 (Supp. 1998). A modest number of ASR projects (approximately 30) now operate around the United States. The majority operate in Florida, New Jersey, California, Texas and Nevada. Internationally, ASR style projects operate in Canada, Israel, England, the Netherlands, and Australia. *See* PYNE, *supra* note 2, at 9-17.

12. CITY OF SALEM, THE WATER SYSTEM MASTER PLAN 8-15 (June 7, 1994); CITY OF WALLA WALLA, WASH., AQUIFER STORAGE AND RECOVERY PILOT TEST WORK PLAN 1-1 (Draft, Aug. 1998).

environmentally friendly.[13] But claims by ASR developers may not tell the whole story.

About a half-dozen ASR-style projects currently operate in the Columbia Basin.[14] In light of growing municipal needs created by urbanization, and practical limits on new dam construction, more ASR projects are likely in the future, and widespread development is possible. Therefore, now is the time to consider the implication of widespread ASR development, before the basin's remaining unappropriated water resources are committed to underground storage and consumptive uses.

The first step in addressing ASR must be the enactment of comprehensive statutory controls to assure a workable regulatory process that protects existing rights, as well as water quality and other environmental interests, from overdevelopment. New laws are necessary because the idea of providing an exclusive right to recover water that is stored underground does not fit within the existing legal framework. Moreover, the Pacific Northwest region is just beginning to come to terms with the environmental legacy of unfettered dam construction. It is clear, or at least it should be, that further ill-considered development of water resources in the basin will aggravate critical harm done to fisheries by the earlier development of water storage projects.[15] Because ASR was not contemplated when existing groundwater recharge laws were enacted, it is important to enact laws that minimize the adverse effects of future ASR development.

In spite of the risks, ASR projects in the basin are developing in advance of the law. Currently, there are ASR-style projects operating in Oregon, Washington, and Idaho. Yet only Oregon has enacted an ASR statute.[16] Consequently, projects in Washington and Idaho operate under laws that do not

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13. PYNE, *supra* note 2, at 19. The idea is that ASR projects will reduce the need for excessive diversions during the dry season by supplementing the water supply. Typically, ASR projects divert source water from streams during the winter and spring months, when the percentage of streamflow diverted is relatively low. The water is then stored until the dry season in late summer when the demand for water is higher. The stored water is then recovered and put to use. EPA, WORKGROUP REVIEW, AQUIFER STORAGE AND RECOVERY WELLS, www.epa.gov (Draft, Dec. 1998) (discussing the risks of ASR projects generally) (On file with author).

14. Information developed through interviews with persons employed by state agencies, municipalities, and engineering firms throughout the basin.

15. *See generally* THE NORTHWEST SALMON CRISIS: A DOCUMENTARY HISTORY (Joseph Cone & Sandy Ridlington eds., 1996); *see also* Michael C. Blumm & Greg D. Corbin, *Salmon and the Endangered Species Act: Lessons from the Columbia Basin*, 74 WASH. L. REV. 519 (1999) (discussing salmon restoration efforts in the Columbia River and the growing federal role under the Endangered Species Act, 16 U.S.C. §§ 1531-1544 (1994)).

16. Oregon's Aquifer Storage and Recovery (ASR) statute was enacted in 1995. OR. REV. STAT. §§ 537.531-.534 (Supp. 1998). Other groundwater projects in Oregon are regulated under the state's general groundwater recharge statute, OR. REV. STAT. § 537.135 (Supp. 1998).

contemplate ASR related issues.[17] Similarly, any near-term ASR development in Montana will lack specific statutory controls.

This article examines the present status of ASR development in the Columbia Basin. Part II surveys state laws governing the development and operation of groundwater projects in the states of Oregon, Washington, Idaho, and Montana.[18] Part III identifies ASR-related issues and discusses possible approaches for controlling ASR development. Oregon's ASR statute, though not comprehensive, provides a useful template for discussion of these issues. Where appropriate, the issues are discussed in the context of actual or proposed groundwater storage projects. The study concludes, in Part IV, that while ASR may be a practical alternative to surface impoundments, new state legislation is needed to ensure that ASR development does not interfere with existing water rights or aggravate the basin's already serious environmental problems.

## II. SURVEY OF UNDERGROUND WATER STORAGE LAWS IN THE COLUMBIA BASIN

There are about a half-dozen regulated ASR projects currently operating in Oregon, Washington, and Idaho.[19] There are no regulated projects operating in Montana.[20] Several more ASR projects are under development in the basin, and others are likely to be proposed, as water users seek to augment supplies and hold down costs. Only Oregon has enacted legislation explicitly governing ASR projects.[21] An ASR bill submitted to the 1999 Washington Assembly was withdrawn in the interest of passing other reforms.[22] Idaho and Montana have not yet formally considered any ASR legislation.

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17. A proposed ASR statute was submitted to the Washington assembly early in the 1999 session. Omnibus Water Resources Bill in Support of the State Salmon Strategy (Draft 3) §§ 17-19 (Jan. 1999) (on file with the author) [hereinafter Proposed Legislation]. The Proposed Legislation was withdrawn from consideration in the interest of passing other water law reform. Telephone Interview with George Schlender, Wash. Dep't of Ecology (Jan. 15, 1999).

18. Groundwater projects in Oregon, Washington, and Idaho are primarily regulated under OR. REV. STAT. §§ 537.135, 537.531 -.534 (Supp. 1998); WASH. REV. CODE §§ 90.44.010 to - .901 (1992 & Supp. 1999); IDAHO CODE §§ 42-4201 to -4231 (1996). Groundwater in Montana is regulated under MONT. CODE ANN. §§ 85-1-701 to -704, 85-2-501 to -520, and 85-2-901 to 907 (1999).

19. *See supra* note 14.

20. Telephone Interview with Don MacIntyre, Attorney with the Mont. Dep't of Natural Resources and Conservation (Dec. 21, 1998). The cities of Havre, Montana and Cutbank, Montana have considered ASR projects, but have not made any development plans. *See* Telephone Interview with Mark Cunnane, *supra* note 9.

21. OR. REV. STAT. §§ 537.531-.534 (Supp. 1998).

22. Telephone Interview with George Schlender, Wash. Dep't of Ecology (Jan. 27, 1999) (discussing fate of proposed ASR legislation). *See* Proposed Legislation, *supra* note 17.

As a result, only Oregon regulates ASR projects with laws that specifically contemplate ASR-related issues. In the absence of ASR laws, agencies in Idaho and Washington regulate development using groundwater statutes and waste water treatment statutes that do not specifically address ASR-related issues. This section examines the laws in Oregon, Washington, and Idaho that govern ASR projects today. Montana law is discussed only briefly, in anticipation of future ASR development.

### A. *Oregon*

#### 1. *Oregon's ASR Statute*

In 1995, Oregon enacted an aquifer storage and recovery statute.[23] Oregon's ASR statute eased the regulatory burden on developers by reducing the number of permits required to operate an ASR project.[24] The statute declares that "aquifer storage and recovery is a beneficial use inherent in all water rights for other beneficial uses."[25] Thus, only one permit is required to divert, store, and recover water, provided the water is applied to its originally intended beneficial use.[26] This does not mean, however, that every water right holder in Oregon is entitled to develop an ASR project.

Oregon's statute limits ASR development by defining ASR as "the storage of water from a separate source that meets drinking water standards in a suitable aquifer for later recovery and not having as one of its primary purposes the

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23. OR. REV. STAT. §§ 537.531-.534 (Supp. 1998).

24. Presently, five different permits are required by both the [Oregon] Department of Environmental Quality ([O]DEQ) and the Water Resources Department (WRD). These include a water source permit (WRD), groundwater recharge permit (WRD), secondary groundwater withdrawal permit (WRD), water pollution control facility permit ([O]DEQ), and a concentration limit variance ([O]DEQ). Neither Department has a clear process for permitting pilot or test facilities. As WRD is given the authority to manage water resources for a variety of uses and purposes, we believe WRD should be the sole permitting agency with opportunity for review, comment, and recommendations on permit conditions for [O]DEQ and other affected agencies.

Aquifer Storage and Recovery, 1995: Public Hearing before the Senate Comm. on Water and Land Use, H.B. 3183, 68th Legis. Ex. B (Or. 1995) (statement concerning the streamlining of the permit process by Clark Balfour, who drafted proposed ASR legislation) [hereinafter *Hearing*].

25. OR. REV. STAT. § 537.531 (Supp. 1998).

26. A transfer application is needed to change the type of use of recovered water under the ASR statute. OR. REV. STAT. § 537.534(7) (Supp. 1998). A detailed discussion of conditional transferability is found *infra* Part III.A.1.d.

restoration of an aquifer."[27] Thus, Oregon's statute expressly limits the scope of ASR development in two ways. First, only developers with a source of drinking water, such as municipalities with treatment facilities, can obtain an ASR permit. Second, Oregon's ASR statute prevents groundwater users seeking to replenish depleted aquifers from diverting additional waters for consumptive use under ASR's streamlined permitting scheme.

Oregon's ASR statute further declares that stored water is not a waste, contaminant, or pollutant.[28] It therefore appears that no discharge permit or concentration variance is required to recharge aquifers, so long as the source water meets drinking water standards. Thus, Oregon's ASR statute allows a limited number of water users—those with high quality source water—to store water for later use without applying for additional permits.[29]

Before applicants can obtain an ASR permit, they must conduct a test program under a limited license issued by the Oregon Water Resources Department (OWRD).[30] To obtain a limited license, applicants must submit detailed information about well construction, water quality, storage time and recovery schedule, as well as hydrologic conditions.[31] Limited licenses are effective for up to five years and are renewable if further testing is still required.[32] Licensed

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27. OR. REV. STAT. § 537.531 (Supp. 1998). Drinking water standards are established by rules promulgated by the Health Division of the Oregon Department of Human Resources under OR. REV. STAT § 448.273 (1992) (administering the federal Safe Drinking Water Act, 42 U.S.C.A. § 300f-j (Supp. 1999)) A detailed discussion of water quality related issues can be found *infra* Part III.A.3.

28. OR. REV. STAT. § 537.532 (1)(a), (b) (Supp. 1998) (referencing OR. REV. STAT. § 468B.050 (Supp. 1998) and OR. REV. STAT. § 468B.053 (Supp. 1998) which implement national pollutant discharge elimination system (NPDES) permit requirements for the Federal Water Pollution Control Act (Clean Water Act), 33 U.S.C. § 1251-1387 (1994)). *But see* OR. ADMIN. R. 690-350-0010(7)(c) (1999) (stating that surface discharges of ASR testing water may require authorization from the Oregon Department of Environmental Quality (ODEQ)). Additionally, OWRD must require project operators to minimize the introduction of constituents not normally present in the receiving aquifer "to the extent technically feasible, practical, and cost-effective." OR. REV. STAT. § 537.532(2) (Supp. 1998). The treatment of source water is discretionary for constituents that are present in the receiving aquifer, up to established standards. *Id.* Notably, constituents associated with the disinfection of drinking water may also be injected into the aquifer, apparently without a pollution control permit, up to established standards. OR. REV. STAT. § 537.532(3) (Supp 1998).

29. Recharge projects that add water that does not meet drinking water standards must still obtain five permits. *Hearing, supra* note 24. (The permitting requirements can be found at OR. REV. STAT. § 537.130 (1998) (permit to appropriate water); OR. REV. STAT. § 537.135(1) (Supp. 1998) (permit to recharge aquifer); OR. REV. STAT. § 537.135(2) (Supp. 1998) (secondary permit to withdraw stored water); OR. REV. STAT. § 468B.005-.485 (Supp. 1998) (pollution control laws)).

30. OR. REV. STAT. § 537.534(2)-(4) (Supp. 1998) (limiting the Health Division and the ODEQ to reviewing, commenting, and recommending conditions in the issuance of ASR permits and limited licenses).

31. OR. REV. STAT. § 537.534(3) (Supp. 1998). Detailed application requirements are found in OR ADMIN. R. 690-350-0010 to 690-350-0030 (1999).

32. OR. REV. STAT. § 537.534(2) (Supp. 1998).

test programs are subject to land use and development approval from local government, and a thirty-day public comment period is required.[33] OWRD may condition licenses to protect other groundwater rights, or revoke them to prevent harm to other water rights or minimum perennial stream flows.[34]

### 2. *Oregon's General Recharge Statute*

Some groundwater projects in Oregon recharge aquifers with source water that does not meet state drinking water standards.[35] Consequently, not all groundwater projects in Oregon are regulated under the state's ASR statute, but instead are regulated under a general recharge statute.[36] Oregon's general recharge law is also administered by OWRD.[37] According to OWRD, the statute remains viable for underground storage applications.[38]

The general recharge statute declares that recharging aquifers is a beneficial use that requires a permit from OWRD.[39] The withdrawal of stored water for later use requires a secondary permit and written consent of the recharge permit holder.[40] The requirement to obtain two water rights is a key difference between ASR projects and projects approved under the general recharge law. Another difference is that projects approved under the general recharge law require Oregon Department of Environmental Quality (ODEQ) authorization,

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33. OR. REV. STAT. § 537.534(1)-(2) (Supp. 1998).

34. *Id.*

35. Recharge projects that predate the ASR statute may apply for ASR permits. At least one such project has inquired about modifying its recharge permits since the ASR law was enacted. Telephone Interview with Mark Lyon, Manager of Buell-Red Prairie Water District, Sheridan, Or. (Mar. 9, 1999). Buell-Red Prairie diverts water to a holding pond from Goose Creek, then through a sand filter and disinfection treatment system before injecting it into the ground for use in their domestic water system. Letter from Rene Dulay, Industrial Waste Specialist, Department of Environmental Quality, to Donn Miller, Hydrogeologist, Water Resources Dep't, Salem, Or. (Jan. 18, 1991) (on file with author).

36. OR. REV. STAT. § 537.135 (Supp. 1998). Oregon's ASR statute prohibits aquifer restoration as a primary purpose. OR. REV. STAT. § 537.531 (Supp. 1998). Therefore such projects are regulated under the state's general statute, even if the source water meets drinking water standards.

37. OR. REV. STAT. § 537.135 (Supp. 1998). Administrative rules promulgated in accordance with subsection (3) of the statute are found at OR. ADMIN. R. 690-350-0110 to 690-350-0130 (1999).

38. Telephone Interview with Donn Miller, Hydrogeologist, Water Resources Dep't, Salem, Or. (Mar. 9, 1999) (summarized interagency discussions between OWRD and ODEQ concerning approval of surface infiltration projects such as the County Line (Ordinance) Recharge Project, a surface infiltration project, under the groundwater recharge statute, OR. REV. STAT. § 537.135 (Supp. 1998)).

39. OR. REV. STAT. § 537.135(1) (Supp. 1998).

40. OR. REV. STAT. § 537.135(2) (Supp. 1998).

while ASR projects do not.[41] Finally, in contrast to the ASR statute, the general recharge law prohibits OWRD from issuing a recharge permit unless the state's Department of Fish and Wildlife has established a minimum perennial flow for the supplying stream.[42]

Because Oregon is the only state in the basin to adopt ASR legislation, its statutory scheme provides a useful template for the discussion of ASR related issues in Part III below. However, before those issues can be discussed fully, it is important to examine how the other basin states regulate the underground storage of water.

### B. *Washington*

Washington does not have an ASR statute or a general recharge law. There are, however, several groundwater projects operating under laws that allow for the recovery and use of artificial groundwater—defined as water that has been stored "intentionally, or incidentally to irrigation."[43] The distinction between artificially stored groundwater and public groundwater is important because persons appropriating public groundwater may obtain a full water right, while persons declaring ownership of artificially stored groundwater cannot.[44] Instead, declarants receive a limited right subordinate to certified water rights.

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41. *See* Letter from Barbara Burton, Water Quality Manager, Oregon Department of Environmental Quality, to Paul Eckley, Chief Utilities Engineer, City of Salem (Nov. 29, 1994) (discussing requirements for recharge project proposal prior to enactment of ASR statute, OR. REV. STAT. §§ 537.531-.534 (Supp. 1998)). *See also* Intergovernmental Agreement Between the City of Salem and the Oregon Department of Environmental Quality (Nov. 1994) (quoting OR. ADMIN. R. 340-044-0055(1) (1999) "[a]ny underground injection activity which may cause, or tend to cause, pollution of groundwater must be approved by the Director[.]").

42. OR. REV. STAT. § 537.135(5) (Supp. 1998). The State Department of Fish and Wildlife can waive this requirement upon determination that a minimum perennial stream flow is unnecessary. *Id.* In contrast, the ASR statute appears to give OWRD the discretion to permit recharge activity even if it interferes with established minimum stream flow limits. OR. REV. STAT. § 537.534(2) (Supp. 1998).

43. "Artificially stored groundwater" is "water that is made available in underground storage artificially, either intentionally, or incidentally to irrigation and that otherwise would have been dissipated by natural waste." WASH. REV. CODE § 90.44.035(5) (1992). The artificial groundwater law was intended to allow for the recovery and use of groundwater occurring incidentally to irrigation. WESTERN STATES WATER COUNCIL, GROUNDWATER RECHARGE PROJECTS IN THE WESTERN UNITED STATES IV-97 (October, 1990) [hereinafter WESTERN RECHARGE PROJECTS].

44. Public groundwaters are all "natural ground waters" of the state as defined in WASH. REV. CODE § 90.44.035(4) (1992), and "all artificial ground waters that have been abandoned or forfeited." WASH. REV. CODE § 99.44.040 (1992).

1. *Washington's Artificial Groundwater Statute*

In order to use artificially stored groundwater, claimants must file a certified declaration of ownership with the Department of Ecology (Ecology).[45] Claimants may file such declarations in connection with an application to appropriate public waters, or the declarations may be related to activities covered under an existing permit or certificate of right to appropriate public waters.[46] A declaration must include (1) the source of artificially stored water, (2) a description of the overlying lands, (3) the amount of water claimed, (4) the earliest date of artificial storage, (5) evidence showing that the water comes from the source identified, and (6) any additional information requested by Ecology.[47]

Before a declaration will be accepted, Ecology must define the location of the artificially stored groundwater by designating or modifying a groundwater area, sub-area, or zone.[48] The designation requirement poses problems for ASR developers because normally the designation or modification of a groundwater area, sub-area, or zone requires either fifty or one-fourth of the groundwater users in the affected area or zone (whichever is less) to petition Ecology.[49] Not surprisingly, ASR project developers have experienced difficulty in convincing other groundwater appropriators to join in petitioning Ecology for a groundwater designation.[50]

This does not mean that ASR developers are without options. Ecology may propose groundwater area, sub-area, or zone designations on its own motion

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45. WASH. REV. CODE § 90.44.130 (1992). *See* Jensen v. Department of Ecology, 685 P.2d 1068, 1072 (Wash. 1984) (holding that artificially stored groundwater, including water that is incidental to irrigation, does not lose its identity and become public property when it commingles with natural groundwater). Thus, water users who file within the time limits specified in WASH. REV. CODE § 90.44.130 retain the use of artificial groundwater that they introduced.

46. WASH. REV. CODE § 90.44.130 (1992). Ecology must notify both the Departments of Fisheries and Wildlife of any permit application to divert or store water. Approval from one or both departments is needed for any project that may impact the flow of surface waters. WASH. REV. CODE § 75.20.050 (1994).

47. WASH. REV. CODE § 90.44.130 (1992).

48. *Id.* Designation of a groundwater area or zone by Ecology gives force and effect to other provisions of this section (i.e. accepted declarations of ownership of artificially stored groundwater). ASR projects tend to occupy sub-areas--that is, part of a public groundwater body--whereas areas and zones typically define an entire discrete body of public groundwater. Groundwater areas and zones "shall, as nearly as known facts permit, be so designated as to enclose a single and distinct body of public ground water." ASR projects are permissible because a sub-area "may be so designated as to enclose all or any part of a distinct body of public ground water[.]" *Id.*

49. WASH. REV. CODE § 90.44.130 (1992).

50. Letter from Robert L. Wubbena, President, Economic and Engineering Services, Inc., to Robert Gordon, Water Department, City of Walla Walla, Wash. (July 8, 1998) (outlining plans to get community leaders to support the city's ASR development plan).

as necessary to prevent the overdraft of public groundwaters.[51] Thus, if a developer convinces Ecology that an ASR project will protect an aquifer from overdraft, Ecology may order a designation, allowing the project to go forward. The designation process is, however, subject to public notice and hearing regardless of who initiates it.[52] As a result, appropriators, who are concerned about the potential effect of an ASR project on their water rights may object and seek review of the proposed designations or modifications.[53]

Ecology is responsible for establishing, among other things, the priorities of rights to withdraw public groundwater.[54] Washington's artificial groundwater statute allows appropriators to reuse water introduced into the aquifer by their actions without adversely affecting the rights of other public (natural) groundwater appropriators. However, by assuring that all natural groundwater rights are fully satisfied before allowing any recovery of artificial groundwater, the law favors the rights of public groundwater appropriators over claimants who declare ownership of artificially stored groundwater. For example, when a groundwater area, sub-area, or zone is designated or modified, Ecology must make written findings and enter the designation by order. Only after Ecology enters the designation order may persons claiming ownership of artificially stored groundwater file their declarations. Claimants must file their claims with Ecology within ninety days for activities that pre-date designation, or within three years of the commencement of activities that begin after designation.[55] These claims are subject to public notice and comment.[56]

Due mainly to the designation requirements, Washington's artificial groundwater law is ill-suited for ASR project development. Existing ASR projects operate in aquifers controlled by municipal water users. According to one urban planner seeking to develop a project in an aquifer shared by many water

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51. WASH. REV. CODE § 90.44.130 (1992). It appears that Ecology does not have clear authority to approve ASR projects over the objections of other groundwater appropriators because area designations must be based on aquifer conditions. Proposed ASR legislation (withdrawn from legislative consideration) specified that the department should delineate the area and aquifer zones based on where project water was to be stored. *See* Proposed Legislation, *supra* note 17, § 18(5). If Ecology already has the authority to delineate areas on grounds other than natural aquifer conditions, the proposed language would have been unnecessary.

52. WASH. REV. CODE § 90.44.130 (1992).

53. *Id.* If Ecology makes an affirmative finding after hearing objections it shall file a written order designating the area, sub-area, or zone. *Id.*

54. *Id.* Ecology's findings and order are subject to review by the pollution control hearings board under WASH. REV. CODE § 43.21B.310 (1998).

55. WASH. REV. CODE § 90.44.130 (Supp. 2000). Both time limits to be extended up to two years for good cause. *Id.* Whenever a claimant begins withdrawing artificially stored groundwater a declaration must be filed within 90 days of the first withdrawal.

56. *Id.*

users, Washington's public groundwater appropriators are concerned about the growing influence of municipalities.[57] Because the designation requirements favor public groundwater appropriators over artificial groundwater appropriators, the public groundwater appropriators are in a position to make ASR development difficult and costly, suggesting the need for reform if Washington wants to pursue ASR development.

2. *Washington's Failed ASR Statute*

A water bill in the 1999 Washington Assembly contained provisions intended to make it easier for Ecology to authorize the storage and recovery of groundwater.[58] The ASR language in the proposed amendments was later withdrawn in the interest of passing other water law reforms.[59] Nevertheless, it is instructive to examine the withdrawn language because it was designed to work within Washington's regulatory scheme. Moreover, future efforts at ASR legislation are likely to incorporate ideas from the withdrawn amendment.

The intent of the proposed ASR bill was to encourage artificial storage and recovery by injection or infiltration as a means of expanding the supply of water for future needs.[60] The key proposal would have done away with the groundwater area designation requirement.[61] Specifically, Ecology would only have had to "*delineate* the area and the aquifer zones in which water is to be artificially stored and recovered."[62] That step alone would have dramatically streamlined the application process by eliminating the notice and hearing requirements.

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57. Telephone Interview with Robert Gordon, Water Supervisor, City of Walla Walla, Wash. (Jan. 12, 1999) (reporting that the city is currently addressing concerns from other appropriators such as groundwater quality and influence of the municipality over rural appropriators).

58. *See* Proposed Legislation, *supra* note 17, § 17 (amending chapter WASH. REV. CODE § 90.44). The proposed legislation specifically included projects designed to use reclaimed water (treated waste water) in accordance with chapter WASH. REV. CODE § 90.46. *Id.* § 17(7).

59. *See* Schlender, *supra* note 22. Other provisions of the proposed water reform legislation included amendments intended to (1) clarify Ecology's authority to require metering and reporting of water use; (2) strengthen policies regarding efficiency and conservation in the use of water and to encourage the use of reclaimed water; and (3) modify existing transfer procedures to allow for allocation of conserved water. Proposed Legislation, *supra* note 17, at §§ 1-35.

60. Proposed Legislation, *supra* note 17, § 18(1).

61. *Id.* § 18(5).

62. *Id.* § 18(5) (emphasis supplied).

Under the proposed system, applicants for an ASR permit would have had to provide Ecology with detailed hydrologic and geochemical data.[63] Test projects operating under a preliminary permit would have allowed collection of the necessary information.[64] In addition to an ASR permit, applicants would have had to apply for a right to appropriate the source water, or to transfer the place or type of use, if such a right had already been secured from another water user.[65] A water quality permit would have been required to recharge aquifers with reclaimed water,[66] and may have been necessary to use any foreign waters as a recharge source.[67] In spite of these permitting requirements, ASR developers are likely to support similar legislation in the future because not only will it streamline the process, but more importantly, it will provide ASR projects with an exclusive right to use stored water, something lacking under the present system.[68]

### C. *Idaho*

Idaho does not have an ASR statute. Nevertheless, there has been some ASR development in Idaho under the state's groundwater recharge statute, and there is the potential for development under the state's wastewater injection laws. In either instance, ASR development is severely limited by potential conflicts between groundwater appropriators and ASR project developers. Thus, like Washington, ASR projects in Idaho are generally limited to aquifers where the project developer is the dominant appropriator.

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63. *Id.* § 18(3). Geochemical data would only have been required where the source water would have commingled with natural groundwater. *Id.* Notably, the proposed amendment would have made artificial storage and recovery projects ineligible for a permanent water right and limited permits to fifty years. *Id.* § 18(7).

64. *Id.* § 18(3) (referencing the preliminary permit procedures contained in WASH. REV. CODE § 90.03.290).

65. Proposed Legislation, *supra* note 17, § 18(4). The potential for development of ASR projects in Washington is presently limited because under existing law water appropriated for a beneficial use may not be transferred to storage. Telephone Interview with Tom McDonald, Att'y, Dep't of Ecology (Jan. 15, 1999).

66. The use of reclaimed water is regulated under chapter WASH. REV. CODE § 90.46. *See* discussion of Washington's reclaimed water statute *infra* Part III.A.3.b.

67. Proposed Legislation, *supra* note 17, § 18(6) (would have required Ecology to deny permits as not in the public interest if the source waters and receiving waters were found to be chemically incompatible).

68. *Id.* § 18(1).

1. *Idaho's Groundwater Recharge Statute*

Idaho's groundwater recharge statute declares that the underground storage of water is a beneficial use and authorizes the Department of Water Resources (IDWR) to issue permits and licenses for the underground storage of "unappropriated waters of the state."[69] Unlike Washington, Idaho does not distinguish between artificial groundwater and naturally occurring groundwater.[70] Nor does Idaho recognize incidental recharge created by irrigation, for instance, as a beneficial use.[71] Therefore, under Idaho law developers can obtain a right to add water to an aquifer but they cannot prevent other appropriators from using it, because once the water reaches the aquifer it becomes generally available for use.[72]

Recharge permits and licenses are subordinated by statute to all perfected water rights.[73] As a result, aquifer recharge projects cannot interfere with reservoir storage rights during the winter and spring. The subordination provision gives the director of IDWR the necessary authority—subject only to recharge project financing agreements—to reduce the amount of water diverted for recharge purposes, even if enough water is available to meet the original amount authorized.[74] If, however, recharging activities actually injure an existing water right, the director loses discretion and must order a cessation of recharging operations until the recharger corrects the problem.[75]

Generally speaking, Idaho's groundwater recharge statute is unsuitable for efficient ASR development. The problem is similar to the one faced by ASR developers in Washington and in Oregon under that state's general recharge law. Specifically, water added to an aquifer under the recharge statute is avail-

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69. IDAHO CODE § 42-4201A(2) (1999).

70. *See* WESTERN RECHARGE PROJECTS, *supra* note 43, at IV-37.

71. *See* WESTERN RECHARGE PROJECTS, *supra* note 43, at IV-36; Letter from John Rosholt, Att'y, Rosholt, Robertson & Tucker to author (Feb. 11, 1999) (describing failed effort to add recharge as an authorized beneficial use to all irrigation rights). Presumably, the holder of a valid right to appropriate surface water for irrigation could transfer the use to recharge. However, Idaho's recharge law is similar to Oregon's in that water added to the aquifer becomes available for use by other groundwater users. Thus, the recharging entity loses control of the stored water, which is a major disincentive for ASR development.

72. *See* WESTERN RECHARGE PROJECTS, *supra* note 43, at IV-37.

73. IDAHO CODE § 42-4201A(2) (1999) (this provision supersedes any contract provisions subordinating power company storage rights to other upstream water rights under IDAHO CODE 42-203B); *Cf.* Rosholt, *supra* note 71, at 1 (explaining that seasonal flows during the non-irrigation season are a primary source for filling some reservoirs). If recharge rights were not subordinated, groundwater users could augment supplies during the winter at the expense of surface storage rights.

74. IDAHO CODE § 42-4201A(3) (1999).

75. *Id.* § 42-4201A(4).

able to all appropriators, subject to their priority of right.[76] Therefore, any appropriator with a valid groundwater right can withdraw water injected by someone else.

Idaho law authorizes the formation of recharge districts to represent the interests of its members.[77] Generally, recharge districts appropriate surface water and add it to the aquifer to ensure there is enough groundwater to satisfy its members' individual rights. According to Idaho officials, the recharge statute does not entitle the recharge district to directly appropriate any of the groundwater that it added to the aquifer.[78] Currently, there is a moratorium on groundwater appropriations from the Snake River aquifer.[79] Obviously, the inability to appropriate stored groundwater has been fatal to ASR development.

Idaho's recharge statute is centered around recharge districts. The formation of a recharge district requires fifty percent or more of the "water users" in the proposed district to petition IDWR.[80] IDWR's director may grant the petition after notice and hearing upon a determination that the district boundaries are properly defined, and the district will provide the benefits described.[81] Water users are defined as individual appropriators who divert more than one cubic foot per second from a well or spring-fed stream, or municipalities that obtain water from the proposed recharge area.[82] Each municipality is considered a single water user for the purposes of petitioning IDWR, and its sole vote is cast in accordance with the majority wishes of the city's council.[83]

ASR development for municipal use is disfavored under Idaho's recharge law because agricultural water users heavily outnumber municipalities. Even if developers could convince other water users to form a recharge district and obtain a right to appropriate stored water, the right to do so would be junior to all other appropriators. It is not impossible, however, for an ASR-style project

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76. *See* WESTERN RECHARGE PROJECTS, *supra* note 43 at IV-37. The primary function of the recharge statute is to assure an adequate supply of water for groundwater appropriators while protecting surface water rights that depend on spring flows fed by groundwater. IDAHO CODE § 42-4201A(4) (1999).

77. IDAHO CODE § 42-4202 (1999).

78. WESTERN RECHARGE PROJECTS, *supra* note 43 at IV-37-38; Telephone Interview with Paul Castelin, Idaho Department of Water Resources (Dec. 18, 1998).

79. IDAHO ADMIN. CODE 37.03.08.040 (1999); Rosholt, *supra* note 71, at 2 (indicating that the moratorium on new permits was motivated by the overappropriation of groundwater and the need to augment instream flows for endangered salmon).

80. IDAHO CODE § 42-4202 (1999). The 50% requirement effectively guarantees that recharge districts will only be formed when it is in the best interests of a majority of the irrigators within the proposed district.

81. IDAHO CODE. §42-4203 (1999).

82. IDAHO CODE § 42-4202(1) (1999).

83. IDAHO CODE § 42-4202(2) (1999).

to be developed under Idaho's recharge law. If, for example, a municipality agreed to finance the construction of a recharge project, the other potential district members could, presumably, agree to lease the city a share of the water added to the aquifer.[84]

2. *Injection Wells*

In order to protect groundwater quality from unreasonable contamination or deterioration, Idaho regulates the construction and use of injection wells.[85] Statutes governing injection wells focus on the effect of waste disposal on groundwater quality.[86] However, the same statutes hold some promise for ASR development. Injection well operators may apply to IDWR for a permit to inject water and, according to one source, IDWR has permitted the appropriation of injected water, but only when there is no risk of injury to existing water rights.[87] To obtain an injection permit, a project developer must show that injected water will not violate the groundwater quality standards established by the Idaho Department of Health and Welfare.[88]

In addition to information about the quality of the injected water, permit applicants must provide enough hydrologic information for IDWR to determine the effect injection will have on the quality and use of the receiving aquifer.[89] Injection applications are subject to public notice and, at the director's discre-

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84. Among the powers recharge districts possess is the power to contract and levy assessments. IDAHO CODE § 42-4212(3), (9) (1999).

85. Underground injection control (UIC) is a federal program enacted under the Safe Drinking Water Act at 42 U.S.C. § 300h-1(a) (Supp. 1998). The purpose of the Act is to protect drinking water from contamination caused by the disposal of liquid wastes using injection wells. 42 U.S.C. § 300h(d) (Supp. 1998). Activities most commonly associated with underground injection are industrial discharge, sewage disposal, groundwater remediation, and oil and gas production. *See* GROUNDWATER AND WELLS, *supra* note 6, at 776-77. Idaho's UIC program, which is found at IDAHO CODE § 42-3901 to 3919 (1999), defines "injection well" as any excavation or artificial opening into the ground that meets the following three criteria: (a) It is a bored, drilled, or dug hole, or is a driven mine shaft or a driven well point; and (b) It is deeper that its largest straight-line surface dimension; and (c) It is used for or intended to be used for injection. IDAHO CODE § 42-3902(8) (1999). Notably, irrigation ditches do not meet part (b) of this definition and are therefore not regulated as injection wells, even when they are used to recharge aquifers. Most of the recharge activity in Idaho uses ditches, so no UIC permit is required.

86. Chapter 39 of Title 42 is entitled "Waste Disposal and Injection Wells." Additionally, applications to operate injection wells must discuss the "availability of alternative sources of disposal[.]" IDAHO CODE § 42-3904 (1999).

87. Rosholt, *supra* note 71, at 2 (explaining that an injection permit can be obtained under IDAHO CODE § 42-3904, provided that the quality criteria are met).

88. IDAHO CODE § 39-120 (1999). *See* Ground Water Quality Rule, IDAHO ADMIN. CODE 16.01.11.000 *et seq.* (1999).

89. IDAHO CODE § 42-3904(1) (Supp. 1999).

tion, an investigative hearing.[90] IDWR may issue an injection permit if it finds that the proposed injection well will not interfere with other water rights.[91] The director may condition the permit as necessary to protect the public interest[92] and may, after a hearing, cancel permits that interfere with the right of the public to withdraw groundwater or cause unreasonable deterioration of ground water quality.[93]

### D. *Montana*

Unlike the other states in the Columbia Basin, Montana does not recognize recharge as a beneficial use.[94] Further, Montana has no groundwater recharge statutes.[95] Thus, ASR projects cannot obtain a right to store water underground.[96] Not surprisingly, there is no regulated ASR activity in Montana. In the event ASR development is proposed under existing laws, it is likely, according to Montana state officials, that the regulatory emphasis would be on the diversion of source water for recharge.[97]

Groundwater quality is protected under Montana's water pollution control laws.[98] Permits are required to insure that discharges into state waters do not lead to unnecessary degradation.[99] Similar to suggestions made concerning Idaho's UIC program, ASR developers in Montana could obtain a discharge

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90. *Id.* § 42-3907.

91. *Id.* § 42-3908.

92. *Id.*

93. *Id.* § 42-3910.

94. "Beneficial use", unless otherwise provided, means:
(a) a use of water for the benefit of the appropriator, other persons, or the public, including but not limited to agricultural (including stock water), domestic, fish and wildlife, industrial, irrigation, mining, municipal, power, and recreational uses;
(b) a use of water appropriated by the department for the state water leasing program under 85-2-141 and of water leased under a valid lease issued by the department under 85-2-141;
(c) a use of water by the Department of Fish, Wildlife, and Parks pursuant to a lease authorized under 85-2-436.

Mont. Code Ann. § 85-2-102(2) (1999) (effective July 1, 2005, terminates June 30, 2009). The statute effective July 1, 2009 will omit part (c). The statute currently in force also contains a part (d) for an Upper Clark Fork pilot program.

95. *See* WESTERN RECHARGE PROJECTS, *supra* note 43, at IV-45 (Oct. 1990).

96. *Id.*

97. *Id.* (discussing Montana's response to a Western States Water Council questionnaire).

98. MONT. CODE ANN. §§ 75-5-101 to 75-5-1122 (1999).

99. MONT. CODE ANN. § 75-5-401 (1999).

permit to recharge aquifers by injection or infiltration, then separately appropriate that water for a beneficial use.[100] This scheme would work only if the project could obtain an exclusive right to the use of some or all of the stored water, either because of no senior groundwater appropriators using the aquifer or by agreement with existing appropriators.

Because Montana is not actively considering ASR legislation or developing ASR projects under existing law, Part III of this study, concerning ASR-related issues, focuses on the other three basin states. However, Montana is a major upstream source of water in the Columbia River system, and Montana will probably eventually be asked to consider ASR projects. At that time it will be important for Montana to create laws that consider the issues discussed below.

## III. ASR DEVELOPMENT ISSUES

Basin dams lack the capacity to store all of the annual runoff, and most of the water that is stored behind dams is controlled by agriculture.[101] Municipalities are particularly interested in ASR because it offers a way to divert and store some of the runoff that remains unappropriated. In the past, aquifer recharge was used primarily to make more groundwater available for irrigators, and states enacted laws to regulate such activity. The idea of storing large quantities of water underground for the exclusive use of a single appropriator is relatively new, and presents a number of issues that were not contemplated when traditional recharge laws were enacted.

Several ASR projects are presently operating in the basin. Most of this development has occurred without the benefit of clear comprehensive statutory control. Two compelling reasons dictate why future ASR development requires legislative action. First, clear legislation will reduce the potential for conflict between ASR developers, existing water users, and state agencies. The problem is that the ASR concept disrupts the existing priority system by granting developers an exclusive right to recover recharged groundwater, something that does not exist under traditional appropriation law.

Second, legislation is needed to limit the diversion of unappropriated flows. The pressure on basin municipalities to develop new water supplies is intense. In the absence of statutory limits, ASR development is likely to continue under the current process of creative regulation by state agencies. Those agencies are relying on laws that were enacted when technology did not allow such large quantities of artificially stored water to be recovered efficiently from the

100. Agricultural irrigation facilities and storm water disposal facilities are expressly exempt. MONT. CODE ANN. § 75-5-401(5)(f), (g) (1999). Further, the Board of Environmental Review may adopt rules exempting other disposal activities from the permit requirements. MONT. CODE ANN. § 75-5-401(8) (1999).

101. MacDonnell et al., *supra* note 4, at 1-1.

ground. Unrestrained ASR development, coupled with the improved ability to store and recover large quantities of water from aquifers, will aggravate environmental problems in the basin's watersheds.[102]

### A. *The ASR Concept and Water Law in the Columbia Basin*

The four basin states regulate the use of water under the prior appropriation doctrine.[103] The ASR concept provides for an exclusive right to the use of stored water. That arrangement conflicts with several traditional aspects of prior appropriation law, including issuance of water rights, priority of right, beneficial use without waste, and conditional transferability.[104]

#### 1. *The Prior Appropriation Doctrine*

##### a. *Issuance of Water Rights*

In appropriation states, government control of water is based on public ownership.[105] On behalf of the public, states may issue a water right to citizens under some form of statutory authorization such as a permit, certificate, or

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102. A typical municipal ASR project may store hundreds of millions of gallons of water. *See* LIMITED LICENSE #002, *infra* note 116 (authorizing the annual storage of 1.2 billion gallons of water); Joe Glicker & Paul Eckley, ASR Case Study - City of Salem, Oregon, unpublished report (Jan. 8, 1996) (detailing plans to store 440 million gallons of water every year for municipal use); *See* WALLA WALLA PILOT TEST WORK PLAN, *supra* note 12, at 1-1 (city is studying the feasibility of a 13 million gallon per day capacity ASR system). Extensive ASR development will further alter natural flow regimes in the basin. Any negative effects from ASR development would be in addition to those already created by dams, which are widely considered as the leading cause of severe environmental damage such as plummeting salmon stocks in the Pacific Northwest. *See* Michael C. Blumm, et al., *Saving Snake River Water and Salmon Simultaneously: The Biological, Economic, and Legal Case for Breaching the Lower Snake River Dams, Lowering John Day Reservoir, and Restoring Natural River Flows*, 28 ENVTL. L. 997 (1998) (arguing that breaching dams is the most important step for restoring Columbia River salmon).

103. Prior appropriation law is codified in all four basin states. IDAHO CODE Title 42; MONT. CODE ANN. Title 85; OR. REV. STAT. Chapter 537; WASH. REV. CODE Chapter 90.03. The prior appropriation doctrine is established in the Idaho Constitution, dating to 1889. IDAHO CONST. Art XV, § 3. In Montana the doctrine is rooted in statutes of the 1860s and 1870s. *See* Mettler v. Ames Realty Co., 201 P. 702, 706-07 (Mont. 1921). Oregon codified prior appropriation as the law of the state in 1909. Washington followed suit in 1917, becoming the last state in the West to adopt a comprehensive water code. Benson, *supra* note 1, at 882 n.1 (citations omitted).

104. *See* Benson, *supra* note 1, at 7-10 (summarizing the fundamental points of western water law).

105. The public owns the water in all four of the basin states. IDAHO CONST. art. XV, § 1; IDAHO CODE § 42-101 (1996); MONT. CONST. art. IX, §3(3); MONT. CODE ANN. § 85-2-101 (1999); OR. REV. STAT. § 537.110 (1998); WASH. REV. CODE § 90.03.005 (1999).

limited license.[106] A few potential sources of ASR project water may be exempt from appropriation requirements.[107] However, as a practical matter, most recharging activities will require a "primary" water right to appropriate project source waters. ASR developers may apply for a new permit to divert unappropriated waters, or apply to transfer an existing water right to a new use.

One problem facing ASR projects under existing recharge laws is the need to obtain a "secondary" permit in order to withdraw and use the stored water.[108] Secondary permits add to the time and expense of project development.[109] Additionally, the multiple-permit system makes it difficult for developers to secure an exclusive right to recover the stored water because, typically, the rights granted by primary and secondary permits differ.

In order to recover all of the stored water under traditional recharge laws, the project must hold a secondary permit that matches the quantity of water recharged. To ensure the project has an exclusive right to recover stored water, the project must be either the only appropriator in the aquifer, or hold a secondary permit with an earlier priority date than the other appropriators on the aquifer. It is also important to note that existing groundwater rights are generally not suitable for ASR development because few, if any, allow for withdrawal of groundwater in quantities useful for ASR applications.[110] These

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106. Today a permit is required to establish new water rights in each of the four basin states. IDAHO CODE § 42-202 (1999); MONT. CODE ANN. § 85-2-302 (1999); OR. REV. STAT. § 537.130 (1998); WASH. REV. CODE § 90.03.250 (1999).

107. Not all potential sources of water require a water right. For example, Oregon exempts the collection of storm runoff from artificial-impervious surfaces. OR. REV. STAT. § 537.141(1)(g) (1998). Washington established a separate permitting system for using reclaimed water to supplement surface and groundwater supplies. WASH. REV. CODE § 90.46.030(4) (1999). In Idaho, sources such as early-season irrigation water, salvage water, or irrigation return flow, are diverted under an existing appropriation, and, according to one source, no additional right may be required to inject irrigation water for reuse. (Telephone Interview with John Rosholt, Att'y, Rosholt, Robertson & Tucker, in Twin Falls, Idaho (Feb. 8, 1999).

108. Recall from Part II, *supra,* that general recharge laws in Oregon and Idaho require secondary permits, and in Washington artificial groundwater users must obtain a declaration of ownership. Additionally, Washington's withdrawn ASR amendment would have required a secondary use permit. Proposed Legislation, *supra* note 17, § 18(4).

109. Basin states that have considered ASR projects under their existing appropriation laws have required two water rights. This was the primary motivation behind Oregon's ASR legislation in 1995. *See* discussion of Oregon's ASR statute, *supra* notes 23 to 26, and accompanying text.

110. Most senior water rights are agricultural and are limited in volume and restricted to the irrigation season (i.e., May-August). In contrast, ASR projects require source water during the winter. Additionally, irrigation rights typically specify a rate and duty. Duty refers to the overall volume of water an appropriator can withdraw, and rate refers to how fast the water can be withdrawn. Notwithstanding differences in the timing of irrigation and ASR withdrawals, Oregon's ASR statute attempts to resolve the issue of duty by making ASR inherent in the primary water right. The issue of rate is less easily dealt with, so to make ASR technically feasible OWRD rules allow withdrawal rates that exceed the original permitted diversion rates. OR. ADMIN. R. 690-350-0010(3) (1999).

limitations explain why most, if not all, of the ASR projects in the basin operate in aquifers with few appropriators.

Large-scale ASR development will not work under traditional recharge laws because there is no provision for secondary permits that gives an exclusive right to withdraw project water, even for appropriators that "create" the water by adding it to the aquifer. In the absence of clear statutory guidance, regulatory efforts to grant developers an exclusive right to use stored water will inevitably lead to conflict. Therefore, states that wish to facilitate ASR development must specify the relationship between ASR and other groundwater rights.

Idaho's recharge law suggests one possible relationship: subordinate the right to divert water for recharge to other water rights.[111] Similarly, a legislature could declare that existing groundwater rights are subordinate to secondary recovery rights granted to ASR projects. Oregon avoided the obvious political barriers to that approach by making ASR a beneficial use inherent in all water rights, eliminating the need for multiple permits altogether.[112] Secondary permits are thus unnecessary because the storage of project water is authorized by the primary permit.

b. *Priority of Right*

Priority is an all-important principle of appropriation water law. In many respects "first in time, first in right" is the essence of the doctrine.[113] As discussed above, ASR projects developed under traditional appropriation laws require a "primary right" to divert source water and a "secondary right" to recover the stored water for its intended use. The problem for ASR developers is that in all but the rarest of circumstances the secondary right, issued to recover stored water, will have a junior priority date. A junior priority date means that when water is scarce, the junior appropriator has to quit withdrawing groundwater first. For an ASR project that would mean that water it stored could be used by senior appropriators. That prospect is, of course, a serious disincentive to ASR development.

In the previous section, two methods were suggested for modifying the multi-permit requirement for recovering recharged groundwater. The first suggestion was to make all other groundwater rights subordinate to secondary recovery rights.[114] While that might be the simplest legal solution, it is proba-

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111. *See* IDAHO CODE § 42-4201A(2)(1999), *supra* note 69 and accompanying text.

112. OR. REV. STAT. § 537.531 (1998).

113. Robert E. Beck, *Prevalence and Definition*, in 2 WATERS AND WATER RIGHTS, § 12.03(c).

114. *See* IDAHO CODE § 42-4201A(2) (1999), *supra* note 69, and accompanying text.

bly "dead on arrival" politically. The second suggestion, which Oregon adopted, is to make ASR an inherent component of other water rights.[115] The Oregon approach eliminates the need for two permits, but it does not solve all of the issues regarding priority. The following hypothetical illustrates the problem.

Assume that OWRD grants City an ASR permit based on City's 1910 water right from River. That winter City begins injecting river water into aquifer which, prior to City's involvement, was shared by two appropriators. Farmer has a 1900 groundwater right, and Chipmaker has a 1980 groundwater right. City injects 500 acre-feet. However, due to a below average snow pack, aquifer does not receive sufficient natural recharge to replace what Farmer and Chipmaker removed the previous year.

During the following summer Watermaster tells Chipmaker to stop withdrawing water.[116] Chipmaker argues that City got there last, so City should have to stop withdrawing water first. City responds that the water it is recovering would not be there if City had not injected it and, in any event, City's 1910

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115. *See* OR. REV. STAT. § 537.531 (1998) *supra* note 23, and accompanying text. Oregon made ASR a beneficial use inherent in all water rights, and then limited the ability to exercise that right to projects with a source of water that meets the state's drinking water standards. OR. REV. STAT. § 537.531 (1998). By restricting ASR permits to projects with such high quality source water, Oregon effectively limited ASR development to municipal developers. An alternative, and one that Oregon may want to consider, is to restrict ASR development to municipal water rights directly, thereby eliminating the possibility that irrigation districts with adequate treatment facilities might qualify for an ASR permit. A broader approach is suggested by Washington's reclaimed water statute. *See infra* notes 198 - 205 and accompanying text. For example, states interested in more aggressive ASR development could allow the injection of lower quality water into aquifers having water quality equal to, or lower than, the quality of the source water. In that way, industrial and agricultural water users that do not have access to treatment facilities could more easily develop ASR projects without degrading groundwater quality. *See generally* WASHINGTON STATE DEPARTMENT OF ECOLOGY AND DEPARTMENT OF HEALTH, WATER RECLAMATION AND REUSE STANDARDS (Draft, Sept. 1997).

116. The curtailment of groundwater withdrawals is more complicated than the curtailment of surface diversions because all withdrawals contribute to declining water levels, and it is difficult to determine the effect of one person's withdrawal on another person's water right. Moreover, in contrast to surface rights, aquifers do not "run dry." Instead, the piezometric level (potential water table elevation) goes down, resulting in higher extraction costs and changes in water quality. WESTERN RECHARGE PROJECTS, *supra* note 43, at VI-10 to 11. In Oregon, designated critical groundwater areas tie allowable withdrawals to water table elevation. When the level drops to a predetermined elevation, withdrawals are curtailed. *See generally* OR. REV. STAT. § 537.735 (1997). Withdrawals made under Oregon's general recharge statute are also tied to aquifer levels. OR. ADMIN R. 690-350-130(4)(g) (1999). Conditions placed on ASR permits may require a project to cease pumping when aquifer levels drop to some established threshold. *See generally* OREGON WATER RESOURCES DEPARTMENT, AQUIFER STORAGE AND RECOVERY (ASR) LIMITED LICENSE #001 p. 5 (Mar. 6, 1997) [hereinafter LIMITED LICENSE #001]; OREGON WATER RESOURCES DEPARTMENT, AQUIFER STORAGE AND RECOVERY (ASR) LIMITED LICENSE #002 p. 6 (July 22, 1998) [hereinafter LIMITED LICENSE #002]. In reality ASR projects in Oregon negotiate the appropriate water table elevation for curtailing recovery with OWRD. Meeting between City of Beaverton, Oregon, Tualatin Valley Water District and OWRD (Jan. 13, 1999).

water right is senior. In that case City will probably win because its water right is senior.[117]

The more challenging issue arises when Watermaster tells Farmer to stop withdrawing groundwater. Farmer can reasonably argue that City's water right is junior and therefore City should be cut off before Farmer. City can only argue that it is entitled to continue recovering water because it put the water into the aquifer. Farmer can then argue that once City injected the water it became groundwater. Oregon's ASR statute does not expressly address this type of problem.[118] However, because Oregon does not make a legal distinction between stored water and natural groundwater, the stored water arguably becomes groundwater when it is injected, and therefore Farmer should prevail because Farmer holds the senior groundwater right.

Just as ASR legislation must be clear about the legal relationship between project rights and other water rights, it must also be clear about the physical relationship between project water and natural groundwater.

c. *Beneficial Use Without Waste*

Two permits are needed to operate an ASR project under existing recharge laws because, traditionally, a single water right cannot provide for more than one beneficial use.[119] To obtain a water right, water users must put public waters to an approved beneficial use.[120] Examples of approved beneficial uses

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117. OWRD rules provide that "[t]he use of water under a water right as injection source water for an ASR project up to the limits allowed in the ASR permit neither affects the *priority date* of the water right, nor changes the use permitted upon its recovery[.]" OR. ADMIN. R. 690-350-010(3) (1997) (emphasis added). Therefore, it is clear that under OWRD's interpretation, stored water retains the priority date of the primary water right. That interpretation appears consistent with the statute, but it is worth noting that the ASR statute itself does not specify that stored water retains the priority of the original water right.

118. State agencies are free to address the problem by imposing conditions on water right permits. LIMITED LICENSE #002 *supra* note 116, at 3 (recovery of stored water does not receive priority protection, and withdrawal of water in excess of storage shall be considered a draft of natural ground water). However, regulatory conditions do not take the place of clear statutory controls. At least one state, Arizona, has specified that water stored in an aquifer retained its legal character. ARIZ. REV. STAT. §§ 45-812.01, 831.01 (1999). *See also* ARIZ. REV. STAT. §§ 45-852.01, 856.01 (1999) (Long-term storage accounts and protection of stored water, respectively). Thus, surface water injected into the aquifer for storage remains legally distinct from groundwater already in place. Washington distinguishes between natural groundwater and artificial groundwater. *See* discussion of Washington's artificial groundwater statute *supra* Part II.B.1; *see also* Jensen v. Department of Ecology, 102 Wash.2d 109, 116, 685 P.2d 1068, 1072 (1984) (holding that artificially stored groundwater, including water that is incidental to irrigation, does not lose its identity and become public property when it commingles with natural groundwater).

119. NATIONAL WATER COMMISSION, A SUMMARY-DIGEST OF STATE WATER LAWS 32 (Richard L. Dewsnup and Dallin W. Jensen eds., 1971); Neuman, *supra* note 3, at 920 (explaining that a right to use water is acquired by applying water to a beneficial use).

120. NATIONAL WATER COMMISSION, *supra* note 119, at 29.

include irrigation, domestic use, in-stream flow, and, in Oregon and Idaho, aquifer recharge.[121]

Oregon law provides that "aquifer storage and recovery is a beneficial use inherent in *all* water rights."[122] The effect of Oregon's ASR statute, which has not yet been challenged in court, is profound because not only does it eliminate the need for secondary rights, it effectively combines more than one beneficial use in a single water right. As a result, all water rights in Oregon are potential sources for ASR projects, subject only to limits established by the ASR statute[123] and the "no-harm rule," discussed below.[124]

Beneficial use is not just the type of use, it is also the measure of a use.[125] Under the prior appropriation doctrine, water diverted in excess of an amount that can be applied beneficially is considered waste, and states may deny appropriators a right to divert waste.[126] Thus, ASR projects are limited, at least in theory, to diverting only the amount of water needed to meet the project needs. To illustrate: if a municipal ASR project stored 200 acre-feet[127] of water during the winter, but only recovered 150 acre-feet, under the waste doctrine it could lose the right to divert the difference—referred to as "carry-over" in ASR parlance.[128]

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121. *See supra* Part II. In the event that Montana adopts recharge legislation, a similar declaration would ensure that such projects are consistent with the beneficial use requirement.

122. OR. REV. STAT. § 537.531 (1998) (emphasis supplied).

123. *See* discussion of limits on ASR in Oregon, *supra* notes 27-29 and accompanying text (ASR projects in Oregon must use source water that meets drinking water standards. Additionally, ASR projects may not have aquifer recovery as a primary purpose. OR. REV. STAT. § 537.531 (1998)). Thus, an ASR developer can purchase and use any water right, so long as the water meets drinking water standards and is applied to its originally intended use or transferred to a new use.

124. *See* discussion of conditional transferability, *infra* Part III.A.1.c.

125. "Beneficial use shall be the basis, the measure, and the limit of all rights to the use of water in this state." OR. REV. STAT. § 540.610(1) (1998).

126. NATIONAL WATER COMMISSION, *supra* note 119, at 32. *But see* Karen A. Russell, *Wasting Water in the Northwest: Eliminating Waste as a Way of Restoring Streamflows*, 27 ENVTL. L. 151 (1997) (demonstrating that anti-waste laws in Oregon, Washington, Idaho, and Montana are seldom enforced, despite widespread wasteful practices).

127. One acre-foot of water is 325,900 gallons or enough to cover one acre of land to a depth of one foot. S. DAVIS & R. DEWEIST, HYDROGEOLOGY 446 (1966).

128. Similar to seepage losses when irrigation water is transported in ditches, reasonable aquifer losses are not considered waste. In fact, OWRD assumes that some water stored under Oregon's ASR statute will be lost to leakage or migration and initially limits the recovery of stored water to 95% of stored amount. *See* LIMITED LICENSE #001, *supra* note 116, at 5. Oregon's ASR statute provides for the recovery of up to 100% of stored water if valid scientific data shows that it is available. OR. REV. STAT. § 537.534 (1998) Data collected during the pilot-phase under a limited license is used to make the determination. *Id.*

In practice, however, the doctrine of waste is rarely applied to reduce or cancel existing uses.[129] The near total failure of courts to enforce the waste doctrine illustrates the need for legislation to minimize excessive ASR diversions.[130] The risk is that, in the absence of statutory control, ASR projects will divert more water than necessary in order to build-up groundwater supplies depleted by drought or, more likely, by overappropriation.

Oregon precludes ASR projects that have aquifer restoration as one of their *primary* purposes.[131] But, "[n]otwithstanding any other provision of law," water injected under an ASR permit "shall not be considered a waste. . . ."[132] Therefore, carryover is not waste, but water that leaks from the aquifer is lost.[133] Taking aquifer leakage into account, OWRD allows ASR permit holders to recover up to ninety-five percent of carryover from the previous year.[134] Oregon's failure to deduct carryover from the quantity of water that can be diverted during the following year not only allows ASR projects to restore aquifers as a secondary purpose, it encourages cities to hoard water by diverting more than is needed to meet existing demands.

ASR statutes should specifically deduct carryover from diversions made in subsequent years. To do otherwise invites the wasteful use of water by encouraging ASR projects to divert more water than they can use in the coming year. And, to the extent Oregon's ASR statute allows this practice, it should be amended.

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129. Russell, *supra* note 126, at 152.

130. See Neuman, *supra* note 3, at 928-46 (discussing the reasons why courts do not reduce water rights on account of waste). For a discussion of how modification of the traditional prior appropriation doctrine can create a disincentive to curbing wasteful practices see Krista Koehl, *Partial Forfeiture of Water Rights: Oregon Compromises Traditional Principles to Achieve Flexibility*, 28 ENVTL. L. 1137 (1998).

131. OR. REV. STAT. § 537.531 (1998) (emphasis added).

132. OR. REV. STAT. § 537.532(1) (1998).

133. Aquifer leakage is analogous to infiltration or evaporation losses from surface storage projects and probably would not be considered waste. Aquifer leakage rates are determined during a project's pilot phase. *See* OR. REV. STAT. § 537.534 (1998).

134. *See* LIMITED LICENSE #002, *supra* note 116, at 5.

d. *Conditional Transferability*

In many parts of the basin no water is available for new appropriations.[135] Therefore, ASR developers must use, purchase, or lease existing rights.[136] Under the doctrine of prior appropriation, a formal transfer is needed to apply water to a new place or type of use.[137] Water rights are a form of property, appurtenant to the designated place of use, and a transfer is needed to convey that property.[138] Transfer applications are subject to the "no-harm rule," which stipulates that water right transfers may not injure other water rights.[139] If it appears that the transfer might interfere with other water rights, the owner or owners of the affected rights may protest the transfer.[140] Another reason for the transfer requirement is to prevent the new owner from increasing the consumptive use of water.[141]

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135. Washington has imposed a moratorium on Columbia and Snake River appropriations. Telephone Interview with Kirk Cook, Hydrogeologist, Wash. Dep't of Ecology (Jan. 15, 1999); *see also* Ellis, *supra* note 1. The Department of Ecology administratively withdrew all unappropriated waters, including hydraulically connected groundwater. WASH. ADMIN. CODE 508-14-030. In addition, Washington officials explained that state law does not allow water users to transfer beneficial uses to storage. Telephone Interview with Bill Nevy, Watermaster, Wash. Dep't of Ecology (Jan. 21, 1999) (explaining that the City of Walla Walla diverts project source water from Mill Creek in Oregon, and therefore may transfer the water to storage). *See* OR. REV. STAT. § 537.835 (1998). Idaho has also imposed a moratorium on new groundwater permits and diversions (at least in the Snake River Aquifer). IDAHO ADMIN. CODE 37.03.08.040 (1999); *See* John Rosholt, *supra* note 71 (explaining that overappropriation of groundwater poses a threat to stream flows).

136. For a detailed analysis of efforts to reallocate developed water supplies to new uses, see MacDonnell et al., *supra* note 4.

137. Transfers are normally required to change a place of use or a type of use. IDAHO CODE § 42-222(1)(1998); MONT. CODE ANN. § 85-2-402(1) (1999); OR. REV. STAT. § 540.510(1)(1999); WASH. REV. CODE § 90.03.380 (1999).

138. Nebraska v. Wyoming, 325 U.S. 589, 613-14 (1945) (defining property rights granted to federal reclamation project beneficiaries).

139. NATIONAL WATER COMMISSION, *supra* note 119, at 37-39.

140. George A. Gould, *Water Rights Transfers and Third-Party Effects*, 23 LAND & WATER L. REV. 1, 20 (1988) (explaining that grounds for challenging proposed transfers by other water users can include changes in the affected party's consumptive use, including the quality, quantity, or timing of return flows). *Cf.* IDAHO CODE § 42-222(3) (1998) which provides that *any* person feeling themselves aggrieved by IDWR's determination in approving or rejecting a transfer may seek judicial review under IDAHO CODE § 42-1701A(4) (1999).

141. The "historic use" doctrine limits the ability of water right holders to transfer more water than the appropriator has previously put to use. City of Westminster v. Church, 445 P.2d 52, 59 (Colo. 1968). Idaho specifies that a change in use may not constitute an enlargement in use of the original right. IDAHO CODE § 42-222(1) (1999). Idaho's transfer statute goes on to provide that any change to municipal use must specify any amount to be reserved for reasonably anticipated future needs. *Id.* In Oregon transfer applications must show that the water right to be transferred has been used during the most recent five years. OR. REV. STAT. § 540.520(2)(g) (1998). ASR legislation must address whether inchoate rights can be transferred. Though Oregon does not say so clearly, the answer under that state's present scheme may be yes.

The majority of existing water rights are for irrigation. Normally, when agricultural land is converted to residential use, the irrigation rights are sold. Perhaps the most likely scenario for ASR development, in areas where no water is available for appropriation, is for growing municipalities to buy irrigation rights, then transfer them to year-round municipal rights. The problem is that this scenario may allow for expanded water use while minimizing the opportunities to protest.

Irrigators divert water during the summer, whereas ASR diversions usually occur in the winter or spring. That means when a water right is transferred from irrigation to ASR, water may be left in the stream during the summer. If that water is unprotected, nothing prevents a junior appropriator from using it. Thus, even though the municipality is not using more water than the irrigator who sold the right, the overall use of water could be greater because the water that used to go to the seller now goes to a junior appropriator, while the ASR project uses the water it diverted during the winter.

Moreover, who will protest? Traditionally, only persons with a water right have standing to protest transfer applications. Because most appropriators are summer irrigators, activity that increases summer flows or decreases winter flows will usually not harm them. Thus, the number of potential protestors is diminished.[142] ASR laws must protect against the expanded consumptive use of water and should allow broader opportunities to protest project development.

Oregon's ASR scheme fails to prevent the increased consumptive use of water rights. Further, by making ASR inherent to all water rights, Oregon all but eliminated the transfer requirement, and with it the ability to protest ASR development. For example, Salem, Oregon's limited license allows the city to divert more water than it needs under an existing water right during the winter and to store the excess in an aquifer.[143] Yet, nothing stops Salem from continu-

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Courts in other states, however, have said no. *Cf.* Green River Dev. Co. v. FMC Corp., 660 P.2d 339, 344 (Wyo. 1983) (reasoning that only water that has already been put to beneficial use can be transferred); United States v. Alpine Land & Reservoir Co., 965 F.2d 731, 736 (9th Cir. 1992) (Nevada statute allowing transfer of "water already appropriated" required that water be beneficially applied before it is subject to transfer). The question of inchoate rights is important in the context of ASR because many cities hold undeveloped water rights, and the inability to transfer the type of use from domestic to storage could interfere with ASR development.

142. Power generators and irrigation projects, concerned that ASR diversions will interfere with storage rights to fill surface reservoirs, are most likely to protest transfer applications seeking to convert summer irrigation rights to a winter recharge rights. (Telephone Interview with Terry Huddleston, Director, Idaho Water Alliance on Jan. 18, 1999).

143. STATE OF OREGON, CERTIFICATE OF WATER RIGHT 12033 (July 21, 1938) (granting Salem Ore , a right to divert twenty-two cubic feet per second (cfs) from the North Santiam River for municipal use with a priority date of July 5, 1923). Interestingly, Salem's ASR License which is based on certificate 12033, allows for the diversion of up to 26 cfs, 4 cfs more than certificate 12033 provides. *See* LIMITED LICENSE #001 *supra* note 116.

ing to divert its entire water right during the summer while supplementing that right with water stored during the winter.[144] Salem did not need a transfer to store the excess water during the winter because it puts the stored water to its original use. Thus, the city was able to increase actual consumptive use of water without affording the opportunity for protest that a transfer proceeding would have provided.

A limited license is the statutory device that allows ASR developers in Oregon to conduct a pilot study.[145] One purpose of a pilot study is to evaluate the potential for harm.[146] Conventional wisdom suggests that it would not make sense to entertain protests based on potential harm when the very purpose of the pilot study is to evaluate that potential.[147] There are, however, obvious flaws in such logic, and the public would be better served by ASR legislation that resolves challenges from all interested parties early in the process.[148] In that way, states can minimize the likelihood of challenges to projects after expensive injection wells are installed to support the pilot study. Additionally, such an approach might alleviate fears that project development is all but assured when substantial expenditures are made on a pilot study before there is any meaningful opportunity for public participation.

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144. Even assuming that Salem does reduce its summertime diversion, there is nothing in Oregon's ASR law to prevent other downstream appropriators from diverting that water for their own use. *See* OR. REV. STAT. §§ 537.531-.534 (1998).

145. OWRD must consider comments concerning ASR projects from interested parties or agencies. OR. REV. STAT. § 537.534(4) (1998). Previously, Oregon authorized pilot studies under a temporary transfer. OR. REV. STAT. § 540.523 (1998); *See also* WASH. REV. CODE § 90.03.390 (1999). Similarly, the agency was only required to determine whether a temporary transfer would harm existing water rights, but was not required to resolve protests. OR. REV. STAT. § 540.523 (1998).

146. Water Resources Commission Meeting, City of Salem Water Rights Application (May 16, 1995) (approving two year transfer of water right from municipal use to ASR testing program in order to evaluate project performance and effects).

147. Oregon's temporary transfer statute does not provide for protests, notice or waiting periods. Instead, OWRD must approve a temporary transfer if it determines that the transfer will not injure existing rights. *Cf.* OR. REV. STAT. 540.520(4)-(6) *to* 540.523(2) (1998).

148. OR. REV. STAT. § 537.534(2) (1998). Oregon's ASR statute provides for public notice and comment prior to authorization of testing, but only allows the department to revoke or modify the use of "stored water acquired under a limited license if that use causes injury *to any other water right* or to a minimum perennial streamflow." Diverting significant amounts of water may cause harm to interests other than water rights or minimum stream flows. Specifically, elevating the water table could damage roads by expanding wetlands, or private property by causing basement flooding. The question is what, if anything, can interested persons do to prevent the transfer of water rights for the purpose of testing. Oregon's ASR statute allows persons holding water rights to a project's source water to comment, but limits the scope of public interest review to matters raised by the proposed ASR application. OR. REV. STAT. § 537.534(4) (1998).

2. *Groundwater*

Historically, states managed surface and groundwater supplies separately because of a general failure to appreciate the connection between them.[149] The importance of groundwater grew as surface waters became fully appropriated, and well construction technology advanced.[150] When groundwater use began to adversely affect surface rights,[151] states began adopting conjunctive management schemes that recognize the connection between surface and groundwater resources.[152] The goal of conjunctive management is to integrate surface and groundwater rights, allowing use of the physically connected systems under the same legal regime.[153]

Although in theory all four basin states manage surface and groundwater conjunctively,[154] in practice surface and groundwater sources are usually managed separately.[155] The move toward conjunctive management may reflect

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149. United States v. Oregon, 44 F.3d 758, 768-770 (1994) (discussing the traditional disconnect between surface and groundwater management). *See also* John D. McGowen, *The Development of Political Institutions on the Public Domain*, 11 WYO. L.J. 1, 8-14 (1956).

150. Goodell, *supra* note 7, at E-12.

151. *See e.g.*, City of Albuquerque v. Reynolds, 379 P.2d 73 (N.M. 1962) (holding that the state engineer had the authority to require the city to purchase and retire surface rights to offset the effects of groundwater pumping on surface flows).

152. Idaho adopted conjunctive management, IDAHO ADMIN. CODE 37.03.11 (1999), following the decision in Musser v. Higginson, 871 P.2d 809 (Idaho 1994), which found that it would be arbitrary to continue issuing groundwater rights without conjunctive groundwater management regulations.

153. *See* GEORGE A. GOULD & DOUGLAS L. GRANT, WATER LAW 378 (5th ed. 1995); *see also* Frank J. Trelease, *Conjunctive Use of Groundwater and Surface Water*, 27B ROCKY MTN. MIN. L. INST. 1853 (1982).

154. Oregon manages surface and groundwater under the same permit system, OR. REV. STAT. §§ 537.505-.796, and the state attempts to manage hydrogeologically related sources conjunctively. OR. ADMIN. R. 690-009-0010 to -0050 (1999); Washington subjected groundwater to a permitting scheme in 1945. G.D. Parker & T. McDonald, *Washington*, in 6 WATERS AND WATER RIGHTS, *supra* note 8, at 832; The appropriation doctrine governs both surface and groundwater in Idaho. *Id.* at 321. Montana introduced a permit system for groundwater in 1961. *Id.* at 473. The courts have also affirmed conjunctive management. *Musser*, 871 P.2d at 812. (IDAHO CODE § 42-602 imposes duty on director to distribute surface and ground water conjunctively); Doherty v. Oregon Water Resources Dir., 783 P.2d 519 (Or. 1989) (holding that designation of critical groundwater area does not detract from other uses); Rettkowski v. Department of Ecology, 858 P.2d 232, 236 (Wash. 1993) ("First in time, first in right" appropriation rule is followed for groundwater and surface water under WASH. REV. CODE § 90.03.010); *see also* Hubbard v. Washington Dep't of Ecology, 936 P.2d 27 (Wash. Ct. App. 1997) (protecting surface rights from impact by new groundwater appropriations). MONT. CODE ANN. § 85-2-102(19) controls the appropriation of surface and subsurface waters. Al Stone, *Montana*, in 6 WATERS AND WATER RIGHTS, *supra* note 8, at 473.

155. Oregon v. United States, 44 F.3d 758, 768-770 (1994) (affirming Oregon's decision to omit groundwater claims from the most recent phase of the Klamath river adjudication). *See* Peter G. Scott, *Certification of Water Rights on the Lost River: A Prelude the Klamath Adjudication*, 13 J. ENVTL. L. & LITIG. 475, 506 (1999) (discussing OWRD's decision not to include groundwater in the latest phase of the

greater public understanding about the connection between surface and groundwater resources, but so far it has done little to solve problems like declining water tables.[156] ASR proponents identify declining water levels as an opportunity to use available underground storage. It could be argued that increased understanding of connectivity between surface and groundwater is contributing to the appeal of ASR and other recharge projects.[157] One observer commented that "[u]nderground storage is frequently possible because a . . . region has historically been overdrafting the [aquifer] that underlies it, leaving space in the aquifer for imported water to be stored."[158]

Importing water from another watershed is the antithesis of conjunctive management because it disturbs the equilibrium in the source watershed to make up for the failure to manage the available resources in the receiving watershed. Moreover, injecting water into the ground, especially unappropriated surface waters, does nothing to address the underlying problem of overappropriation. In fact, it only diverts additional waters for consumptive use, perpetuating the over-appropriation of water resources in general. Oregon's ASR statute allows for the increased consumption of water under an existing right.[159] Absent statutory control, if groundwater levels rise in response to ASR, nothing prevents appropriators from using that water or applying for new appropriations. State legislatures should not allow the appropriation of water made available by the restorative effect of ASR projects because to do so simply invites the excessive diversion of water.

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Klamath adjudication.).

156. For example, groundwater levels in the vicinity of Walla Walla, Wash. have declined about 3 feet per year between 1961 and 1995. *See* WALLA WALLA PILOT TEST WORK PLAN, *supra* note 12, at 2-2. All four basin states provide for establishing special groundwater management areas to deal with declining water tables. IDAHO CODE § 42-233a (1999); MONT. CODE ANN. § 85-2-508 (1999); OR. REV. STAT. § 537.730 (1998); WASH. REV. CODE § 90.44.400 (1999). Measures imposed to halt declining water tables are a popular reason for litigation. *Doherty*, 783 P.2d at 522-25. Lowering the water table (the saturated elevation within the aquifer) changes the hydraulic gradient (the pressure difference between interconnected waterbodies). As a result, streams that normally gain water from the aquifer (by springs or seepage) will receive less water or may even begin to lose water into the aquifer. The potential impact of ASR development on instream flows is important. For more information on beneficial instream uses of water, see Jack Sterne, *Instream Rights & Invisible Hands: Prospects for Private Instream Water Rights in the Northwest*, 27 ENVTL. L. 203 (1997). Declining spring flows in the Snake River Valley are due to increased groundwater use and more efficient application of surface water, which in turn decreases incidental recharge. ESPA RECHARGE PROJECT, *supra* note 7, at 2-6. One proposed solution is a major recharge project intended to restore spring flows. *Id.* at 1-1.

157. The International Conference on Water Law and Administration urged governments to encourage the seasonal storage of surface waters in aquifers. LUDWIK A. TECLAFF, WATER LAW IN HISTORICAL PERSPECTIVE 220 (1985).

158. Agthe, *Potential Benefits and Costs of Inground Storage of Imported Water*, 22 WATER RESOURCES BULL. 129 (1986).

159. *See supra* notes 141-142 and accompanying text (discussing the potential for increasing actual consumptive use of water under OR. REV. STAT. § 537.531-.534 (1998)).

Relying on the connection between surface and ground waters, recharge proponents tout the environmental benefits of stored runoff entering the stream later in the season.[160] Specifically, they suggest that fisheries will be enhanced by the increased stream flows during the dry season. Assuming for the sake of argument that storing seasonal runoff underground will minimize the adverse effect of heavy summer diversions (instead of simply allowing junior appropriators to continue diverting later in the season),[161] what is the cost of robbing Peter to pay Paul? Stated another way, does it make environmental sense, or economic sense for that matter, to reduce winter and spring flows in order to enhance summer flows? Increasingly, people are raising questions about the wisdom of further altering natural flow regimes by diminishing seasonal runoff.[162] Some factors to consider are the overwintering and migration of endangered fish species as well as channel maintenance. The answer is uncertain; however, it would behoove us to find out before the die is cast. Ultimately, the decision is a legislative function, not an administrative one. State legislatures must therefore direct agency action by enacting laws that balance the needs of the basin's growing population with the capacity of the natural system to bear the added burden.

3. *Water Quality*

Another major issue related to ASR projects is their potential effect on water quality. The key water quality concern among regulators is contamination of the receiving aquifer, particularly in places where the receiving aquifer is a primary source of drinking water.[163] Regulators are also concerned about surface waters that are hydraulically connected to the receiving aquifer, as well as those that receive discharges from the testing and operation of ASR projects.

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160. ESPA RECHARGE PROJECT, *supra* note 7, at 2-1; PYNE, *supra* note 2, at 19; *Hearing*, *supra* note 24, at 2.

161. Obviously, ASR developers and other recharge proponents are not proposing injection projects solely for the benefit of the basin's crippled fisheries. Instead they tend to characterize ASR projects as a "win-win" solution, allowing the storage and use of water that is eventually released so that it can serve instream uses.

162. *See infra* notes 214-219 and accompanying text.

163. 42 U.S.C. § 300h-3(e) (1994) (providing for federal funds to develop injection programs in areas with only one viable aquifer). *See* Sole Source Aquifer Demonstration Program 42 U.S.C. § 300h-6 (1994 & Supp. III 1997). Water quality is a major issue in Idaho recharge projects because the Eastern Snake River Aquifer is a designated sole source aquifer. Draft Comments from Idaho Fish and Game to Paul Castelin, Idaho Department of Water Resources (Summer, 1997) (on file with author).

Contamination can be injected directly into the aquifer or may result from geochemical processes within the aquifer.[164] ASR projects are usually required to monitor source water in order to minimize the chance of introducing contamination.[165] To protect against geochemical contamination, it is equally important to monitor the geochemistry of the receiving aquifer.[166] Because of the potential for catastrophic damage, states must ensure that ASR projects abide by comprehensive monitoring protocols and comply with state water quality standards. Significantly, state water quality standards, unlike water rights, are subject to federal oversight.[167] The most important federal laws for the purposes of this study are the Safe Drinking Water Act[168] and the Clean Water Act.[169] The administration of state standards established under the federal laws

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164. Geochemical contamination refers to the chemical alteration of receiving waters, caused by the introduction of incompatible, but not necessarily "polluted" injectate. For example, a recent study found that elevated fluoride levels in recovered water were likely caused by anion exchange between introduced hydroxyl ions and floroapatite surfaces in the aquifer. J.E. Castro and L.R. Gardner, *A Geochemical Model for the Aquifer Storage and Recovery Project at Myrtle Beach, SC*, Proceedings of AWRA Symposium, Conjunctive Use of Water Resources: Aquifer Storage and Recovery (Long Beach, CA, October 19-23, 1997).

165. PYNE, *supra* note 2, at 51. Monitoring requirements for individual projects are established by the states. Generally, a monitoring plan sets forth sampling and testing requirements. Each state must determine the location of sample points, test inventory, assignment of costs, standards of analyses (and whether they must be done independently), test frequency and duration, and reporting requirements. *See* OR. REV. STAT. § 537.534(3)(b) (1998); *see also* LIMITED LICENSE #001, supra note 116, at 4.

166. Geochemical contamination can degrade the physical integrity of an aquifer. For example, injectate with a ph that is slightly lower (more acidic) than the receiving water can dissolve and mobilize calcium carbonate (e.g., limestone, marl, marble). As the stored water is recovered (raising ph), the calcium might precipitate in discrete layers and degrade the permeability of the aquifer–a parameter that describes an aquifer's ability to conduct water. *See* DAVIS AND DEWEIST, *supra* note 127, at 163.

167. State fears that federal water quality laws would usurp states' authority under the McCarran Amendment, 43 U.S.C. § 666 (1952) (subjecting federal water right claims to state adjudication), led to enactment of the "Wallop Amendment," 33 U.S.C. § 1251(g) (preserving states' authority to allocate jurisdictional waters). *See* GOULD & GRANT, *supra* note 153, at 542.

168. 42 U.S.C. § 300f-j (1994 & Supp. III 1997). The Administrator of the EPA may grant primary enforcement responsibility to states that meet the following conditions. *Id.* § 300g-2. States must adopt regulations that provide: drinking water standards that are at least as strict as the national primary drinking water regulations; in addition to enforcement, monitoring, and inspection procedures; record keeping and reporting requirements; compliant variance criteria; emergency measures; and the imposition of civil penalties for violators. *Id.* § 300g-1. The Administrator may revoke state enforcement responsibility following notice and public hearing upon finding that the stated requirements are no longer met. *Id.* § 300g-2(b)(1).

169. 33 U.S.C. § 1251 *et seq.* (1994). Regulators and ASR developers must consider project evolutions that might result in the discharge of pollutants. 33 U.S.C. § 1342 (1994). Specifically, discharges associated with well construction, project testing, well reconditioning, or emergency operations may contain contaminants. PYNE, *supra* note 2, at 135. For example, whenever ASR projects using dual purpose wells shift operations from injection to recovery the system must be flushed to keep accumulated solids (mainly silts and clays) out of the distribution system. *Id.* at 135. Also, injectate is typically disinfected with chlorine, in part to control biological growth in the well. Flushed water may contain residual treatment chemicals and by-products. Specifically, the degradation of chlorine results in elevated trihalomethane and

is different for each basin state. Therefore, issues related to water quality are discussed below in the context of each state's program.

a. *Oregon*

The Safe Drinking Water Act requires states to set standards for drinking water.[170] The Health Division of the Oregon Department of Human Resources (Health Division) administers the drinking water standards under an agreement with the U.S. Environmental Protection Agency (EPA).[171] Oregon established state drinking water standards by rule.[172] In order to obtain an ASR permit in Oregon, OWRD must be satisfied that the applicant is using source water that meets those standards.[173] If source water meets state standards, the developer does not need a permit from the Oregon Department of Environmental Quality (ODEQ) that would otherwise be required to inject water underground.[174]

As Oregon's lead agency for water quality,[175] ODEQ is responsible for administering the National Pollutant Discharge Elimination System (NPDES).[176] NPDES permits are required to discharge pollutants into state surface waters.[177] ODEQ is also responsible for regulating discharges to other public waters, such as groundwater.[178] Water pollution control facilities per-

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haloacetic acid concentrations, which gradually dissipate during storage. *Id.* at 116. EPA authorizes states to administer the NPDES program under the Clean Water Act. 33 U.S.C. § 1342(b) (1994). Approval requires states to issue permits that ensure adequate compliance. Permits are reviewable at least every five years and control the disposal of pollutants into wells, and can be terminated for violating conditions, submitting misleading applications, or due to changing conditions. 33 U.S.C. § 1342(b)(1) (1994). There are also reporting, record keeping, monitoring, and inspection requirements. 33 U.S.C. § 1342(b)(2) (1994). In addition, states must notify the EPA and other states that might be affected whenever an application for a discharge permit is received. 33 U.S.C. § 1342(b)(3)-(5) (1994). The EPA can block a permit from issuing by protesting within 90 days of receiving notice. 33 U.S.C. § 1342(d)(2) (1994). And a savings clause preserves federal enforcement. 33 U.S.C. § 1342(i) (1994).

170. 42 U.S.C. § 300f-j (Supp. 1998).

171. Authority to establish and administer state drinking water standards is found at OR. REV. STAT §§ 448.115-.285 (1998); OR. ADMIN. R. 333-061-0005-0098 (1999).

172. State drinking water standards are found at OR. ADMIN. R. 333-061-0030 and OR. ADMIN. R. 333-061-0032; OR. ADMIN. R. Ch. 340, div. 40 (1999).

173. OR. REV. STAT. § 537.531 (1998). OWRD may impose monitoring requirements as conditions on ASR project permits and limited licenses.

174. OR. REV. STAT. § 468B.050 (1998).

175. OR. ADMIN. R. 340-040-0020(6) (1999). Policy and rulemaking authority lies with the Environmental Quality Commission. OR. REV. STAT. §§ 468B.010-.0030.

176. OR. ADMIN. R. 340-045-0035 (1999).

177. OR. REV. STAT. § 468B.050 (1998).

178. OR. REV. STAT. §§ 468B.150-.190 (1998).

mits are required for most underground injection activities including groundwater recharge wells.[179] Oregon regulations prohibit injection activities that might 1) cause a violation of the federal Safe Drinking Water Act, 2) create a public health hazard, or 3) degrade public waters.[180] However, ODEQ's director may grant ODEQ approval for injection activities other than waste disposal, if the director is satisfied that the project's lead agency (OWRD, for example) will provide adequate safeguards to protect water quality.[181]

Oregon's ASR legislation does not resolve all of the issues related to water quality. For example, the ASR statute provides that injected water that meets drinking water standards "[s]hall not be considered a waste, contaminant, or pollutant" and "[s]hall be exempt from the requirement to obtain a discharge permit" from ODEQ.[182] This means that ASR projects can inject water treated with disinfectants, such as chlorine, without a water pollution control facilities permit because under the ASR statute chlorine is not a pollutant.[183] Chlorine kills bacteria, but some bacteria play a critical role in regulating the chemistry of aquifers.[184] The introduction of chlorine, or other disinfectants, could therefore have serious unintended consequences. The reason for disinfecting source water is to reduce project cost.[185] Oregon's legislature should reconsider whether injecting disinfectants into natural aquifers is worth the benefit of reduced expenses for ASR projects.

An unanswered question is whether ASR projects in Oregon must obtain a NPDES permit for non-injection phases of the project. The statute provides that *the injection of water* shall comply with "all other applicable local, state or federal laws."[186] The statute does not, however, clearly require ASR pro-

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179. OR. ADMIN. R. 340-044-0015(1) (1999); OR. ADMIN. R. 340-045-0025 (1999).

180. OR. ADMIN. R. 340-044-0015(4)(d) (1999).

181. OR. ADMIN. R. 340-044-0055(2) (1999).

182. OR. REV. STAT. § 537.532(1) (1998).

183. Golder Associates, *Storing Drinking Water Underground: Salem Oregon Aquifer Storage and Recovery System* 3 (1995) (explaining that the chlorine residual and concentration of trihalomethane compounds declined to nondetectable levels during the storage period). Nevertheless, ODEQ required the project to obtain a NPDES permit for any discharges of recovered water to surface drainage systems because chlorine is toxic to aquatic life. Burton, *supra* note 41.

184. DAVIS AND DEWEIST, *supra* note 127, at 92-93 *citing* S.I. Kuznetsov (editor, *Geologic Activity of Microorganisms*, Trans-Siberian Institute of Microbiology (1961).

185. Disinfecting the source water before it is injected allows municipalities to transport source water to the injection point through the public water system. *See e.g.*, SALEM WATER SYSTEM MASTER PLAN, *supra* note 12. If source water were not disinfected projects would need separate distribution systems for source water and drinking water, adding significantly to the cost of developing ASR projects. In addition, chlorine protects well performance from degradation caused by biological growth. *See* PYNE, *supra* note 3, at 116.

186. OR. REV. STAT. § 537.531(1)(c) (1998) (emphasis added).

jects to obtain NPDES permits for *non-injection* activities such as discharging test water or redevelopment (backflushing) of project wells. OWRD rules do suggest that applicants for ASR permits should be prepared to obtain NPDES permits from ODEQ as necessary.[187] The absence of a clear statutory requirement creates confusion about whether a NPDES permit is needed. To avoid confusion and possible litigation, ASR statutes should clearly require compliance with state and federal law in all phases of operation, not just during the injection phase.[188]

b. *Washington*

The Department of Ecology administers water rights and water quality in Washington.[189] Washington Department of Health (WDOH) establishes and administers safe drinking water standards.[190] The list of water quality parameters that Ecology monitors is different than WDOH's drinking water standards.[191] This raises the question of which standard applies to ASR projects. One project, currently under development, elected to use the WDOH standards because the receiving and source waters are already monitored by WDOH.[192] However, the engineer's report stated that "[i]f organic compounds on the [W]DOH list are detected, the analytical program can be expanded to include the additional constituents on the [Ecology] list."[193] This lack of certainty about which standards apply further illustrates the need for legislative clarification.[194]

EPA delegated administration of the NPDES program to Ecology.[195] Washington appears to have no firm policy concerning the need for ASR projects to obtain NPDES permits, however. At least one project developer assumed that

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187. OR. ADMIN. R. 690-350-0010(7)(c) provides "the disposal of recovered ASR testing water may require discharge authorization from [O]DEQ. All applicants should investigate this possibility."

188. See discussion of Walla Walla's pilot plan, *infra* note 191 and accompanying text.

189. Ecology administers water quality standards under WASH. REV. CODE § 90.48. The quality standards are found at WASH. ADMIN. CODE Ch. 173-201A (1999). G.D. Parker & T. McDonald, *Washington, in* 6 WATERS AND WATER RIGHTS, *supra* note 8, at 840. Final determinations may be appealed to the Pollution Control Hearings Board. *See* WASH. ADMIN. CODE. § 371-08-315(2) (1999).

190. WASH. REV. CODE § 43.21A.445 (1999); WASH. ADMIN. CODE § 246-290-310 (2000).

191. WASH. ADMIN. CODE § 246-290-310 (2000).

192. WALLA WALLA PILOT TEST WORK PLAN, *supra* note 12, at 2-2 to 2-3.

193. *Id.*

194. The City of Walla Walla, Wash., Ecology, and DOH negotiated the project permit requirements through meetings and correspondence. Letters and electronic correspondence on file with author.

195. WASH. ADMIN. CODE, Ch. 173-220 (2000).

a NPDES permit is unnecessary to discharge recovered water in a nearby stream during testing or periodic redevelopment of injection wells.[196] The project's engineer concluded that such discharges are not wastewater because chlorine and other disinfection chemicals dissipate during storage.[197] Yet, this engineering firm is the same one that developed Salem, Oregon's ASR project, where OWRD expressly required a NPDES permit for exactly the same kinds of discharges.[198] Once again, uncertainty indicates the need for legislative clarification.

Ecology is also responsible for administering Washington's underground injection control (UIC) program.[199] The UIC program aims to protect groundwater quality from the injection of wastes generated primarily from sewage treatment and petroleum extraction.[200] Washington has an innovative program for using reclaimed water (water discharged by sewage treatment facilities).[201] The crossover between UIC and ASR projects in the basin is perhaps best illustrated in the context of Washington's reclaimed water laws.

The Washington Assembly has declared the use of reclaimed water in the best interest of the state.[202] The reclaimed water statute seeks to supplement surface and groundwater supplies for suitable beneficial uses, thereby conserving potable water supplies for domestic consumption.[203] Among the uses contemplated for reclaimed water are surface percolation, discharge into wetlands, and the augmentation of streamflows and regional water supplies.[204] If reclaimed water is added to the aquifer by an injection well, a UIC permit is

196. WALLA WALLA PILOT TEST WORK PLAN, *supra* note 12, at 3-2.

197. *Id.*

198. *See* Burton, *supra* note 41. Ecology has not yet decided whether to require the Walla Walla ASR project to apply for a NPDES permit.

199. *See supra* note 85 and accompanying text. The federal UIC program is delegated to the states and is intended to protect groundwater quality from various injection activities. *See* 40 C.F.R. § 146.5 (2000) (establishing injection well classifications for different qualities of discharge).

200. All four basin states have federally designated UIC programs: Oregon, 40 C.F.R. § 147.1900 (2000); Washington, 40 C.F.R. § 147.2400 (2000); Idaho, 40 C.F.R. § 147.650 (2000); and Montana, 40 C.F.R. § 147.1350 (2000). *See* 42 U.S.C. § 300h(b) (Supp. 1998) (establishing minimum requirements for state UIC programs).

201. Reclaimed Water Act, WASH. REV. CODE, § 90.46 (1999)

202. WASH. REV. CODE § 90.46.005 (1999).

203. *Id.*

204. WASH. REV. CODE § 90.46 (1999).

needed.[205] Because the statute does not define infiltration galleries—like ponds, fields, or ditches—as injection wells, projects that add reclaimed water to the aquifer by percolation do not require a UIC permit.

The Lakehaven Utility District (Lakehaven) operates an ASR project in Federal Way, Washington that injects drinking water from one aquifer into a second deeper aquifer that supports higher pumping rates.[206] The problem is that potable water leaks from the source aquifer into a hydraulically connected wetland downgradient from Lakehaven's ASR project. Lakehaven is currently seeking permission from Ecology to use reclaimed water downgradient from its well field to create a hydraulic barrier that should reduce the loss of potable groundwater from the source aquifer.[207] In turn, the wetland would be supplied with reclaimed water, allowing the project to conserve drinking water.[208]

Assuming that Ecology approves Lakehaven's proposal, the utility district and Ecology must decide whether it makes more sense to add water to the aquifer via an infiltration gallery or to add water directly, using injection wells. If the project uses infiltration, a UIC permit probably would not be necessary.[209] Hybrid projects like Lakehaven's may be desirable from a comprehensive resource development perspective, but in the absence of clear legislative guidance about development requirements, they pose some difficult questions. For example, does supplementing groundwater supplies by infiltration of treated waste water circumvent federally delegated UIC laws and the Clean Water Act? A related question is whether the UIC program itself can be used to regulate ASR projects. Recent proposals in Idaho suggest that injection well regulations can be adapted to ASR development. [210]

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205. "Injection well" is defined as "a 'well' [a bored, drilled or driven shaft, or dug hole whose depth is greater than the largest surface dimension] that is used for the subsurface emplacement of fluids" WASH. ADMIN. CODE § 173-218-030 (11), (18)(2000). UIC permit terms and conditions are provided for in WASH. ADMIN. CODE § 173-218-100 (2000).

206. Telephone Interview with John Bowman, Engineer with Lakehaven Utility District, Federal Way. Wash. on Feb. 6, 1999. The Lakehaven project is an ASR project in the sense that the district has an exclusive right to recover the stored water. This is not a statutory right, but Lakehaven is the only appropriator. According to Mr. Bowman, groundwater is transferred from the upper unit to the lower unit gradually during the winter months. During that time Lakehaven supplements its drinking water supply by leasing water from a nearby surface water right.

207. KENNEDY JENKS CONSULTANTS, WATER REUSE 6.1.3 (Nov. 1998).

208. The use of reclaimed water to maintain wetlands diminished by groundwater withdrawals may raise eyebrows in the context of restrictions against non-point source pollution.

209. *See supra* note 205 and accompanying text. Significantly, the use of reclaimed water does not require a water right. Grant D. Parker & Tom McDonald, *Washington, in* 6 WATERS AND WATER RIGHTS. *supra* note 8, at 215 (Supp. 1999) (discussing amendments to WASH. REV. CODE § 90.46 that grant owners of waste water treatment facilities the exclusive right to use reclaimed water).

210. *See* discussion of injection wells in Idaho, *supra* Part II.C.2.

c. *Idaho*

In addition to water rights, the Idaho Department of Water Resources (IDWR), regulates waste disposal and injection wells.[211] Thus, IDWR administers the state's UIC program. Surface and groundwater quality standards are set by the Idaho Department of Health and Welfare, Division of Environmental Quality (IDEQ).[212] Idaho is not delegated authority to administer the NPDES program; therefore, discharge permits must be obtained from EPA Region 10 in Seattle.[213]

There is very little ASR activity in Idaho, so it is difficult to isolate water quality issues related to specific projects. In spite of this, Idaho's ambitious approach to aquifer recharge provides an opportunity to evaluate the potential consequences of basin-wide ASR development. Idaho is in the process of developing the largest recharge project in the basin. The proposed East Snake Plain Aquifer Managed Recharge Project would divert tens of thousands of acre-feet of unappropriated water from the Snake River each year (mostly during the winter and spring months) to recharge the regional aquifer at multiple sites.[214]

Concern about potential adverse effects from the proposed East Snake Plain Aquifer Project on water quality (and other issues) parallels concern over the likely cumulative effects from large-scale ASR development. For example, EPA opposed the project if it would further dewater the Snake River, adversely affecting water quality.[215] At least one Idaho agency has also been critical: the director of the Idaho Department of Fish and Game (IDFG) took exception to an East Snake Plain Aquifer Project interim report, stating that "some of the information included in the report is not accurate."[216] IDFG challenged claims that water quality in the Snake River will improve as a result of increased flows from springs sustained by the recharge project.[217] In particular, the agency director noted that:

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211. Phillip J. Rassier, *Idaho*, *in* 6 WATERS AND WATER RIGHTS, *supra* note 8, at 330; *See* IDAHO CODE §§ 42-3901 to 3919.

212. IDAHO CODE §§ 39-101 to 130 (1999).

213. Rassier, *supra* note 211 at 331. EPA does maintain a field operations office in Boise, Idaho.

214. *See generally* ESPA RECHARGE PROJECT, *supra* note 7. The project is intended to increase spring flows that have diminished since World War II as more and more appropriators turn to groundwater sources. The result is less incidental recharge and therefore, reduced spring flows. *Id.*

215. Idaho: Department of Water Resources' Recharge Plans Breed Controversy, W. WATER L. & POL'Y REP. July 1998 at 237.

216. Letter from Stephen P. Mealey, Director, Idaho Department of Fish and Game to Paul Castelin, Section Manager, Idaho Department of Water Resources, at 1 (Nov. 27, 1998).

217. *Id.* at 4.

> most if not all of the [water discharged from the aquifer] would be used for fish hatcheries, irrigation, and power generation prior to entering the Snake River. It is highly likely that the water will acquire elevated levels of nutrients, sediment, and temperature prior to entering the Snake River and it is therefore unlikely that the general water quality in the Snake below the springs would be significantly improved.[218]

Similar concerns were cited by numerous environmental groups, which protested a small industrial ASR project operated by Micron Technology, Inc.[219] Micron is the only appropriator in an aquifer that is allowed to store flood stage waters from the Boise River and that may be allowed to use this stored water in its manufacturing process.[220] In response to protests, Micron agreed not to divert water when instream flows drop below specified minimums, and the project went forward. However, the combination of many small ASR projects is likely to create cumulative impacts that mimic those of large-scale recharge projects. State legislatures need to evaluate the potential impact of dewatering streams during winter and spring before IDWR and its counterparts in the other basin states grant project developers the legal right to do so.

d. *Montana*

Water quality in Montana is primarily the responsibility of the Board of Environmental Review and the Montana Department of Environmental Quality (DEQ).[221] The DEQ sets quality standards in compliance with the federal Safe Drinking Water Act and administers Montana's UIC program.[222] In addition, EPA has delegated to Montana authority to administer the NPDES program.[223] Discussion of ASR or recharge-related water quality topics in Montana is

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218. *Id.*

219. PROTEST AND PETITION TO INTERVENE, BEFORE THE DIRECTOR OF THE DEPARTMENT OF WATER RESOURCES OF THE STATE OF IDAHO, APPLICATION NO. 63-12420, Dec. 19, 1997. The groups protesting the application included Idaho Rivers United, Idaho Conservation League, Trout Unlimited, and the Idaho Wildlife Federation. *See also* WITHDRAWAL OF PROTEST AND AGREEMENT OF CONDITIONS, BEFORE THE DEPARTMENT OF WATER RESOURCES OF THE STATE OF IDAHO, APPLICATION NO. 63-12420, Nov. 4, 1997

220. IDAHO DEPARTMENT OF WATER RESOURCES, APPLICATION NO. 63-12420 (1997) (approved Apr 1, 1999).

221. Stone, *supra* note 154, at 124.

222. MONT. CODE ANN. § 75-5 (1999).

223. Stone, *supra* note 154, at 482.

premature because, as noted above,[224] Montana does not recognize recharge as a beneficial use and there are currently no groundwater storage projects proposed in Montana.

### B. *ASR Environmental Issues*

There are fewer than a dozen small ASR projects operating in the Columbia basin. Consequently, the potential for significant adverse environmental effects appears slight. But now is the time for state legislatures to consider the likely consequences of future large-scale ASR development in the basin. Of particular importance is the possibility that adverse effects from ASR development will add to existing cumulative effects from flood control and irrigation storage projects. State legislatures must consider the potential long-term adverse effects of ASR development because, while unintended consequences are difficult to estimate, history teaches it is more difficult to undo environmental damage than it is to prevent it.[225]

Specific environmental issues related to ASR projects may be categorized into three areas of concern: stream flow reductions, injection and storage, and return flows. Diverting water reduces stream flows, often with adverse effects on fish, wildlife, and stream conditions. This is particularly true immediately downstream from points of diversion.[226] Most ASR projects are designed to divert water in the winter or spring and store it for later use in the summer.[227] However, the importance of adequate stream flows during these seasons, particularly to fish, is well documented.[228] In some locations, winter flows already do not meet existing flow recommendations because of surface storage rights

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224. *See supra* note 94 and accompanying text.

225. *See* OR. ADMIN. R. 340-040-0020(2) (1999) (stating that "[g]roundwater, once polluted, is difficult and sometimes impossible to clean up."). *See also* Blumm et al., *supra* note 102 (exploring the cost of breaching dams on the Snake River in order to restore endangered salmon fisheries).

226. Unlike waters stored instream, water stored by ASR projects cannot easily be released to assist fish migration and provide for channel maintenance. In 1996, Secretary of the Interior, Bruce Babbitt authorized experimental releases of Colorado River water from the Glen Canyon Dam so that scientists could evaluate the impact of diminished seasonal runoff on stream morphology and health of the aquatic environment. Rick Giase, *Grand Canyon Renewal Starts Today*, ROCKY MTN. NEWS 1A (Mar. 26, 1996).

227. Spring flushing flows are the subject of important and ongoing litigation in Idaho. *Memorandum Decision Denying The State of Idaho's Motion for Summary Judgment*, Case No. 39576 (5th Dist. Dec. 21, 1998) (denial of state's motion clears the way for claim of federal reserved water rights for channel maintenance flows on national forests to go forward on the merits); *See also* In re: Amended Application of United States for Reserved Water Rights in the Platte River, No. W-8439-76 18-20 (Dist. Ct. Colo., Weld Cty.,- Water Div. No. 1, Feb. 12, 1993) (United States failed to prove that the Act of June 4, 1897, 16 U.S.C. §§ 473-482, 551 (1994), reserves instream water rights for channel maintenance "to an extent that [the rights] would interfere with efficient use of the 'favorable water flows' for irrigation and domestic purposes.").

228. *See* Mealey, *supra* note 216, at 2 (discussing side-channel flow studies of Henry's Fork and South Fork that reveal the importance of winter flows to fish survival, particularly juvenile salmonids).

for power generation and irrigation.[229] Further reductions in river flows will contribute to declining fish populations, which in turn affects all of the wildlife in a fish-supported food chain.

Projects are often designed to capture unappropriated runoff waters from the annual spring melt. However, river systems evolved amidst dramatic seasonal flow variations.[230] For example, high flows in the spring clear debris, flush sediments and help anadromous fish reach the sea. The spring melt is responsible for virtually every significant feature of fish habitat from spawning beds to predatory cover.[231] Moreover, seasonal floods nourish riparian areas that provide extensive wildlife habitat throughout the year. In the view of some, dampening seasonal flow variations ("flattening the hydrograph," a graphic representation of seasonal variability) is one of the most damaging environmental consequences of the western water system as currently engineered.[232] ASR legislation must require regulators to account for the effect of existing storage projects on the hydrograph and consider the long-term consequences of flattening it further.

The second area of concern relates to the injection and storage of water, specifically, the potential for incidental terrestrial impacts. For example, some projects rely on surface infiltration, which creates ponds that attract wildlife.[233] These artificial ponds may then dry up at critical times in the reliant wildlife's reproductive cycle. Similarly, projects that inject water may create wetlands by elevating the water table to the surface, which then can dry up as stored water is recovered. A non-endemic cycle of wetting and drying may also create favorable conditions for noxious weeds and other non-indigenous plant life.[234]

A third area of concern relates to the quality and timing of project return flows. Most ASR projects store water for consumptive use. Therefore, some portion of the stored water will probably eventually find its way to a stream. Depending on the individual project, water may leak into the stream directly from the aquifer, or it may return as agricultural runoff, or it may be reclaimed water discharged from a municipal treatment facility. Each case poses differ-

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229. *Id.* at 4.

230. *See* ENVIRONMENTAL PLANNING, *supra* note 6, at 257.

231. *Id.* at 714.

232. *See* The Independent Scientific Group of the Northwest Power Planning Council, *Return to the River: An Ecological Vision for the Recovery of the Columbia River Salmon*, 28 ENVTL. L. 503 (1998); Mealey, *supra* note 216, at 4; *See generally* Letter from Marti Bridges, Water Policy Director, *Idaho Rivers United* to Paul Castelin, Section Manager, *Idaho Department of Water Resources* (May 21, 1998).

233. *See* Mealey, *supra* note 216, at 5.

234. *Id.*

ent problems, so it is important for ASR legislation to require agency consideration of the likely effects of project return flow on ecosystem health. For example, the temperature of late-season flow from groundwater may alter important thermal conditions in a stream.[235] On the other hand, agricultural runoff may carry excessive nutrients that contribute to eutrophication--excessive algae growth in slow moving waterbodies.[236] Finally, low dissolved oxygen concentrations in reclaimed water can create anoxic conditions stressing or killing aquatic life.[237]

## IV CONCLUSION

The Columbia Basin is generally ill-prepared to regulate aquifer storage and recovery Yet some development has already occurred and further development is almost certain because of the intense pressure on basin municipalities to develop new water supplies for growing populations without building new dams or treatment facilities. If ASR projects continue to be developed without adequate statutory control, conflicts between and among water users and regulators are inevitable. In the first place, the ASR concept is fundamentally inconsistent with prior appropriation law, disrupting key aspects of the doctrine, such as priority, beneficial use, and transferability Secondly, technical advances, which make it possible to store and recover large quantities of unappropriated seasonal runoff quickly and reliably, increase the likelihood of aggravating existing environmental damage caused by dams and other water projects.

The Columbia Basin states need to enact clear and comprehensive ASR legislation to minimize both the potential for conflict and the adverse effects of ASR development. At a minimum, ASR legislation must accomplish the following three things: First, ASR laws must define the relationship between traditional water rights and ASR developers. Second, ASR laws must expressly require compliance with all applicable federal, state, and local laws at all phases of operation, including water quality standards. Finally, ASR development must be tightly controlled in order to be a viable water management tool with long-term benefits that exceed long-term environmental and economic costs.

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235. *See* ENVIRONMENTAL PLANNING, *supra* note 6, at 719.

236. *Id.*

237. *Id.* at 740.

## V. POSTSCRIPT

In March, 2000, while this article was in publication, the Washington Assembly unanimously passed an ASR statute.[238] The new "Underground Water Storage" law, which takes effect June 8, 2000, provides in part:

> In an effort to promote new and innovative methods of water storage, the legislature authorizes the department of ecology to issue reservoir permits that enable an entity to artificially store and recover water in any underground geological formation, which qualifies as a reservoir under RCW 90.03.370.[239]

"Artificially stored ground water" is distinguished from "natural ground water" based on the manner in which it is made available.[240] "Underground artificial storage and recovery projects" are projects that intentionally store artificial ground water for subsequent use, but do not include irrigation water, which continues to be regulated under the state's artificial recharge laws.[241]

In addition to a primary "reservoir permit," project beneficiaries must apply for and obtain a "secondary permit."[242] Applicants for reservoir permits must meet specified standards of review and mitigation, which include: (1) Aquifer vulnerability and hydraulic continuity; (2) Potential impairment of existing water rights; (3) Geotechnical impacts and aquifer boundaries and characteristics; (4) Chemical compatibility of surface waters and ground water; (5) Recharge and recovery treatment requirements; (6) System operation; (7) Water rights and ownership of water stored for recovery; and (8) Environmental impacts.[243] Applicants for secondary permits must reach an agreement with the reservoir permit holder for the use of stored water, and may obtain a certified water right once the water is used beneficially.[244]

Implementation of the listed standards has been left to rulemaking by the Department of Ecology, which is required to report to the legislature by

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238. House Bill 2867 (March 24, 2000) (amending WASH. REV. CODE §§ 90.44.035 (1999) and 1987 c. 109, § 107).

239. House Bill 2867, § 1.

240. House Bill 2867, §§ 1 (4), (5).

241. House Bill 2867, § 1 (6) (referencing WASH. REV. CODE §§ 90.46 and 90.44.130).

242. House Bill 2867, § 3.

243. *Id.*

244. *Id.*

December 31, 2001.[245] A rulemaking development plan is beginning to take shape for the coming fiscal year, which begins July 1, 2000.[246] Ecology hopes to select a technical advisory committee in June of 2000 and expects to complete the rulemaking process in 12 to 18 months.[247] The formal rulemaking process provides an opportunity for the public to discuss issues raised by this article or any other concerns relevant to ASR development and use of the public's water.

245. *Id.*

246. Telephone Interview with Kenneth O. Slattery, Senior Policy Analyst, Wash. Dep't of Ecology (May 5, 2000).

247. *Id.*