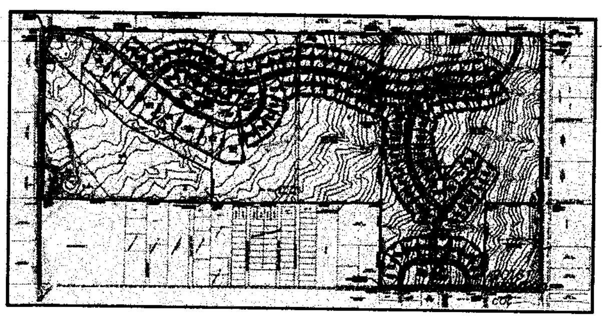
The Exemption

To change or not to change?

A study of water wells allowed without a permit



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A Report to the 63rd Legislature by the Water Policy Interim Committee
October 2012

Prepared by Joe Kolman

WATER POLICY INTERIM
COMMITTEE 2015-16

September 3, 2015 Exhibit 14

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* This information complies with section 2-15-155, MCA.

This report is a summary of the work of the Water Policy Interim Committee pursuant to House Bill No. 602 as passed by the 2011 Legislature. Members received additional information and public testimony during meetings. This report is an effort to highlight key information. To review additional information, including written minutes, exhibits, and audio minutes, visit the WPIC website:

www.leg.mt.gov/water

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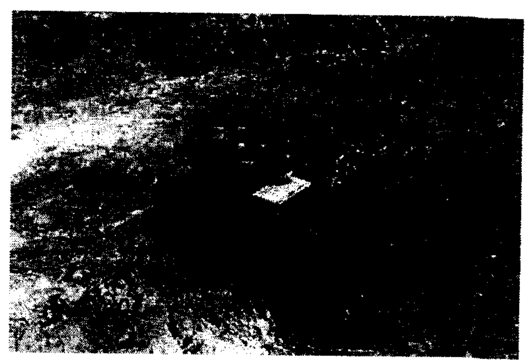
Executive Summary

This is the fourth consecutive interim that legislators made the topic of water wells that are exempt from permitting part of their work between sessions. However, the 2011 Legislature and the 2011-12 Water Policy Interim Committee (WPIC) devoted more time and resources to the issue than before.

The evolution of the exempt well in Montana and the study of it by the WPIC are well documented.[1]

To summarize, since Montana started requiring permits for most types of water use in 1973, there has been an exemption for some ground water wells. The amount of water allowed and the rules used to implement the law have changed, but the current law and accompanying rules have been around almost 2 decades.

The law states that a permit is not required for a well or developed spring that diverts water at 35 gallons per minute or less and does not exceed a volume of 10 acre-feet a year. It adds, however, that a combined appropriation from the same source from two or more wells or developed springs exceeding this limitation requires a permit.



Since Montana started requiring permits for most types of water use in 1973, there has been an exemption for some ground water wells.

[1] Boiling It Down, http://leg.mt.gov/content/Publications/Environmental/2010-water-policy.pdf
Water: Montana's Treasure; Water Policy in Montana, http://leg.mt.gov/content/Publications/Environmental/2008montanastreasure.pdf.

The term "combined appropriation" is not defined in law. That is left to administrative rules, which explain the term as "an appropriation of water from the same source aquifer by two or more ground water developments, that are *physically manifold into the same system.*"[2] (emphasis added).

In recent years, legislative attempts have been made to change the exemption, including codifying the administrative definition of combined appropriation. The rules also have been challenged. None of the attempts succeeded.

What makes exempt wells controversial?

Most debate centers on the use of exempt wells in residential housing developments. About two-thirds of the subdivision lots created between July 2004 and June 2011 received water from exempt wells.[3]

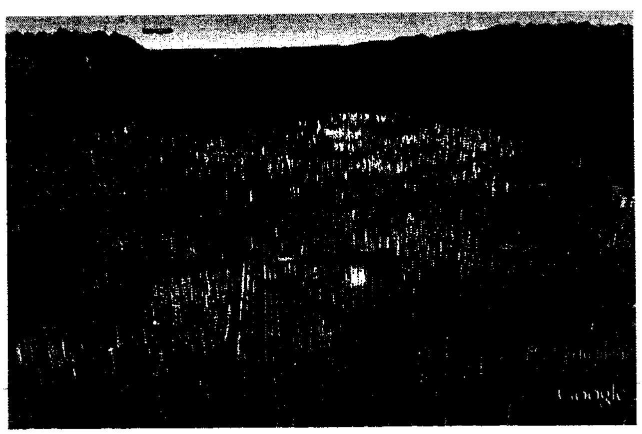


Illustration of wells constructed in the Belgrade area. Montana Bureau of Mines and Geology.

Most debate centers on the use of exempt wells in residential housing developments.

Even if each well uses only a small amount of water, there are those who argue that the cumulative effect is not analyzed for harm to existing water right holders to the same

[2] 36.12.101 ARM.

[3] Department of Environmental Quality Subdivision Review Program.

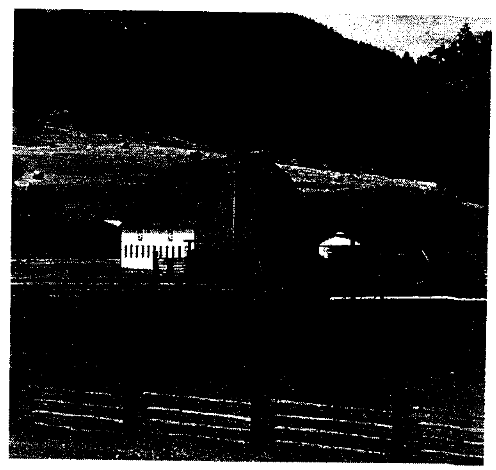
extent that another use of the same amount of water would be, such as an irrigation system. Others note that in some areas, if the effects of an exempt well are even measurable, they are so small in the larger scheme of water use as to be harmless.

Given the rural nature of Montana, some argue that an outright ban on exempt wells is unrealistic. The permitting system could be overloaded evaluating new applications. Furthermore, allowing relatively small amounts of water for domestic or stock use could be seen as an unalienable right.

But after that, options for addressing concerns about providing water for new uses, including housing, while protecting existing water right holders become more controversial.

In 2011, the Legislature passed House Bill No. 602 requiring a study of exempt wells. Among other things, the Legislature found that exempt wells may be adversely affecting existing water rights and that existing water law does not give the Department of Natural Resources and Conservation adequate direction on how to administer exempt wells. (Appendix A).

The legislation requires the WPIC to examine a wide variety of topics related to exempt wells, including the amount of water used, the effects on other water rights, the enforcement of water rights, the relationship of exempt wells and land use, how other states deal with exempt wells, and the adequacy of existing programs.



Wolf Creek, Montana. Photo by Ron Zeller, courtesy of Travel Montana.

Given the rural nature of Montana, some argue that an outright ban on exempt wells is unrealistic.

With that direction, the WPIC pledged most of its time and efforts to evaluating the issue and gathering as much public comment as possible, including three meetings around western Montana, where most of the exempt wells used in subdivisions have been drilled in the last 2 decades.

At its final meeting in September 2012, the WPIC approved the findings and recommendations included in this report as well two committee bills to be introduced in the 2013 Legislature.

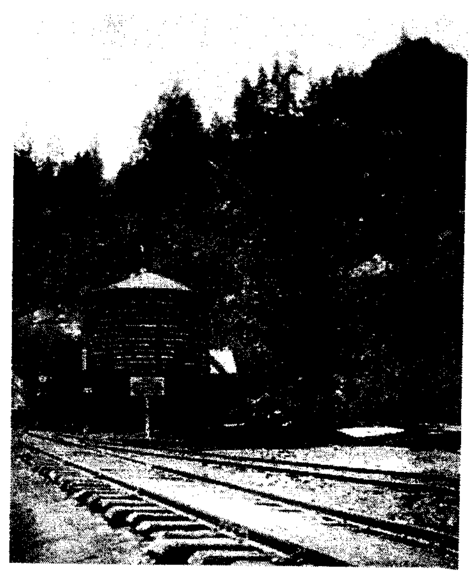
The committee voted 7-2 in favor of legislation that would create stream depletion zones, an area where hydrogeologic modeling concludes that the withdrawal of water from an exempt well would have specific effects on surface water. Within these areas, which would be adopted through administrative rule, the exemption would be limited to 20 gallons per minute and no more than 1 acre-foot a year.

The committee voted 7-1 for a bill that would define the term combined appropriation as "an appropriation of water from the same source aquifer by two or more wells or developed springs that are physically connected into the same system."

Exempt From What? A Permitting Overview

For someone unfamiliar with western water law, the idea that a bureaucratic permit system must be negotiated prior to using water may seem needless. If you can see water in a creek or someone assures you that cool, clean liquid is bountiful below the surface, what more does one need to know?

Quite a bit. The actual presence of water at the time one wants to use it and in the quantity one needs are just a couple of the criteria that must be proven before most would-be water users can appropriate the precious but reusable resource.



Water tank at Mullen Road Tunnel circa 1900. Montana Historical Society photo.

The use of water is a property right. Montana and other western states allocate that right based on when the water was put to use or the right was permitted. This is known as the Prior Appropriation Doctrine. For example, a water right dating to 1889 is entitled to be exercised before any right occurring after that date.

More than a century ago, western lawmakers started seeing the need for a regulated system of water rights. The use and reuse of water by many parties, the complexity of a water right, was a recipe for confusion and disagreement without a centralized system.

More than a century ago, western lawmakers started seeing the need for a regulated system of water rights.

In Montana, the 1972 Constitution required that "The legislature shall provide for the administration, control, and regulation of water rights and shall establish a system of centralized records, in addition to the present system of local records." A permit system administered by the Department of Natural Resources and Conservation (DNRC) was created within the Water Use Act of 1973.

Revisions in 1997 to the declaration and purpose section of the Water Use Act reiterate the role of permitting and how it relates to the adjudication of rights that existed prior to the Water Use Act. Subsection (5) of 85-2-101, MCA, reads in part:

> It is the intent of the legislature that the statutory determinations for issuing new water use permits and authorizing changes do not require the adjudication of all water rights in the source of supply. The legislature recognizes the unique character and nature of water resources of the state. Because water is a resource that is subject to use and reuse, such as through return flows, and because at most times all water rights on a source will not be exercised to their full extent simultaneously, it is recognized that an adjudication is not a water availability study. Consequently, the legislature has provided an administrative forum for the factual investigation into whether water is available for new uses and changes both before and after the completion of an adjudication in the source of supply.

The permitting requirements of the law apply to both surface water and ground water. To understand more about exempt ground water wells, it may be helpful to examine the process from which these appropriations are exempt.

The criteria for a permit in Montana are contained in 85-2-311, MCA. An applicant must prove that:

- √ the proposed use of water is a beneficial use;
- √ water is physically available at the proposed point of diversion in the amount and during the period that the applicant seeks to appropriate;
- √ the amount of water requested can reasonably be considered legally available during the period in which the applicant seeks to appropriate. Legal availability includes an analysis of the physical availability and the existing legal demands on the source.
- √ the water rights of a prior appropriator will not be adversely affected;

- √ the proposed means of diversion, construction, and operation of the appropriation works are adequate; and
- √ the applicant has a possessory interest, or the written consent of the person with the possessory interest, in the property where the water is to be put to beneficial use.

The determination of physical availability for a ground water well entails an aquifer test supervised by a hydrogeologst or other professional, a minimum duration of pumping, an observation well, and a report that includes ground water and surface water monitoring data.

The examination of legal demands and possible adverse effects includes:

- √ identification of prior appropriators;
- √ a comparison of physical water supply within area of impact at point of diversion during the period of diversion requested with existing legal demands;
- √ describing the effect on existing wells and hydraulically connected surface water; and
- √ demonstrating that the proposed diversion can be regulated during periods of water shortage to satisfy rights of prior appropriators.

At this point in the process, if the above criteria are satisfied, the DNRC issues a preliminary determination that the permit will be granted. That triggers the public notice and objection portions of the law. General notice is provided by publication in a newspaper and specific notice is provided to senior water right holders and others who may be affected by the new appropriation. The notice may result in someone objecting to the application and being granted a hearing. An objector may be anyone whose property, water rights, or interests would be adversely affected.

Objections may be withdrawn or denied, or the approval may be conditioned to mitigate objections. The permit might be granted for less water than applied for, or the water use may require the retirement of another water right to offset the new use. Monitoring and reporting of the water use also may be required.

In September of 2011, the WPIC heard about two projects for which water right permits were granted and another that used exempt wells.

The town of Stevensville obtained a permit for a ground water well to serve the 117-lot Twin Creeks Subdivision, which sits on 40 acres. The appropriation is for municipal use with 33.6 acre-feet per year for in-home domestic uses and 62.7 acre-feet per year for lawn and garden uses. The total consumptive use is about 50 acre-feet a year.[4]

Because the appropriation is in a closed basin, the applicant also was required to obtain an aquifer recharge plan. The plan shows how water historically used for irrigation will be diverted to a pond and gravel pit to recharge the aquifer, thereby offsetting the new use.

Another project reviewed by the WPIC was a preliminarily approved application in Lewis and Clark County for a three-well system serving the Elk Creek Colony. The water will be for use in 28 homes for up to 150 people, stock use, and industrial use which will include a concrete batch plant and shop use. Again, this application is in a closed basin. The mitigation plan is to retire two water rights on 65 acres for a mitigation amount of about 50 acre-feet per year.[5]

Both the Stevensville and the Lewis and Clark County appropriations will be required to meter the wells and monitor ground water levels.

The third project, Timberworks Estates in the Helena Valley, chose to use exempt wells on 108 lots. While this project is also located in a closed basin, the use of the exemption means that no analysis for legal availability or adverse effect was required.

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[4] http://leg.mt.gov/content/Committees/Interim/2011-2012/Water-Policy/Meeting-Documents/September-2011/stevensville-permit.pdf.

[5] http://leg.mt.gov/content/Committees/Interim/2011-2012/Water-Policy/Meeting-Documents/September-2011/elk-creek-permit.pdf.

To use the exemption, one drills the well and puts the water to use. To obtain a certificate of water right, which includes a priority date, the water user pays the DNRC $125 and provides the location, the flow rate, and the beneficial use of the well.

All western states except Utah and California provide a ground water exemption. Most exemptions were created decades ago, with the idea that evaluating small uses of water for homes or stock would consume more time and money than it was worth.[6]

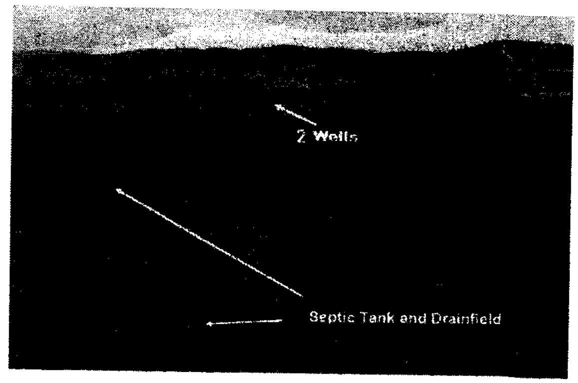

Illustration of proximity of wells and septic systems in the Helena Valley. From 2007 Department of Environmental Quality presentation to the WPIC.

Exempt wells are often used in conjunction with septic systems and can become contaminated depending on location.

However, Montana and other states also share common challenges associated with exempt wells, including concern about the cumulative effect of withdrawls not subject to analysis of their effect on ground water or hydrologically connected surface waters. Exempt wells are often shallow, making them susceptible to contaminants. They are also often used in conjunction with septic systems to treat sewage and can become contaminated depending on location.[7]

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[6] Report: Exempt Well Issues in the West, Nathan Bracken, Western States Water Council, http://leg.mt.gov/content/Committees/Interim/2011-2012/Water-Policy/Meeting-Documents/September-2011/exempt-well-issues-west.pdf.

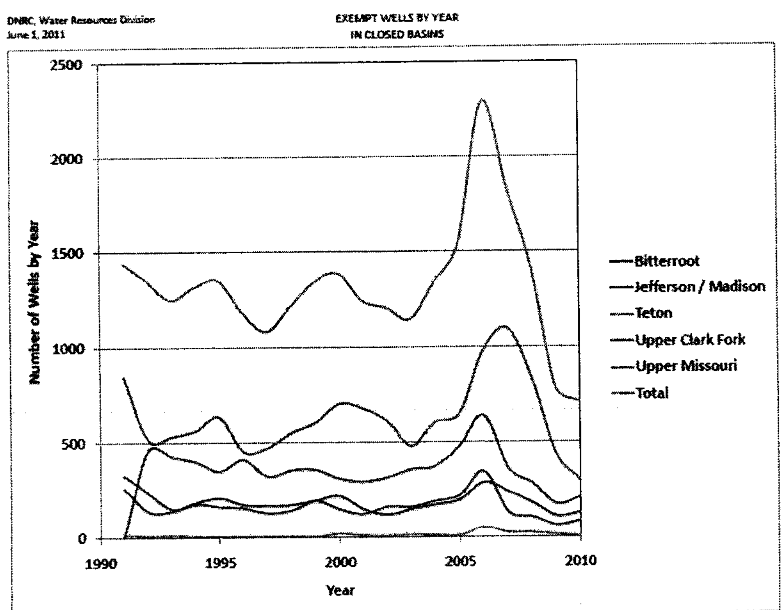
[7] Ibid. At the request of the WPIC, the 2011 Legislature passed House Bill No. 28, which revised requirements for septic mixing zones. http://data.opi.mt.gov/bills/2011/sesslaws/ch0083.pdf.

Exempt Wells: How Many? How Much Water?

There are more than 113,000 wells around Montana for which a permit was not necessary.[8]

About 56,000 of those wells were drilled after 1991, when the current law took effect. Of those, about 26,000 were drilled in closed basins. (Appendix B)

Closed basins are areas of the state where new surface water appropriations are mostly banned to protect existing uses and permit applications for ground water undergo extra scrutiny for possible effects to surface water. Ground water permits that are approved may be required to mitigate those effects. The closed basin restrictions do not apply to exempt wells.[9] (Appendix C)



- Of the approximately 56,000 wells drilled in Montana after 1991, about 26,000 were drilled in closed basins.

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[8] DNRC database of water rights as of March 2012.

[9] Basins can be closed by the Legislature, the DNRC, a court, or a negotiated compact. See 85-2-319, 85-2-321, 85-2-330, 85-2-336, 85-2-341, 85-2-343, and 85-2-344, MCA.

Most closed basins are in western Montana, which is also where much of the state's population growth occurred over the last 2 decades. Between 1990 and 2010, the populations of Gallatin County and Broadwater County, both located in the closed Upper Missouri Basin, increased by about 70% each. In Gallatin County, that was an increase of almost 40,000 people.

Ravalli County, located in the closed Bitterroot Basin, increased in population by about 15,000 people during those 2 decades for a 61% increase.

To house new residents in those and other areas, subdivisions were created. Many lots within those developments are served by exempt wells. Of the more than 28,000 lots created between July 2004 and June 2011, about two-thirds were slated to get water from exempt wells.[10]

The DNRC estimates that the number of exempt wells in existing closed basins could double to 53,000 by the year 2030.[11]

While the effect of water use by exempt wells is not analyzed by the permitting process, the committee examined several scenarios based on well location, assumptions of actual use, and area-specific availability and allocation of ground water.

The exemption allows for a flow rate of 35 gallons per minute, not to exceed a volume of 10 acre-feet a year.[12]

That amount is equal to a football field under 10 feet of water. To put that much water on the gridiron, one would have to fill a 1 gallon milk jug every 10 seconds, around the clock, for an entire year.

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[10] Department of Environmental Quality Subdivision Review Program.

[11] DNRC presentation to WPIC. June 1, 2011. Number does not include stock wells. http://leg.mt.gov/content/Committees/Interim/2011-2012/Water-Policy/Meeting-Documents/June-2011/exempt-well-statistics-dnrc.pdf.

[12] This reflects the 1991 change in law from 100 gallons per minute with no limit on volume.

Water is deemed consumed if it does not return to the system. How much water is consumed depends on the use.

The amount of water allowed under the exemption is sufficient for a variety of uses. Ten acre-feet could quench the thirst of 500 cows for a year, keep 5 acres of grass green in Bozeman, sprinkle up to 7 acres of pasture, serve a 150-room hotel, run a gravel operation, or supply a 10-lot subdivision in Billings.[13] (See Appendix C)

In terms of the water used in a housing development, it is estimated that a household of 2.5 people would divert about one-third of a single acre-foot per year for in-house uses, including drinking, cleaning, and toilet operation. In Bozeman, an acre of lawn and garden could be irrigated with 2 acre-feet a year. [14]

The language in the exemption refers to the amount of water pumped out of the ground. But while the use of water is a property right that can be owned by an individual, the water returned to the system, such as through a septic system, will be used by many water right holders as it cycles through each use. When it comes to debating the effect the exemption may have on existing users, the other component is the amount of water consumed.

Water is deemed consumed if it does not return to the system, meaning it cannot be used by other water right owners. The largest consumptive uses are evaporation from soil and surface water bodies and transpiration, which is water used by plants.[15]

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[13] DNRC presentation to WPIC. Sept. 13, 2011 http://leg.mt.gov/content/Committees/Interim/2011-2012/Water-Policy/Meeting-Documents/September-2011/water-use-table.pdf.

[14] Ibid.

[15] John Metesh, Hydrogeology Related to Exempt Wells in Montana, Montana Bureau of Mines and Geology.

How much water is consumed depends on the use. A household that diverts one-third of an acre-foot for 2.5 people would consume just 0.03 acre-feet because most of the water is returned through the wastewater system. Nine out of every 10 gallons of water pumped out of the ground return to the system. In contrast, a growing lawn consumes about 80% of water put on it.[16]

On a statewide scale, using assumptions more conservative than those above, the amount of water diverted by exempt wells in closed basins in 2010 was more than 30,000 acre-feet with the consumed volume of almost 18,000 acre-feet.[17]

As previously noted, any use of ground water in excess of 10 acre-feet requires an analysis of how the use would affect existing water right owners. Any single request to appropriate 3,000 acre-feet or more of ground water requires not only that analysis, but also approval by the Legislature.[18]

But caution should be used when looking at the cumulative use of water on a statewide basis and comparing those cumulative amounts to single, larger applications to appropriate. A water budget, much like a financial budget, can be analyzed by scale. When looking at the withdrawal of water across the state, less than 3% is ground water and only 8% of that is withdrawn by exempt domestic wells. Even less than that is actually consumed. On that scale, the effect of exempt wells could be negligible. [19]

The Ground Water Investigation Program at the Montana Bureau of Mines and Geology examined consumptive use on a much smaller scale. The analysis compared domestic lawn watering from exempt wells to three different types of agricultural irrigation.

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[16] DNRC presentation to WPIC. Sept. 13, 2011, http://leg.mt.gov/content/Committees/Interim/2011-2012/Water-Policy/Meeting-Documents/September-2011/water-use-table.pdf.

[17] DNRC presentation to WPIC. June 1, 2011. Number does not include stock wells. http://leg.mt.gov/content/Committees/Interim/2011-2012/Water-Policy/Meeting-Documents/June-2011/exempt-well-statistics-dnrc.pdf. Assumes .21 AF diverted for in-house use and .95 diverted for half acre lawn.

[18] 85-2-317, MCA.

[19] John Metesh, Hydrogeology Related to Exempt Wells in Montana, Montana Bureau of Mines and Geology.

As seen on page 27 of Appendix E, the percentage of consumptive use varied widely. In the lower Beaverhead River study area, exempt wells consumed just 2% of the water budget, while in the Eightmile Creek area of Ravalli County, lawn watering accounted for more than half of water consumed.

In small study areas, there also can be marked differences in consumptive use based on an annual budget and a smaller, seasonal time frame. As seen on page 29 of Appendix E, the domestic use in April and May in the Eightmile study area isn't much different in early spring than overall. However, in the Four Corners study area, the consumptive use of lawns in early spring is a much greater percentage of the water budget than when it is measured annually.

In subbasin study areas in regions where the growth of exempt wells has raised concerns, including Florence, Helena, Belgrade, and Bozeman, the study found that lawn watering from exempt wells consumed 15% of all water not returned to the system, or just less than 5,000 acre-feet annually.

What effect, if any, the consumptive use of exempt wells may have on existing surface right holders is not analyzed. However, the DNRC presented testimony on the legal availability of water in some of the areas studied by the Ground Water Investigation Program. Considering that an exempt well would be a year-round use, the DNRC concluded that in the Threemile Creek Area, any depletion of surface flows by a new ground water use would affect existing demands. While there is water legally available during certain times of the year in Eightmile Creek and the Bitterroot River, DNRC Water Division Administrator Tim Davis said that a year-round use of ground water that was subject to a legal availability analysis would likely need to also provide mitigation to offset effects on existing water rights.[20]

The committee also heard testimony from the Montana Association of Realtors referencing a study the association commissioned in 2008 on exempt wells. That study found that "it is difficult to conceive that there would be any practical circumstance in any closed basin in

[20] Tim Davis testimony to WPIC. January 10, 2012. http://leg.mt.gov/content/committees/interim/2011-2012/Water-Policy/minutes/January-10-2012/Exhibit03.pdf.

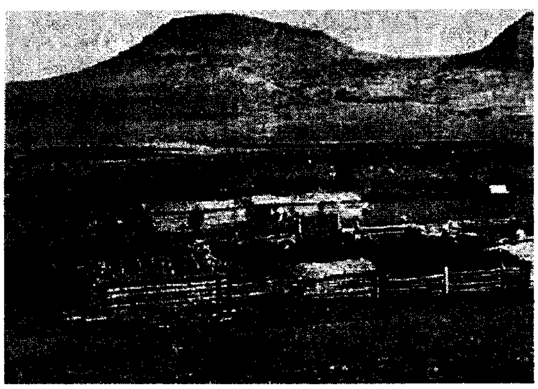
Montana where future growth in exempt wells would result in any discernable, detectable, or measurable adverse impact to any prior surface water appropriator."[21]

[21] Jim Day testimony for Montana Association of Realtors to WPIC, Jan. 10, 2012. Nicklin Earth and Water Inc., submitted two reports to WPIC in 2008. The one quoted above is "Update on Evaluations Significance Of Exempt Wells Montana's Closed Basins."
http://leg.mt.gov/content/Committees/Interim/2007_2008/water_policy/staffmemos/evaluationssignificance.pdf The other is "Water Rights in Closed Basins."
http://leg.mt.gov/content/Committees/Interim/2007_2008/water_policy/staffmemos/waterrightsnicklin.pdf The DNRC responded to the Nicklin studies, concluding in part that the analysis only examined annual water budgets on a basin wide scale to concluded that there are no cumulative impacts from exempt wells.
http://leg.mt.gov/content/Committees/Interim/2007_2008/water_policy/staffmemos/nicklinreportcomments.pdf.

Enforcing the Exemption - Making a Call[22]

The Legislature asked the WPIC to evaluate the legal options for integrating exempt wells into the principle that first in time is first in right when senior water rights are not fulfilled. The study also directs the committee to examine enforcement options for exempt wells.

In Montana, as with other water uses, exempt wells are issued a priority date. The date is key to the prior appropriation doctrine. When the water is applied to a beneficial use determines the user's priority in the water; i.e., the first user to obtain the right is the first user who gets to use the water in times of shortages.



Montana ranch, 1872. National Archives photo.

The notion of "first in time, first in right" is the bedrock of western water law.

This notion of "first in time, first in right" is the bedrock of western water law and has been recognized by courts throughout Montana's history. In 1911, for example, the Montana Supreme Court recognized the concept of "first in time, first in right" in a decision involving a change of use from power to agricultural.[23] In 1953, the Montana Supreme Court stated the rule as follows: "The rule is that he who first diverts the water to a beneficial use has the prior right thereto where the right is based upon the custom and practice of the early settlers as here . . ."[24] The concept of "first in time, first in right" has been integrated into the Montana Water Use

[22] Adapted from legal memorandum of Helen Thigpen, WPIC attorney, Aug. 30, 2011.

[23] Featherman v. Hennessy, 43 Mont. 310, 316, 115 P. 983, 986 (1911).

[24] Midkiff v. Kincheloe, 127 Mont. 324, 328, 263 P.2d 976, 978 (1953).

Act. Section 85-2-401, MCA, specifically provides that "[a]s between appropriators, the first in time is the first in right."

To enforce a water right under the prior appropriation doctrine, a senior user can make a call on the source. When this occurs, water users with the most junior rights must cease using the water in reverse order of priority so that the more senior right is fulfilled first. In some cases each junior user upstream from the senior's point of diversion may be required to curtail use of water.

Because the concept of a call is rooted in practice and judicial common law, the concept does not appear consistently throughout Montana's statutes. The concept is defined, in a section codifying a water compact, as "the right of the holder of a water right with a senior priority and an immediate need for a recognized use to require a holder of a water right with a junior priority to refrain from diverting water otherwise physically available."[25] Section 85-2-351, MCA, which addresses requirements for notices to provisional permit holders in the Clark Fork River basin, provides that "[i]n accordance with Montana law, you may be subject to a call by senior water right holders, in which case you may be required to discontinue your use of water for the period of the call."

In the context of surface water, a senior user will contact junior users upstream from the senior's point of diversion to notify them that a call is being made. The senior will call each user in the order of the most junior to the most senior until the right is satisfied. If the junior user does not yield to the senior's request, the senior may seek a judicial remedy, usually an injunction. In addition to private enforcement by the senior user, the Department of Natural Resources and Conservation (DNRC) is authorized to petition a District Court supervising the distribution of water among appropriators to order the person to cease using the water.[26] The DNRC may direct the Attorney General or a county attorney to bring a suit to enjoin the unlawful use, or the Attorney General or a county attorney may decide to bring the action.[27] Either way, priority must be given to protecting the rights of prior appropriators.

[25] 85-20-1501, MCA.

[26] 85-2-114, MCA.

[27] 85-2-114 (3) and (4), MCA.

In most cases a junior user cannot ignore a call by a senior user. However, this is not an absolute rule. The futile call doctrine may relieve a junior surface or ground water user from complying with the call. The futile call doctrine holds that a call may be denied if a junior user can prove that the water would not actually reach the senior to satisfy the call; i.e., if the call is futile. Courts have recognized the doctrine, but according to some, the doctrine can be difficult to establish, especially if some water will eventually reach the senior user.[28]

The case most often cited to illustrate the difficulty of establishing the futile call doctrine is State ex rel. Cary v. Cochran, 138 Neb. 163, 292 N.W. 239 (1940). In Cary, junior users alleged that a call by downstream seniors would be futile because of substantial losses from seepage and evaporation along the way to the seniors' point of diversion. The Nebraska Supreme Court refused to apply the doctrine even though the juniors would be required to let 700 cfs of water go by to satisfy senior users who needed only 162 cfs. Because some water would actually reach the seniors, the court reasoned that the call would not be futile even though the result created significant waste.

The futile call doctrine has been recognized by courts in Montana. In 1892, the Montana Supreme Court recognized the concept, stating:

> Under the theory of the law of this State relating to water rights, the prior appropriator may insist that the water remain in the stream, from which he has the right of prior appropriation, so long as any useful quantity thereof would reach his point of diversion, if allowed to remain. He is entitled to insist that all of such water remain, in order to carry the flow down to his point of diversion, although a large portion of it would be lost by evaporation and percolation. He has the right to the prior use of the water of the creek, and while he may be entitled to a stated quantity only, it may require much more than that quantity in the creek to carry the amount he is entitled to down to his point of diversion.[29]

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[28] Dan Tarlock, *Law of Water Rights and Resources* 5:33 (Clark Boardman Callaghan 1988 & Supp. 1989-2009).

[29] Raymond v. Wimsette, 12 Mont. 551, 31 P. 537 (1892).

In a later decision, the Montana Supreme Court again recognized the futile call concept.[30] In Irion v. Hyde, 105 P.2d 666 (1940), the Court reversed and remanded a District Court finding that junior users were entitled to use any of the water flowing in the creek at their property that, if permitted to flow, would not reach the senior user's point of diversion in any useful quantity. The Supreme Court concluded that the District Court erred because it seemed to "make the test the volume of the flow at defendant's dam." The Supreme Court held that the diversion was justified only if the juniors could prove that the seniors received their full appropriation or if no water would reach the seniors.

Not all western states have recognized the futile call doctrine. For example, courts in Washington have consistently rejected the doctrine, choosing instead to rely on the language of decrees and priorities. Most recently, in 2006, the Washington Supreme Court reaffirmed its position that the futile call doctrine is best left to the Legislature, stating that "[w]ater management is a huge issue in this state."[31] The Washington court went on to say that "[t]here is clearly controversy as to the best way to manage this state's water resources. However, policy decisions are the province of the Legislature, not of this court."[32]

The State of Idaho has incorporated the futile call concept into the state's conjunctive management rules, which apply to areas that share a common ground water supply. In 1994, Idaho adopted a set of conjunctive management rules for the management of surface water and ground water. The rules "apply to all situations in the state where the diversion and use of water under junior-priority ground water rights either individually or collectively causes material injury to uses of water under senior-priority water rights."[33] Under the rules, a call may be denied if it is considered futile, but the Department of Water Resources may require mitigation or staged curtailment if the diversion causes material injury to a senior user. This may be true even though the hydrological connection is remote. With respect to exempt wells, the rules provide that a call is not effective against any ground water right used for domestic purposes or stock water right so long as

[30] Irion v. Hyde, 110 Mont. 570, 105 P.2d 666, (1940).

[31] Fort v. State Dept. of Ecology, 133 Wash. App. 90, 135 P.3d 515 (Div. 3 2006).

[32] Id.

[33] Idaho Admin. Code 37.03.11.020.01.

the amount used is within the limits of Idaho's exemption statute.[34] The Idaho Supreme Court has upheld the constitutionality of the rules. For more information, see American Falls Reservoir Dist. No. 2 v. Idaho Dept. of Water Resources, 143 Idaho 862, 154 P.3d 433 (2007).

Ground water and surface water

Historically, Montana law distinguished ground water from surface water. Gradually, both the Legislature and the courts began to recognize the connection between ground water and surface water and treat them similarly for purposes of water appropriation and management. For example, in 1966, the Montana Supreme Court issued a decision that explicitly recognized the connection between ground water and surface water. In the decision, the court stated that "[m]odern hydrologic innovations have permitted more accurate tracing of groundwater movement."[35] The court also stated that "traditional legal distinctions between surface and groundwater should not be rigidly maintained when the reason for the distinction no longer exists."[36]

In 2006, the Montana Supreme Court issued a decision that squarely addressed the connection between surface water and ground water.[37] At issue in the case was the DNRC's interpretation of the state's closed basin law in the Upper Missouri River Basin, which prohibited the DNRC from granting permits within the Upper Missouri River Basin until the issuance of the final decrees.[38] The DNRC was not prohibited, however, from processing applications for the appropriation of ground water unless the ground water was "immediately or directly connected" to surface water.[39] In interpreting the meaning of "immediately or directly connected" to surface water, the DNRC determined that a well

[34] Idaho Admin Code 37.03.11.020.11.

[35] Perkins v. Kramer, 148 Mont. 355, 363, 423 P.2d 587, 595 (1966).

[36] Id.

[37] Montana Trout Unlimited v. DNRC, 2006 MT 72, 331 Mont. 483, 133 P.3d 224.

[38] Section 85-2-343, MCA.

[39] Section 85-2-342, MCA. The definition of ground water was deleted from section 85-2-342, MCA, in 2007. Prior to 2007, section 85-2-342, MCA, defined ground water as "water that is beneath the land surface or beneath the bed of a stream, lake, reservoir, or other body of surface water and that is not immediately or directly connected to surface water."

for ground water could not pull surface water directly from the source (i.e., induced infiltration). The DNRC's interpretation did not prohibit wells that captured ground water that would otherwise end up in the stream (i.e., prestream capture). The Supreme Court held that both pumping methods reduced surface flows and that DNRC's interpretation did not protect senior water right holders.[40]

Demonstration by the DNRC of the interaction between surface and ground water. Photo by Joe Kolman.

Gradually, both the Legislature and the courts began to recognize the connection between ground water and surface water.

Under current Montana law, ground water and surface water are managed under the same permitting system. This means that an applicant for a ground water permit must go through the same permitting process as a surface water applicant unless the appropriation is exempt from the permitting requirements. This is significant because, like a surface water applicant, a ground water applicant must demonstrate that "the water rights of a prior appropriator under an existing water right, a certificate, a permit, or a state water reservation will not be adversely affected."[41]

It also means that senior users have the opportunity to formally object to the application. As such, Montana law recognizes that a senior water right may be affected by both surface and ground water uses. In addition, Montana law does not prioritize any water use over any other, regardless of whether the use is for domestic, agricultural, or municipal purposes. The result is a strict adherence to the prior appropriation doctrine – first in time,

[40] Montana Trout Unlimited v. DNRC, ¶ 43.

[41] Section 85-2-311(1)(b), MCA.

first in right – applied to both ground water and surface water, and without prioritization of use.

Challenges to making a call

While senior users may legally make a call against more junior ground water users under the framework outlined above, there are significant practical and legal challenges associated with implementing and enforcing the call, especially if the call is made against a well that is exempt from the permitting process under the Montana Water Use Act.

As noted above, Montana law does not distinguish between surface water and ground water for purposes of priority enforcement, which presents unique challenges for making a call to enforce a water right. Dan Tarlock, an expert in water law, has noted that "[i]n the western states that apply the prior appropriation system to ground water, priority has proved impossible to administer in practice for basins that are not directly hydrologically connected to surface systems."[42] The problem, according to Mr. Tarlock, "is that a causal connection between a victim senior well and a junior well is extremely difficult, if not impossible, to establish. All wells contribute to mining and it is difficult to insulate the causal connection between a well and the relevant cone of depression."[43]

Additionally, a senior user will make a call on a source only when a water shortage exists, and thus, timing is a significant issue in the context of using a call to enforce a water right. With surface flows, it is relatively easy to predict when a senior will receive water pursuant to a call. In the context of ground water, timing can be a significant challenge because it could take several days or weeks for water to reach the surface source depending on the connection. The Montana Bureau of Mines and Geology has illustrated this problem in a report issued to WPIC in 2008. In the report the Bureau stated:

> There may be a considerable time lag between the start of pumping and any reduction in stream flow depending upon the location of the pumping well (distance and depth) relative to the stream, the hydraulic characteristics of the aquifer, and the pumping rate. Furthermore, the effect of ground-

[42] Dan Tarlock, *Prior Appropriation: Rule, Principle, or Rhetoric*, 76 N. Dak. L. Rev. 881, 102, (2000).

[43] *Id.* at 102-103.

> water pumping on stream flow may persist long after pumping has stopped. This is a simplified scenario; in the real world there will be other hydrogeologic factors such as ET, recharge variability, the presence of disconnected streams or reaches, low-permeability streambeds, and deep confined ground-water systems that complicate the stream–aquifer interactions.[44]

Because a call may be made in an area where the connection between surface and ground water is not immediately known and because water may not be received immediately, a call against a ground water development may not be a practical or timely means of enforcing a senior surface right.

It is also unclear what a senior would have to demonstrate upon making a call against a ground water user. As discussed above, upon making a call in Idaho, senior users must allege that they have been materially injured by the ground water pumping. Under the Idaho rules "material injury" is defined as "[h]indrance to or impact upon the exercise of a water right caused by the use of water by another person as determined in accordance with Idaho Law . . ."[45] The Idaho Department of Water Resources looks at several factors in determining whether material injury exists, including "[w]hether the exercise of junior-priority ground water rights individually or collectively affects the quantity and timing of when water is available to, and the cost of exercising, a senior-priority surface or ground water right."[46]

Unlike other western states, Montana law does not prioritize certain water uses over others. This strict enforcement of the prior appropriation doctrine means that a call could be made against a junior permitted well used for agricultural purposes or a junior exempt well used for domestic purposes. From a practical standpoint, however, a senior surface user will likely run into several challenges in attempting to enforce the call, including the futile call doctrine. For example, if a call is made in an area where the hydrological

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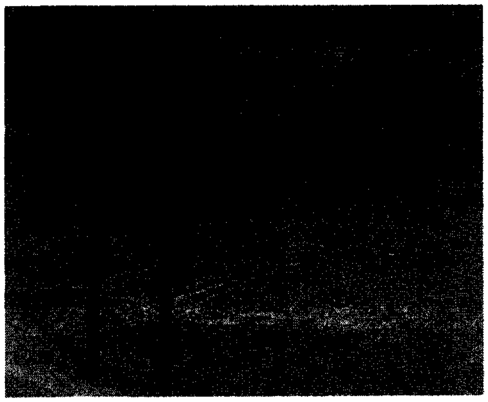
[44] See Final Case Study Report to the 60th Legislature Water Policy Committee at: http://www.mbmg.mtech.edu/gwip/gwip_pdf/hb831book_appendix.pdf

[45] Idaho Admin. Code 37.03.11.10.14.

[46] Idaho Admin. Code 37.03.11.42.01.



Unlike other western states, Montana law does not prioritize certain water uses over others.

connection between surface water and ground water is unclear, a ground water user could invoke the futile call doctrine and argue that the senior would not receive any water to fulfill the senior's right despite curtailment of the use. Even if the hydrological connection between the surface and ground water source was relatively clear, a junior user could argue that the senior would not receive the water in time to prevent the call from being futile or that seepage or evaporation would prevent the senior from receiving a usable quantity. However, in attempting to invoke the futile call doctrine, a junior user would have to overcome the general rule that a call is futile only if the senior will not receive any water pursuant to the call.

Calling exempt wells

Each of the challenges outlined above would also apply to calls made against exempt wells. However, these challenges may be even more pronounced in the context of exempt wells.[47]

The most significant challenge with making a call against an exempt well is likely attempting to assess how the well is affecting the senior user and determining which well or wells caused the depletion.

[47] The WPIC asked for a list of water right calls made in Montana over the last several years. Unfortunately, it does not seem that such a list exists. This lack of information may be due in large part to the nature of a water right call. In a time of water shortage, a senior water user may make a call on junior water users in order to fulfill the senior's water right. This is an action between private parties and could be something as informal as a phone call, an e-mail, or a chat at the post office, though that chat may be less than friendly. In these circumstances, a call is not an action performed and recorded within a government-based system. If the junior refuses to comply, the senior may ask a court for an injunction. But it does not appear these records are centrally recorded.

The common concern with exempt wells is not necessarily the use by a few individual users but rather the cumulative effect of numerous exempt wells in a particular area or development. The question in the context of call, then, is how a senior user would actually make a call to ensure water availability. If the surface depletion is a result of numerous exempt wells in an area, a senior user would theoretically need to make a call on the wells in the entire area to enforce the senior's right. This could include making a call against a subdivision that relies exclusively on exempt wells for domestic water supply. In this context, would the senior make the call against the subdivision as a whole (i.e., against the homeowner's association if one exists) or against each individual user? What if a subdivision has 200 wells?

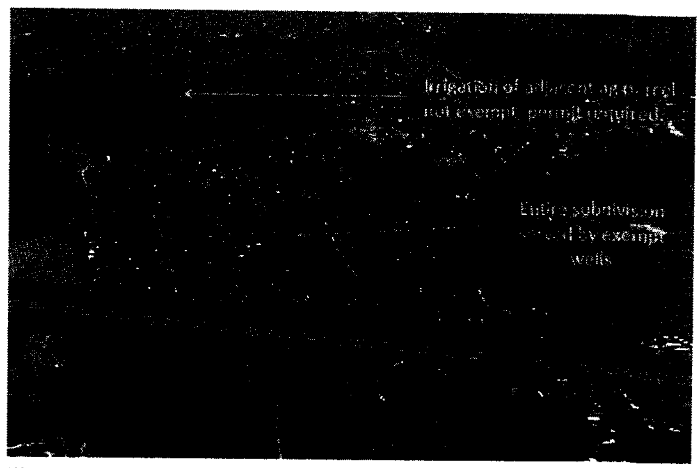


Illustration of use of exempt and nonexempt wells. Alan English, Gallatin Local Water Quality District Manager.

The common concern with exempt wells is not necessarily the use by a few individual users but rather the cumulative effect of numerous exempt wells in a particular area or development.

In addition, there could be serious health and safety problems with making a call on an exempt well. Because of the nature of the exemption itself, many exempt wells are used primarily for domestic purposes, including for drinking water. It is not practical for a senior user to attempt to enforce a call against these wells when shutting off the wells may result in a lack of drinking water for individuals and families. Courts are likely to take a dim view of such attempts. Idaho has prioritized the use of water for domestic purposes over other uses. Therefore, a call from a surface irrigator against a well used primarily for domestic purposes is not effective in Idaho.

Beyond practical problems associated with attempting to curtail the use of an exempt well, there may be constitutional provisions that would limit the ability of a senior user to enforce a water right through a call. The Montana Constitution broadly recognizes that "All persons are born free and have certain inalienable rights", which include the right to pursue life's basic necessities and seek safety, health, and happiness.[48]

Water is one of life's most essential basic necessities, and it does not take much to see that a user that relies solely on a well for water would likely invoke Montana's constitutional protections for relief from compliance with a call.

Finally, it is worth noting that the permitting process itself may alleviate the need for a senior to make a call. To receive a surface or ground water permit from the DNRC, an applicant must demonstrate that an existing right will not be adversely affected. Oftentimes this requires applicants to mitigate effects on senior users. Whether an adverse effect exists is "based on a consideration of an applicant's plan for the exercise of the permit that demonstrates that the applicant's use of the water will be controlled so the water right of a prior appropriator will be satisfied".[49]

Because permitted ground water users are required to first demonstrate that senior users will not be harmed by the development, many of the issues that would have otherwise resulted in a senior attempting to enforce a water right through a call may be addressed through the permitting process. Nevertheless, because the individual exemption is relatively small, a larger permitted ground water well may have a greater effect on the source than a certain number of exempt wells.

[48] Mont. Const. Article II, section 3.

[49] Section 85-2-311, MCA.

Exempt Wells: What Are the Options?

As legislators and others debated the exemption over the last few years, suggestions ranged from maintaining the status quo to major overhauls in the way water is dispensed. Attempts included proposed rule changes and legislation. To date, none have succeeded in changing the way exempt wells are administered.[50]

There are "hammer" approaches and "scalpel" approaches for addressing exempt wells, Nathan Bracken, an attorney for the Western States Water Council, told the WPIC in January 2012. Bracken, who wrote a report on exempt wells, said hammer approaches include repealing the exemption, a statewide reduction for existing wells, and requiring meters on every well.

The scalpel approaches, he said, may include refining the exemption or targeting specific watersheds. [51]

In his report, Bracken wrote that overloading the permitting system with small applications, reducing an existing property right, or trying to administer a statewide reporting system rendered most of the hammer solutions infeasible.[52]

Feasible solutions may include limiting the type of exempt development (large subdivisions, for example) or requiring local governments to condition subdivision approval based on a water right determination. Other feasible approaches Bracken discussed included reducing flow rates and volumes for new wells and reducing the exemption in areas where water

[50] In a December 2011 agreement to dismiss a lawsuit brought by the Clark Fork Coalition and others, the DNRC agreed to initiate rulemaking to define the term "combined appropriation" in a way that would be broader than the current definition of only wells physically connected. House Bill No. 602 prevented the DNRC from rulemaking until after Oct. 1, 2012..

[51] http://leg.mt.gov/content/committees/interim/2011-2012/Water-Policy/minutes/September-13-2011/Exhibit10.pdf.

[52] Report: Exempt Well Issues in the West, Nathan Bracken, Western States Water Council, http://leg.mt.gov/content/Committees/Interim/2011-2012/Water-Policy/Meeting-Documents/September-2011/exempt-well-issues-west.pdf.

availability is of concern. He also discussed revising the exemption to focus on the amount of water consumed instead of the quantity withdrawn.[53]

The WPIC heard two examples of how exempt wells may be managed in specific areas of the state.

In 2011, the DNRC established the Horse Creek Controlled Ground Water Area, a 12-square-mile area southwest of Absarokee. According to the agency, data showed that springs in the Horse Creek drainage could dry up and the average annual flows in Horse Creek could be reduced by 25% during dry years if a platted subdivision is completed as intended. In that area, an exempt well of 35 gpm may be used if the volume does not exceed 1 acre-foot per year. [54]

The other example was a proposal that is part of the Confederated Salish and Kootenai Tribes' (CSKT) water right compact being negotiated in northwestern Montana. As proposed, a well for a single home or business with a rate of up to 35 gpm could divert up to 2.4 acre-feet annually. Irrigation would be limited to 0.7 acres. Up to three homes or businesses could share 2.4 acre-feet annually with 0.75 acres of irrigation allowed. Neither of these options would require metering.[55]

Multiple homes and businesses could share up to 10 acre-feet annually, with a quarter acre of irrigation allowed for each. However, metering and reporting would be required.[56]

In an effort to involve those who would be affected by any changes to exempt well policy, the WPIC asked for suggestions from stakeholders. That resulted in five bills being drafted for discussion purposes at public meetings.

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[53] Ibid.

[54] http://leg.mt.gov/content/Committees/Interim/2011-2012/Water-Policy/Meeting-Documents/January-2012/horse-creek-gwa.pdf

[55] http://leg.mt.gov/content/committees/interim/2011-2012/Water-Policy/minutes/January-10-2012/Exhibit16.pdf.

[56] Ibid.

As proposed by Trout Unlimited, LC8000 would prohibit multiple exempt wells in new subdivisions anywhere in the state. And in Gallatin, Lewis and Clark, Missoula, and Ravalli counties, a mitigation exchange would be established to offset the effects of new water uses.[57]

The Montana Building Industry Association proposed in LC8001 that larger, denser subdivisions (30 or more lots, with an average lot size of 3 acres or less) install public water systems, which would most likely also require a water use permit.[58] The association also proposed LC8002, which would reduce the volume allowed under the exemption to 10 gpm and 1 acre-foot consumed. The amount of water consumed is that amount used by plants or lost to evaporation.[59]

The Montana Well Drillers Association proposed in LC8003 to lower the exemption volume to 5 acre-feet for wells drilled in unconfined aquifers within closed basins, for the reason that those wells are more likely to be connected to surface water used by senior water right holders.[60]

The Senior Water Rights Coalition proposed in LC8004 to limit new subdivisions to an exemption of 35 gpm and 10 acre-feet a year using one or more wells. Appropriations of more water would be subject to permitting.[61]

At the July 2012 meeting, the WPIC voted to consider versions of three of the bills at its final meeting. The committee asked to have LC8004 apply only to basins closed by

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[57] LC8000 http://leg.mt.gov/content/Committees/Interim/2011-2012/Water-Policy/Legislation/lc8000-02.pdf.

[58] LC8001 http://leg.mt.gov/content/Committees/Interim/2011-2012/Water-Policy/Legislation/lc8001-02.pdf.

[59] LC8002 http://leg.mt.gov/content/Committees/Interim/2011-2012/Water-Policy/Legislation/lc8002-02.pdf.

[60] LC8003 http://leg.mt.gov/content/Committees/Interim/2011-2012/Water-Policy/Legislation/lc8003-02.pdf.

[61] LC8004 http://leg.mt.gov/content/Committees/Interim/2011-2012/Water-Policy/Legislation/lc8004-02.pdf.

statute. Members also wanted to combine aspects of LC8001 and LC8002, and also limit those to statutorily closed basins.

The draft LC8011 would have required public water and sewer systems in subdivisions of 20 or more lots that have an average lot size of 3 acres or less, as opposed to individual wells and septics. For lots in new subdivisions not covered by that provision, the owner would be allowed an individual water well that pumped 10 gallons a minute or less and consumed less than 1 acre-foot a year.[62]

The other draft, LC8012, would have limited subdivisions in those basins to a total appropriation of water of 35 gallons per minute up to 10 acre-feet a year, no matter the number of wells.[63]

At its final meeting, the WPIC considered and approved two bills for introduction in the 2013 Legislature.

The WPIC voted 7-2 in favor of LC8015 to limit the exemption to 20 gallons per minute and 1 acre-foot annually in "stream depletion zones." These zones would be created by administrative rule. The zones could only exist in areas where hydrogeologic data exists and must be within closed basins.

The boundaries of the depletion zone on either side of a stream would be determined by running a hydrogeologic model to see how far away from the stream the pumping of an exempt well would result in at least half of the amount of water pumped being depleted from the stream within 30 days.[64]

The committee also voted 7-1 for LC8013 to define the term combined appropriation as "an appropriation of water from the same source aquifer by two or more wells or developed springs that are physically connected into the same system."[65]

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[62] LC8011
http://leg.mt.gov/content/Committees/Interim/2011-2012/Water-Policy/Legislation/lc8011-02.pdf

[63] LC8012
http://leg.mt.gov/content/Committees/Interim/2011-2012/Water-Policy/Legislation/lc8012-02.pdf

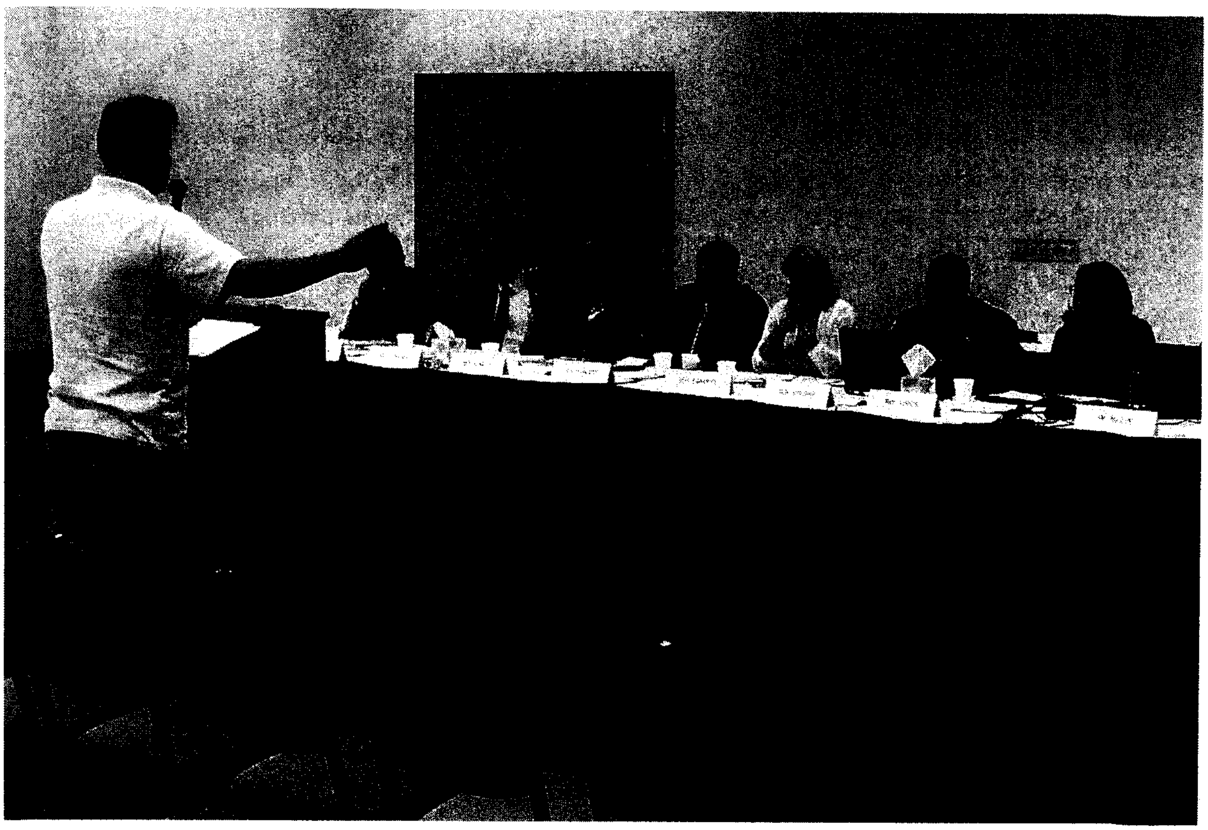
[64] LC8015
http://leg.mt.gov/content/Committees/Interim/2011-2012/Water-Policy/Legislation/lc8015-01.pdf

[65] LC8013
http://leg.mt.gov/content/Committees/Interim/2011-2012/Water-Policy/Legislation/lc8013-01.pdf

Public Comment

The WPIC received much public comment, both through written comments as well as testimony at hearings.

The written comment is included in Appendix F. Other testimony is included in the minutes of each meeting, including the public hearings in Bozeman, Kalispell, and Hamilton. Please refer to the committee web site.[66]



Members of the WPIC listen to testimony on exempt wells during a June 2012 hearing in Hamilton. The WPIC also held public hearings in Kalispell and Bozeman in addition to its regular Helena meetings. Photo by Joe Kolman.

[66] WPIC web site. http://leg.mt.gov/css/Committees/Interim/2011-2012/Water-Policy/default.asp.

Findings and Recommendations

Exempt wells

1. Finding: The use of individual water wells exempt from permitting is appropriate and necessary in many parts of Montana, especially rural areas.

2. Finding: There are more than 113,000 wells around Montana for which a permit was not necessary. The exemption of 35 gpm, up to 10 acre-feet a year, provides a sufficient amount for a variety of uses including domestic, irrigation, stock water, and some industrial.

3. Finding: It is estimated that a 20-lot subdivision could be developed using less than 10 acre feet of water per year, assuming 2.5 persons and 0.08 acres of lawn and garden per household.

4. Finding: The consumption of water by in-house uses is minimal, estimated to be 0.3 acre-feet a year for an average 2.5 person household. Lawn and garden use, however, can consume 80% of the water diverted. One acre of lawn and garden in Billings would divert 2.4 acre-feet of water and consume 2 acre-feet.

5. Finding: On a statewide scale, there is little agreement or evidence to determine if the exemption as written is detrimental to senior water right holders. On smaller scales, such as subbasins, the effect of exempt wells may still be arguable, but more specific calculations can be made.

6. Finding: The statewide regulation of water is under the purview of the Legislature however, the WPIC recognizes those regulations may have significant local economic impacts.

7. Finding: In areas where exempt wells are most controversial, local testimony called for hydrologic evidence when creating water policy.

8. Finding: Those concerned about the effects of exempt wells mainly advocate stricter limits within the closed basins of western Montana. Furthermore, most concerns are about the use of exempt wells for subdivisions near existing urban areas, especially those that have experienced large gains in population.

9. Finding: Current law allows for local water users and others to establish controlled ground water areas where all ground water withdrawals are subject to review. However, there are concerns that establishing a controlled ground water area requires an applicant to provide a significant amount of hydrologic evidence that may be expensive to obtain.

10. Finding: Except for exempt wells, new ground water uses within closed basins are analyzed for net depletion to surface water and adverse effect on senior water rights. A subdivision that may appropriate in total more than 10 acre-feet a year through exempt wells does not undergo the analysis, while an irrigation project or any other appropriation of that amount of water is subject to permitting.

11. Finding: For residential development and other uses, especially in closed basins, using exempt wells is less expensive and faster than obtaining a permit. The DNRC is revising application forms and proposing legislation that the agency says will streamline the process.

12. Finding: The prior appropriation doctrine is enforceable in Montana, but there are challenges faced by senior surface water right holders against junior users of ground water, including exempt wells. Junior users may contend the call is futile because a senior may have difficulty proving surface water would be available even if ground water use was curtailed. For exempt wells, senior water right owners may face additional challenges, including how to make a call against the cumulative use of exempt wells in a subdivision and potential health, safety, and constitutional issues associated with curtailing drinking water.

13. Finding: Unlike some other states, Montana does not prioritize water uses. Water use is enforced strictly by first in time, first in right. The permitting process is a proactive way to ensure new uses do not affect existing uses.

14. Finding: Senior water rights must be protected as property rights while ensuring that new uses, including those that use the exemption, are allowed.

15. Finding: The term "combined appropriation" in 85-2-306, MCA is not defined in statute and has been defined over the last two decades in opposite ways by the DNRC resulting in debate, legislation, and litigation without resolution.

A. Recommendation: The DNRC should continue to work with water use applicants to identify specific issues that may unnecessarily impede the permit and change process and report those findings, along with suggestions to improve the process, to the next WPIC.

B. Recommendation: It is reasonable to restrict the use of exempt wells in basins where new surface water uses are mostly limited and where hydrogelogic modeling concludes that surface waters would be depleted by an exempt well within a fairly short period of time that would be most likely to affect senior water right holders.

C. Recommendation: Restrictions on exempt wells in certain areas should be limited to areas where hydrogeologic data exists, including studies conducted by the Ground Water Investigation Program or other hydrogeologic studies.

D. Recommendation: The term "combined appropriation" should be defined by the Legislature. That definition should be appropriation from the same source aquifer of more than 35 gallons per minute and 10 acre-feet by two or more wells or developed springs that are physically connected into the same system.

E. Recommendation: Local water users and others who are concerned about the effects of exempt wells beyond what the WPIC proposes may pursue regulations under the controlled ground water area statutes.

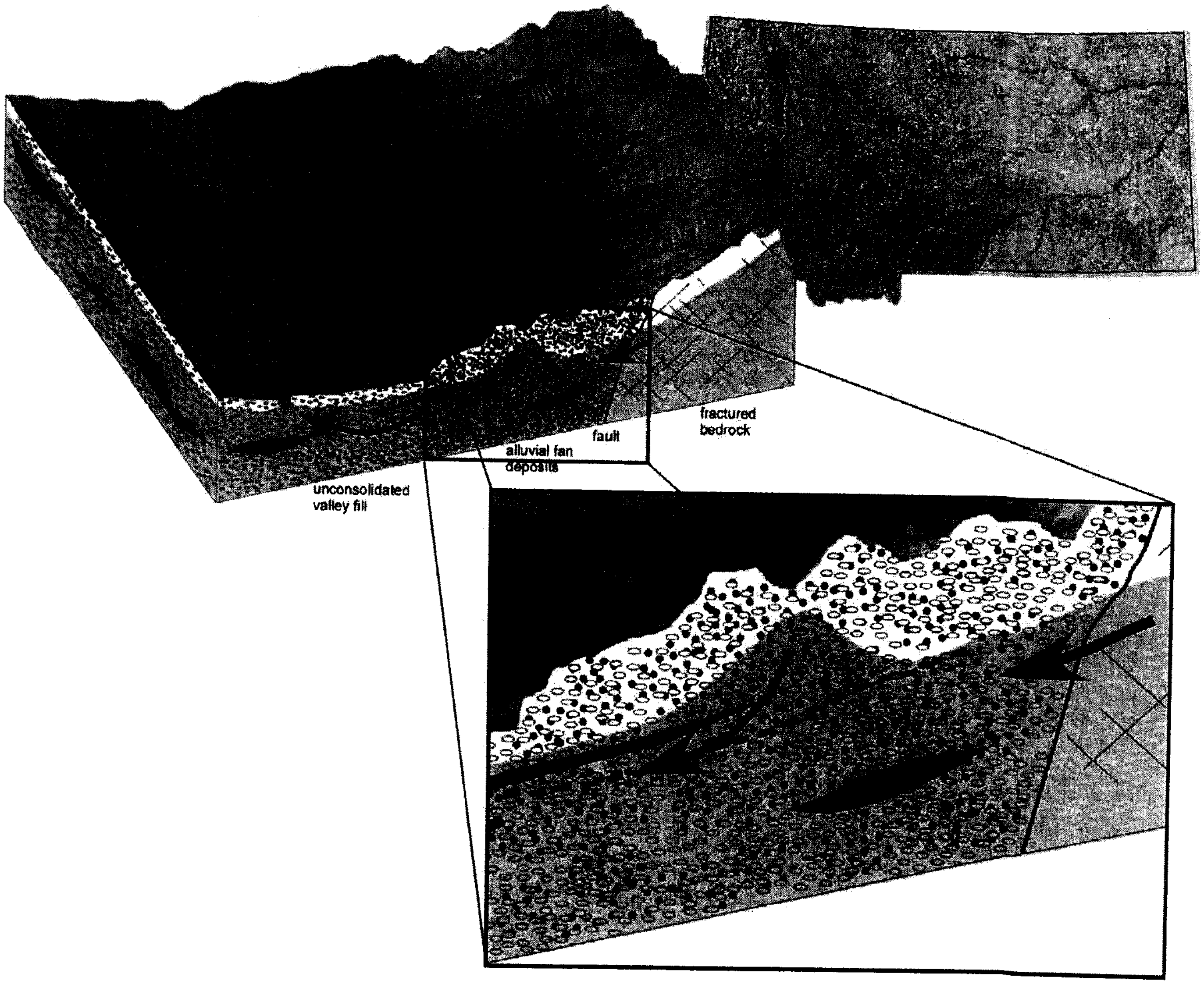
Ground Water Investigation Program

1. Finding: The continued and expanded study of ground water resources is vital to shaping statewide policy as well as providing the data necessary for local decisions regarding water.

2. Finding: The 2007-08 WPIC proposed creating a Ground Water Investigation Program (GWIP) within the Montana Bureau of Mines and Geology. Scientists with the program conduct studies across the state, regularly report to the WPIC, and answer specific questions posed by legislators.

3. Finding: Each investigation completed by GWIP includes a description of the hydrogeologic system, a computer model simulating hydrogeologic features and processes, and online data. The models, reports, and supporting data are available for use by scientists and engineers representing agencies, senior water right holders, new applicants, and other stakeholders.

A. Recommendation: The GWIP is an unbiased source that can provide policy makers and others, including those who may petition for a controlled ground water area, with valuable hydrogeologic information about the effects of exempt wells and other ground water withdrawals. Funding for the GWIP should continue at the level needed to provide this information.



Hydrogeology Related to Exempt Wells in Montana

A Report to the 2010–2012 Water Policy Interim Committee of the Montana Legislature

John Metesh
Montana Bureau of Mines and Geology
Open-File Report 612

Contents

Figures

Table

Introduction

Montana has over 200,000 wells on record with the Montana Bureau of Mines and Geology (MBMG) Ground Water Information Center database (GWIC; mbmggwic.mtech.edu) whose use has been identified as domestic. Some estimates show as much as 30 percent of the population relies on wells for water supply.

For the purposes of this discussion, it is important to note the difference between the terms domestic and exempt. When a well log is filed, the driller or well owner indicates the intended use of the well. Domestic use is one option; other options include, but are not limited to, stock, irrigation, public water supply, or monitoring. The term exempt refers to a groundwater development that, based on the maximum proposed annual volume pumped (currently 10 acre-feet per year) and the maximum pumping rate (currently 35 gallons per minute), is exempt from permitting; the exemption is established by a certificate issued by the Montana Department of Natural Resources and Conservation. The use of the exempt well, whether it be domestic, irrigation, or stock, does not affect the exemption. Due largely to changes in the regulatory requirements regarding well log and water-right filing, there are many wells that indicate domestic use on the well log for which a certificate does not exist. More than 90 percent of all the wells for which a use has been reported are used for domestic or stock.

Figure 1 shows the distribution of all the wells across Montana; each well is represented by a small red dot. Population centers and river valleys are easily distinguished by areas of high well density. Although a geologic source or aquifer is not reported for all wells in the GWIC database, shallow basin-fill aquifers along river and stream valleys are subject to the greatest development.

Wells in Montana

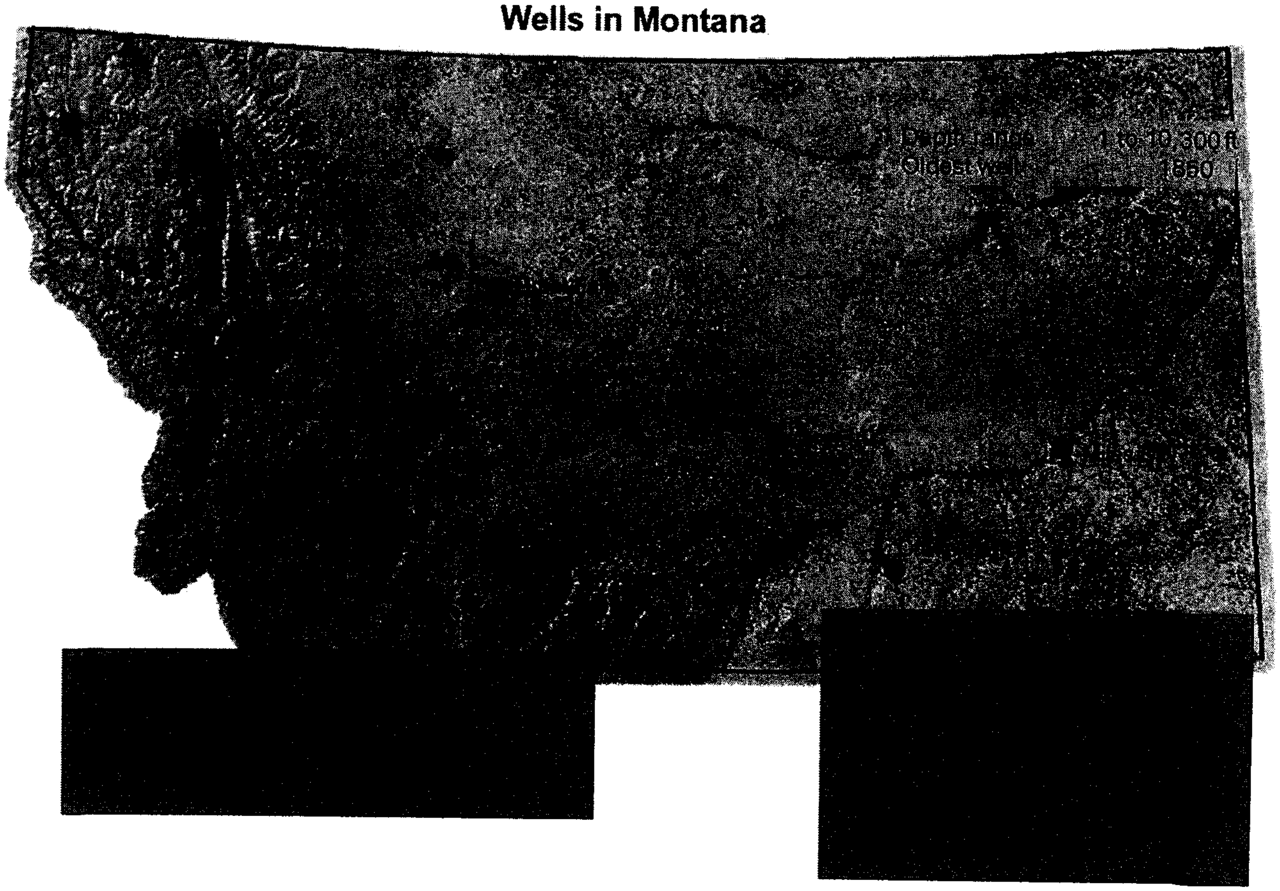


Figure 1. The Ground Water Information Center (GWIC) database contains more than 221,000 records for wells throughout Montana. Each well is represented by a small red dot on the map.

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Groundwater Sources

Montana is often described in terms of its contrasting physiographic or geologic provinces—the mountainous western third and the plains of the eastern two-thirds. An aquifer is permeable geologic material capable of storing and transmitting groundwater. An unconfined or water-table aquifer (bottom of fig. 2) is recharged directly by infiltration of precipitation or surface water; the water table typically ranges from a few feet to tens of feet below the surface. Unconfined aquifers are sensitive to changes in precipitation and withdrawal and are particularly vulnerable to contamination by surface sources such as septic systems and applied chemicals.

Confined aquifers (top of fig. 2) are overlain by a low-permeability material that limits the vertical flow of water into or out of the aquifer. In central and eastern Montana, confined aquifers are typically consolidated, permeable sandstone or limestone formations overlain by low permeable shale. These aquifers extend for hundreds of miles, from the recharge areas in the mountains to the northern and eastern areas of the State. In the western Montana valleys, the deeper portions of the basin-fill aquifers may be confined or partially confined by layers of clay or silt.

It is important to note that confined aquifers must somewhere be unconfined or exposed to receive surface recharge; likewise, for groundwater to flow, the aquifer must discharge to the surface. The recharge areas for several of the important confined aquifers in eastern Montana are in the central mountains; the discharge areas are unknown, but certainly are north and east of the State. Recharge areas for the deep confined aquifers of the western Montana valleys are in the mountains that define the valley or unconfined aquifers in the upland valley margins.

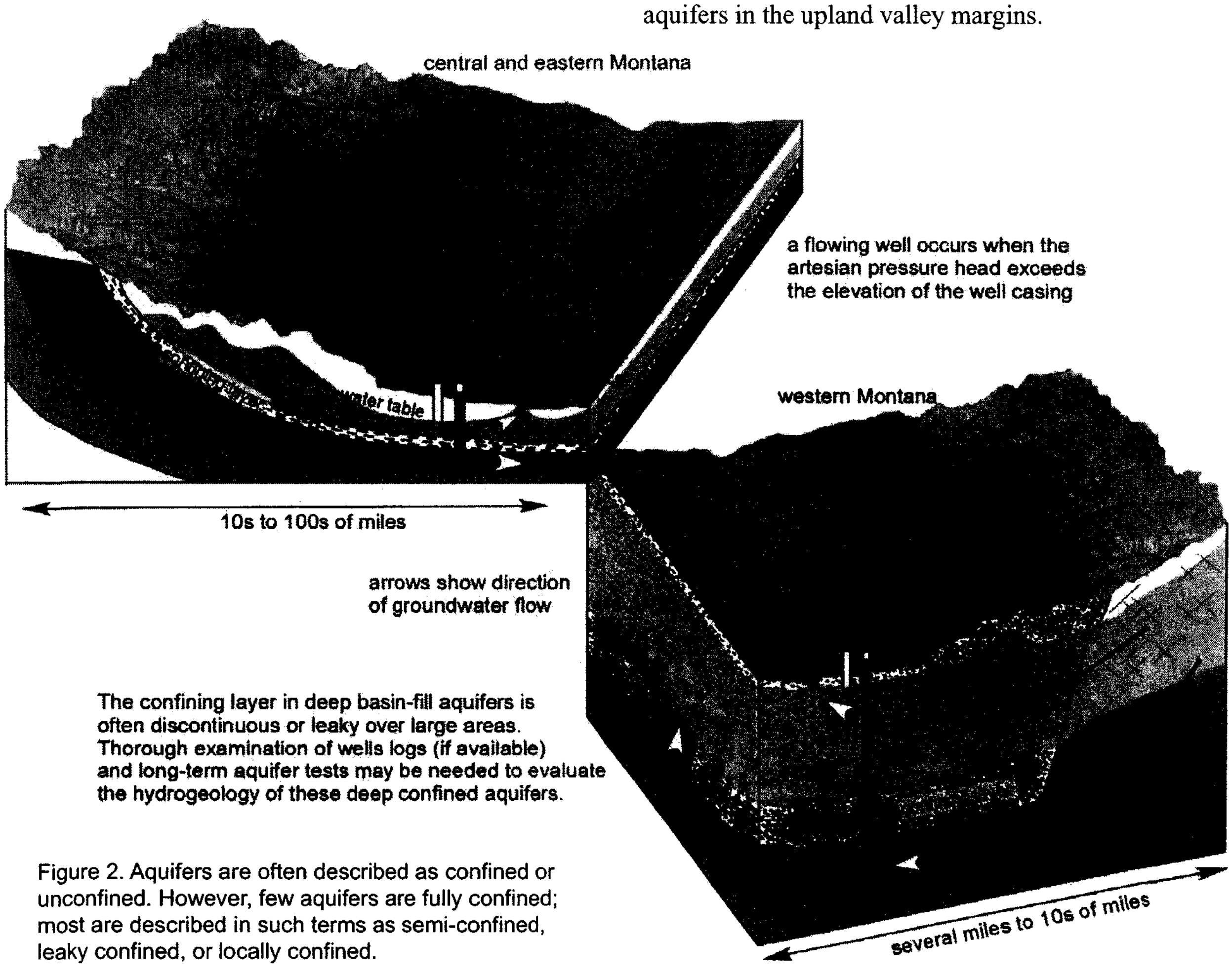


Figure 2. Aquifers are often described as confined or unconfined. However, few aquifers are fully confined; most are described in such terms as semi-confined, leaky confined, or locally confined.

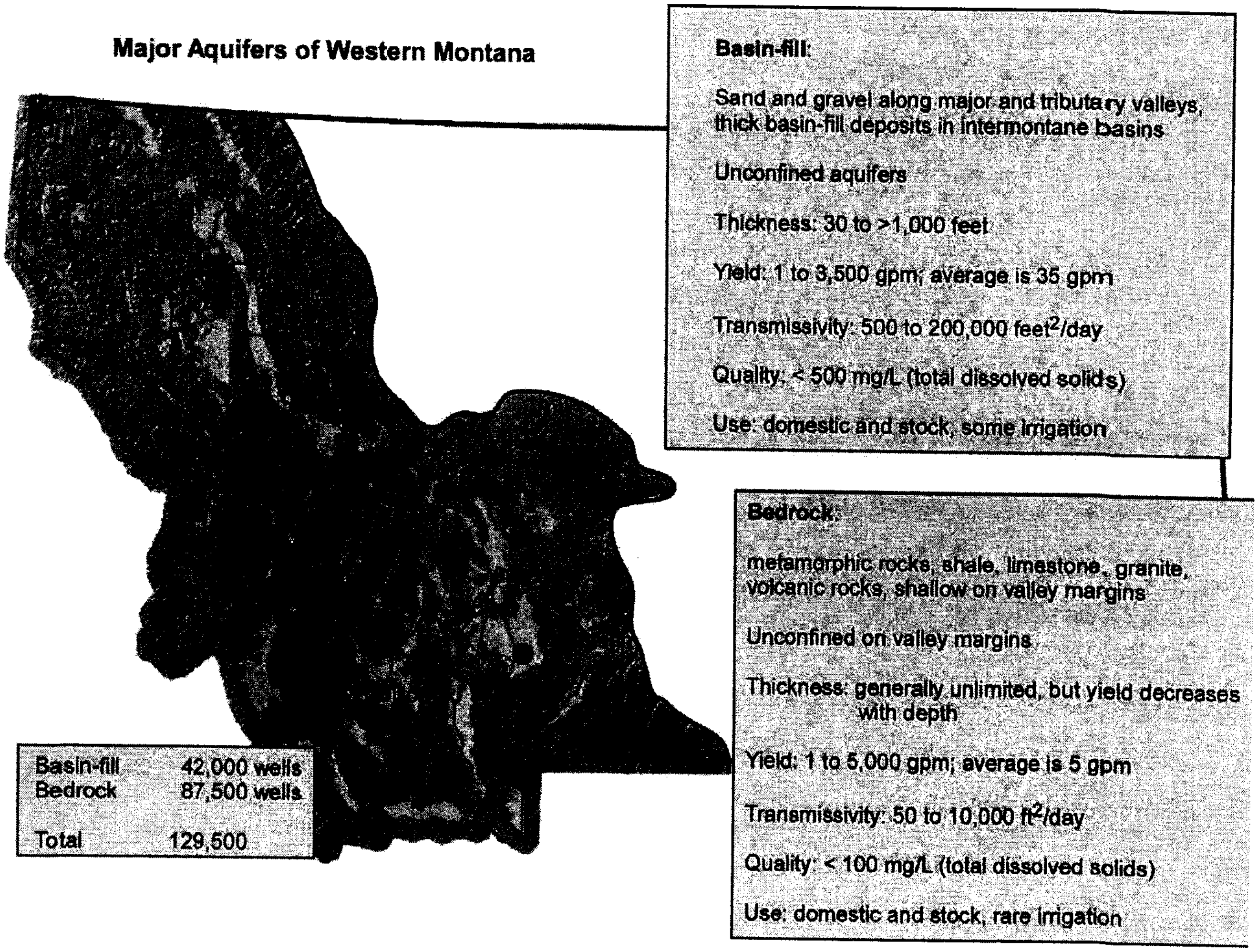


Figure 3. GWIC reports about 130,000 total wells in western Montana. The bedrock aquifers consist of igneous, metamorphic, and sedimentary rocks.

Western Montana

Domestic wells in western Montana are most often completed in the shallow basin-fill aquifers composed of unconsolidated sand and gravel in the major valleys or along tributary valleys. Basin-fill aquifers, shown as yellow and tan in figure 3, are typically thick (>1,000 ft); well yields are usually far greater than the demand of a typical domestic user. Natural water quality is generally very good, but the shallow unconfined nature of these aquifers makes them vulnerable to contamination.

As population growth continues and development expands into the foothills and valley margins, wells in the fractured-bedrock aquifers will become an important source of water for domestic use. Wells in the fractured-bedrock aquifers tend to have low or marginal yield for domestic use, which will limit growth in some areas.

John Metesh

Major Aquifers of Eastern Montana

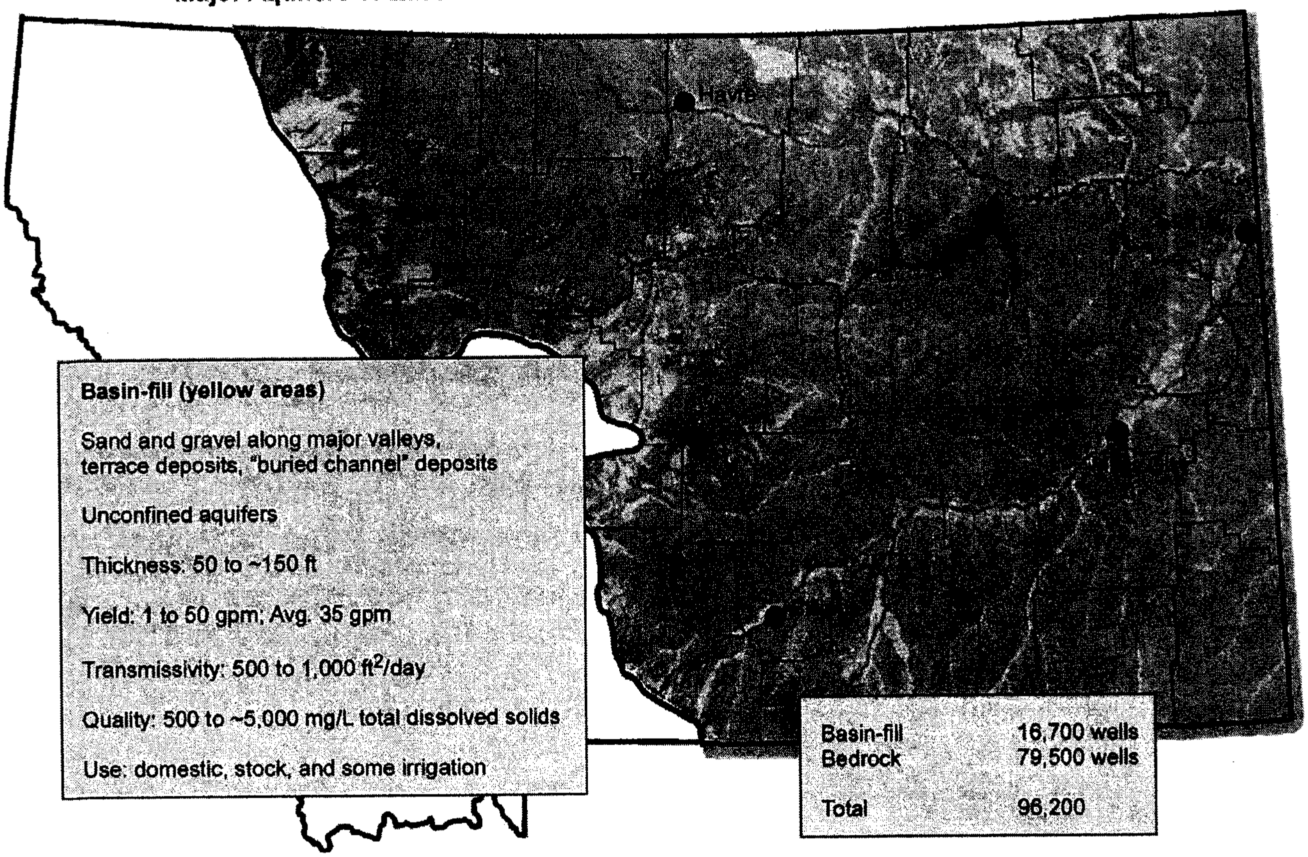


Figure 4. Productive basin-fill aquifers are generally restricted to river valleys. Most areas outside the major river valleys rely on bedrock aquifers for water supply.

Eastern Montana

Population centers in central and eastern Montana have developed along the major river valleys; surface water is the typical source for cities and towns. Outside the population centers, domestic wells are the principal source of water. The unconsolidated basin-fill aquifers of eastern Montana, shown in yellow in figure 4, are notably thin compared to those of the western valleys and are vulnerable to overpumping and contamination by surface sources.

There are several important bedrock aquifers in eastern Montana (not shown); these include the sandstone and coal beds of the Fort Union (14,000 wells), the sandstone beds of the Fox Hills–Hell Creek (5,500 wells), the Judith River (2,700 wells), and the Eagle–Virgelle Formations (2,200 wells). As discussed in the previous section, the bedrock aquifers in the central and eastern part of the state are generally extensive and confined; aquifers in the eastern part of the state are confined and flowing wells are common. These aquifers are generally the sole source of water for domestic and stock use throughout eastern Montana.

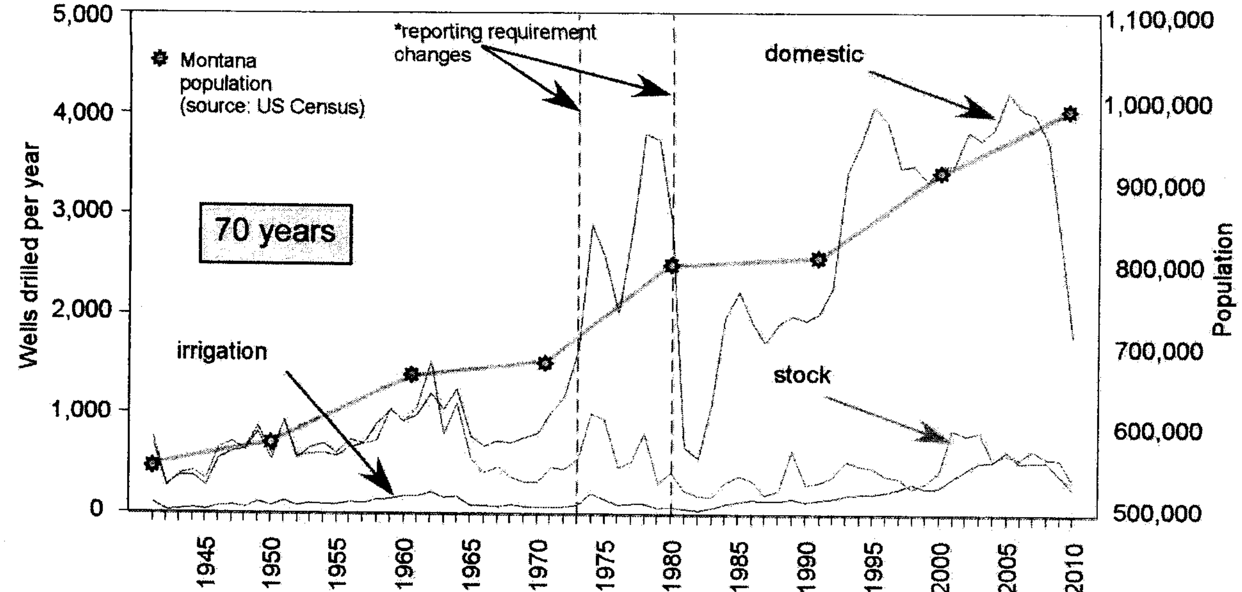
Growth Trends

More than half of the 200,000 wells in Montana were drilled in the past 20 years, and more than 6,000 wells were drilled in 2004, a trend that appeared likely to continue, but was disrupted by the (temporary?) economic downturn of 2008 (fig. 5).

Although changes in reporting requirements over the past 70 years affect the accurate account of drilling activity, the trend of the number of domestic wells appears to mimic population growth. By far, the highest rate of growth has been for domestic wells, which accounts for 85 to 90 percent of all wells drilled in a given year; there has also been a notable increase in the number of wells for which irrigation is the reported use (top graph of fig. 5).

Growth trends of wells in Montana

(source: GWIC database)



*prior to 1973, well logs were not required
1980 to 1983, "well use" was not recorded

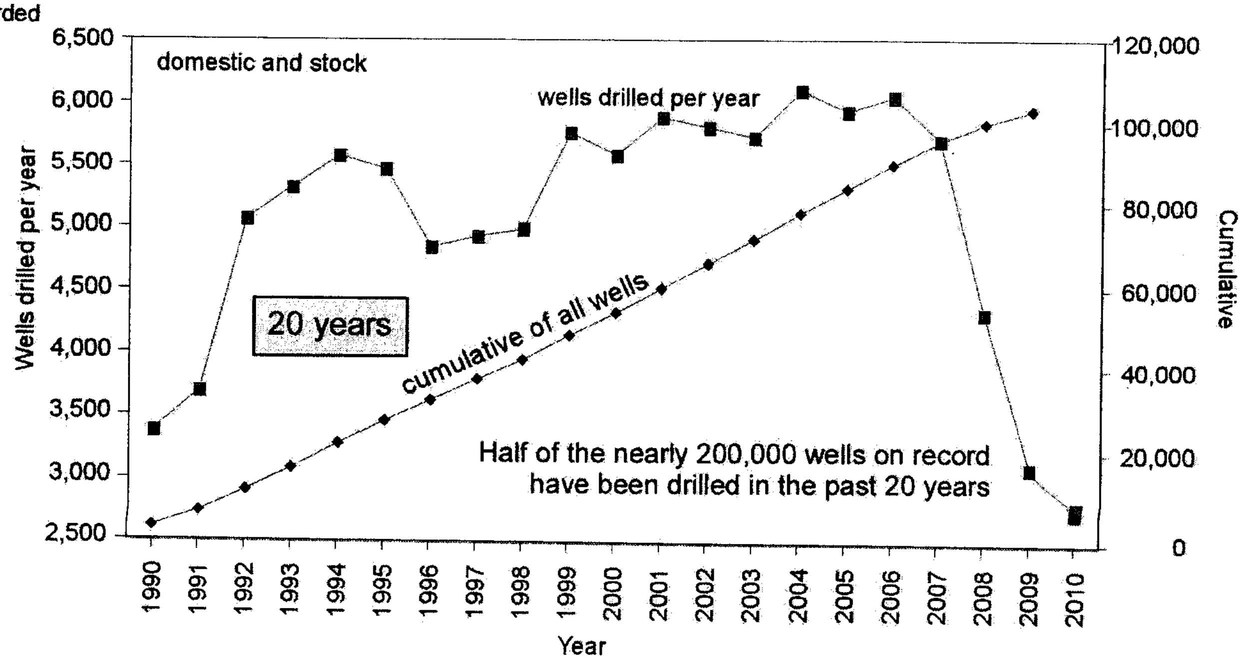


Figure 5. Changes in reporting requirements affect short-term changes in growth trends, but the steady long-term growth in the number of wells is evident.

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Hydrologic Budgets— The Importance of Scale

A budget, whether it be for finances or water, relates the income/inflow to expenses/outflow at a specific scale of time or space; it provides a means to evaluate the availability and allocation of the supplies and demands. A change in the scale of the budget can drastically change the emphasis. For example, compare the financial budget of Montana (about $4 billion) with that of the US (about $1.4 trillion). Montana's budget, at 3% of the national budget, is much smaller than that of many Federal agencies. However, a budget change of $1 billion would have a much greater impact in Montana than at the Federal level. Similarly, farmers and businessmen appreciate that the amount of money in the bank, or in the field, or in stock, differs widely on a daily, monthly, or annual scale. Just like comparing a small business budget to that of a large corporation, the monthly financial budget for a retail business can tell a much different story than that of the annual budget. The same analysis can be applied to hydrologic budgets. It is critical for the discussion of budgets to examine the scale, both temporal and spatial, of the budget and to appreciate the importance of individual budget components.

Large Area Budgets

The U.S. Geological Survey (USGS; Cannon and Johnson, 2004), estimated that 94 percent of all water withdrawn in Montana each was for irrigation and 1 percent was for domestic purposes (fig. 6). Consumption of that water followed a similar pattern; irrigation consumed almost 96 percent of the water withdrawn and domestic about 0.2 percent. Cannon and Johnson also point out that about 2.5 percent of all water withdrawn is groundwater; the rest is surface water. On the scale of the entire State, on an annual basis, groundwater withdrawal or consumptive use, for any purpose, is a minor component of the budget. However, if the scale of the budget is changed, the importance of groundwater can drastically change. Consider the global scale of water storage: only 2.5 percent of all the water on the planet is fresh; almost 69 percent of that fresh water is inaccessible as ice. Of the remaining, useable water, 99 percent is available as groundwater and only 1 percent is surface water (Gleick, 1996; inset box of fig. 6).

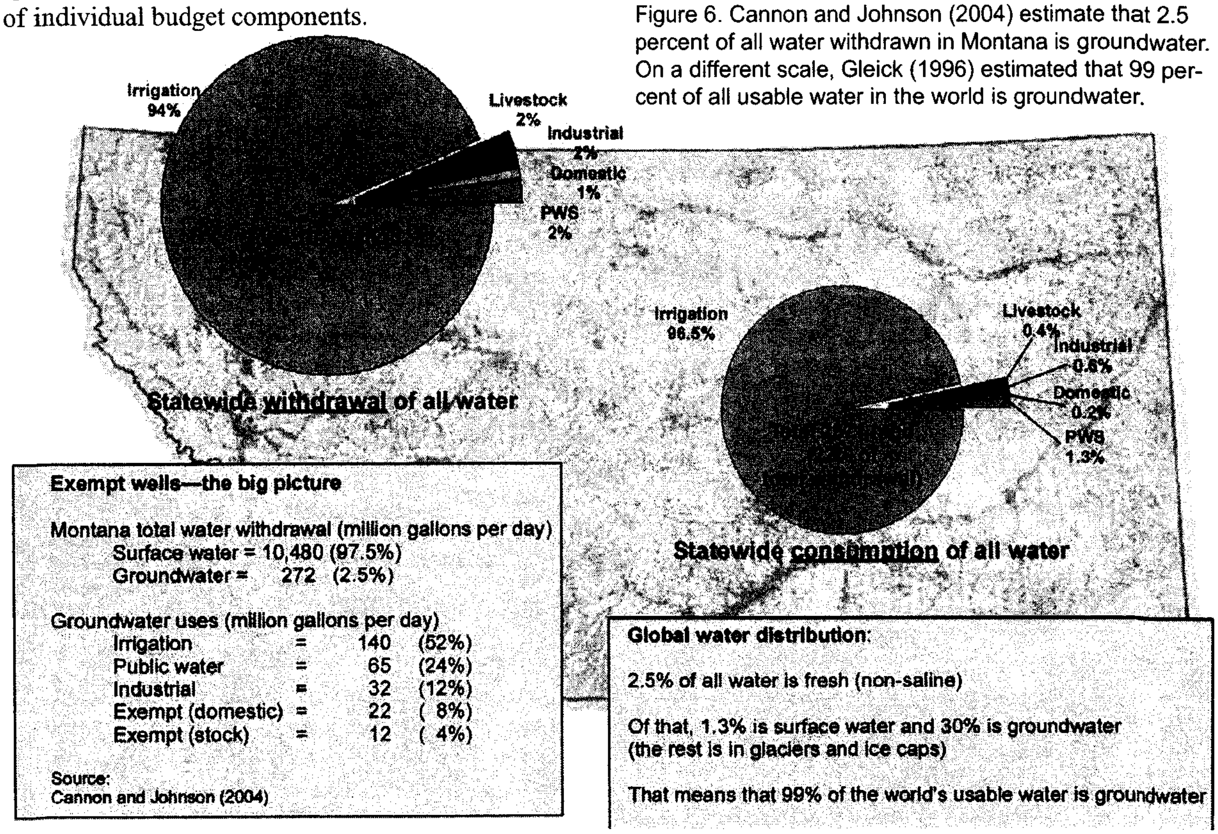

Figure 6. Cannon and Johnson (2004) estimate that 2.5 percent of all water withdrawn in Montana is groundwater. On a different scale, Gleick (1996) estimated that 99 percent of all usable water in the world is groundwater.

Groundwater Consumptive Use at the Basin Scale

Consumptive use is water removed from the hydrologic system without replacement or return. Water consumed by plants, known as transpiration, and evaporation from the soil and surface water bodies are the largest consumptive uses. Plant transpiration and soil evaporation is termed evapotranspiration. Estimates of the evapotranspiration component of a water budget are typically taken as consumptive use.

As noted, Canon and Johnson (2004) estimated that 2.5 percent of all the water withdrawn in Montana annually is groundwater. Within that 2.5 percent, they estimate that about 21 percent of the water withdrawn for irrigation is consumed, about 21.5 percent of the water withdrawn for industrial use is consumed, and 37 percent of the water withdrawn for public water supply is consumed. Consumption of water for domestic and livestock use was assumed to be 100 percent of the water withdrawn. When these percentages are applied to reported withdrawals on the basin scale (fig. 7), the relative consumptive use rates change dramatically from those presented on a statewide scale.

Consumptive use by domestic wells in southwest Montana ranges from 15 to over 50 percent of the total groundwater consumed (fig. 7). Irrigation consumptive use has a similar range, but in different basins. Total consumptive use ranges from less than 1 million gallons per day (mgd) to about 15 mgd.

Consumptive Use at the Sub-Basin Scale

Domestic consumptive use is attributed largely to lawn and garden watering; in-house consumptive use is small. In this analysis, the in-house consumptive use was considered zero; that is, domestic consumptive use was attributed entirely to evapotranspiration by lawns. Agriculture consumptive use is attributed to water consumption by crops irrigated by one of three methods: (1) center pivot, (2) flood irrigation by canals and turnouts, or (3) sprinkler.

Consumptive use of both surface water and groundwater was estimated for the six MBMG Ground Water Investigation Program areas for each of the three agriculture irrigation categories and for domestic use. The monthly crop-water demand was multiplied by the estimated area irrigated by each of the three methods for agricultural land and for each lot served by a domestic well. Crop-water demand data for each area was obtained from the local AgriMet station (U.S. Bureau of Reclamation, 2011) for the 2010 water year; alfalfa was used to represent agricultural use and lawn was used to represent domestic use. The area of each agricultural application was determined from GIS coverages (Montana State Library's Natural Resource Information System, 2011). The lawn area assigned to domestic wells was determined from air photos showing late summer or fall irrigation for a randomly selected 10 percent of the total number of lots in the sub-basin. The results are summarized in the table in figure 8. Where data were available, the average irrigated area for domestic use estimated from the air photos for the entire area was compared to data from local subdivisions. The Helena (North Hills) project area included several subdivisions with public water supplies. In their evaluation of the water budget, Waren and others (2010) determined a consumptive use equivalent to 0.25 acres irrigated. This compares well to the 0.23 acres determined by the method used for this analysis. Similar comparisons showed good agreement in the lower Beaverhead and Belgrade study areas. The pie charts in figure 8 present the total annual consumptive use by each land use type. At this scale, with project sub-basins ranging from 7,000 to 78,000 acres, the impact of domestic wells used for lawn irrigation is markedly different from that presented at a statewide scale.

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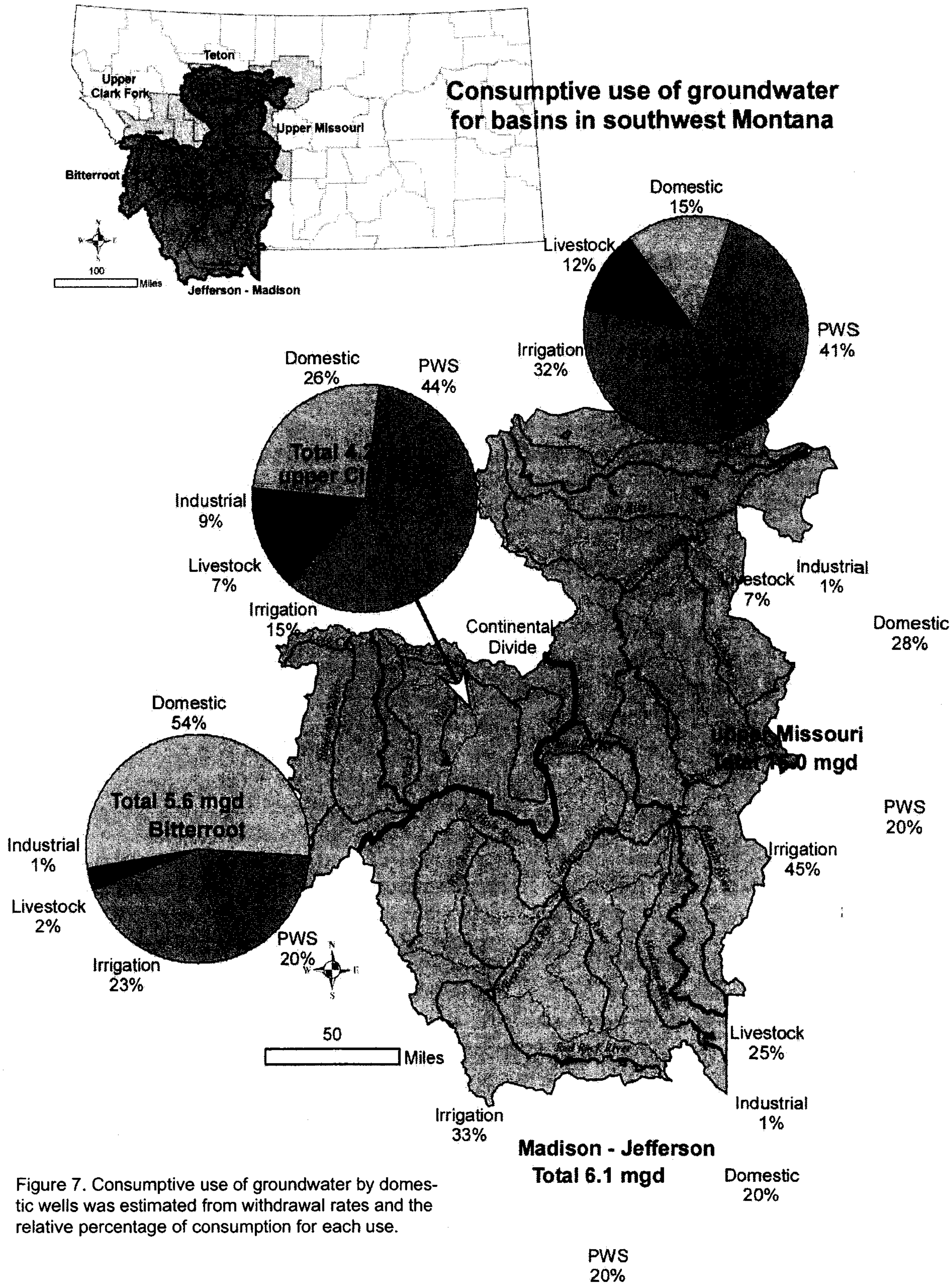


Figure 7. Consumptive use of groundwater by domestic wells was estimated from withdrawal rates and the relative percentage of consumption for each use.

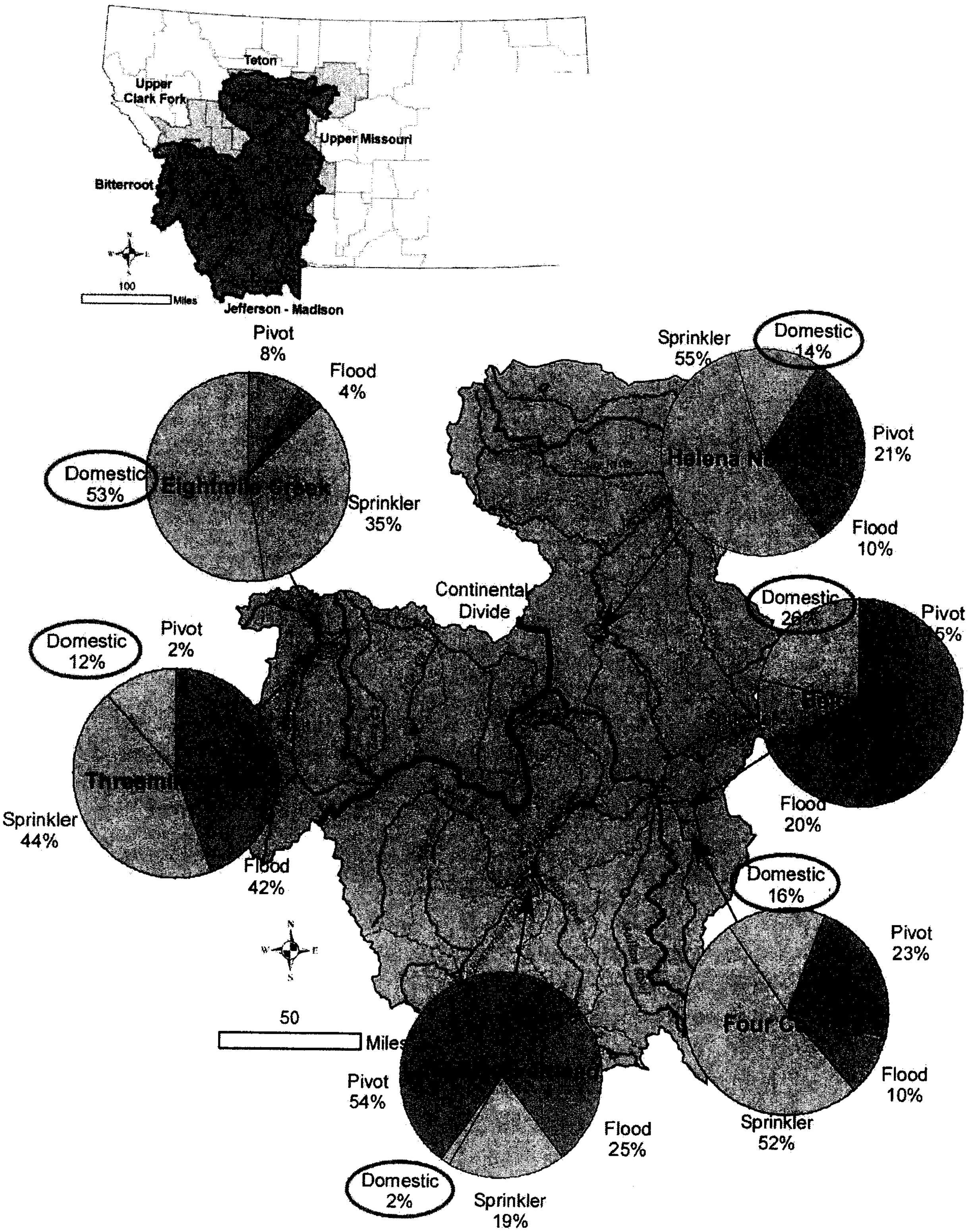


Figure 8. Consumptive use of all water was estimated for each of six sub-basins within southwest Montana.

The Importance of the Temporal Scale

Water budgets are most often presented on an annual basis; generally the changes in the hydrologic system respond to annual climate cycles. Consumptive use, particularly by human activities, varies significantly daily, monthly, or seasonally depending on local conditions and activity. Overall, consumptive use by lawns in the six study areas showed the greatest variance at a monthly temporal scale. With the exception of the lower Beaverhead, all the study areas were focused in areas of high domestic well density.

The pie charts in figure 9 compare the annual consumptive use to an early summer, monthly consumptive use. In Eightmile Creek, the peak consumptive use month did not vary much from the annual, but in the Four Corners area, there is considerable difference. Identifying where and when these seasonal differences are important may help manage water use during the months of high demand and low supply.

Another aspect of the temporal scale is the time between the diversion of the water and the consumption of the water. Reduction of stream flow from a surface-water diversion is immediate; reduction of stream flow from a pumping well can take days or decades depending on the aquifer properties and the distance between the stream and the well. Thus, the timing of consumptive use may be very different than the impact of that consumptive use on stream flow or groundwater levels. A more detailed discussion of the factors affecting the timing of groundwater pumping is presented later.

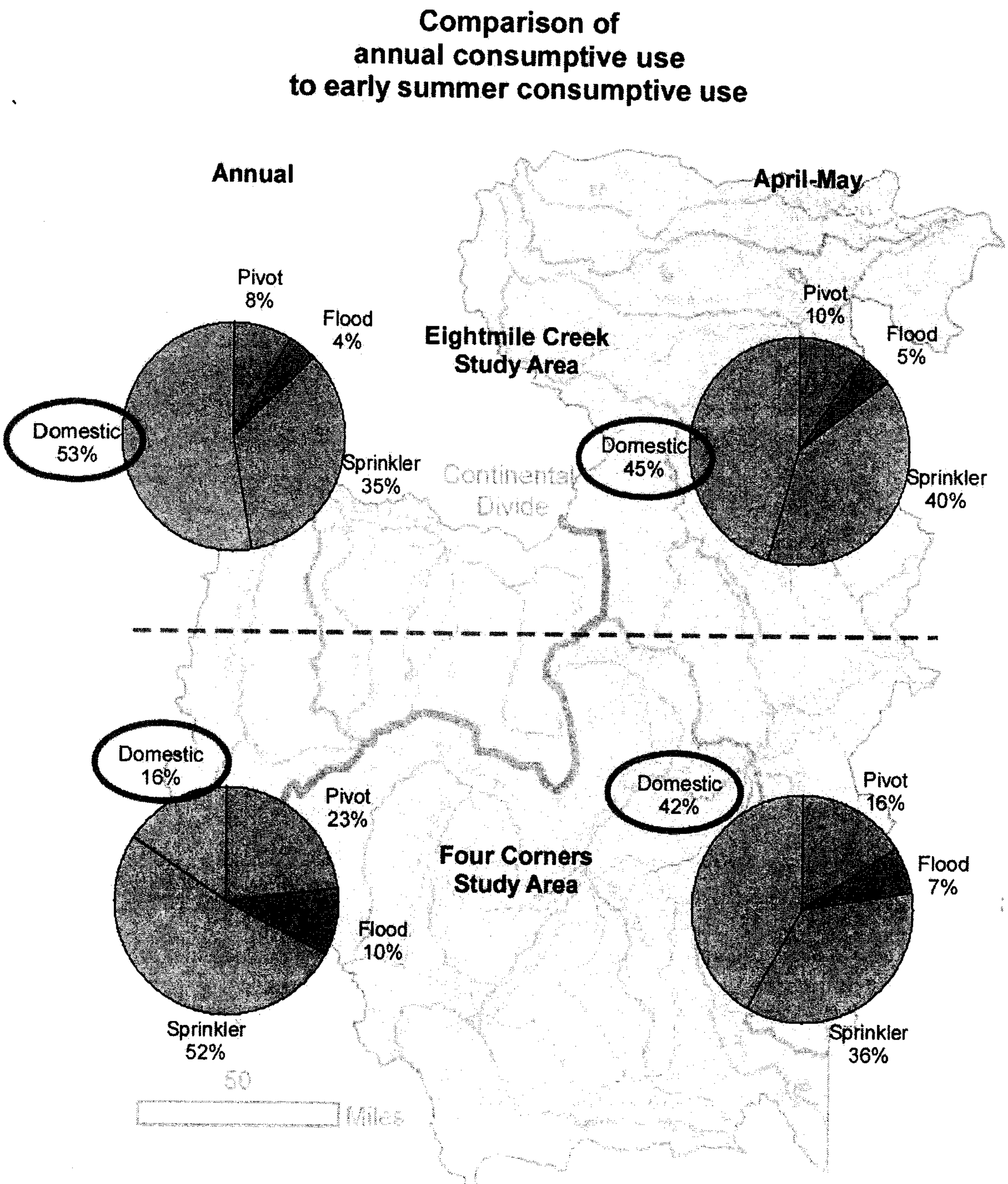


Figure 9. Consumptive use was compared for two different time scales at two of the study areas. In Eightmile Creek the high-use months did not differ from the annual total, whereas in the Four Corners area, the difference was markedly different.

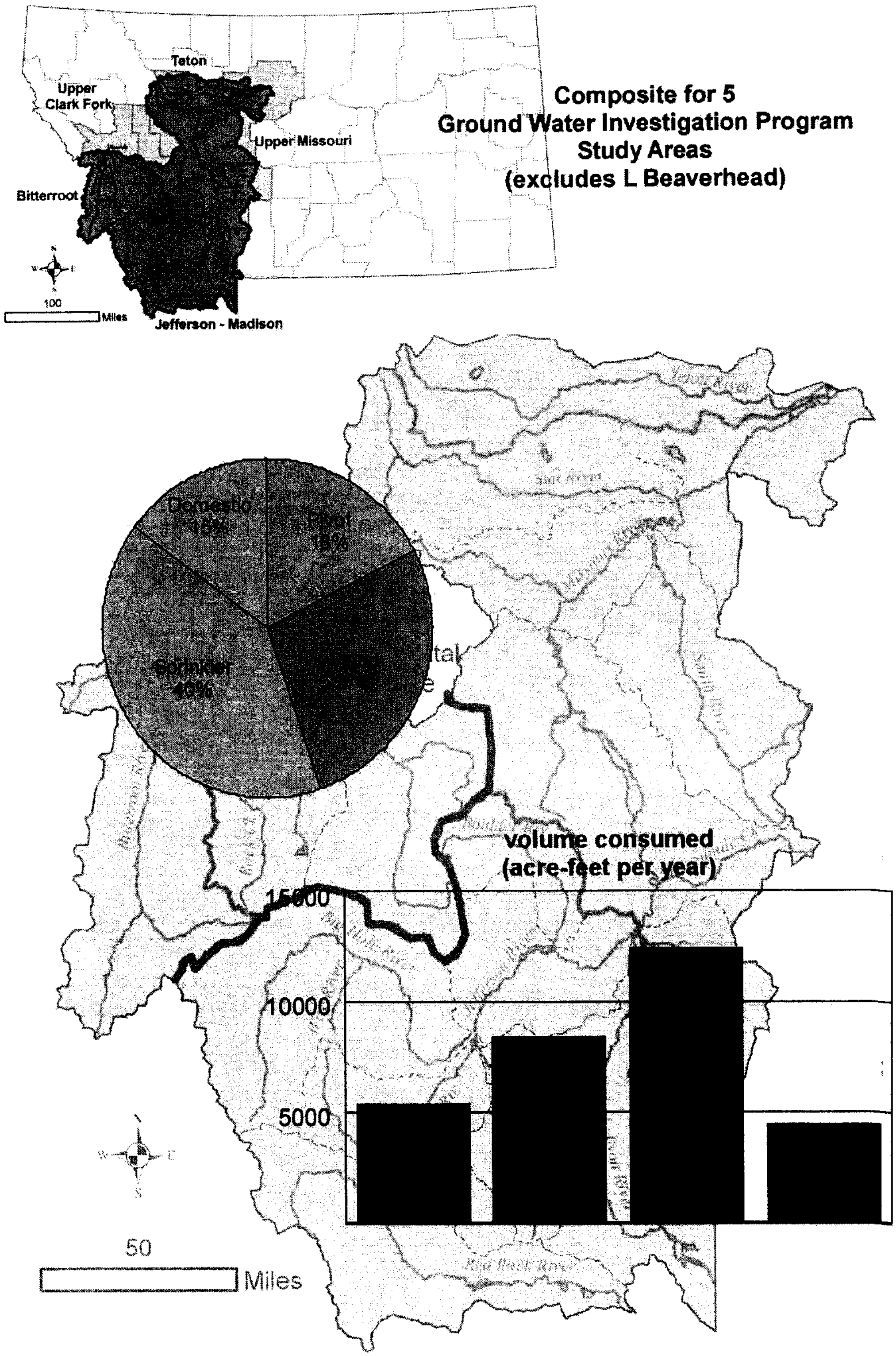


Figure 10. Consumptive use was compiled for the study areas in which the growth of domestic wells is of concern: Florence–Eightmile Creek, Florence–Threemile Creek, Helena–North Hills area, Bozeman–Four Corners area, and the Belgrade area.

Summary of Study Area Budgets

A composite of data for the five sub-basins shows that domestic lawn use accounts for 15 percent of the annual consumptive use of groundwater (fig. 10). This is notably higher than the 0.2 percent consumptive use based on a statewide average reported by Canon and Johnson (2004). That is not to say the data or analyses of the data are in conflict, or that there is no impact at the basin or statewide scale; it demonstrates the importance of the scale of observation. Data collected and analyzed for local conditions in a sub-basin will likely reveal potential issues sooner than those of the basin scale.

Altered Watersheds

Montana has more than 3,000 miles of irrigation canals that carry 11.6 million acre-feet to irrigate about 2.2 million acres of crop and pasture on an annual basis. Crop water demand ranges from 1 to 3 acre-feet per year (Bauder and others, 1983); the average consumptive use rate for all crops and pasture is about 1.2 acre-feet per year (Cannon and Johnson, 2004). Thus, almost 9 million acre-feet of the 11.6 million acre-feet, or 77 percent, of the water diverted for irrigation is available for return flow as run off or recharge to groundwater. Table 1 shows the ditch loss reported by MBMG investigations throughout the State.

The volume of groundwater recharge from irrigation ditch loss often overwhelms the natural recharge processes. For example, the East Bench Irrigation Canal in the lower Beaverhead River may lose as much as 398 acre-feet per season; with a length of about 17 miles between Dillon and Beaverhead Rock, the seasonal ditch loss would be about 6,800 acre-feet. Additional recharge occurs from direct flood irrigation.

The groundwater flow systems in nearly all of the watersheds of western Montana and the large watersheds of eastern Montana have been substantially altered by recharge from irrigation canals (fig. 11).

Table 1. Ditch loss reported by MBMG investigations throughout Montana.

Figure 11 Inset Map Reference: Source	Ditch Loss (cubic feet per second per mile)	Ditch Loss (acre-feet per year per mile)*
A: Osborn and others (1983)	0.45–4.7	81–850
B: Madison (2006)	0.6	114
C: Abdo and Metesh (2005) Abdo and Roberts (2008)	0.15–1.5	27–271
D: GWIP Beaverhead	2.2	398
E: GWIP Belgrade	0.40–4.3	72–778
F: Kuzara and others (2012)	1.1–1.8	199–326
G: Olson and Reiten (2002)	0.05–0.5	9–90

*Assumes the ditch is active 3 months per year.

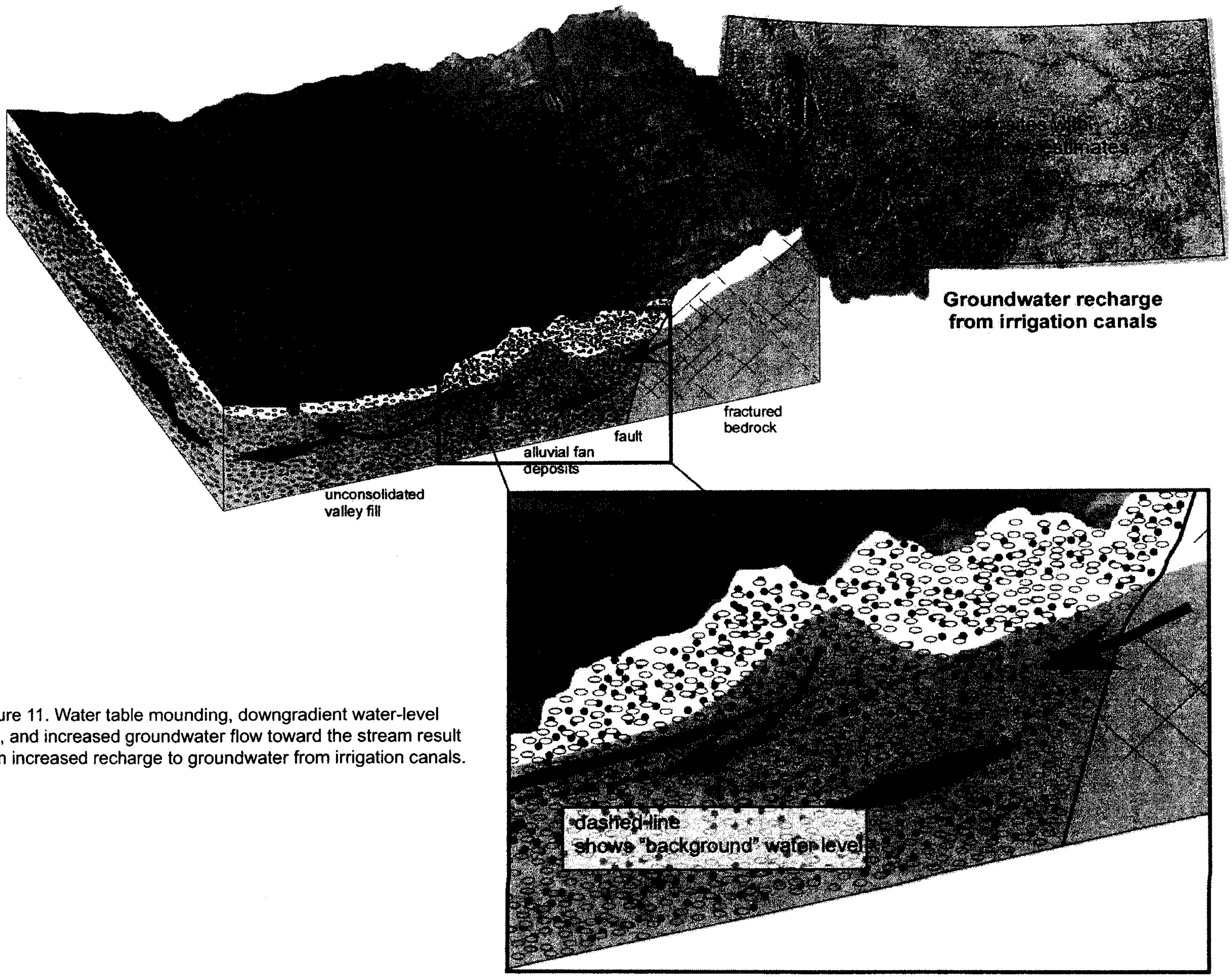


Figure 11. Water table mounding, downgradient water-level rise, and increased groundwater flow toward the stream result from increased recharge to groundwater from irrigation canals.

Effects of Irrigation Canals on Groundwater Levels

Nearly all of the intermontane valleys of western Montana are irrigated and sub-irrigated (recharged) by surface-water diversions. Recharge to groundwater from irrigation ditch loss is substantial; in many areas, the irrigation system is more than 100 years old and has established an artificial recharge system. There are several examples of wetlands and groundwater-dependent ecosystems that rely on recharge from these irrigation systems.

The hydrograph in figure 12 shows water levels in a well influenced by the East Bench Irrigation Canal in the lower Beaverhead River drainage. The water levels (red squares) show a 40 ft water-level rise in response to flow in the canal. The canal was shut off for about 2 years (2003 through mid-2005) for lack of water; water levels dropped nearly 30 ft due to the lack of precipitation in the area and the lack of recharge from the canal.

Similar water-level responses to irrigation canals have been observed in other areas of Montana. Waren and others (2012) observe a 15- to 20-ft response near the Helena Valley Irrigation District canal, and Kuzara and others (2012) observed an 18-ft response in the Stillwater River drainage. Smith (2006) discussed water-level response to irrigation in wells of the Bitterroot Valley.

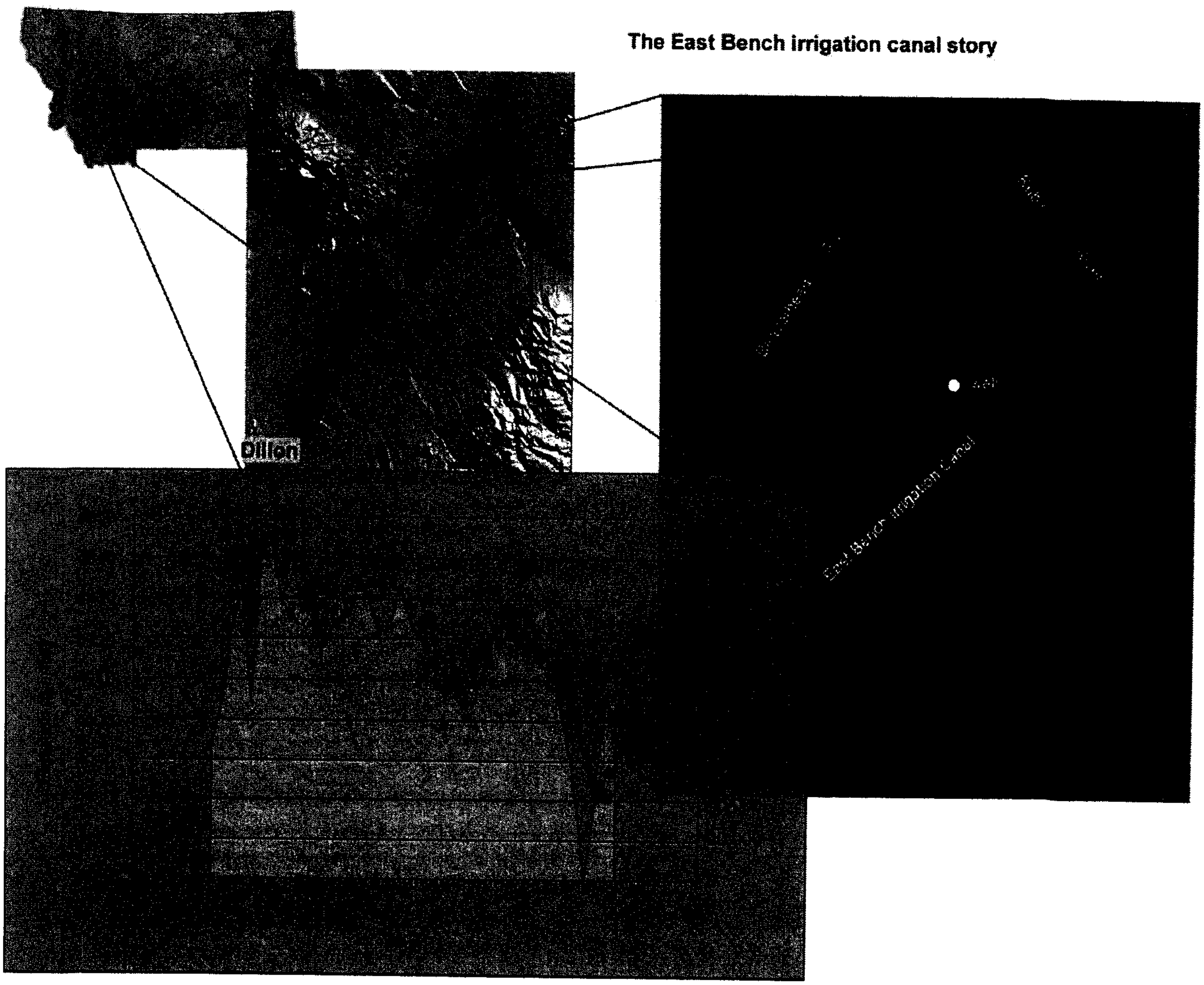


Figure 12. The East Bench irrigation canal provides one of many examples of groundwater recharge by irrigation. In addition to groundwater levels, the pattern of stream discharge has also been changed.

John Metesh

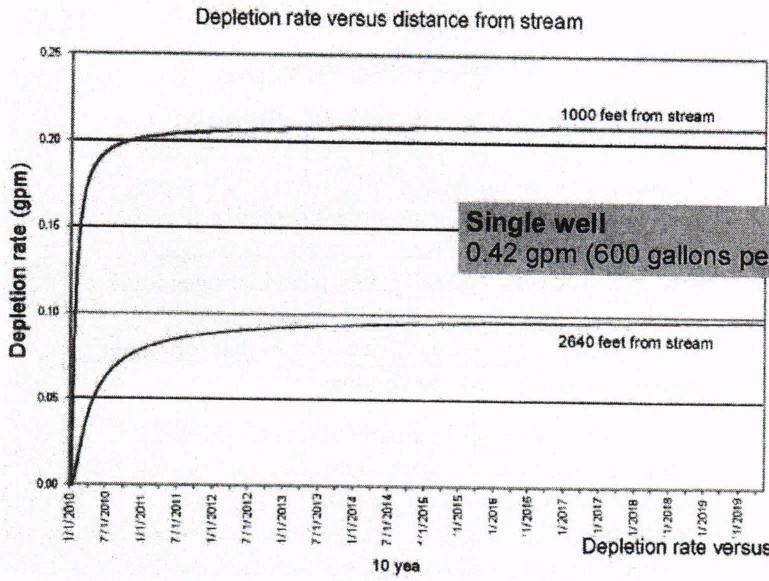
As land use changes from one type of irrigated agriculture to another or from irrigated agriculture to domestic use, recharge to the local groundwater flow system is likely to be affected. When irrigation canals are abandoned, the reduction to groundwater recharge may be substantial. Water levels in wells may decline, even to the point of wells going dry, groundwater flow to tributary streams and wetlands may be reduced, and the effects of stream depletion by existing pumping projects may be exacerbated.

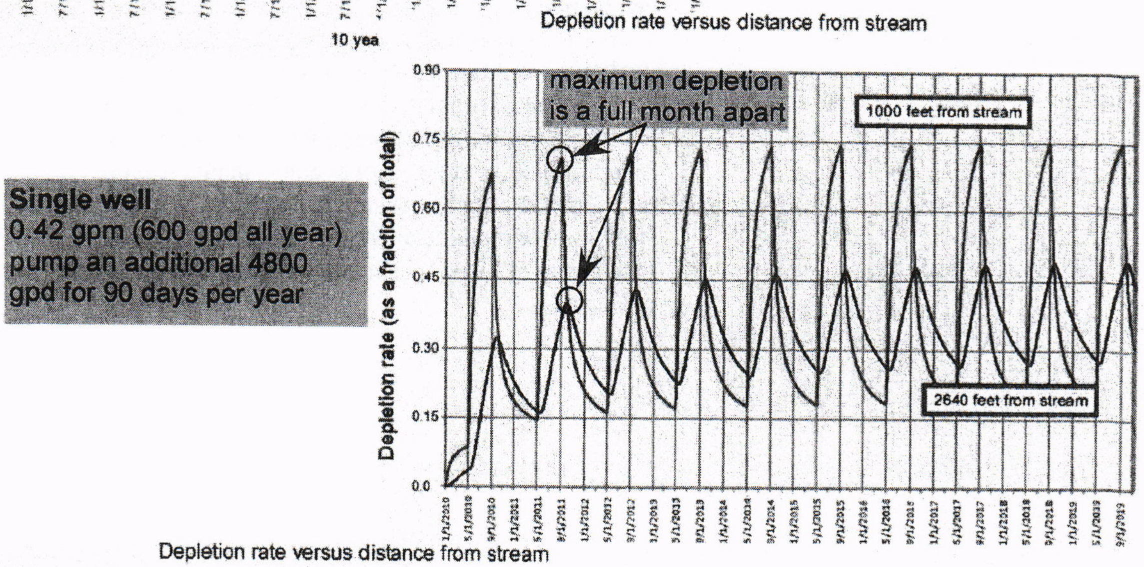
Stream Depletion by One Well or Many

Stream depletion or stream-flow reduction from groundwater withdrawal presents a complex challenge to management of water. Stream depletion is ultimately equal to the discharge rate of the well as it relates to the periodicity of that discharge. For example, pumping 400 gpm for 3 of every 12 months will establish a depletion rate of 100 gpm. Stream depletion is independent of stream discharge; the 100 gpm depletion in the example will be the same whether the stream discharges 1000 cubic feet per second (cfs) or 10 cfs. The ultimate volume of depletion is independent of distance from the stream; however, the rate and timing of depletion is dependent on distance, aquifer properties (transmissivity and storage coefficient), as well as the pumping rate. There is no difference between pumping from one or many wells; one well pumping at 1,000 gallons per minute (gpm) is equivalent to 100 wells pumping at 10 gpm; however, the location of the well(s) can be very important.

Figure 13 presents the effect of well placement and other factors such as septic drain fields on stream depletion. The top figure shows the difference between two wells, pumping at the same rate of 600 gallons per day (gpd) for in-house use, at different distances from the stream. The second figure shows the same wells pumping 600 gpd for in-house use plus cyclical pumping for lawn irrigation for 90 days each year. Under the same hydrogeologic conditions, the difference between a well at 1,000 versus 2,620 feet from a stream changes the peak stream depletion by a full month. That is, instead of depleting the stream during critical low flows in August (red line), it could be delayed until September when stream flows are not as critical (blue line). The third figure shows stream depletion rates for a case where the well is 2,640 feet from the stream, but the septic drain field is 1,000 feet from the stream. In this example, installing the supply well away from the stream and using near-stream recharge from the drain field to offset consumption reduces stream depletion by 60 to 75% each year (green line). The latter example is not always practical for individual homes, but demonstrates a potentially useful strategy for managing a public water supply with properly installed individual septic systems in a multi-home subdivision.

Stream depletion: one well versus many





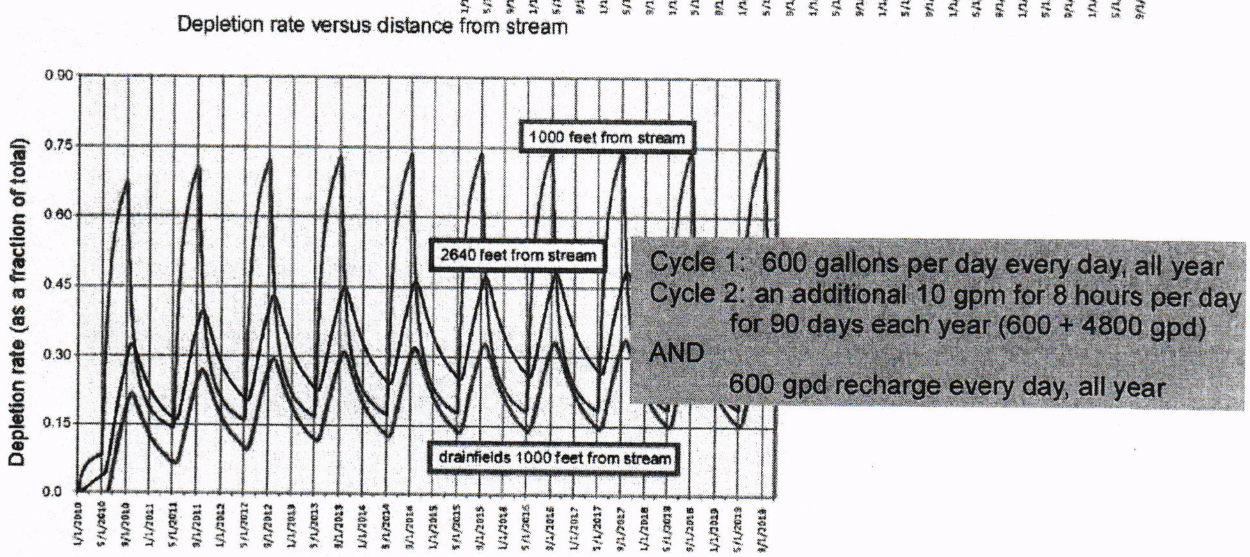


Figure 13. The rate of stream depletion by pumping groundwater is largely affected by the distance between the well and the stream.

Stream Depletion Zones

As discussed, stream depletion is affected by aquifer properties, the discharge of the well, and the distance between the well and the stream. Using predictive modeling to estimate stream depletion for each and every proposed well can be onerous and expensive. Alternatively, modeling data from hydrogeologic studies with representative or anticipated values for well discharge can be used to map zones that represent stream depletion rates and volumes.

Figure 14 shows an example of a map where stream depletion zones were established for various areas in the aquifer near the stream. The hydraulic conductivity and storage coefficient of the aquifer were used to map areas where stream 80% if the total depletion would occur within 1 month, between 1 and 2 months, and within 3 months at a specific pumping rate. In addition to those presented, zones of peak-month depletion or zones of average annual stream depletion can also be constructed. Where data are sufficient for more detailed modeling, groundwater recharge as affected by climate variation can also be evaluated.

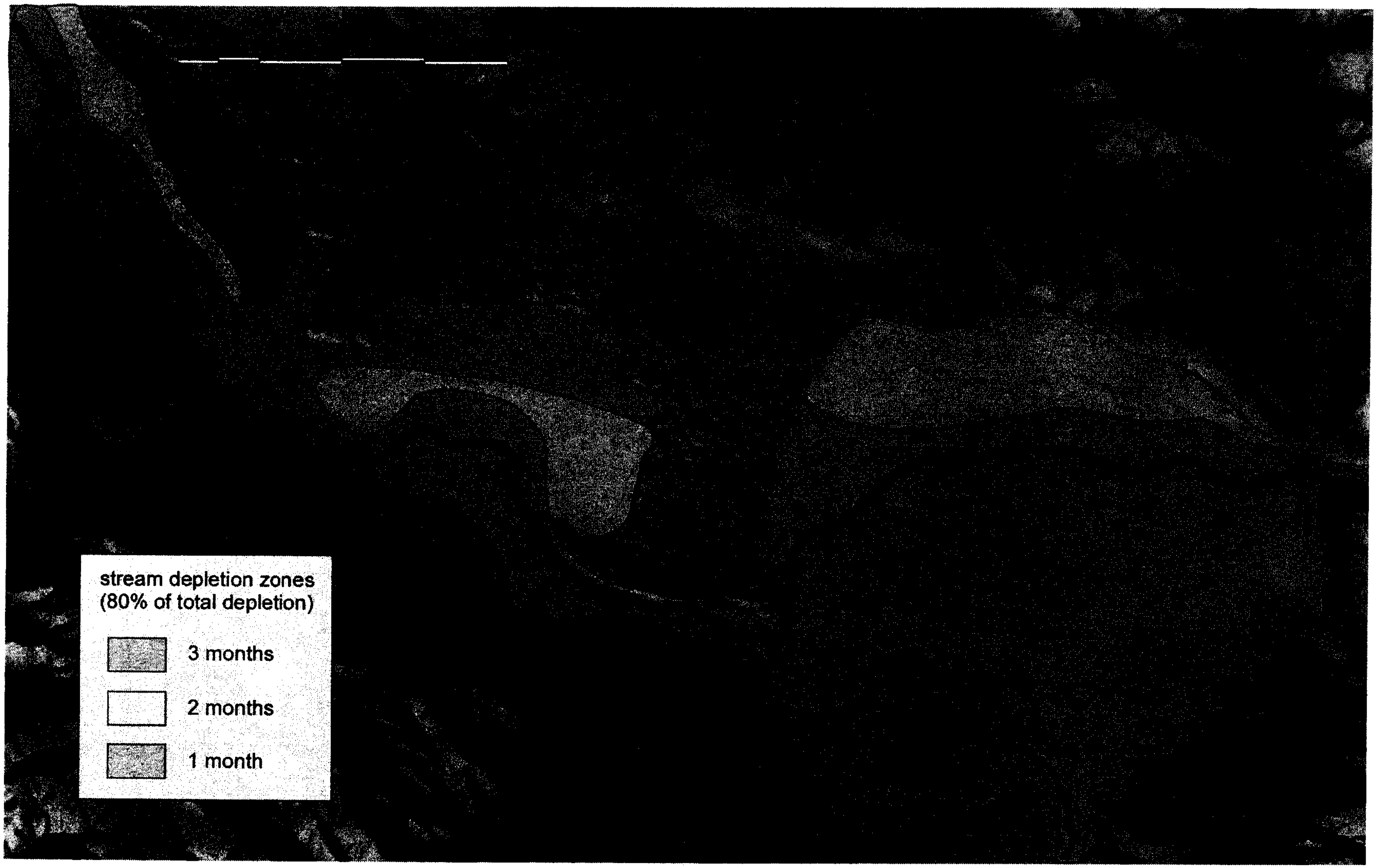


Figure 14. Stream depletion zones can be established based on aquifer properties and groundwater flow modeling.

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