

# Seeping Through the Cracks: North Carolina Regulatory Gaps Enable Unchecked Groundwater Use as Growing State Thirsts for More Resources

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## *Introduction*

By many standards of measurement, North Carolina is, as the legendary and fictional news anchor Ron Burgundy might say, “kind of a big deal.”<sup>1</sup> After all, North Carolina was ranked fourth best in the nation for business in 2012;<sup>2</sup> the State’s Biz Boost program supported the creation or retaining of nearly 8,000 jobs throughout 2010 and 2011;<sup>3</sup> and fourteen companies ranked in the 2012 edition of the Fortune 500 call North Carolina home.<sup>4</sup>

But North Carolina is not all about business. The state also offers a myriad of attractions and an enviable quality of life for its residents. With a strong public university system,<sup>5</sup> high-ranking private educational institutions,<sup>6</sup> and a number of cities in the top 30 of the 2011 Gallup-

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<sup>1</sup> ANCHORMAN: THE LEGEND OF RON BURGUNDY (DreamWorks 2004) (“I don’t know how to put this but I’m kind of a big deal,” says Mr. Burgundy. “People know me . . . I’m very important. I have many leather-bound books and my apartment smells of rich mahogany.”).

<sup>2</sup> *America’s Top States for Business 2012 – Overall Rankings*, CNBC, [http://www.cnbc.com/id/46414199/Top\\_States\\_for\\_Business\\_2012](http://www.cnbc.com/id/46414199/Top_States_for_Business_2012) (last visited Nov. 1, 2012).

<sup>3</sup> Scott Daugherty (N.C. DEP’T OF COMMERCE, SMALL BUS. COMM’R OFFICE), *Small Business Happenings in North Carolina, in 2012 STATE OF SMALL BUSINESS AND ENTREPRENEURSHIP 3* (2012), available at <http://www.sbtcd.org/pdf/ssb.pdf>.

<sup>4</sup> See *Fortune 500: States: North Carolina*, CNN MONEY (May 21, 2012), <http://money.cnn.com/magazines/fortune/fortune500/2012/states/NC.html>.

<sup>5</sup> The system’s flagship university, the University of North Carolina at Chapel Hill (UNC), ranked first in *Kiplinger’s Personal Finance* magazine’s assessment of value in American public universities for the eleventh consecutive time in 2012. See *Kiplinger’s Best Values in Public Colleges, 2012*, KIPLINGER’S PERSONAL FINANCE MAGAZINE (Oct. 2012),

[http://www.kiplinger.com/tools/privatecolleges/index.php?table=prv\\_univ&state\\_code%5B%5D=NC&id%5B%5D](http://www.kiplinger.com/tools/privatecolleges/index.php?table=prv_univ&state_code%5B%5D=NC&id%5B%5D)

=none. The list, which considered factors such as competitiveness, tuition, graduation rate, and academic support, also included five other UNC system campuses among the top 45 institutions. *Carolina Tops Best-Value Rankings for 11th Year*, UNC GENERAL ALUMNI ASSOCIATION (Jan. 3, 2012), <http://alumni.unc.edu/article.aspx?sid=8635>.

<sup>6</sup> *Kiplinger’s* ranked three North Carolina schools in its “Best Values in Private Colleges” list: Duke University at number four; Elon at twenty-two; and Wake Forest at twenty-nine. See *Kiplinger’s Best Values in Private Colleges, 2012*, KIPLINGER’S PERSONAL FINANCE MAGAZINE (Oct. 2012),

[http://www.kiplinger.com/tools/privatecolleges/index.php?table=prv\\_univ&state\\_code%5B%5D=NC&id%5B%5D](http://www.kiplinger.com/tools/privatecolleges/index.php?table=prv_univ&state_code%5B%5D=NC&id%5B%5D)

=none.

Healthways Well-Being Index,<sup>7</sup> North Carolina’s resume looks quite strong. And North Carolina is poised for growth in the future, with Raleigh among the top 15 “hottest American cities of the future” and an “amazing place to get a job,” according to *Business Insider*.<sup>8</sup>

If actions speak louder than awards, then it is clear that individuals are excited about North Carolina as well. The state population grew by 18.5% between 2000 and 2010,<sup>9</sup> a rate surpassed by only five states and one that represents nearly twice the rate of the United States as a whole.<sup>10</sup> Tourism is also a major industry in North Carolina, with travelers spending \$17.6 billion statewide in 2010 while visiting natural and manmade attractions.<sup>11</sup> Between 2010 and 2011, North Carolina’s GDP grew by 1.8%, outpacing the national rate of 1.5%.<sup>12</sup>

North Carolina’s status as a destination both for visitors and those who intend to make the state a permanent home paints a bright future for the state. But there are underlying costs that come with the accolades, including the need for increased development to cater to visitors and new residents. Perhaps ironically, some of the factors that attract many to the state—wide open spaces, clean air and water, and vibrant ecosystems—are threatened by increased development.<sup>13</sup> No good environment, it seems, goes unpunished.

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<sup>7</sup> GALLUP-HEALTHWAYS WELL-BEING INDEX, STATE OF THE WELL-BEING 2011 7 (2012), *available at* <http://www.well-beingindex.com/files/2011CompositeReport.pdf>. The index is based on “not only the absence of infirmity and disease but also a state of physical, mental and social well-being.” *Id.* at 3. Two of the top ten large cities and three of the top thirty cities in the index’s composite city ratings are located in North Carolina. *Id.* at 6–7.

<sup>8</sup> Jennifer Pollard, *PRESENTING: The 15 Hottest American Cities of the Future*, BUSINESS INSIDER (June 26, 2012), <http://www.businessinsider.com/up-and-coming-cities-2012-6?op=1>.

<sup>9</sup> U.S. CENSUS BUREAU, STATISTICAL ABSTRACT OF THE UNITED STATES: 2012 19 (2012), *available at* <http://www.census.gov/compendia/statab/2012/tables/12s0014.pdf>.

<sup>10</sup> *See id.*

<sup>11</sup> U.S. TRAVEL ASS’N, THE ECONOMIC IMPACT OF TRAVEL ON NORTH CAROLINA COUNTIES 2010 2 (Sept. 2010), *available at* <http://www.nccommerce.com/LinkClick.aspx?fileticket=lzOnrIypkCU%3d&tabid=1586&mid=4665>.

<sup>12</sup> *Gross Domestic Product by State, Southeast Region*, BUREAU OF ECONOMIC ANALYSIS (June 5, 2012), [http://www.bea.gov/newsreleases/regional/gdp\\_state/gspSE\\_glance.htm](http://www.bea.gov/newsreleases/regional/gdp_state/gspSE_glance.htm).

<sup>13</sup> Development in North Carolina has been rapid and significant, moving from areas along the coast to more inland locations. Jay Price, *Coastal Boom Moves Inland*, THE NEWS & OBSERVER (RALEIGH, NC), June 4, 2006, at 1A. *See also supra* notes 9–12 and accompanying text. The growth in the area has led developers to “scout remote creeks” for real estate plots, “prowl[ing] the waterfront” and building developments that sell in a weekend.” *Id.*

While using resources is unavoidable to a certain extent, failing to protect what has helped turn North Carolina into a major destination is unacceptable. Unfortunately, North Carolina's current policies and regulations provide inadequate protection for groundwater, a resource that is essential in luring new companies to Charlotte and making visitors feel at home on the coast. However, solutions abound, and tightening the current regulatory structure and looking to the successful regulatory models in other states can help North Carolina maintain enough groundwater to supply its current population and accommodate future growth. The first part of this paper focuses on North Carolina's existing groundwater resources and regulations, and the latter portion suggests solutions based on regulatory practices and laws in other states.

### *I. Seeping Through the Cracks: Regulatory Gaps Enable Unchecked Resource Use*

Groundwater plays a crucial role in the everyday lives of North Carolinians, with fifty-two percent of the state population relying on the resource for drinking water.<sup>14</sup> Use varies across the state, with groundwater supplying ninety percent of total water use in the coastal plain.<sup>15</sup> Of course, the demand for public supply is just one of groundwater's uses in North Carolina; mining, irrigation, agriculture, livestock, and other industrial uses also contribute to the demand.<sup>16</sup> The State also has major aquifers—the Bedrock, Black Creek, Castle Hayne, Lower Cape Fear, Peedee, Surficial, Upper Cape Fear, and Yorktown aquifers—and minor aquifers—the Beaufort, Lower Cretaceous, and Pungo River aquifers—to supply residential, commercial, and industrial uses.<sup>17</sup>

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<sup>14</sup> See *Fast Facts*, N.C. GROUNDWATER ASSOCIATION, <http://www.ncgwa.org/> (last visited Oct. 4, 2012).

<sup>15</sup> *What is Ground Water?*, N.C. DEP'T OF ENV'T AND NATURAL RES., DIV. OF WATER RES. (May 17, 2012), [http://www.ncwater.org/Education\\_and\\_Technical\\_Assistance/Ground\\_Water/What/](http://www.ncwater.org/Education_and_Technical_Assistance/Ground_Water/What/).

<sup>16</sup> See *Facts About Groundwater Usage in North Carolina*, N. C. GROUNDWATER ASSOCIATION, <http://www.ncgwa.org/facts.shtml> (last visited Oct. 4, 2012) [hereinafter *Facts About Groundwater Usage*].

<sup>17</sup> *North Carolina Aquifers*, N.C. DEP'T OF ENV'T AND NATURAL RES., DIV. OF WATER RES. (Oct. 1, 2012), [http://www.ncwater.org/Education\\_and\\_Technical\\_Assistance/Ground\\_Water/AquiferCharacteristics/](http://www.ncwater.org/Education_and_Technical_Assistance/Ground_Water/AquiferCharacteristics/).

Such an ample supply of groundwater can foster a cavalier attitude regarding usage, but groundwater is a limited resource. Although the water cycle provides natural recharge to groundwater supplies, wells withdraw up to 2,000 gallons per minute, making it difficult for nature to match recharge with usage.<sup>18</sup> Additionally, low-quality water, existing salinity, and the threat of potential saltwater intrusion mean that not all aquifers are ideal choices for heavy pumping.<sup>19</sup>

The rules in place to regulate pumping depend upon where in the state the water is being withdrawn. The regulation is most stringent in the Central Coastal Plain Capacity Use Area (CCPCUA), which is comprised of Beaufort, Carteret, Craven, Duplin, Edgecombe, Greene, Jones, Lenoir, Martin, Onslow, Pamlico, Pitt, Washington, Wayne, and Wilson counties as well as their “adjoining creeks, streams, and rivers.”<sup>20</sup> In the CCPCUA, all users who withdraw more than 100,000 gallons of ground water per day must first obtain a permit from the Director of the Division of Water Resources (DWR), which is part of the State’s Department of Environment and Natural Resources.<sup>21</sup> All users in this area must report water use data four times annually;<sup>22</sup> adverse impacts—such as dewatering and land subsidence—“shall be avoided or minimized;”<sup>23</sup> and the Director may modify and revoke permits in certain situations.<sup>24</sup>

Even in the CCPCUA, though, gaps exist. For instance, an enterprising group of users could independently pump up to 100,000 gallons per day as long as they did not operate as a system, skirting the usage limitations imposed on each individual “person.” And even if there existed no intent to game the system, allowing users to pump up to 100,000 gallons per day

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<sup>18</sup> *See id.*

<sup>19</sup> *See id.* Some groundwater is naturally salty, but some can become salty when excessive pumping causes saltwater from the ocean or saline aquifers to move into fresh water areas. *Id.*

<sup>20</sup> 15A. N.C. ADMIN. CODE 2E.0501 (2011).

<sup>21</sup> 15A. N.C. ADMIN. CODE 2E.0502(b) (2011).

<sup>22</sup> *Id.*

<sup>23</sup> 15A. N.C. ADMIN. CODE 2E.0502(c)(1) (2011).

<sup>24</sup> 15A. N.C. ADMIN. CODE 2E.0502(e) (2011).

without requiring permits or reporting does present the potential for a large number of low-volume users to tax the groundwater supplies in the area. Such large volume use would not go completely unnoticed, however, due to the requirement that users who withdraw more than 10,000 gallons per day are subject to annual registration and withdrawal reporting.<sup>25</sup> The regulations refer only to withdrawal by “a well, group of wells operated as a system, or sump” but do not explicitly define those terms.<sup>26</sup>

While the CCPCUA rules call for the avoidance of dewatering and “declines in aquifer water levels that indicate that aggregate water use exceeds the aquifer replenishment rate,”<sup>27</sup> the policy has not been completely effective.<sup>28</sup> According to DWR, average daily groundwater withdrawals from the Black Creek aquifer exceeded the maximum permitted allowance by nearly four million gallons in 2011.<sup>29</sup> DWR data also indicates that two of the CCPCUA counties had withdrawals exceeding permit limits in the same year.<sup>30</sup> Greene County reported groundwater withdrawal of 1,445,200 gallons per day despite its maximum daily limit of 864,000 gallons, while Lenoir County reported withdrawal of 4,272,390 gallons per day, more than 150% of its permitted limit of 2,836,320 gallons per day.<sup>31</sup>

This data suggests that the DWR’s permitting system is not comprehensive enough to maintain the limits the Division itself has promulgated. As increased statewide development heightens the demand for groundwater, the permit system may fall farther behind. A comparison of the current trends in North Carolina’s population growth and groundwater use underscores

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<sup>25</sup> 15A N.C. ADMIN. CODE 2E.0505 (2011).

<sup>26</sup> 15A N.C. ADMIN. CODE 2E.0502(b) (2011).

<sup>27</sup> 15A N.C. ADMIN. CODE 2E.0502(c)(1)(D) (2011).

<sup>28</sup> See *Central Coastal Plain Capacity Use Area 2011 Water Withdrawal Summary Tables*, N.C. DEP’T OF ENV’T AND NATURAL RES., DIV. OF WATER RES. (Oct. 21, 2011), [http://www.ncwater.org/Permits\\_and\\_Registration/Capacity\\_Use/Central\\_Coastal\\_Plain/ccpcuatables\\_reported.php](http://www.ncwater.org/Permits_and_Registration/Capacity_Use/Central_Coastal_Plain/ccpcuatables_reported.php)

<sup>29</sup> *Id.*

<sup>30</sup> See *Id.*

<sup>31</sup> *Id.*

this point. Between 1995 and 2005 the state population increased 20.7%, from 7,195,130 to 8,683,242.<sup>32</sup> During the same interval, groundwater use grew from 534,890,000 gallons per day to 700,090,000 gallons per day—an increase of 30.9%.<sup>33</sup> It seems that the discrepancy between population growth and increased usage is only getting worse as time goes on, as the rate of increase for population between 1985 and 1995 was 15%,<sup>34</sup> while North Carolina’s groundwater use grew by 23% during that period.<sup>35</sup> The fact that the gap between the increase in groundwater use and state population is getting worse as North Carolina has had more time to regulate withdrawals of this resource suggests that the current regulatory scheme is ineffective at best.

It is relevant to note that outside of the CCPCUA, the restrictions for groundwater withdrawals are much less stringent and provide less helpful resource management information. A primary difference is that permits are not required for any users outside of the CCPCUA, although registration with the State is required for individuals who withdraw 100,000 gallons of water per day or more from the surface or ground.<sup>36</sup> Such users are allowed two months of unregistered operation before registration must be filed,<sup>37</sup> and information such as daily maximum and average withdrawal figures must only be submitted to the state every five years after the initial registration.<sup>38</sup> Such a gap provides a considerable amount of time for the State to

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<sup>32</sup> *Total Water Withdrawal, by Source, Use, and County, in North Carolina, 1995*, U.S. GEOLOGICAL SURVEY, [http://nc.water.usgs.gov/infodata/wateruse/data/1995/Source\\_totals\\_by\\_county\\_1995.txt](http://nc.water.usgs.gov/infodata/wateruse/data/1995/Source_totals_by_county_1995.txt) (last visited Nov. 1, 2012); *Water Use in North Carolina*, U.S. GEOLOGICAL SURVEY, <http://nc.water.usgs.gov/infodata/wateruse.html> (last visited Nov. 1, 2012).

<sup>33</sup> *See Water Use in North Carolina*, *supra* note 32.

<sup>34</sup> *Population Overview: 1970-1995*, N.C. OFFICE OF STATE BUDGET AND MGMT. (Apr. 8, 2008), [http://www.osbm.state.nc.us/ncosbm/facts\\_and\\_figures/socioeconomic\\_data/population\\_estimates/demog/pop7095.html](http://www.osbm.state.nc.us/ncosbm/facts_and_figures/socioeconomic_data/population_estimates/demog/pop7095.html).

<sup>35</sup> *Total Water Withdrawals, by Source and Water-Use Category, in North Carolina, 1985*, U.S. GEOLOGICAL SURVEY, [http://nc.water.usgs.gov/infodata/wateruse/data/1985/Category\\_totals\\_by\\_source\\_1985.txt](http://nc.water.usgs.gov/infodata/wateruse/data/1985/Category_totals_by_source_1985.txt); *Total Water Withdrawal, by Source, Use, and County, in North Carolina*, *supra* note 32.

<sup>36</sup> N.C. GEN. STAT § 143-215.22H(a) (2011).

<sup>37</sup> N.C. GEN. STAT § 143-215.22H(b) (2011).

<sup>38</sup> N.C. GEN. STAT § 143-215.22H(d) (2011).

fall behind in understanding the state of groundwater management efforts and makes it difficult for proactive, informed action.

Not every user outside of the CCPCUA who withdraws more than 100,000 gallons per day has to register and report use. North Carolina's law provides a loophole for withdrawals used to support "activities directly related or incidental to the production of crops, fruits, vegetables, ornamental and flowering plants, dairy products, livestock, poultry, and other agricultural products, or to the creation or maintenance of waterfowl impoundments."<sup>39</sup> Users falling into this broad category are free to withdraw ground or surface water without registration unless they use 1,000,000 gallons per day or more.<sup>40</sup> Because agricultural and industrial users tend to be among the most prominent users of groundwater in the state,<sup>41</sup> allowing more of such users to draw on this resource without having to report withdrawals is illogical. If North Carolina is to keep its groundwater use under control, it is better to have more information about how much of the resource is being used, especially when the users in question account for a large fraction of total statewide withdrawals.

The patchwork of regulatory standards for persons at different usage levels creates a complex scheme that also produces questions as to the logic of the setup. While the CCPCUA was identified as an area of higher concern prompting lower thresholds for registration and greater usage tracking, a more proactive approach would have been to apply these stricter

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<sup>39</sup> N.C. GEN. STAT §143-215.22H(b1) (2011).

<sup>40</sup> *Id.*

<sup>41</sup> *See Water Use in North Carolina*, U.S. GEOLOGICAL SURVEY, <http://nc.water.usgs.gov/infodata/wateruse.html> (last visited Nov. 1, 2012). The U.S. Geological Survey reports that in 2005, groundwater withdrawal for livestock and irrigation alone accounted for 24 percent of total statewide groundwater withdrawals, while industrial users accounted for another 24 percent. Not all industrial users will fall into the 1,000,000 gallon loophole, but the statute is worded broadly enough that some industrial tasks might be "incidental" to the activities described in section N.C. Gen. Stat. §143-215.22H.

standards consistently across North Carolina.<sup>42</sup> In addition to reducing potential confusion among regulators, additional consistency would demonstrate the importance of monitoring groundwater use to individuals and entities. Consistent standards would also give regulators more information as to statewide usage, making it easier to identify resource management issues sooner.

Enforcement options to keep groundwater users in compliance with regulations are even less effective than the regulations. While the groundwater reporting and permitting statutes provide many rules to follow, they don't grant the North Carolina Environmental Management Commission much muscle in enforcing the standards, as low fines are unlikely to compel compliance.<sup>43</sup> The civil penalty for failing to register despite falling into an applicable category is just \$100, and the failure to file a required five-year update report subjects the offending party to a \$50 penalty.<sup>44</sup> A redeeming aspect of the rather weak penalties is the fact that the statute grants discretion for the Commission to consider each day the required information is late to be considered a separate violation, with each violation subject to the applicable penalty.<sup>45</sup> Still, the effectiveness of this regulation in encouraging compliance depends on the Commission's

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<sup>42</sup> The CCPCUA rules aimed to "decrease withdrawals . . . to a sustainable rate of use," which would be beneficial across the state. *CCPCUA Rule FAQs*, N.C. DEP'T OF ENV'T AND NATURAL RES., DIV. OF WATER RES. (Dec. 9, 2004), [http://www.ncwater.org/Permits\\_and\\_Registration/Capacity\\_Use/Central\\_Coastal\\_Plain/CCPCUA\\_rule\\_summary\\_FAQ.php](http://www.ncwater.org/Permits_and_Registration/Capacity_Use/Central_Coastal_Plain/CCPCUA_rule_summary_FAQ.php). Stricter statewide rules could help avoid a situation in which "aquifers . . . are being overused such that they will fail to meet the area's water supply needs in the near future." *Id.* The goal of ensuring "aquifers are protected from dewatering and salt water intrusion and assur[ing] their long term maximum productivity" is one that is admirable for the entire state, not simply the CCPCUA. *Central Coastal Plain Capacity Use Area Stakeholder Committee*, N.C.S.U. NATURAL RESOURCES LEADERSHIP INSTITUTE, <http://www.ncsu.edu/nrli/decision-making/archive/CCPCUA.php> (last visited Nov. 1, 2012). Also, consistent statewide standards would be more "fair to all types and sizes of water users" and would be more "simple, understandable to the public, and practical to administer." *Id.*

<sup>43</sup> Additionally, there may be reduced incentive to punish offenders if Senate Bill 851 passes, as it seeks to eliminate several seats on the Commission, namely three members of the public interested in water and air pollution control; a scientific expert on pollution; a health sciences expert; and a wildlife conservation expert. Boards and Commissions Efficiency Act of 2012, S.851, N.C. Gen. Sess. (2012), *available at* <http://www.ncga.state.nc.us/Sessions/2011/Bills/Senate/PDF/S851v2.pdf>. The elimination of these positions gives more power to the remaining members, who are mostly drawn from industries such as agriculture. *Id.*

<sup>44</sup> N.C. GEN. STAT §143-215.22H(e).

<sup>45</sup> *See id.*

willingness to treat each day as a separate offense as well as the size and budget of the offending user; smaller organizations will likely be more easily persuaded to provide required information than large corporations.

The general weakness of penalties also extends to the CCPCUA. Despite the apparent urgency that necessitated a separate set of regulations for this area, the penalty for late registration is a mere \$5 per day, with a maximum allowable penalty of \$500.<sup>46</sup> The existence of such a limit suggests that this penalty might be ineffective, as an operation large enough to be withdrawing such significant amounts of groundwater on a daily basis can likely afford a \$500 fine.<sup>47</sup> And while arbitrarily increasing penalties might be difficult to justify, doing so to enhance the effectiveness of the fines and to provide additional resources for the enforcement of more comprehensive regulations would be a more welcome initiative.

Traditionally, changes in the law move slowly. However, moving expeditiously to alter North Carolina's groundwater regulations is crucial. In addition to the surging population and ever-increasing rate of development, the State's recent decision<sup>48</sup> to permit hydraulic fracturing may compound issues of escalating groundwater withdrawal. Hydraulic fracturing (fracking) is a method of resource extraction in which a mixture of water and chemicals is pumped into underground rock formations to create fractures through which oil and natural gas can flow and be collected.<sup>49</sup> This method of oil and gas extraction has allowed some states to tap into previously unreachable resources,<sup>50</sup> but it also requires the use of another resource: groundwater.

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<sup>46</sup> 15A. N.C. ADMIN. CODE 2E.0301(b)(3) (2011).

<sup>47</sup> Major groundwater users in North Carolina include mining operations, industrial users and utilities companies, for whom a \$500 fine would not present a hardship. *Facts About Groundwater Usage*, *supra* note 16.

<sup>48</sup> Clean Energy and Economic Security Act, ch. 143, 2012 N.C. Sess. Laws 658.

<sup>49</sup> *Hydraulic Fracturing Background Information*, U.S. ENV'T PROT. AGENCY (May 9, 2012),

[http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/wells\\_hydrowhat.cfm](http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/wells_hydrowhat.cfm).

<sup>50</sup> The Marcellus Shale, located up to 8,000 feet below the earth's surface, "was previously considered unreachable – but the development of horizontal drilling and hydro-fracking technology has allowed natural gas explorers to reach these depths." *Natural Gas Drilling in the Marcellus Shale Uncovered: Community, Environment, and Law*,

According to Michigan’s Department of Environmental Quality, “the amount of water needed to fracture a horizontal well may be up to 5,000,000 gallons or more,” a volume that is equivalent to that “typically used by eight to ten acres of corn during a growing season.”<sup>51</sup> In drought-prone states such as North Carolina,<sup>52</sup> the wisdom of putting more of a strain on groundwater supplies can be called into question. Additionally, growth tends to be rapid once hydraulic fracturing begins in a new area.<sup>53</sup> In Pennsylvania alone, the number of active wells jumped from 36,000 in 2000 to 71,000 in 2011.<sup>54</sup> Nationwide, the number of active natural-gas wells nearly doubled between 1990 and 2009, and about 90% of wells use fracking techniques.<sup>55</sup> With North Carolina requiring groundwater users to update withdrawal information just once every five years, the state stands to fall far behind in tracking the severity of groundwater usage by the industry.

Fracking may also pose problems due to the potential for contamination of groundwater supplies. Although laws allow companies to avoid disclosing all of the chemicals they use in fracking, some known substances used in the practice include kerosene, benzene, formaldehyde, diesel fuel, and countless others.<sup>56</sup> A major concern is that these chemicals may seep, through natural or man-made channels under the surface, into groundwater supplies.<sup>57</sup> In 2010, sixty-five percent of households in Dish, Texas—near Barnett Shale gas wells—tested positive for toluene,

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SWARTHMORE COLLEGE ENVIRONMENTAL STUDIES, <http://www.swarthmore.edu/academics/environmental-studies-capstone.xml> (last visited Oct. 23, 2012).

<sup>51</sup> MICHIGAN DEP’T OF ENVTL. QUALITY, OFFICE OF GEOLOGICAL SURVEY, HYDRAULIC FRACTURING OF NATURAL GAS WELLS IN MICHIGAN (2011), *available at* [http://www.michigan.gov/documents/deq/Hydrofrac-2010-08-13\\_331787\\_7.pdf](http://www.michigan.gov/documents/deq/Hydrofrac-2010-08-13_331787_7.pdf).

<sup>52</sup> Droughts have been frequent in recent years, with a “moderate drought” between 2010 and 2012, and a “severe drought” stretching from 2007 to 2008. *North Carolina Drought-Free for First Time in Nearly Two Years*, THE NEWS & OBSERVER (June 8, 2012), <http://www.newsobserver.com/2012/06/07/2119751/north-carolina-drought-free-for.html>.

<sup>53</sup> *See, e.g.*, Ian Urbina, *Regulation Lax as Gas Wells’ Tainted Water Hits Rivers*, N.Y. TIMES, Feb. 26, 2011, at A1.

<sup>54</sup> *Id.*

<sup>55</sup> *Id.*

<sup>56</sup> Dianne Rahm, *Regulating Hydraulic Fracturing in Shale Gas Plays: The Case of Texas* 39 ENERGY POLICY 2974, 2976 (2011).

<sup>57</sup> *Id.*

while fifty-three percent tested positive for xylene, two other hazardous chemicals used in fracking.<sup>58</sup> Meanwhile, in Pavilion, Wyoming, a discovery that drinking water wells were contaminated with toxic substances used in fracking in 2009 helped explain a decade of rare cancers, central nervous system disorders, and miscarriages in the community.<sup>59</sup> Thus, the regulations promulgated to control fracking in North Carolina may also impact the future of groundwater availability and quality across the state. The Commission promulgating regulations began meeting in September 2012.<sup>60</sup>

## *II. Leading by Example: States to Which North Carolina Should Look for Guidance*

### *A. Tennessee*

Tennessee provides a logical comparison for North Carolina, as the states both have warm climates in which hot, dry conditions are common. Additionally, Tennessee and North Carolina are growing rapidly; the Census Bureau estimated Tennessee's population to be 6,403,353 in 2011,<sup>61</sup> up from 4,877,185 in 1990.<sup>62</sup> Like North Carolina, Tennessee requires every person who withdraws a certain amount of groundwater per day to register with the state.<sup>63</sup> But in Tennessee, the threshold is just 10,000 gallons of groundwater per day to register with the

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<sup>58</sup> *Id.*

<sup>59</sup> *Id.*

<sup>60</sup> For meeting agendas and minutes from the Commission, see *Mining and Energy Commission Meeting Agendas*, N.C. DIV. OF ENERGY, MINERAL AND LAND RES., <http://portal.ncdenr.org/web/mining-and-energy-commission/agendas> (last visited Nov. 1, 2012).

<sup>61</sup> *Tennessee QuickFacts from the US Census Bureau*, U.S. CENSUS BUREAU (Sept. 12, 2012), <http://quickfacts.census.gov/qfd/states/47000.html>.

<sup>62</sup> Richard L. Forstall, *Population of Counties: by Decennial Census: 1900 to 1990*, U.S. CENSUS BUREAU (March 27, 1995), <http://www.census.gov/population/cencounts/tn190090.txt>.

<sup>63</sup> TENN. CODE ANN. §69-7-304 (West 2012).

state.<sup>64</sup> The law does exempt certain uses from this requirement, such as non-recurring withdrawals for human health and safety emergencies.<sup>65</sup>

The Commissioner of Tennessee's Department of Environment and Conservation (TDEC) may also collect and compile data on water quality and quantity on an annual basis.<sup>66</sup> This increased frequency of collection, combined with the wider scope of registered users, provides the State with better potential for analyzing use, spotting overuse potential, and predicting future trends. More information of this kind collected on a more frequent basis is especially beneficial for states with rapid growth and development rates.

Tennessee is also harsher on those seeking to take more than their fair share of groundwater.

The State gives the TDEC the right to assess a civil penalty of between \$50 and \$7,500 per day for violation of "any order of the commissioner or board . . . or any rule, regulation, or standard adopted pursuant to this part."<sup>67</sup> And unlike in North Carolina, where permissive language states that each day *may* be considered a separate violation per the state's discretion, Tennessee mandates that "each day such violation continues *is* a separate violation."<sup>68</sup> The TDEC Commissioner may also seek injunctive relief against any person "when there is reason to believe that a person has violated, or is about to violate," any provisions or orders of the groundwater regulations.<sup>69</sup> Those who intentionally violate or "fail[s], neglect[s], or refus[es] to comply with, any of the provisions" of the rules and regulations "commits a Class C misdemeanor," and "[e]ach day upon which such violation occurs is a separate offense."<sup>70</sup>

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<sup>64</sup> *Id.*

<sup>65</sup> *Id.*

<sup>66</sup> TENN. CODE ANN. §69-7-305(1) (West 2012).

<sup>67</sup> TENN. CODE ANN. §69-7-307(c) (West 2012).

<sup>68</sup> *Id.* (emphasis added).

<sup>69</sup> TENN. CODE ANN. §69-7-307(g) (West 2012).

<sup>70</sup> TENN. CODE ANN. §69-7-307(h) (West 2012).

## B. Kentucky

As with Tennessee, Kentucky is in close proximity to North Carolina, which provides climatic similarities between the states that may result in similar water demands. Kentucky is also experiencing a rapid rise in population; it experienced a jump in population of approximately nineteen percent between 1990 and 2011.<sup>71</sup> Kentucky mandates water withdrawal permits for users who withdraw more than 10,000 gallons per day, albeit with limited exceptions.<sup>72</sup> The state administrative code notes that withdrawals “made on an irregular basis and at an irregular rate” may require permits “if the water withdrawn represents a significant portion of the available water supply or collection of withdrawal data is necessary for water resource planning purposes.”<sup>73</sup>

A notable feature of Kentucky’s regulations that provide for proactive groundwater management is the availability of permits with issue dates up to three years before their effective dates.<sup>74</sup> Those applying for such a permit must provide a project schedule and information on planned withdrawal with quarterly updates on progress.<sup>75</sup> This level of specificity and frequency allows Kentucky to gather information about future conditions and plan ahead for resource management.

Kentucky’s regulations also provide for a high frequency of usage data collection. Permit holders who withdraw groundwater at a “relatively constant daily rate” must record withdrawal information daily and submit water withdrawal forms to update the state on a monthly basis.<sup>76</sup> Those who make irregular withdrawals are subject to a recording frequency to be determined by

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<sup>71</sup> *Kentucky QuickFacts from the US Census Bureau*, U.S. CENSUS BUREAU (Sept. 18, 2012), <http://quickfacts.census.gov/qfd/states/21000.html>; Richard Forstall, *Population of Counties by Decennial Census: 1900 to 1990*, U.S. CENSUS BUREAU (March 27, 1995), <http://www.census.gov/population/cencounts/ky190090.txt>.

<sup>72</sup> 401 KY. ADMIN. REGS. 4:010 §1(1) (2012).

<sup>73</sup> *Id.* §1(3) (2012).

<sup>74</sup> *Id.* §2(b)(2) (2012).

<sup>75</sup> 401 KY. ADMIN. REGS. 4:010 §2(3) (2012).

<sup>76</sup> 401 KY. ADMIN. REGS. 4:101 §3(1) (2012).

the Kentucky Division of Water.<sup>77</sup> Additionally, users whose withdrawals “may adversely impact other water users, water quality, or aquatic habitat” may be required to provide more frequent usage information.<sup>78</sup>

### *C. Maryland*

Maryland is significantly smaller in population than North Carolina, although it is experiencing a rapid rate of growth—the statewide population grew by twenty-two percent between 1990 and 2011.<sup>79</sup> More importantly, Maryland has comprehensive groundwater regulations that states such as North Carolina may wish to emulate. A significant feature of Maryland’s system of regulations is that “every person is required to obtain a permit” prior to using surface water or groundwater and applicants must “provide the Department [of the Environment] with satisfactory proof that the proposed withdrawal of water will not jeopardize the state’s natural resources.”<sup>80</sup>

The exemptions in Maryland are limited; users with an annual average use of 5,000 gallons per day or less, as well as agricultural users with average annual use of less than 10,000 gallons daily are not required to register.<sup>81</sup> Maryland also imposes a notice and hearing requirement in the application process<sup>82</sup> for the benefit of owners of property “contiguous to the parcel upon which the proposed activity will occur.”<sup>83</sup>

Maryland, like Tennessee, takes a hard line on sanctions for violations. The state’s regulations make users in violation of regulations, orders, and permits subject to injunctive

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<sup>77</sup> 401 KY. ADMIN. REGS. 4:101 §3(2) (2012).

<sup>78</sup> 401 KY. ADMIN. REGS. 4:101 §3(3)(a) (2012).

<sup>79</sup> *Maryland QuickFacts from the US Census Bureau*, U.S. CENSUS BUREAU (Sept. 18, 2012), <http://quickfacts.census.gov/qfd/states/24000.html>.

<sup>80</sup> MD. CODE ANN., Env’t §5-502(a) (West 2012).

<sup>81</sup> MD. CODE ANN., Env’t §5-502(b) (West 2012).

<sup>82</sup> MD. CODE ANN., Env’t §5-506(a) (West 2012).

<sup>83</sup> MD. CODE ANN., Env’t §5-204(b)(1) (West 2012).

action and civil penalties of up to \$5,000 per violation.<sup>84</sup> Users accumulate an additional violation each day the user is not in compliance with their permits,<sup>85</sup> and criminal sanctions—including misdemeanor conviction and imprisonment—may be enforced for serious or repeated violations of the environmental regulations.<sup>86</sup>

#### *D. Pennsylvania*

While Pennsylvania has had a much slower rate of population growth in the past two decades than North Carolina,<sup>87</sup> the demand on groundwater has been far from stagnant, particularly due to the recent fracking boom in the state.<sup>88</sup> The state's existing regulatory system is merely an interim setup until formal rules are adopted.<sup>89</sup> Under the current system, users whose withdrawal rates exceed 10,000 gallons per day must register with the state.<sup>90</sup>

Pennsylvania's regulations focus on comprehensive planning as a means to protect groundwater resources, with a Statewide Water Resources Committee responsible for working with regional committees to develop a statewide water plan.<sup>91</sup> The plan is to be amended every five years,<sup>92</sup> and aims to provide public information and guide policies to reduce the risk of

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<sup>84</sup> MD. CODE ANN., Env't §5-514(a)(1) (West 2012).

<sup>85</sup> MD. CODE ANN., Env't §5-514(a)(2) (West 2012).

<sup>86</sup> MD. CODE ANN., Env't §9-343(b) (West 2012).

<sup>87</sup> Between 1990 and 2011, Census Bureau data indicates a population increase of 7.2 percent. *Pennsylvania QuickFacts from the US Census Bureau*, U.S. CENSUS BUREAU (Sept. 18, 2012), <http://quickfacts.census.gov/qfd/states/42000.html>. See Richard L. Forstall, *Population of Counties by Decennial Census: 1900 to 1990*, U.S. CENSUS BUREAU (Mar. 27, 1995), <http://www.census.gov/population/cencounts/pa190090.txt>.

<sup>88</sup> See *Regulation Lax*, *supra* note 53 and accompanying text.

<sup>89</sup> See 27 PA. CONS. STAT. §3118(a) (2012).

<sup>90</sup> *Id.*

<sup>91</sup> 27 PA. CONS. STAT. §3114(a) (2012).

<sup>92</sup> 27 PA. CONS. STAT. §3115(a)(1) (2012).

conflicts and shortages.<sup>93</sup> Pennsylvania also calls for the development of “critical area resource plans” for potentially problematic areas as well as regional plans to complement the state plan.<sup>94</sup>

### *III. Conclusion*

With states, rather than the federal government, in charge of groundwater regulation, a diversity of approaches is to be expected and the variety can provide inspiration and spur innovation in other states. While no state program is without its deficiencies, acknowledged weaknesses should not be accepted. Given North Carolina’s continued development and growth and the future fracking in the state, adopting some of the more effective and ingenious aspects of other state regulatory programs would be wise. Before doing so, however, a myriad of state-specific factors—including regulatory capacity, funding, rate of aquifer recharge, current and future demand—must be considered carefully in light of any potential regulatory changes.

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<sup>93</sup> 27 PA. CONS. STAT. §3116(b) (2012).

<sup>94</sup> 27 PA. CONS. STAT. §3112(d) (2012).