

Drought:

Ten to Do Ten

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Introduction

To have a drought, there has to be “an extended period of dry weather” (p. 405).¹ Additionally, a drought can cover a range of areas, from a single county to an entire region. A drought can also last up to several years or decades.¹ According to the National Integrated Drought Information System, there are six categories to quantify a drought.² The D0 category is for when the area is abnormally dry, but it is not in a drought. The D1 category is moderate drought. The D2 category is severe drought. The D3 category is extreme drought. The D4 category is exceptional drought. The final category is the total area in drought, and it consists of the sum of D1 through D4. To detect for a drought, several physical indicators are tracked. These include temperature, precipitation, water supply, and soil moisture. Lastly, scientists can assess quantitative data from looking at the historical trend from years when a drought occurred.²

I chose to do my internship with the Delaware Academy of Medicine/Delaware Public Health Association on how drought is connected to public health issues. I am interested in the topic of drought, and this was an area that I identified as lacking existing research. To increase awareness about the issue, I wanted to use the existing literature to show the important association that drought has with public health issues. I also wanted to look at information pertaining to Delaware because this is where I am from, and I wanted to know how the topic is currently forecasted to impact the area or what actions could occur to decrease the potentially severity of the relevant issues.

Background

The droughts of 1953 to 1957, 1961 to 1971, 1979 to 1983, 1984 to 1988, 1995, and 1999 were among the most prominent drought periods that Delaware has faced within the last century. The drought of 1953 to 1957 affected the entire state, with more prolonged effects impacting northern Delaware.¹ According to Paulson et al., this drought significantly decreased the water supply in Delaware.¹ Less total water means that there is a reduced amount even for essential activities, such as drinking water. An inadequate amount of drinking water is one primary cause of dehydration. The U.S. Department of Veterans Affairs notes that dehydration can have a particularly fast onset for older adults, and it can spur more severe health problems.³ It is also admitted that older adults might not be fully aware of the need to drink water or that the recommended amount of water for adults to have per day is nine to thirteen cups.³ Statistics from the Administration for Community Living also highlight the increasing older population in Delaware.⁴ The state’s population of individuals 60 and older is growing at a faster rate than the 0 to 19, 20 to 39, and 40 to 59 age ranges. It is also projected that the 2030 population of individuals 60 and older will be 28.4 percent, and this translates to an increase of 41 percent than compared to 2012.⁴ The cumulation of these data points reinforces the potential problems that drought conditions could have in the future.

The drought of 1961 to 1971 was the longest drought that Delaware has had in the last century. Kent County endured drought conditions all the way until 1971. New Castle County dealt with the drought until 1970, and Sussex County faced it until 1967. This was also the most severe and longest drought affecting the northeastern United States. To meet demands for water in these communities during the drought, many areas tried to build additional water-supply facilities.¹ However, Delaware still relies on a limited number of sources for water. The Brandywine Creek is the only resource for drinking water for Wilmington city. To the same end, the watershed demand from 2013 to 2020 was projected to increase by 10.4 million gallons per day (mgd) because of increased industrial use and population. This means that even without a drought, Wilmington's source for drinking water was already strained because of increasing demand.⁵ An improved drinking water resource is a source that includes tube wells or boreholes, protected springs, public taps or standpipes, protected dug wells, and rainwater collection. With Delaware's example of limited water resources, people could be forced to use unsafe water in the case of a drought. These types of water sources lead to about 1.2 million deaths per year, which is 2.2% of deaths worldwide. Additionally, unsafe water is stated to be one of the most significant health and environmental issues across the globe.⁶

During the drought of 1979 to 1983, conditions first impacted northern Delaware, then went on to hurt central Delaware followed by southern Delaware. One of the responses to the decreased water supply was a water-rationing program. However, this was only implemented at certain times of the drought, so it was partially unsuccessful at conserving water. The rationing of water could potentially have had a more effective impact if it was implemented for the entire time of the drought.¹ Although more consistent water rationing could help alleviate some demands for water during a drought, it could cause people to resort to using other water resources that are unsafe. In addition to death, unsafe water sources can make malnutrition worse and increase an individual's risk for infectious diseases, including typhoid, cholera, dysentery, polio, and hepatitis A.⁶

As with the previous droughts, the drought of 1984 to 1988 negatively impacted agricultural yields from decreased soil moisture, streamflow, and rainfall. As northern Delaware's water supplies became increasingly lower in 1988, there was a more direct attempt to limit nonessential water usage. This meant that certain water-based activities were restricted, such as lawn watering and vehicle washing.¹ The U.S. Department of Veterans Affairs created information to inform older adults about how to prevent dehydration.³ The information mentions that dehydration can cause dark colored urine, frequent urination with limited output, dry mouth or coated tongue, constipation, dry skin, frequent urinary tract infections, headache, confusion, lightheadedness after standing up, increased heart rate, and dry eyes. These dehydration symptoms could become exacerbated and turn into even worse health problems as, according to the information, older adults might not even feel thirsty when they are dehydrated.³ During a drought, older adults could be similarly susceptible to overlooking the use of unsafe water resources as they focus more on just having water to use, in general.

The droughts of 1995 and 1999 were the starts of multi-year droughts.⁷ During these periods, Delaware agriculture particularly suffered. From 1995 to 2001, land usage decreased as a result of the drought conditions. This had consequences for pastures, cropland, and other areas of agricultural operations. In turn, decreased agricultural product due to drought could have critical economic impacts.⁵ Those of the middle and upper classes might be able to handle some period with lower income or lack of access to agricultural products, but people living in poverty might

not be able to adapt as easily. Agricultural workers already living in poverty could be laid off and have to find other work in order to have an income. If those workers have to perform different manual labor outdoors during a drought, they might not be accustomed to the higher-than-normal temperatures associated with drought.² Furthermore, this could increase the likelihood of dehydration as the workers either drink too little of water, lose too much fluid from sweating while they work, or a combination of these factors. Dehydration can cause a range of symptoms, and some of these, like headache or confusion, could inhibit workers or even prevent them from performing their jobs.³ This could ultimately result in the workers being fired, which would mean the loss of income and insurance. Those individuals could then have a much more difficult time seeking affordable healthcare, so pertinent health issues could go undiagnosed or untreated as those individuals become financially barred from medical care. The droughts of 1995 and 1999 were the precursor to an even more extreme dry period.

According to the Institute for Public Administration, “[t]he drought of 2002 was the 100-year-drought” (p. 4).⁷ This assessment was made after looking at streamflow and precipitation data from the Brandywine Creek over the past century. Additional findings suggested that the water-management plans at the time were insufficient to meet the predicted demand in 2020. As of 2002, the Delaware Water Supply Coordinating Council had been trying to increase the Delaware water supply by more than one billion gallons. This additional water was coming from the Hoopes Reservoir Deep Storage Project, Aquifer Storage and Recovery Project, Newark Reservoir, Artesian Water Company new wells project, and Newark South Wellfield Treatment Plant. The identified gap between the projected water supply levels versus the projected water supply demand resulted in a Delaware Policy Forum meeting on October 9, 2002.⁷ This allowed for a debate and panel discussion to propose a plan for moving forward. The proceedings centered on one main question, “What should be done to ensure the delivery of clean and plentiful drinking water to Delaware residents and businesses?” (para. 2).⁷ Some proffered ideas were supply-side approaches, like constructing desalination plants or enlarging reservoir capacities. Other ideas were demand-side approaches, like altering prices to promote water conservation. After discussion, the ideas for a water policy ranged from highest to lowest, respectively, included to expand Hoopes Reservoir, recycle wastewater, store water in underground reservoirs, and not make any changes.⁷

Case Studies

There have been a few Delaware case studies related to drought. One case report focused on Wilmington, Delaware. It looked at how food, water, and energy systems are handled in three cities near water in the United States. It also notes that after the drought of 2002, certain actions were taken in 2003 to prevent a future drought from being as impactful. These included constructing a 300-million-gallon capacity reservoir on the White Clay Creek and putting in an iron removal plant for treating ground water.⁵ However, the study fails to mention projected demand, allocations, and availability of water resources. These would be important factors for state-wide planning regarding water supply.

Another case study was carried out in northern New Castle County, Delaware. The research presents a model for drought demand rates to lessen the impact of urban drought. Drought demand rates are a method for water conservation that increases water rates to prompt consumers to use less water. The article concludes that the drought demand rates fostered favorable outcomes, with increased efficiency, neutral revenue, equitable distribution, and guaranteed

conservation of water. Additionally, the research supported the idea that long-term outreach efforts are essential to increase awareness about water conservation and truly change consumer demand.⁸

An additional field study was partly conducted in New Castle County, Delaware. The research focuses on whether people would utilize recycled water or only stick to conventional sources for water usage. To do the study, the researchers utilized a questionnaire to gather data from participants. The results from all three cities in the study showed that people tend to be more opposed to using recycled water for purposes where they are near the water, such as drinking. To illustrate this, differences were observed between participant responses to using recycled water for lawn irrigation, food irrigation, and drinking water. In addition, the results indicated that a region's water abundance is not necessarily linked to preference for or against using recycled water.⁹ These examples of Delaware-based research are crucial when weighing options for how to handle drought. They offer particularly relevant insight into solutions that could be most effective.

Initiatives have also been tested in a state where drought is currently more of a pressing issue: California. Quin and Horvath looked at different water sources to use for irrigation, and it serves as a point of reference for a more emergent situation that Delaware could face if there is a failure to act.¹⁰ One of the primary catalysts for this research is drought. The other motivating factors include unreliable water supplies and increased demand for water usage, both of which drought is closely linked. The information appears to be very objective as it focuses on quantitative statistics to assess recycled water, desalinated brackish water and seawater, and stormwater. Findings indicate that, economically, stormwater and recycled water are more advantageous for irrigation over desalinated brackish water and seawater. Importantly, stormwater and recycled water have already been used for irrigation purposes. According to Qin and Horvath, these types of irrigation-water sources have also been used in several places within the state.¹⁰

The National Integrated Drought Information System does not currently forecast a drought in its monthly or seasonal outlooks.² However, drought preparation is still vital for mitigating potential public health issues over the next several decades. With the Institute for Public Administration classifying the drought of 2002 as the once-in-a-century drought, this insinuates the recurrence of a severe drought.⁷ Historical trends of drought in Delaware are relevant to consider for preparations today. The National Drought Mitigation Center contains data about drought impacts in Delaware over time, and it filters these results based on the National Integrated Drought Information System's drought severity categories, D0 to D4. Over the past ten years, drought impacts under the D0 category include corn yields suffering as a result of insufficient rainfall. The statistics also reflect Delaware being in a D1 category drought for five weeks during the summer of 2022 and two weeks during the fall of 2019. Observed effects included lower corn yields from less rain and increased difficulty with planting because of hard and dry soil.¹¹ These issues could deteriorate over time. Information about trends in extreme weather support the idea that climate change is an imminent problem. Additionally, predictions for the 21st century include more rapid and frequent occurrences of extreme weather compared to that of the 20th century, which was already record-breaking for its time.¹²

Transtheoretical Model

The transtheoretical model is a theory to promote behavior change using a series of steps to recruit the population. The model was first developed by James Prochaska and Carlo

DiClemente, and they applied it to their 1983 paper about a plan for promoting smoking cessation.¹³ This model uses the temporal dimension as the foundation for five progressing steps to foster change: precontemplation, contemplation, preparation, action, and maintenance. The time before action occurs is the temporal distance of behavior, and the time afterward is the duration of behavior. Additionally, unlike other behavioral theories that focus on one measurable outcome, the transtheoretical model emphasizes intermediate outcomes throughout its stages. The decisional balance involves an assessment of the pros and cons to making change. Typical trends show that before the change is instituted, the cons increase at a faster rate than the pros, but the pros then become more equal to the cons and the pros even surpass the cons after the change is instituted. Another intermediate measure is for temptations. The temptations measure notes the level of urges to engage in the adverse behavior, and the urges have typically been observed to decline with progression through each stage. The transtheoretical model also includes ten independent measures to assist in stage progression, the processes of change.

The ten independent measures include consciousness raising, dramatic relief, environmental reevaluation, social liberation, self-reevaluation, stimulus control, helping relationship, counter-conditioning, reinforcement management, and self-liberation. Consciousness raising is about increasing people's awareness of the issue and ideas for change. Dramatic relief has to do with recognizing how discussions related to the topic of change impact people emotionally. Environmental reevaluation occurs when considerations are made regarding the behavior's negative impact on the environment and others. Social liberation emphasizes finding the opportunities that make it easier to change the negative behavior. Self-reevaluation notes the personal detriment of continuing the behavior in question. Stimulus control deals with removing potential triggers. Helping relationship is about forming support to aid in carrying out the behavior change. Counter-conditioning is when a healthier behavior is substituted for the old, more negative action. Reinforcement management centers on the reward for engaging in the healthier behavior. Lastly, self-liberation is about committing to moving forward and not regressing. The transtheoretical model provides a thorough outline for creating a program of behavioral change in society.

The stages involved in the transtheoretical model directly apply to Drought: Ten to Do Ten (DTDT). The program utilizes the transtheoretical model's ten process of change steps to address the public health implications of drought in Delaware over ten years. DTDT will have a timeline that is in accordance with the model's precontemplation, contemplation, preparation, action, and maintenance steps for change. DTDT will also include the intermediate, dependent measures related to decisional balance and temptations. Keeping track of these measures will help improve the program's potential for success throughout its stages, and it will allow the program to consider the individual challenges that the Delaware population could face when instituting change.

DTDT will start Delaware off at the transtheoretical model's precontemplation stage. The first step of the program will try to increase awareness about the numerous ways in which drought is connected to public health. The program will achieve this with methods of mass communication. The second step of the program will involve in-person informative sessions about the topic to reach the audience on a more personal level. Ideally, this would bolster initial thoughts about the program to aid Delaware's progression within it.

DTDT will then advance Delaware to the contemplation stage. The third step of the program seeks to expose Delawareans to the current state of the drought issue. It will consist of video to

show the actual areas that drought has impacted. The purpose would be to prompt consideration about the need for change.

The program will further move Delaware to the determination/preparation stage. DTD T will have the greatest focus on this stage of change to provide the most solid foundation possible for the program to succeed long term. The program's fourth step will take a societal view to establish how support for the program is more than an effort from individuals alone. The fifth step of the program will illustrate the state's position in this preparation stage because this step involves directly providing informative material about drought to Delawareans in order to increase overall readiness for change. The sixth step of the program will provide an external motivating factor to prevent Delawareans from regressing or ending their progress on understanding more about drought and personal changes to prevent the issue from becoming a more prevalent public health concern. Additionally, the seventh step of the program will provide reinforcement for the importance of the program's original intention and current actions. This involves fostering a relationship with medical providers to ensure further progression through the transtheoretical model's stages of change and promoting the long-term success of the program.

After establishing determination, DTD T will move Delaware to the action stage. The eighth step of the program involves the true action of change because new drought-mitigating actions will have to replace previously adverse behaviors. This will take time and tremendous effort, but the program's ninth step will initiate additional fortifying factors. This step will utilize a type of incentive for engaging in behavior that works to improve or mitigate drought conditions. In other words, the step will increase the likelihood of Delawareans engaging in the program's actions.

The final goal of DTD T is to keep Delaware in the maintenance stage and prevent termination of the program's progress. The tenth step of DTD T will assess program status at intervals over time, and it will seek out feedback from the Delaware population to consider adjustments if appropriate. As a result of following the procedural-like steps of this theory, DTD T intends to establish a firm foundation for addressing the impact of drought and, in turn, aid the conditions of public health in Delaware.

Drought: Ten To Do Ten

Drought: Ten to Do Ten (DTD T) is intended to address the public health implications of drought in Delaware. Over the next ten years, DTD T will progress through each step of the transtheoretical model to allow for a greater percentage of Delawareans to be informed about drought and how it is related to public health. The program aims to build on this foundation to maintain its awareness-based, model-based, and action-based efforts for reducing the public health implications of drought.

The first goal of DTD T, definition and structure, is one of the most important program goals (Table 1). DTD T will form relationships with local environmental agencies or clubs interested in a topic pertaining to drought and public health. Health-related research about drought will be emphasized with these organizations, and the focus of the partnership will be on ultimately promoting public health. DTD T will work with the Delaware Academy of Medicine/Delaware Public Health Association, the Delaware Division of Public Health, and other stakeholders to educate about the public health impacts of drought in Delaware. DTD T will also coordinate with water companies in Delaware to allow monetary rebates for customer water usage that complies

with standards DTDT helps establish to limit water consumption without limiting usage for activities essential to public health promotion.

Table 1. Drought: Ten to Do Ten Logic Model

Goal	Step	Implementation Activities/Objectives	Short Term Deliverables	Mid Term Deliverables	Long Term Outcomes
Definition and Structure	4	Work with current environmental and public health organizations in Delaware to initiate partnership	2023 Year End Reached out to 10 organizations	10/2024 Formulated partnership with 1 environmental agency and 1 public health organization	Create new partnerships yearly until all companies in Delaware are in partnership
	9	Work with Delaware water companies to design incentives for water conservation or non-traditional methods promoting sustainability	2023 Year End Created list of 10 potential incentives to present to companies	10/2025 Presented incentives list to over half of major Delaware water companies and have plans for at least 1 partnered incentive	2033 Implemented incentive plan for customers at water-resource company with 10000 individual or commercial customers
Increased Awareness	1	Utilize mass communication to inform Delawareans about drought and its ties to public health	2023 Year End Compiled research on topic into 1 formal paper	10/2028 Published research in e-newsletters with combined viewer base of at least 10000	Submitted ongoing research to print/electronic news sources at yearly intervals for update
	2	Provide in-person presentation to Delawareans about the issue to convey information using a more personal level	2023 Year End 1 presentation created to be used at each event	10/2029 Presentation given to combined total audience of at least 10000	2033 Agreement formulated to allow yearly presentations at 10 local schools in addition to increasing current presentation agreement obligations by 10% per year
	7	Create flyers about drought for use in Delaware physician offices	2023 Year End Flyers created and 10000 produced	10/2026 All initially created flyers distributed to and put up in physician offices	Flyers distributed throughout Delaware until all primary care offices contain them
Education	3	Create video to show Delawareans actual drought-stricken locations and caution about excessive at-home water usage	2023 Year End 1 video filmed to be used until updated over time	10/2028 Video updated to account for increased/decreased drought effects	2033 Video updated within the past year and distributed to viewing audience of at least 10000
	5	Distribute typed list of issues not commonly thought to contribute to drought and related health risks	2023 Year End List created with 10 most important issues	10/2028 Physical copies sent to homes in 10000 residencies throughout Delaware	Physical and electronic copies sent to personal residencies each year until all population in all major Delaware towns have been covered

	8	Livestream alternative everyday activities to promote actual ideas for water conservation	2023 Year End Created livestream account with at least 1 site	10/2029 Created consistent schedule of posting videos with 10% increase in amount produced per year	2033 Accumulated 10000 total views
Public Policy	6	Advocate for legislative restrictions on water usage	2023 Year End Formal letter sent to 1 state Congressmen	10/2025 Organized at least 1 protest in Delaware	2033 Organized annual protests with at least 10000 attendees
Evaluation	10	Gather feedback from initial outreach populations about behavioral changes related to water conservation and potentially observed health benefits	2023 Year End Finalized list of total initial outreach populations	10/2024 Sent feedback inquiry to entire list via physical and/or electronic communication	Continue to reach out to recipient list yearly until at least 10000 responses received

Increased awareness is another main goal of DTD. The program will use mass communication of information to convey that drought is connected to public health issues. DTD will attempt to do that through presenting research to electronic and print news sources to try to gain assistance in mass dissemination of material to their viewers. To be cost effective, DTD will initially try to work with types of organizations that offer opportunities for free newsletter submissions that, if published, are sent to the organization's entire subscriber base. This will also assist in establishing the authority of drought as an important topic, particularly as it pertains to the connection to public health repercussions. Additionally, the DTD aims to use in-person presentations to connect directly with Delawareans of all ages and backgrounds. This approach allows the audience to have an interactive experience that is unavailable with other types of information consumption. The presentation audience will have the opportunity to ask questions about drought and public health that might pertain to them on a more individualized level. DTD intends to use this approach to increase Delawareans' inclination to want to further understand the program and the topic of issue. Another method for DTD to increase awareness will come from working closely with professionals in the healthcare industry to have flyers in doctors' offices that are about drought and can bolster an initial conversation. Additionally, the physician will be there, as an informed professional, to answer questions about the flyer's information regarding health issues connected to drought.

After increasing awareness, DTD will try to show how drought is directly impacting the local area to see that drought, itself, is already a present issue. This educational view serves to indicate the idea that Delaware could see resulting repercussions from drought, not only in the physical environment, but also within the public health sphere. DTD will also prioritize independent, informed decision-making while providing Delawareans with a typed list of information about drought-mitigating behavioral changes (Appendix A). DTD expects this to increase determination to address the public health issues associated with drought because Delawareans use the provided information to come to their own motivating conclusions. Direct instruction will also be an educating method because casual-style livestreams will allow DTD to promote healthier alternatives from an everyday view. These ideas about how to address drought and its public health issues are intended to be straightforward to show that it does not have to be an overwhelming task. Individuals each make a difference through their choices, and like DTD being a long-term plan, counteracting adverse behavior will become increasingly important as more Delawareans act over time.

Another main intention of DTDT is to change public policy. DTDT will try to impact legislative decisions around drought-related issues. Restrictions created to address drought conditions, such as water-usage limits or bans, will provide foundational support for improving the human factors that make drought conditions worse. In other words, people will be less likely to engage in adverse behaviors, like using excessive amounts of unnecessary water, if these actions have additional repercussions, like monetary fines. With the drought issue itself addressed, DTDT will decrease the potential for resulting public health issues.

The final goal of the program is to assess the implementation over time. Important factors to consider will involve reaching out to the populations that had been exposed to DTDT. One main point will include gathering qualitative data and quantitative information about the presence of and/or type of drought-mitigating changes made over time. Assessing correlating health information will also be important to observe. This type of approach to program assessment will provide additional opportunity for Delawareans to voice their opinions about improvements to DTDT. The program will be adjusted thereafter to increase the potential for continued effectiveness.

Discussion

This topic applies to overarching public health topics, which include epidemiology, health inequity, health in all policies, and population health. Epidemiology is the study of diseases and their methods of transmission to prevent negative health outcomes among the population.¹⁴ This connects to drought as drought is associated with a lack of water, and that could lead people to use other, unsafe water sources. In either or both cases, drought can cause dehydration, disease, and even death.⁶ The Centers for Disease Control and Prevention notes that typhoid, polio, and cholera can especially be transmitted via contaminated water.¹⁵ This is also particularly relevant to Delaware because even fifty years after the federal Clean Water Act was passed to improve water quality across the country, 70.5% of reservoir and lake acres and 100% of harbor, estuary, and bay square acres are impaired.¹⁶ This indicates that drought could cause severe epidemiological consequences for the state.

Health inequity is the concept that people have variable health outcomes and access to resources because of social determinants.¹⁷ There is an inherent lack of water supply when there is a drought. From an economic standpoint, this tends to increase the cost to access water when demand remains at least the same. To that end, low-income areas are more likely to face health inequities from a drought, compared to higher-income areas, because people in the lower-income areas would be less likely to afford the increased pricing of water. As a result, this population would be more susceptible to using unclean water resources or not using water for activities vital to individuals' health. In Delaware, 10.6 to 13.3% percent of the population lives below the poverty line, and the county with the highest percentage of poverty is Kent County.¹⁸ This suggests that individuals in Kent County could be particularly vulnerable to health inequities from drought.

The idea of health in all policies is to approach policymaking with consideration for population health and equity, and it can involve public health liaisons within organizations or the government.¹⁴ This has to do with drought because as policies are made regarding water resources, a 'health in all policies' approach would include high regard for factors such as the way the policy could impact access to clean, usable water.

Population health is the focus on individuals' overall well-being.¹⁷ In addition to drought having impacts on physical health, it can also affect people mentally and emotionally. During a three-phase research study, the psychological effects of drought were assessed to impact mental health. The reason for this stems from drought being a time of potentially severe environmental challenges. The study suggested that the direct results of a drought could then increase psychological distress and psychiatric disorders from the persistence of the drought issues.¹⁹ The plan for handling a drought has to be comprehensive in order to mitigate public health issues.

Conclusion

The internship experience I had allowed me to increase my understanding of the impact of drought. The information I had previously focused on with drought was primarily about the environment. However, this internship pushed me to think about how else drought affects the world. I initially tried to find sources that directly linked drought to public health issues, but I was unable to find adequate information. The internship allowed me to figure out how to synthesize information to form conclusions. This is a foundational skill that I can implement in future academic studies to investigate ideas while also being able to back up the information using credible sources. During the process, I was also able to increase my understanding of public health issues. This included finding out about the various areas within public health, overall, and the specific applications that those areas had to my topic. The internship showed me just how comprehensive public health is as I was able to center on a topic that, at first, appeared unrelated. Overcoming issues faced during the internship increased my ability to be more informed about a variety of important topics.

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Appendix A.

Overlooked Issues Contributing to Drought^{20–23}

01. Leaking toilet: Can waste over 100 gallons of water per day. Test if toilet is leaking by putting food coloring in the tank. The evidence of a leak would be if the color seeps into the bowl without the toilet being flushed.
02. Leaking outdoor pipe, faucet, or hose: Wastes water 24 hours per day.
03. Overwatering lawn: Wastes water when there are colder temperatures or rain. The lawn should be watered less frequently but for a longer period to get the most out of the process if lawn watering is necessary.
04. Using toilet to be like a trashcan: Each toilet flush uses 5 to 7 gallons of water.
05. Not having aerators on home faucets: The aerator creates small air pockets in the water to prevent splashing and conserve water flow.
06. Flushing toilet excessively: Toilet flushing accounts for most in-house water usage for average family of four at 40% of total usage.
07. Overlooking usage of water bill: Use water bill to identify how much of the resource is being used. Consumers can ask the local government to do home water audit.
08. Not conserving water using toilet tank: Put plastic bottle filled with one inch of weigh-down material into tank to conserve water while maintaining toilet operation.
09. Not collecting outdoor water runoff: Use a barrel to catch stormwater runoff from hard surfaces.
10. Not having flow restrictors: These items can be purchased at inexpensive prices. They can reduce water usage to 3 gallons per minute instead of up to 10 gallons per minute.

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