

EXPLORING INDIVIDUALS' AFFECTIVE INTERACTION WITH THE OBJECT OF
WATER AFTER AN INFRASTRUCTURE DISASTER

by

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DEDICATION

To small communities living by dams around the world, may you wield your power individually and collectively.

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ABSTRACT

As climate change yields volatility in the environment, much of the critical water infrastructure in Texas, which is already failing, is subject to a significantly increased risk of failure. Researchers have begun to incorporate the study of people's perceptions of water, and relative affairs, to support and sustain infrastructure and environmental policy. Across the literature, there is a clear demand for localized, individual, content and context about people's relationship with water, which may be used to empower data and analysis outcomes that may ultimately inform the field of water resources and its pedagogy as a whole. Our ability to understand what affective relations, individuals who experienced an infrastructure disaster, construct with the object of water is vital to increasing the efficacy of engagement by those working in water. While there is a lack of research in this area, researchers have concluded that it is important for researchers to continue to cross-pollinate theoretical approaches to further understand affective relations. The theoretical shift presented in this study is the recognition that affective spaces grant agency to objects with which people may construct affective relations, recognize materialism in the construction of knowledge about abstract objects, embrace the heterogeneity of individual experience, and gives power to the individual in a way which allows a more authentic version of lived experience to be captured in data. To substantiate my argument, I analyzed qualitative interview data which captured constructed affective relations with the object of water from people who have experienced a dam failure in the Lake Dunlap community. My analysis suggests that (1) participants' affective relations

with family history, recreation, and the building of family intertwined significantly with the object of water to impact their decision in which physical location they chose to settle in; (2) a desire to return the physical landscape to its previous state as a lake drove people to support individual and organizational roles in accomplishing this, even if it conflicted with their interests; and (3) participants formed different perspective frames of authority, responsibility, and water-resources management based on their differences in constructed knowledge.

I. INTRODUCTION

As climate change yields volatility in the environment, much of our critical water infrastructure, which is already failing (ASCE-TS 2021), is at significantly increased risk of damage (Hui et al. 2018). This is particularly true of dams in Texas, where dam incidents and failures are exorbitantly increasing (ASDSO 2020, Dascher and Meitzen 2020, ASCE-TS 2021)—with the Infrastructure Report Card for Texas reporting more than double the dam failure incidents since 2000 than what occurred between 1900 and 2000 (ASCE-TS 2021).

The increase in dam incidents and failures can be attributed to the increasing ages of dams and their components, with many dams across the state near or beyond their useable lifespans; an increase in severe weather events; and the need for rehabilitation (Dascher and Meitzen 2020, ASCE-TS 2021, TWDB 2021, GBRA 2022c). Of particular concern to dams across the state are trends due to climate change, such as rainfalls shifting seasonality and increasing extremity in addition to increased temperatures and potential for drought (Dascher and Meitzen 2020, Nielsen-Gammon et al. 2020, Marvel et al. 2021). With more than 95 percent of dams in the state being earthen and “particularly susceptible to cracking during dry conditions...”, the risk of dam failure can be high—a risk which is exacerbated in dams that are already damaged (Dascher and Meitzen 2020). The Texas Commission on Environmental Quality is responsible for managing a Dam Safety Program which is intended to monitor and regulate private and public dams within the Commission’s regulatory criteria (Dascher and Meitzen 2020). However, the program is unable to fulfill its mandate due to a lack of resources which hinders the agency’s ability to manage and regulate the high number of dams in Texas

(Dascher and Meitzen 2020).

Along a stretch of the Guadalupe River in Central Texas, numerous historic dams owned and operated by the Guadalupe-Blanco River Authority, a government-owned corporation that acts as a steward of water resources for a ten-county statutory district, are facing all of these issues (Dascher and Meitzen 2020, ASCE-TS 2021, GBRA 2021a, TWDB 2021, GBRA 2022c). These dams create lakes along which a string of communities have deeply embedded their lives. Limited funding, in addition to the substantial issues in information management regarding dam incidents and failures and negative connotations around dam removal, makes it extremely difficult for communities to address incidents and failures, let alone commit to preventative processes and actions (ASDSO 2020, Dascher and Meitzen 2020, GBRA 2020a, ASCE-TS 2021). When dams fail, communities are left to pick up the pieces of their lives while simultaneously seeking solutions. At the time of this study, two of these historic dams, Lake Wood dam and Lake Dunlap dam, had already failed (Gonzales 2019, GBRA 2020a).

Researchers have begun to incorporate the study of people's perceptions of water, and relative affairs, to support and sustain infrastructure and environmental policy (Gu et al. 2015, Gyasi et al. 2018, Smith et al. 2018, Chew et al. 2019, Gholson et al. 2019, Glick et al. 2019, Araya et al. 2020, Okumah and Bonyah 2020). Across the literature, there is a clear demand for localized, individual, content and context about people's relationship with water, which may be used to empower data and analysis outcomes which may ultimately inform the field of water resources and its pedagogy as a whole (Gu et al. 2015, Ayre et al. 2018, Gyasi et al. 2018, Smith et al. 2018, Chew et al. 2019, Gholson et al. 2019, Glick et al. 2019, Araya et al. 2020, Okumah and Bonyah 2020).

The gathering and use of this perceptive information also aid in creating more effective water-resources management and practices, including education and advocacy (Gu et al. 2015, Chew et al. 2019, Gholson et al. 2019, Glick et al. 2019, Ayre et al. 2018, Araya et al. 2020, Okumah and Bonyah 2020). The variations and advancement of these types of studies have added invaluable knowledge to the field. However, many studies do not seek to contextually qualify the participants lived experiences. Further, the methodology and survey instruments employed are typically focused on deriving information on particular aspects of water such as water use and water recycling, water availability, conservation, water reuse, and water quality (Gu et al. 2015, Smith et al. 2018, Gholson et al. 2019, Glick et al. 2019, Araya 2020, Okumah and Bonyah 2020) with some variations including variables such as testing of science and policy knowledge (Glick et al. 2019). However, none focus on water as an object which participants construct affective relations with.

Within the field of affective geography, *affect* has been “translated into [a] number of different competing perspectives...” but central to them is an “impersonal autonomy” which may be considered as an “impersonal ‘force’ that precedes processes of cognition [which] provides us with the opportunity to explore the movements and consequences of these forces and how they impact on and shape” everyday life (Bissell 2021). My study carves a new path in affective geography through conceptual and theoretical alterations which allow for the recognition of affective spaces in which agency is granted to abstract objects, such as water, with which people construct affective relations, and, ultimately, produce knowledge of. This theoretical shift closes the gap between *natural* and *social* sciences and gives shape to developing an understanding of

how affective relationships with objects impact people and the world around them. The consideration of affect in these terms, alongside methodologies such as phenomenological interviewing and qualitative coding, makes it possible for researchers to capture a snapshot of what affective relations individuals have constructed with objects, such as water, and interpret them.

The goal of this research is to explore what affective relations people who have experienced a dam failure have constructed by exploring their lived experiences with water through a phenomenological interviewing process. Our ability to understand how individuals who experienced an infrastructure disaster construct affective relations with the object of water is vital to increasing the efficacy of engagement by those working in water (Sivapalan 2015, Smith et al. 2018). While there is a lack of research in this area, researchers have concluded that it is important that researchers continue to cross-pollinate theoretical approaches to further understand affective relations (Smith et al. 2018). My results seek to answer the question: What affective relations have people who have experienced an infrastructure failure constructed with the object of water? This is the first study that interacts with people in the Lake Dunlap community. Additionally, this is the first study of its kind—conceptually linking the specific ontology, metaphysic, and epistemology, to overcome issues in affective geography and enable the capturing of affective relations with objects such as water.

II. DEVELOPMENT AND MANAGEMENT OF THE GUADALUPE RIVER

Physical Geography of the Study Area

The Guadalupe River Basin is located in central Texas (Figure 1). The total drainage area of the Guadalupe River basin is around 15,500 square kilometers (Joseph et al. 2013, Dascher and Meitzen 2020). The headwaters of its namesake river, the Guadalupe River, are springs of the Edwards-Trinity (Plateau) Aquifer located in Kerr County, Texas. The entire Guadalupe River basin is classified as humid subtropical with hot summers (Kottek et al. 2006, Earl 2007, Dixon and Moore 2014). The climate along the course of the river is “transitional between the humid subtropical characteristics of east Texas and the subtropical semiarid of south Texas” (Earl 2007).

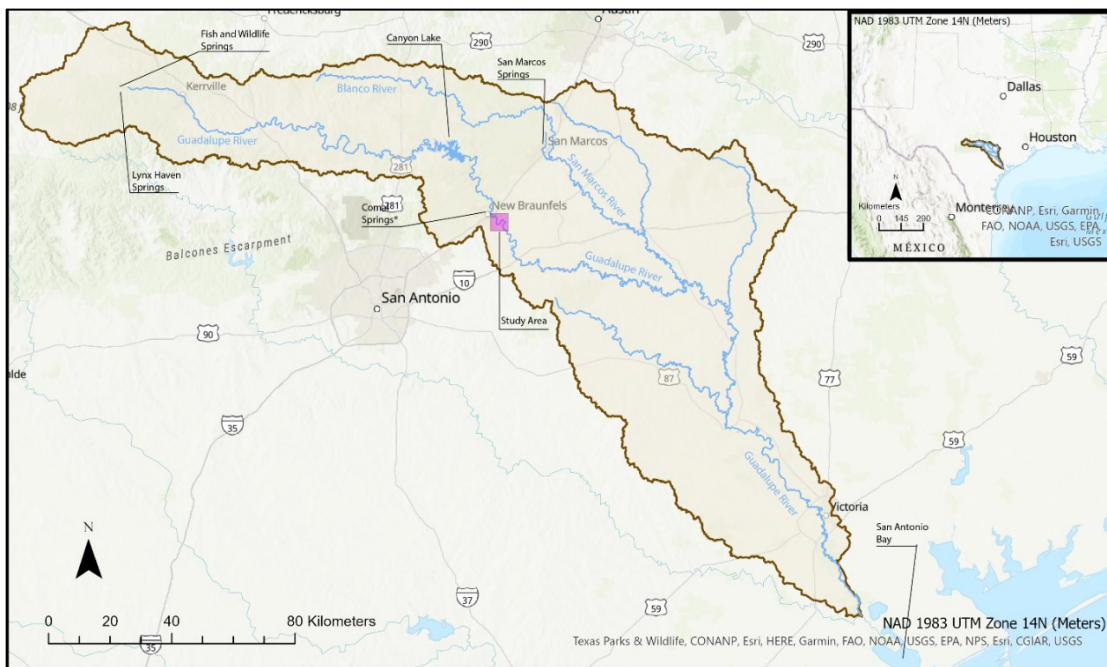


Figure 1: Guadalupe River Basin. (*Note: the Comal River is not visible due to its very short length)

As the river begins its journey from Lynx Haven Springs, the source of the South Fork of the Guadalupe River, and Fish and Wildlife Springs, the source of the North Fork of the Guadalupe River, to its estuary in San Antonio Bay, it moves “through the Edwards [Plateau] to yellowish-buff shale and marl, the upper member of the Glen Rose

limestone... which is relatively impermeable...and keeps water at the surface”

(McAlister 2008). The river flows east-southeast, over the limestones of the Edwards Plateau, 144.8 kilometers toward Canyon Lake where the water is impounded (McAlister 2008, Sansom 2008).

Throughout its journey to the reservoir, the water pools, flows, and riffles through the Hill Country region of Texas. Bear grass, musk thistle, firewheels, Mexican hats, Horse mint, Texas thistle, Texas persimmons, Arizona walnuts, soapberry, escarpment black cherries, scarlet leatherflower, black willows, various species of oaks, and various species of cypresses dominate the flora visible from the river (McAlister 2008). The river speeds through bluffs creating rapids as well as flowing more docilely as it passes through numerous small cities and small dams (McAlister 2008).

The flow of the Guadalupe River from Canyon Lake to New Braunfels is controlled through scheduled releases of water from the lake, and typically maintains a flow of 11.3 to 22.7 cubic meters per second (McAlister 2008). The upstream banks of this section of the river are filled with bald cypresses, American elm, sycamore, red mulberry, green ash, rough dogwood, soapberry, pecan, and abundant mustang grape (McAlister 2008). There are green kingfishers, Carolina wrens, redbirds, yellow-billed cuckoos, wood ducks, green herons, giant swallowtails, and fox squirrels (McAlister 2008).

As you head downstream from Canyon Lake, the environment transitions—there are exotic species, most of the riverbank is developed with recreational features, such as decks, and nearly every home has a pump pulling water from the river to irrigate their lawns (McAlister 2008). There is immense recreational pressure on the river—

particularly within the river reach between Canyon Lake Dam and New Braunfels—the tubing capital of the world (McAlister 2008). As the river flows, the water races in rapids through the last bits of the Hill Country region, going south-southeast for 25.8 kilometers to New Braunfels as it crosses the Balcones Fault Zone (McAlister 2008).

McAlister (2008) notes that, although impressed by the scenic bluffs and rapidly moving water, the anthropogenic impact on this area of the Guadalupe River “leaves no room for native herbs or communities of wild creatures” and “despite the hummingbird feeders, brazen wood ducks, and fat fox squirrels, this is a relatively sterile, urbanized environment, perpetually patrolled by overweight but innately deadly house cats.”

In New Braunfels, the Comal River flows into the Guadalupe River. The Comal River, which is 4.8 kilometers long, is fed by the Comal Springs—the largest artesian springs west of the Mississippi River—springs that discharge the largest volume of water from the Edwards Aquifer at a rate of 8.5 cubic meters per second (Brown 1996, Earl 2007, Burnett 2008, McAlister 2008, Rosen 2015, U.S. Geological Survey 2022A). It joins the Guadalupe River just north of Interstate 35 in New Braunfels. When the Guadalupe River is experiencing low flows, the Comal River contributes significantly to the base flow from New Braunfels to the estuary (Sansom 2008). In many years, the flow of the Comal River contributes as much to the Guadalupe River as the entire Upper Guadalupe (Brown 1996, McAlister 2008, Sansom 2008).

The base of the Balcones Escarpment marks the end of the Hill Country, the beginning of the Coastal Plains, and the final stretch of the Guadalupe River. Sansom (2008) notes that the river “changes from a Hill Country stream of rapids and pools to a slower, more meandering river as it begins its journey through the coastal plains...” This

portion runs from Interstate 35 in New Braunfels to San Antonio Bay—approximately 321.9 kilometers to the southeast (Texas Parks and Wildlife Department 1974, Sansom 2008).

Immediately south of Interstate 35 in New Braunfels, the Guadalupe River enters the Guadalupe Valley Lakes Region¹. A significant contributor to the base flow of the Guadalupe River within this region is the San Marcos River—fed by both San Marcos Springs, which has a mean flow of 5.2 cubic meters per second, and the Blanco River, which has an annual mean flow of 3.98 cubic meters per second and a drainage area of 1,190 square kilometers, on its way to meet the Guadalupe River at Lake Gonzales—the fifth hydroelectric dam in the Guadalupe Valley Lakes Region (Earl 2007, Sansom 2008, GBRA 2018a, U.S. Geological Survey 2022b).

Both San Marcos Springs and Comal Springs are fed by the Edwards (Balcones Fault Zone) Aquifer at the base of the Balcones Escarpment. It is this contribution from the Edwards Aquifer (including the Edwards part of the Edwards-Trinity [Plateau] Aquifer) that makes the Guadalupe River a strong-flowing, perennial stream, from the headwaters to the coast, through all but the most severe drought (McAlister 2008). If water levels in the Edwards (Balcones Fault Zone) Aquifer were to fall to a level that would cease flows from Comal and San Marcos springs, the threat to the flow of the Guadalupe River and flows to the estuary would be extreme.

¹The name *Guadalupe Valley Lakes* has appeared in numerous Guadalupe-Blanco River Authority materials and presents a branding of the dams and associated reservoirs, along a small portion of the Guadalupe River from south of interstate 35 to the City of Gonzales, as lakes. The name has also been used extensively by local and national media. Additionally, in similar materials—more frequently in state agency materials, the name *Guadalupe Valley Hydroelectric System* is used.

Development and Management of The Guadalupe River

Between 1800 and 1899, very few dams were built across the state (Dascher and Meitzen 2020). Those that were built were designed without automation or electronic power systems (GBRA 2020a). Of the recorded dams built during this time, over 30 percent had no purpose listed—while recreation (26 percent), flood control and stormwater management (13.4 percent), and irrigation (14 percent) constituted those with listed purposes (Dascher and Meitzen 2020).

The years between 1900 and 1939 are considered the early era of dam building (Dascher and Meitzen 2020). Of the recorded dams built during this time, recreation (36.5 percent), irrigation (23.9 percent), and water supply (21 percent) constituted those with listed purposes (Dascher and Meitzen 2020). In the early part of this era, prior to the existence of river authorities in Texas in 1917, speculators along the Guadalupe River began purchasing land to develop hydropower, using power plants that were dependent on the flow of the river, versus the storage of water, for generating energy (McAlister 2008, GBRA 2020a).

River authorities are quasi-governmental agencies established by the State of Texas and “authorized under the 1917 Conservation Amendment to the Texas Constitution” (Harper and Griffin 1988) to manage, develop, conserve, and protect water resources and make water available for beneficial use (TX Const. art. XVI, § 59 (a) (1917), Harper and Griffin 1988, Sansom 2008, GBRA 2019b).

The goal of these authorities, as specified in the Texas Constitution, is:

(a) The conservation and development of all of the natural resources of this State, and development of parks and recreational facilities, including the control, storing,

preservation and distribution of its storm and flood waters, the waters of its rivers and streams, for irrigation, power and all other useful purposes, the reclamation and irrigation of its arid, semi-arid and other lands needing irrigation, the reclamation and drainage of its overflowed lands, and other lands needing drainage, the conservation and development of its forests, water and hydro-electric power, the navigation of its inland and coastal waters, and the preservation and conservation of all such natural resources of the State are each and all hereby declared public rights and duties; and the Legislature shall pass all such laws as may be appropriate thereto. (T.X. Const. art. XVI, § 59 (a) (1917))

Between 1928 and 1932, the Texas Power Corporation and the Texas Hydro-Electric Corporation constructed and put into operation six hydroelectric dams, with a total of fifteen spillgates, in the Guadalupe River Basin (Sansom 2008, GBRA 2020a, TWDB 2021, GBRA 2022b).

Origin of the Guadalupe-Blanco River Authority

The Texas Legislature established the Guadalupe-Blanco River Authority in 1933 as a water conservation and reclamation district called the *Guadalupe River Authority* (Hendrickson 1985; Harper and Griffin 1988; GBRA 2019b, 2022a). The Authority was established as a state-owned corporation that operates within a 10-county statutory district encompassing the Guadalupe and Blanco river basins in central to southeast coastal Texas (GBRA 2019b, 2022a).

After the Texas legislature created the Authority in 1933, the board of directors

had their first meeting in December 1933 where they prioritized a series of dams for flood control and hydropower (McAlister 2008). According to McAlister (2008), the board of directors had a “visionary proposal to open the river channel for shipping all the way from San Antonio Bay to New Braunfels,” but the U.S. Army Corps of Engineers, which conducted a cost-benefit analysis of the proposal, was unable to justify the cost of inundation—let alone the dam and associated costs.

At the time, few electric companies provided services in rural areas, and the ones that did charged rural customers exorbitant prices (Yancy 1988, Cooke 2017). President Franklin D. Roosevelt, at the January 1935 State of the Union address, declared that “among the subjects that lie immediately before us are... the restoration of sound conditions in the public utilities field through abolition of the evil features of holding companies” (Roosevelt 2011). While many people did not support the “concept of government-owned generation facilities selling to publicly-owned distribution systems”—a tension that still thrives today—Roosevelt, and those in this camp, saw a lack of rural access to electric services as a fault of massive conglomerations of utilities under the umbrella of holding companies (Cooke 2017). Even avid supporters of holding companies, such as syndicated journalist Walter Lippmann, acknowledged the “occasional abuses and ‘flagrant profiteering’” (Cooke 2017).

One month later, in February 1935, the Public Utility Holding Company Act was introduced in both chambers of congress by House Speaker Samuel Rayburn of Texas and Senator Burton K. Wheeler of Montana to “discourage control of the electric utility industry by a few large corporations” (Cooke 2017). It passed and was signed into law on August 26th, 1935.

Throughout this time, Texas State Senator Alvin J. Wirtz, a close friend of U.S. Congressman Lyndon B. Johnson (later the 36th President of the United States from 1963–69), was championing legislation to create public power programs in Texas modeled after the Tennessee Valley Authority (Cooke 2017). Working alongside Wirtz, U.S. Congressman James P. Buchanan secured funding from the Works Progress Administration, and, in 1934, the Texas Legislature created the Lower Colorado River Authority (Cooke 2017). One year later, in 1935, the Texas Legislature reauthorized the *Guadalupe River Authority* as the *Guadalupe-Blanco River Authority* (Cooke 2017; GBRA 2019b, 2022a). According to Hendrickson (1985), the river authorities established in the thirties required funding assistance, such as federal assistance, to launch their initial operations. Some agencies, such as the Brazos River Authority and the Lower Colorado River Authority, were recipients of financial assistance which allowed them to thrive (Hendrickson 1985). Whereas other agencies, such as the Guadalupe-Blanco River Authority and the Nueces River Authority, did not—resulting in a period of dormancy (Hendrickson 1985).

Historical Management of the Guadalupe River by the Guadalupe-Blanco River Authority

Although the Guadalupe-Blanco River Authority had little initial success in dam building in the 1930s, they succeeded later that decade when a report to congress in 1939, supporting the construction of a dam north of New Braunfels for flood control as well as water and soil conservation, was considered (McAlister 2008). Hendrickson (1985) noted that “... just prior to World War II, the pattern for the management of Texas’ surface

water was established... [as] a system emphasizing flood control and power production.” By 1942, Congress authorized the dam north of New Braunfels (McAlister 2008). The project came to be known as Canyon Lake Dam (McAlister 2008). The Rivers and Harbors Act of 1945 authorized the initial funds, and “final construction approval came in the Flood Control Act of 1954” (Comal County 2015).

A site was selected in 1949, and a shared control agreement between the Authority and the federal government was signed in 1957—with the flood pool being under the management of the U.S. Army Corps of Engineering and the conservation pool (water stored for municipal supply, hydroelectric power, and recreation) being under the management of the Authority (McAlister 2008, Sansom 2008, Comal County 2015). Construction began in 1958, and impoundment of the river to fill the reservoir began in 1964—reaching its conservation level in 1968; hydroelectricity did not come online until January 14, 1989 (McAlister 2008, Comal County 2015, GBRA 2022b). This process spanned two eras in dam-building.

The third era, from 1940 to 1959, was a time when dam building progressively developed in Texas (Dascher and Meitzen 2020). Dams in this era with listed purposes were constructed mainly for flood control and stormwater management (28 percent) and recreation (24.5 percent) (Dascher and Meitzen 2020). Hendrickson (1985) noted that by 1959 there were thirteen river authorities.

The fourth era, from 1960 to 1979, “captures the peak of dam building in Texas...” (Dascher and Meitzen 2020). Dams in this era with listed purposes were constructed mainly for flood control and stormwater management (36.8 percent), recreation (18.3 percent), and water supply (14.9 percent) (Dascher and Meitzen 2020).

Just prior to the beginning of the Canyon Lake reservoir’s impoundment on May 1, 1963, the Authority acquired the six small hydroelectric dams built in the Guadalupe River basin between 1928 and 1932 from the Texas Power Corporation and the Texas Hydro-Electric Corporation (Sansom 2008, Brown 2020, GBRA 2020a, GBRA 2022b). The dams were designed with technology from the 1890s and were without automation or electronic power systems (GBRA 2020a). After the purchase of the entire reservoir system was completed, the Authority renovated and automated hydroelectric operations at all six sites—which have been in operation since (McAlister 2008, Brown 2020). These hydroelectric dams and their reservoirs create the Guadalupe Valley Hydroelectric System, which, along with the Canyon Hydroelectric System, produces electricity for wholesale to the Guadalupe Valley Electric Cooperative (Yancy 1988, GBRA 2022b).

The reservoirs associated with the six small dams have come to be known as the Guadalupe Valley Lakes consisting of (from upstream to downstream) Lake Dunlap, Lake McQueeney, Lake Placid, Meadow/Nolte Lake, Lake Gonzales, and Lake Wood. The water rights for the Guadalupe Valley Hydroelectric System are granted by the Texas Commission on Environmental Quality and were initially “issued to private developers for hydroelectric generation... [and] acquired by the [Guadalupe-Blanco River Authority] when it purchased the hydro lakes system in 1963” (GBRA 2020a). The Authority is authorized to impound waters of the state in a reservoir and divert waters for non-consumptive use for hydroelectric generation—meaning all diverted water must be returned to the river (GBRA 2020a).

The dams are intentionally designed to not act as a barrier during flooding (GBRA 2020a). They act as “pass-through” lakes which have “no room for temporary

storage of flood waters... so during a flood event all flood water is released from the dam at the same rate it flows into the lake upstream” (GBRA 2020a). As flood flows are not able to be moderated, “the hydro lakes do not qualify as traditional ‘flood control’ reservoirs” (GBRA 2020a). This is in contrast to Canyon Lake which has “an additional 34 feet of space above the water supply storage to store and hold approximately 355,000 acre-feet of flood water for... managed release” (GBRA 2020a).

Today, the Authority’s region encompasses approximately 20,461 square kilometers and services the counties of Kendall, Comal, Hays, Caldwell, Guadalupe, Gonzales, DeWitt, Victoria, Calhoun, and Refugio—with operations in water and wastewater treatment, water-quality testing, water-rights management, water storage and delivery, hydroelectric (seven hydroelectric plants), engineering, economic and community development, and educational support (Harper and Griffin 1988; Sansom 2008; GBRA 2018a, 2019b).

An Overview of Dams in Texas

There are approximately 7,377 dams in the State of Texas (National Inventory of Dams 2022)². The dams are owned by a mixture of federal, state, and private entities as well as “the ‘other government’ category [which] includes the full array of cities, counties, county level Water and Control Improvement Districts (WCID), the Texas Soil and Water Conservation Districts, and river authorities, among others” (Dascher and Meitzen 2020). The majority of dams in the state are earthen dam construction (greater

²There are discrepancies in the number of dams across numerous databases. Dascher and Meitzen (2020) recognize there are two databases for dams in Texas. The National Inventory of Dams (federal), and the other managed by the Texas Commission on Environmental Quality (state). They have different discrepancies in dam counts.

than 95 percent) which are small to medium and privately owned (Dascher and Meitzen 2020). According to a report by Dascher and Meitzen (2020), the most common listed purposes for dams in order from most common to least common are: flood control and stormwater management (31.5 percent), recreation (20.7 percent), water supply (13.8 percent), no purpose (9.7 percent), or *other* (3.4 percent). Dascher and Meitzen (2020) also noted that the variety of purposes declines as the dam size increased—with the sharpest decline occurring between large and very large dams. With regard to small dams, Dascher and Meitzen (2020) noted of the purposes, from most common to least common: recreation (27.8 percent); fire protection, stock and farm pond (14.6 percent). With regard to medium dams, Dascher and Meitzen (2020) noted of the purposes, from most common to least common: flood control and stormwater management (36.6 percent), recreation (19.4 percent), and water supply (14.2 percent).

The dams are categorized by hazard potential—each level indicating a varied risk to human life as well as risk to economic, environmental, and lifeline losses in the event of a dam’s failures³ (Table 1). In 2013, the Texas Legislature passed House Bill 677 which amended the Texas Water Code to exempt dam owners from dam safety regulation if their dam (1) *impounds less than 500 acre-feet*, (2) *has a hazard classification of low or significant*, (3) *is located in a county with a population of less than 350,000*, and (4) *is not inside the corporate limits of a municipality*. As a result, “3,273 of [the dams in Texas] are exempt from state dam safety requirements... [leaving] about 4,000 dams in Texas that must comply with dam safety regulations” (ASCE-TS 2021). Of the 4,069 dams subject to state safety regulations, 1,502 dams are classified as high hazard

³There are disparities in the classification of dam risk by various sources with Dascher and Meitzen (2020) noting a lack of transparency in how dam hazard are classified.

potential (probable loss of life if the dam fails), 306 are classified as significant hazard potential (possible loss of life if the dam fails), and 2,261 are classified as low hazard potential (no loss of life expected) (ASCE-TS 2021). As Dascher and Meitzen (2020) noted, the exemptions “could prevent awareness of hazard risks in many rural areas experiencing rapid population growth and development.”

Table 1: Dams in Texas—Hazard Category. Dams in Texas categorized according to hazard potential (data from the Texas Section of the American Society of Civil Engineers 2021). *There are discrepancies in the number of dams in the state, the number of dams exempt from state dam safety requirements, and the classification of dams depending on which source is viewed (i.e., Texas Commission on Environmental Quality versus National Inventory of Dams versus Association of State Dam Safety Officials).

<u>Dams in Texas*</u>	
Total number of dams	7,342
<i>Number of dams exempt from state dam safety requirements</i>	
High hazard potential	0
Significant hazard potential	240
Low hazard potential	3,033
<i>Total number of exempt dams</i>	<i>3,273</i>
<i>Number of dams subject to dam safety requirement</i>	
High hazard potential	1,502
Significant hazard potential	306
Low hazard potential	2,261
<i>Total number of dams subject</i>	<i>4,069</i>
<i>Number of documented incidents and failures since 1900</i>	
Before 2000 (1900–1999)	89 incidents (3 failures)
After 2000 (2000–2021)	189 incidents (19 failures)

The Texas Commission on Environmental Quality manages a dam safety program that is intended to monitor and regulate private and public dams (TCEQ 2022a).

However, according to the Infrastructure Report Card for Texas, a significant percentage of the dams classified as high hazard potential do not have maintenance or inspection programs, and less than 25 percent of the state-regulated dams “show a current inspection with the remaining dams either overdue for inspection or not listing an inspection date” (ASCE-TS 2021). While emergency action plans have been required for years, and

around 80 percent of dams classified as high hazard potential have emergency action plans, there are still many private and municipal-owned dams that do not have emergency action plans due to a lack of funding (ASCE-TS 2021). The Infrastructure Report Card for Texas further noted that “underfunded and understaffed regulatory agencies impact dam safety and increase risk” (ASCE-TS 2021).

Although there are numerous sources of data on dam incidents and failures, it is difficult to definitively identify the number of dam incidents and failures due to discrepancies in definitions of failure and discrepancies in reporting (ASDSO 2020, Dascher and Meitzen 2020, ASCE-TS 2021). Dascher and Meitzen (2020) noted that “the lack of consistency among sources indicates a need for the standardization of terms regarding dam failures and how they are categorized and discussed.” Data provided by the Texas Commission on Environmental Quality Dam Safety Program indicated a “total of 209 dam incidents, which resulted in damage to the dam but not a draining of the reservoir, and 119 dam failures, which included either overtopping or breaching and resulted in the draining of the reservoir” (Dascher and Metizen 2020). Yet all the sources of data on dam incidents and failures do make evident that in recent years, dam failures are increasing—with overtopping, a phenomenon when water levels exceed the height of the dam and spill over into protected areas, as the most common mode of failure (ASDSO 2020, Dascher and Meitzen 2020, ASCE-TS 2021). The Infrastructure Report Card for Texas reported that *“Since 2000, there have been more than double [the incidents of] what occurred between 1900 and 2000...”* (ASCE-TS 2021).

The increase in dam incidents and failures can be attributed to the increasing ages of dams and their components—with many dams across the state near or beyond their

useable lifespans, an increase in severe weather events, and the need for rehabilitation (Dascher and Meitzen 2020, ASCE-TS 2021, TWDB 2021, GBRA 2022c). Of particular concern to dams across the state are trends as a result of climate change, such as rainfalls shifting seasonality and increasing extremity in addition to increased temperatures and potential for drought (Dascher and Meitzen 2020, Nielsen-Gammon et al. 2020, Marvel et al. 2021). The majority of dams in the state are earthen dam construction (more than 95 percent) which are susceptible to cracking during dry conditions (Dascher and Meitzen 2020). Extended dry periods infused with recurring torrential rains and/or flash floods, which are especially common in this area, exacerbate cracking issues in earthen dam construction (Dascher and Meitzen 2020).

Guadalupe-Blanco River Authority and Dam Failure

There are approximately 215 dams located in the Guadalupe River basin—all of which fall under the monitoring and regulatory purview of the state (Table 2) (Dascher and Meitzen 2020). Of these, approximately 96.7 percent, or 208 dams, are classified as small and medium (Dascher and Meitzen 2020).

Table 2: Dams in Texas—Size. Dams in the Guadalupe River basin classified according to size (data from Dascher and Meitzen 2020)

	Number of dams	% Dams	Maximum reservoir storage (acre-feet)
Guadalupe River Basin	215		
Small	56	26	< 100
Medium	152	70.7	100 – 10,000
Large	6	2.8	10,000 – 1,000,000
Very Large	1	0.5	> 1,000,000

The six small hydroelectric dams the Authority acquired in 1963 make up the Guadalupe Valley Hydroelectric System (TWDB 2021). All the dams were constructed

between 1928 and 1932. The reservoirs associated with the six small hydroelectric dams are (ordered upstream to downstream): Lake Dunlap, Lake McQueeney; Lake Placid; Meadow/Nolte Lake; Lake Gonzales; and Lake Wood (Table 3). Only Lake Gonzales and Lake Wood do not have public water supply.

Table 3: Dams in the Guadalupe Valley Hydroelectric System. Information on all six reservoirs and dams, owned and operated by the Guadalupe-Blanco River Authority, which constitute the Guadalupe Valley Lakes Region (data from Guadalupe-Blanco River Authority [2018a] and National Inventory of Dams [2022]; see *Appendix I* for additional information). Definitions per the National Inventory of Dams 2022: Max storage (acre-feet): maximum storage, in acre-feet, which is defined as the total storage space in a reservoir below the maximum attainable water surface elevation, including any surcharge storage. Normal storage, in acre-feet, is defined as the total storage space in a reservoir below the normal retention level, including dead and inactive storage and excluding any flood control or surcharge storage. If unknown, the value will be blank and not zero. Surface area, in acres, is of the impoundment at its normal retention level.

Reservoir name	Dam name	Dam height (feet)	Dam length (feet)	Year completed	Maximum storage (acre-feet)	Normal storage (acre-feet)	Surface area (acres)	Drainage area (square miles)	Spillway width (feet)
<i>Lake Dunlap</i>	TP-1 Dam	41	1800	1928	14330	5900	410	1676	779
<i>Lake McQueeney</i>	McQueeney Dam	42	1555	1928	6170	2999	396	1697	855
<i>Lake Placid</i>	TP-4 Dam	46.8	2057	1932	5650	750	248	37.75	325
<i>Meadow Lake</i>	Nolte Dam	43.6	2550	1930	3210	243	107	1771	741
<i>Lake Gonzales</i>	H-4	42	2170	1931	28070	7500	696	2058	480
<i>Lake Wood</i>	H-5 Dam	42	6450	1931	27450	4000	488	2110	1105

According to the Guadalupe-Blanco River Authority, regular maintenance was consistent and “significant repairs [were] made to the dams following the floods of 1998 and 2002” (GBRA 2019a). However, in 2008, the Authority recognized the dams were “nearing the end of their useful life” and hired an engineering firm, Freese and Nichols, Inc., to conduct a comprehensive evaluation of the dams (GBRA 2022c). The evaluations did not include inspection of some internal and upstream elements since the lakes did not allow for dewatering to allow access to underwater parts of the systems (GBRA 2022c, 2022d). It is unclear whether this evaluation resulted in a plan for repairs to all the dams in the system. However, in 2012, the Authority replaced tie bars and locking bars, associated structural brackets, and miscellaneous structural steel components of the Lake Dunlap dam (GBRA 2022). Just four years later, the first dam failure occurred.

On March 9th, 2016, the Lake Wood Dam tie-bar, a major structural member which connects the upstream and downstream leaves of the spillgates, failed—causing the downstream leaf of one of the spillgates to separate from the dam’s concrete superstructure (GBRA 2020a, TWDB 2021). After the failure, operations ceased, but maintenance of the dam and embankments continued in accordance with Texas Commission on Environmental Quality regulations (GBRA 2020a, TWDB 2021, National Inventory of Dams 2022, TCEQ 2022b).

Then, in April 2016, the Guadalupe-Blanco River Authority staff, contractors, and engineers began an engineering feasibility study to determine “the best option for replacement of the failed gate and the remaining gates in the Guadalupe Valley Hydroelectrical Division...” (GBRA 2016, 2020; TWDB 2021). The Authority, again, hired Freese and Nichols to “assess the failure at Lake Wood and make recommendations

related to repairs needed at Lake Wood and the other gates in the system” (GBRA 2020a). In November 2016, Freese and Nichols concluded that the “damaged gate at Lake Wood was unrepairable and the remaining spillgates in the system required replacement” (GBRA 2020a). At a board meeting on November 16th, 2016, the board of directors for the Authority authorized the General Manager/CEO Kevin Patteson to “negotiate and execute contract(s) with the lowest responsible bidder for gate repairs... in accordance with the engineering feasibility study for the gate replacement and rehabilitation program for the Guadalupe Valley Hydroelectric Division” (GBRA 2016).

On Thursday, March 9th, 2017, the Authority hosted a public meeting on issues related to the Lake Wood dam failure where they (1) walked “constituents through the dam gate failure and the most plausible replacement options” under consideration, and (2) “explained the financial challenges related to replacing” the dam gates throughout the Authority’s hydroelectric system (GBRA 2018b). One of the most significant challenges was financing the dam replacements because the “electricity generated and sold... [by the Guadalupe Valley Hydroelectrical Division] ... no longer provide[d] the revenue needed to repair or maintain the existing system” (TWDB 2021). Further, Lake Wood, and all the reservoirs composing the Guadalupe Valley Lakes, serve no flood control purposes—excluding them from qualification for existing state or federal relief programs (Dascher and Meitzen 2020, GBRA 2020a, TWDB 2021, GBRA 2022c).

Nonetheless, in August 2017 the Authority began emergency repair activities on ten of fifteen spillgates, to address critical components in need of immediate repair at Lake Wood dam as well as the other dams in the system (GBRA 2018b, Daniel and Paulus 2019, GBRA 2019A, GBRA 2020a). The Authority planned to first repair the

dams at Meadow/Nolte Lake and Lake Placid with repairs on the dams at Lake McQueeney and Lake Gonzales to follow (GBRA 2020a, TWDB 2021). The Authority stated that the repair sequence was designed to “preserve [the Authority’s] ability to operate the remaining spillgates to pass elevated flows” (GBRA 2018d). According to a June 11th, 2018, press release from the Authority, the dam at Lake Dunlap was not included in the scheduled repairs because it had “received substantial repairs in 2012, and is believed to be in good operational condition” (GBRA 2018d).

Just months later, in November 2017, the Authority retained the services of the engineering firm Black and Veatch to design the spillgate replacements for all six dams in the Guadalupe Valley Hydroelectric system (GBRA 2020a, TWDB 2021). According to the Texas Water Development Board (2021), a hydraulically actuated crest gate system “was determined to be the most robust and operationally efficient... [and the Authority] contracted with Black and Veatch to develop a preliminary design... [for the] replacement gates for the six similarly configured hydroelectric dams in the system.” The design work occurred concurrently with the emergency repairs (TWDB 2021).

However, in 2019, maintenance and repairs on all spillgates across all Guadalupe Valley Lakes dams ceased for safety reasons—another failure had occurred (TCEQ 2022b).

On May 14th, 2019, a structural hinge failed at the dam at Lake Dunlap, causing the entire gate to eject from the spillway structure (TWDB 2021, GBRA 2022, National Inventory of Dams 2022, TCEQ 2022B). The hinge that failed was “embedded in the concrete superstructure behind the spillgates—” an area where dam elements were not evaluated due to their inaccessibility during the 2008 evaluation (GBRA 2022c).

Both failures were the results of the deterioration of original steel components but are attributed to entirely different issues—a fact which intensified “concerns surrounding the unpredictability of spillgate failures” (GBRA 2019a).

Dascher and Meitzen (2020) provide a succinct summary of the events:

“Two of the six dams [owned and operated by the Guadalupe-Blanco River Authority] experienced spill gate failures and partial lake draining, Lake Wood in 2016 and Lake Dunlap in 2019, with the remaining four dams [in the Guadalupe Valley Hydroelectric System] expected to follow a similar fate (Black & Veatch 2019). Though neither the Lake Wood or Lake Dunlap dam incidents met the [Texas Commission on Environmental Quality] classification of a dam failure, they were portrayed as such in the media, and their very publicized damage sparked a highly controversial debate on what entity is responsible for the hazard liability, maintenance, and repair of aging dam infrastructure and who ultimately benefits from the dams.”

As a result of the dam failures, the physical landscapes of multiple lake communities were significantly altered: houses were left hanging above barren fields, once peaceful porches became falling hazards, and piers and boat ramps led only to muddy, waterless lake beds. Appraisals for real estate across entire communities evaporated, and the lifestyle, and business, of recreation ceased. The question of responsibility, the resolution of anger, and the journey to find a solution these communities agreed were in their best interest, would take years to resolve.

III. LAKE DUNLAP

Physical Geography of Lake Dunlap

The Guadalupe Valley Lakes Region envelopes the Guadalupe River between the Comal River confluence and the San Marcos River confluence as it makes a controlled descent through a series of six small hydroelectric dams and their reservoirs (Figure 2). The hydroelectric dams take advantage of the water flow created from the 91-meter drop in elevation—from 585 meters above mean sea level to 266 meters—to generate energy as the water flows from Lake Dunlap in New Braunfels to Lake Wood just south of Gonzales (Sansom 2008; GBRA 2018a, 2022b, 2022c). At 11.3 kilometers long, Lake Dunlap is the first (most upstream) and largest of the six reservoirs in the Guadalupe Valley Lakes Region. The mean precipitation of the region is approximately 874 millimeters⁴ (Dascher and Meitzen 2020).

The streamflow of the 162.5-kilometer stretch of the Guadalupe Valley Lakes Region, designated *Segment 1804* by the Texas Commission on Environmental Quality, is fed by releases of water from Canyon Lake, located around 25 river kilometers upstream from Lake Dunlap, and spring flows from the Comal River (Brown 1996, GBRA 2018a). The Guadalupe-Blanco River Authority notes that “[t]he upper portions of the segment are primarily dominated by Lake Dunlap (TP-1 Dam), Lake McQueeney (McQueeney Dam), Lake Placid (TP-4 Dam), and Meadow Lake (Nolte Dam). These impoundments... are extensively used for recreational boating, swimming, public water supply and fishing... [In the lower portion of the segment, t]he river also flows into the two hydroelectric impoundments of Lake Gonzales (H-4) and Lake Wood (H-5 Dam) which are used for recreational fishing and boating” (GBRA 2018a).

⁴Mean precipitation is a product of the mean precipitation for the Guadalupe River Basin

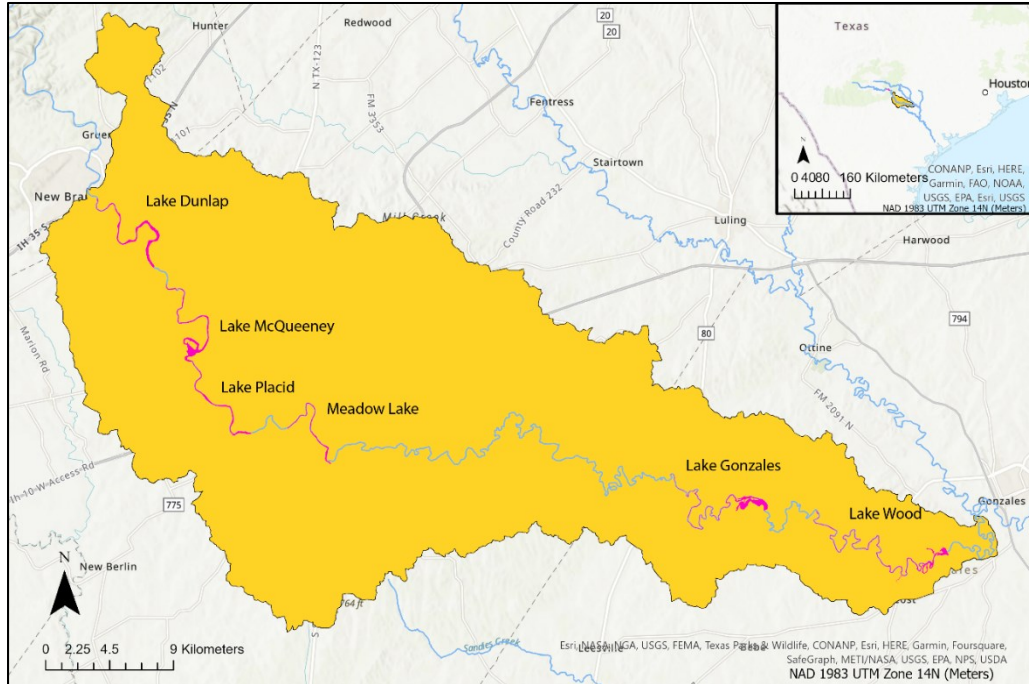


Figure 2: Guadalupe Valley Lakes. This 163-kilometer portion of the Guadalupe River expands from just below its confluence with the Comal River to its confluence with the San Marcos River near the City of Gonzales. It contains the six small hydroelectric dams and their associated reservoirs which make up the Guadalupe Valley Lakes Region.

The Texas Commission on Environmental Quality further divides the river segment into five assessment units which each have one active monitoring station (GBRA 2018a). The assessment unit containing Lake Dunlap Dam is *AU 1804_04* and includes the 13 kilometers of the Guadalupe River from the confluence with the Comal River to Lake Dunlap Dam (GBRA 2018a). Each assessment unit contains a surface water quality monitoring station which the Authority assesses monthly—a task taken over from the Texas Commission on Environmental Quality which monitored the data from 1980 to 1990 (GBRA 2018a). The monitoring station (#12596), for this unit of the segment, is located on the northwest bank of Lake Dunlap. According to the Authority’s Basin Summary Report (2018) “[t]he only long term trend in water quality that was observed at this station was a significant increase in nitrate nitrogen over time... This increase in nitrate nitrogen concentrations is most likely due to influence from

wastewater treatment in this segment as effluent loads rise as a result of population growth” (GBRA 2018a).

The “proximity of ecological regions with different characteristics” in this portion of the river, makes it a “convergent zone of soil, climatic, biographic, and biotic features” (Joseph et al. 2013). Lake Dunlap Dam was built on the first ledge of Dittmar Falls, and the streambed just below consists of the uppermost Cretaceous stratum in the area, the Taylor Marl (McAlister 2008, Samson 2008). McAlister (2008) said that even “miles” from the edge of the Edwards Plateau, the shift in biota is still occurring, noting:

“Depending on what kind of map I consult, we are passing from the Balconian into the Texan biotic province; from the Edwards Plateau onto the Blackland Prairie; from the Great Plains physiographic province into the Gulf Coastal Plain province; from the upper river to the middle river; from one ecological neighborhood into another, and the transition takes awhile.”

Commonly known as the *flash flood capital of the world*, the complex geography of the Balcones Escarpment lends itself to significant flooding (Bomar 1995, Earl 2007, Burnett 2008, Sansom 2008, Bomar 2017). The “enhanced orographic lift along the Balcones Escarpment [in this area] is co-located with the greatest elevation gradient (thus concentrating runoff and flood potential) from the Texas Coastal Plains to the Hill County” (Wang et al. 2008). If there is a sufficient amount of rainfall in the previous autumn and winter, leaving the landscape moist in April and May, flash floods are virtually guaranteed due to a lack of infiltration and the steep slopes of rivers and creeks (Bomar 2017).

Further contributions to the flood hazard are due to the region having a bimodal

precipitation regime that produces a variety of storm types that are capable of producing floods, such as (1) squall lines produced by cold fronts encountering maritime tropical air from the Gulf of Mexico in late spring; (2) remnants of late summer and early fall tropical storms which sometimes stall over the Balcones Escarpment; (3) and, less frequently, “the region is hit by a series of tropical easterly waves that produce prodigious amounts of precipitation over many days...” (Earl 2007). Beyond intense precipitation and floods, this region experiences other hydrologic extremes such as drought (Bomar 1995, Xie et al. 2011).

Toward the center of Lake Dunlap, the banks are approximately 180 meters apart. Throughout the entirety of the lake, the depth varies from 3.7 to 8 meters deep (Brown 1996, McAlister 2008). The reservoir itself has a “shallow, riverine basin morphometry with epilimnetic (overflow) releases” and a water residence time of less than one week (Brown 1996). The chemistry of the water within Lake Dunlap is heavily influenced by the Comal River—which lies just 14 river kilometers above the dam (Brown 1996, GBRA 2018a).

Additional influences on the water quality include the inflow from three wastewater treatment facilities (GBRA 2018a). Two facilities, owned by New Braunfels Utilities, are permitted to treat up to a total of 27.3 megaliters per day which enters the river around 2 kilometers south of Interstate 35 (GBRA 2018a). The third facility, owned by the Guadalupe-Blanco River Authority, is “permitted to discharge up to 0.95 [million gallons per day or 3.6 megaliters per day] of effluent into Lake Dunlap approximately 0.7 miles [1.1 kilometers] upstream of the Dunlap Dam” (GBRA 2018a).

The land uses in Segment 1804 are categorized as partly urbanized—a mixture of

small lake and pastoral communities, small urban centers such as New Braunfels, light industry, and recreational activities (McAlister 2008, Joseph et al. 2013, GBRA 2018a, Dascher and Meitzen 2020). The banks are developed with homes running along most of the available shoreline (McAlister 2008, GBRA 2018a). McAlister (2008) noted Texas sophoras, anaqua trees, black willows, and poison hemlock—beyond which, the lands are pastoral. According to the Authority’s 2018 Summary Basin Report, the vegetation cover is shrubland (25.4 percent), evergreen forest (16.8 percent), pasture hay (12.2 percent), deciduous forest (11.5 percent), cultivated crops (10. percent), grassland (8.9 percent), and woody wetlands (3.1 percent) (GBRA 2018a).

History of Lake Dunlap Dam

As the Guadalupe River begins to leave New Braunfels, the first 3.2 kilometers of Lake Dunlap are located in Comal County. This area is heavily tied to New Braunfels and early German settlements—which came to be established in the Hill Country as a result of German entrepreneurs leading Germans to settle in Texas in the 1830s (Sansom 2008).

Around the turn of the 20th century, Adolph Dittmar made use of a “modest five-foot drop,” one in a series of ledges named Dittmar Falls, “to power an irrigation pump that lifted water forty-two feet [12.8 meters] to irrigate his own fields and sell to his neighbors” (McAlister 2008). However, it wasn’t until 1912 that hydropower development began on this portion of the river (McAlister 2008). One of the early speculators to purchase land for the purpose of dam building was W.B. Dunlap—a member of an investment consortium that purchased “land between New Braunfels and

Seguin for a series of small dams” (McAlister 2008). However, ownership changed prior to the beginning of construction in 1927, and by 1928, the Texas Power Corporation completed construction of a dam at Dittmar Falls creating a man-made reservoir that could be used to generate hydroelectric power (McAlister 2008, National Inventory of Dams 2022).

The reservoir, which has come to be known as Lake Dunlap, has provided recreation and economic activity in the area since the 1930s (McAlister 2008, GBRA 2018a, Brown 2020, Dascher and Meitzen 2020, TWDB 2021). The Guadalupe-Blanco River Authority assumed responsibility for the dam, and five others in the Guadalupe Valley Lakes region, on May 1, 1963 (McAlister 2008, Sansom 2008, GBRA 2022c). After the purchase of the entire reservoir system was completed, the Authority renovated and automated hydroelectric operations at all six sites, which have been in operation since (McAlister 2008, Brown 2020).

The residential development of Lake Dunlap began around 1962 (McAlister 2008). Today, the banks are filled with houses, and—before the dam failure—the reservoir with recreationists. As McAlister (2008) noted:

“This is not even a weekend and the boat traffic is perilous; worse, in a way, than on Canyon, because of less room... We hug the bank and keep alert, not so much for fishermen as for joyriders with sleek speedboats, or for overcharged motorboats pulling water-skiers.”

Today, the water in the Lake Dunlap reservoir is sold to the City of San Marcos which treats the water for municipal use. The Authority additionally notes that “[t]he San

Marcos plant also supplies water to the cities of Kyle and Buda. Many other water purveyors draw on water from this segment as well: Canyon Regional Water Authority, Spring Hills Water Supply Corporation and Gonzales County Water Supply” (GBRA 2018a).

A Description of Lake Dunlap Dam

Lake Dunlap Dam is approximately 610 meters long and 15.4 meters high, with the water height behind the dam at 6.7 meters and a storage capacity of 7,278 megaliters (McAlister 2008; GBRA 2018b, 2018c, 2020a). The earthen dam construction has three spillgates that provide primary control of the headwater levels in the reservoir—which were automated by the Guadalupe-Blanco River Authority in 1963 (McAlister 2008, Dascher and Meitzen 2020, GBRA 2020a, TWDB 2021).

The concrete superstructure was constructed with a hollow core that was reinforced by steel girders (McAlister 2008). The earth bank on the right is concrete-capped, and the left bank is an earth-fill levee extending approximately 0.4 kilometers into the prairie (McAlister 2008). Except during floods, the Lake Dunlap Dam routes the flow of the river through the diversion channel, and nothing goes over the edge of the dam (McAlister 2008). The powerplant is 3.2 kilometers downstream just before the diversion channel returns flow to the river. According to the Authority, hydroelectricity at the Dunlap power plant is only generated when the stream flow is at least 15 cubic meters per second (GBRA 2018a).

Lake Dunlap Dam, like most dams in the Guadalupe Valley Lakes Region, uses bear trap gates: two independently rotating gates with hinges on the upstream side and the

downstream side which operate based on water pressure and buoyancy (Black and Veatch 2019, Daniel and Paulus 2019, GBRA 2021b, TWDB 2021, GBRA 2022c). The inside chamber is filled with water from upstream and pressure is built by wooden boards wedged together between steel trusses, which provide a seal as well as protect the underlying steel components, forcing the gate into the up position (Black and Veatch 2019; Daniel and Paulus 2019; GBRA 2020a, 2021b). The design of the dams makes it difficult to access components that require regular maintenance and impossible to inspect some components without a total dewatering of the lake (Daniel and Paulus 2019, GBRA 2021b, TWDB 2021, GBRA 2022c).

The Failure Event

At approximately 7:49 AM on Tuesday, May 14th, 2019, the structural steel hinges of the middle gate, one of three total, of the Lake Dunlap Dam failed—causing the total detachment of the spill gate which ejected from the dam’s concrete superstructure downstream (Black and Veatch 2019; Dascher and Meitzen 2019; GBRA 2019c, 2021b; TWDB 2021, GBRA 2022c, TCEQ 2022b).

The failure event “sent flows of up to 11,000 cubic feet per second (cfs) [311 cubic meters per second] downstream, resulting in the dewatering (draining) of the lake” (GBRA 2020a). The Guadalupe-Blanco River Authority reported that “*[o]n this day of routine operations, elevated flows were being diverted to pass through the hydropower turbines. These elevated flows were the result of scheduled releases upstream at the Canyon Lake Reservoir. A water level notification received in the control room caused crews to be dispatched to restore the gate position and lake level. However, a review of*

the surveillance video showed the gate had completely separated from the dam” (GBRA 2020a).

The Authority released a 30-second video that shows the 7 seconds leading to the failure event and an additional 23 seconds of footage of the actual failure and post-events (GBRA 2019d). This video, and edited forms of it, went viral on the internet—amassing tens of millions of views across numerous social media, media upload, and news platforms.

In both failures—Lake Dunlap Dam and Lake Wood Dam—the cause of the spillgate failures were due to aging steel components, but they were “two different failures in the original structural steel components” (GBRA 2019a, 2020a, 2022c). In both cases, the reservoirs were effectively dewatered and left without hydroelectric production or recreational access (Figure 3 and Figure 4) (Black and Veatch 2019, Dascher and Meitzen 2020, TWDB 2021).



Figure 3: Entire Lake Comparison. Map depicting entirety of Lake Dunlap, Texas. Version **A** shows imagery from 2018—before the dam failed. Version **B** shows imagery from 2019—after the dam failed.

Source: Google Earth, earth.google.com/web/.



Figure 4: Zoomed Lake Comparison. Map depicting Lake Dunlap, Texas at its final bend before the dam. Version **A** shows imagery from 2018—before the dam failed. Version **B** shows imagery from 2019—after the dam failed. Source: Google Earth, earth.google.com/web/.

State Agency Response to the Failure

The Guadalupe-Blanco River Authority announced the spillgate failure at Lake Dunlap Dam in a press release from May 16th, 2019 (GBRA 2019c). Due to the previous failure at Lake Wood Dam, the Authority’s contracted work with Freese and Nichols and Black and Veatch meant that (1) they were already informed that all the spillgates at all the dams across the entire Guadalupe Valley Hydroelectric System needed to be replaced, (2) all spillgates would be replaced by hydraulically actuated crest gates, and (3) 30 percent of the design and engineering work for construction was already completed (GBRA 2019a, 2019c, 2020, 2020a). That same month, the Authority directed Black and Veatch to finalize the remaining 70 percent of the design work for Lake Wood Dam—with plans to immediately pursue construction on Lake Dunlap Dam once financing was secured (GBRA 2020a). The Authority’s General Manager Kevin Patteson said that “the ability to move forward with construction at Lake Dunlap, Lake Wood, and the other dams is dependent on securing funding for these multi-year, multi-million dollar projects” (GBRA 2019c). At this point, the design was expected to take an additional year to complete—with construction to take two to three years—at a cost of approximately \$15 million to \$35 million per dam (GBRA 2019c).

Other state institutions, such as the Texas Legislature, responded to the catastrophic failures at Lake Wood Dam and Lake Dunlap Dam. In 2019, the 86th Texas Legislature (2019) amended Subchapter B, Chapter 201 of the Texas Agricultural Code by adding the following, Section 201.0227 (d-1) (TWDB 2021):

“(d-1) The water development board, in coordination with the state board and the Texas Commission on Environmental Quality, shall prepare a

report of the repair and maintenance needs of all dams that:

- (1) Are not licensed by the General Energy Regulatory Commission;*
- (2) Do not have flood storage;*
- (3) Are required to pass floodwaters; and*
- (4) Have failed”*

Where “state board” refers to the Texas State Soil and Water Conservation Board.

With this change in statute, the Texas State Soil and Water Conservation Board, and other agencies, were compelled to conduct analyses of the dams under their authority—ultimately determining that the only two dams in the entire state which met the language of the amendment were Lake Wood Dam and Lake Dunlap Dam (TWDB 2021). The Texas Water Development Board and the Texas Commission on Environmental Quality then coordinated with the Authority to produce a comprehensive report on the repair and maintenance needs for these dams—which was published in November 2021 (TWDB 2021).

After the failure, the Authority hired Black and Veatch to evaluate the damaged components (Dascher and Meitzen 2020, GBRA 2022f). The resultant hinge inspection report focused on one of the hinge assemblies from Lake Dunlap Dam and reported that the spillgates across the system had warping and misalignment issues within the structure as a result of debris impacts and vibration during repeated flood events—leading to the deterioration and instability of the structural steel components (Black and Veatch 2019, GBRA 2020a, 2021e). The report stated that additional inspection of these components at other dams in the system would require the dewatering of the lakes and destruction of

critical components—an expensive process that would have impacts on the communities (Black and Veatch 2019). Without inspecting the other components, but consideration of the historical and engineering evidence, the report concluded that the hinge assemblies were no longer adequate for service and recommended the dams be taken out of operation (Black and Veatch 2019, GBRA 2022f).

As a result of the failure at Lake Dunlap Dam and the engineering report by Black and Veatch (2019), which was the second third-party engineering evaluation of the dams over the course of three years (2016 to 2019), the Authority took the position that other dam failures were imminent and made the decision to voluntarily dewater four of the six lakes in the system as a preventative measure to reduce the risk of failure (GBRA 2019a, Dascher and Meitzen 2020, GBRA 2022f). The Authority coordinated with the Texas Parks and Wildlife Department to develop a dewatering plan which minimized impacts on the environment (GBRA 2019a). The dewatering was scheduled to begin on September 16, 2019, and finish by the end of the month (GBRA 2019a). It would take three days per lake, and the Authority would dewater working downstream to upstream—Lake Gonzales, Meadow Lake, Lake Placid, and then Lake McQueeney (GBRA 2019a). However, members of the community immediately responded.

Legal Action in Response to the Failure

The Authority's plan to dewater the lakes which were not in a state of failure, as Lake Dunlap and Lake Wood were, was met with immediate backlash and concern for the local economy, personal property, and lifestyle from the communities (Baugh 2019, Short et al. 2019, Brown 2020, Kless 2021).

Two lawsuits were filed against the Authority. The first, *Kevin Skonnord et al., vs. Guadalupe-Blanco River Authority* (Cause No. 19-2053-CR), was brought by property owners from Lake McQueeney and Lake Placid and focused on stopping the dewatering of the lakes, ensuring the maintenance of normal operational water levels until solutions were found, and getting the Authority to financially contribute to whatever solution is developed (25th Judicial District Court of Guadalupe County 2019). The second lawsuit, *Jimmy and Cheryl Williams et al., vs. Guadalupe-Blanco River Authority* (Cause No. 19-2054-CV), also intended to stop the Authority from dewatering the lakes, but it later focused on pursuing the Authority for damages due to the destruction of aesthetic and recreational value which resulted in reduced property values (25th Judicial District Court of Guadalupe County 2019, Dascher and Meitzen 2020, GBRA 2021f, Kless 2021).

On September 5th, 2019, the plaintiffs in both suits filed a request for an order to joinder the defendants in the pursuit of a temporary injunction which would stop the dewatering of the lakes and ensure that normal operating levels were maintained (25th Judicial District Court of Guadalupe County 2019, GBRA 2020b). On September 11th, 2019, the court conducted an evidentiary hearing—ruling that the plaintiffs’ suits may be joined and issuing a temporary restraining order preventing the lakes from being dewatered by the Authority until the outcomes of the *temporary injunction* hearing (25th Judicial District Court of Guadalupe County 2019, Brown 2020, Dascher and Meitzen 2020).

All parties came to an agreement, and on September 16th, 2019, the Honorable Stephen B. Ables of the 25th Judicial District Court of Guadalupe County issued an *agreed temporary injunction*⁵ which established (1) that the Authority is enjoined from

the dewatering, drawing down, or draining of the lakes except as otherwise permitted by the order—requiring that water levels remain the same as they were under normal operating conditions on September 11, 2019; (2) that the Authority may maintain their restrictions on activity and recreation in areas the Authority has designated unsafe—effective 12 AM on September 19th—until an evaluation can be conducted by independent experts to identify areas which are unsafe and make recommendations; (3) that all parties shall reasonably cooperate; and (4) the construction of an Expert Independent Panel to evaluate and make recommendations on areas, and activities in those areas, which should be prohibited and restricted—due within 30 days; and (5) set the full trial for October 5, 2020 (25th Judicial District Court of Guadalupe County 2019, GBRA 2019e, Independent Expert Panel 2019, Brown 2020, Dascher and Meitzen 2020, GBRA 2020b).

As a result of this ruling, on September 25th, 2019, the Authority issued an ordinance to bring its activities and operations into compliance (GBRA 2019e). These ordinances superseded the original June 19th ordinances issued by the Authority—and installed new temporary rules to prohibit and restrict activities on the lakes which would be in effect until the conclusion of the independent expert panel (25th Judicial District Court of Guadalupe County 2019, GBRA 2019e, Brown 2020).

The Independent Expert Panel was composed of three independent engineers and the Chief of the Texas Division of Emergency Management—with the goal of producing an unbiased opinion on the safety of the lakes (25th Judicial District Court of Guadalupe County 2019, Independent Expert Panel 2019, Brown 2020, TWDB 2021). The final assessment was filed on November 15, 2019, and it validated the Authority’s safety

⁵*Kevin Skonnord et al.* [Plaintiffs] (Cause No. 19-2053-CV), *vs. Guadalupe-Blanco River Authority* [Defendant], *vs. Jimmy and Cheryl Williams et al.* [Plaintiffs] (Cause No. 19-2054-CV)

concerns—with the entire expert panel concluding that specific areas around the dams must be prohibited or restricted from use for activities (Independent Expert Panel 2019, GBRA 2020b, TWDB 2021, GBRA 2022e). The measures recommended by the independent expert panel were implemented by the Authority, and they will be enforced by local law enforcement authorities until replacement gates are constructed, or the dams are decommissioned (Brown 2020, GBRA 2020b, TWDB 2021).

Lake Associations Response to the Failure

While the lawsuits were beginning, another organization was springing into action. On the day of the dam failure, the Preserve Lake Dunlap Association made a post on their website announcing the failure and urging residents to contact their state representatives—State Senator Donna Campbell and Representative John Kuempel—regarding the restoration of Lake Dunlap Dam (PLDA 2019a). Four days later, the Association announced that a \$35 million amendment to Senate Bill 8 was made by Representative Kuempel, which, if passed, would fund the repair of the dam (PLDA 2019b). The next day, Senator Campbell shared a letter with the Association, which was sent to the office of the Governor of Texas, where she expressed concerns about the failure and requested financial assistance on \$28 million in estimated costs (PLDA 2019c). However, just six days later, the Association urged community members to make a last-minute appeal to the governors’ offices in addition to State Senator Jane Nelson’s office as the funding amendment to the bill did not pass muster with the senate finance

committee (PLDA 2019d). The Association pointedly blamed Nelson, the senate chair for appropriation, saying she “failed the people of Texas” (PLDA 2019d).

The Association next communicated with the community when they announced a town hall meeting would be held on June 5th (PLDA 2019e). In addition to the Association’s Board, representatives from the Authority’s management, county representatives, and members of the Texas senate and house were there to provide information about the status of funding and repair of the dam (PLDA 2019e). It was accepted that the funding requests had failed and that nearly all options were exhausted (PLDA 2019e). However, just weeks later, on June 24th, the Association announced a restoration proposal which, for the first time, brought into focus the potential future of the Lake Dunlap Dam, and other dams in the Guadalupe Valley Hydroelectric System (PLDA 2019f).

Building a Solution—Water Control and Improvement Districts

The inability of the Guadalupe-Blanco River Authority to finance the dam spill gate replacements and other repairs has been known for years (GBRA 2016, 2018b, 2019c). In addition to not being able to qualify for existing state and federal funds, the Authority’s hydroelectric operations have not produced adequate revenue to cover the cost of maintenance and operations for over ten years (Dascher and Meitzen 2020; GBRA 2020a, 2020b, 2021c).

On June 24th, 2019, the Preserve Lake Dunlap Association announced their ongoing collaboration with local government agencies and local political leaders to source funding for the replacements and repairs had failed—stating, “The fact is that

unless we come together with one mind, determined to create a solution where none currently exists, the lake is going to stay the way it is” (PLDA 2019f). The Association went on to discuss a proposed plan for the waterfront property owners to step in and fix it themselves by creating a water control and improvement district—which was endorsed by the Preserve Lake Dunlap Association Board in a meeting the night prior with more than 100 members of the Association in attendance (PLDA 2019f, Brown 2020). A key financial feature of water control and improvement districts is that they can levy taxes. The goals of the district were planned to (1) restore and preserve the value of the waterfront property along the shores of Lake Dunlap, (2) restore the economic viability of businesses that support recreation on Lake Dunlap, and (3) ensure that the dam is repaired in a way that preserves the legacy of Lake Dunlap for our families and future property owners for generations to come (PLDA 2019f).

The Association created an advisory committee, composed of local business and community leaders, which assisted the Association’s Board of Directors by (1) advising the Association on communication strategies and materials and associated tasks; (2) looking at the bond/debt markets and developing financial projections; (3) assisting the Texas Commission on Environmental Quality with the application for the creation of the water control and improvement district; (4) advising on the development of web and email strategies—and, ultimately, the bond election; (5) helping the public understand the engineering work the Authority has done; and (6) general work looking at all options for funding (PLDA 2019f, g). The Association reported (PLDA 2019f) that:

“The Advisory Committee is hard at work drafting the application package. Our timeline has us looking for approval for the water district by

(or before) November this year. By that time, our engineering subcommittee will also have completed its review of all the recommendations and reviews of systems done by the [Guadalupe-Blanco River Authority], and we should have a firm handle on costs and other factors related to the financial aspects of the plan. This is a very ambitious timetable, but everyone involved is committed to reaching this milestone by November.”

Around this time, the first week of July, the Association issued a vague notice to members about a demand letter stating that the Friends of Lake McQueeney, a lake association for Lake McQueeney, wanted to announce that they are not involved in a recently, publicly discussed lawsuit against the Authority (PLDA 2019h, i). One week later, on July 16th, the Association clarified that a demand letter had been sent to the Authority, the Authority’s board members, a list of state and local leaders, and a list of members of the local business community by Douglas Sutter of the firm Kelly, Sutter and Kendrick, PC who was representing plaintiffs in the *Williams* case (PLDA 2019i). The letter itself, and other details, were published in the local paper in Seguin, Texas that week with a meeting and press conference to occur between the lawyer and the Authority later that week (PLDA 2019i).

In both notices to members, the Association strongly clarified their non-involvement in all those affairs, stating that “we want to be clear that we are neither part of this lawsuit, nor do we endorse any part of it, or support the action in any way” (PLDA 2019i). The Association also clarified in both statements that their preference was to “work together as a community, standing with our neighbors, local leaders, government,

and business to solve the problems we are currently facing” (PLDA 2019i) and to work in the “spirit of collaboration, community, and full transparency” (PLDA 2019h). The Association went on to clarify the recent partnership the Association and Authority entered to create a water district with the Authority responsible for the restoration, upgrade, and future maintenance of the dam (PLDA 2019i).

With the establishment of the formal partnership with the Authority, the Association moved forward with creating the petition, required via Texas Water Code, to create the water control and improvement district (PLDA 2019i). The Association asked waterfront property owners who support the creation of the district to file petitions for each parcel of waterfront property owned—a task that would satisfy one of the Texas Commission on Environmental Quality requirements (PLDA 2019j). The Association also hired a lawyer, Tony Corbett of McLean and Howard, LLP of Austin, to represent them in the application process to create and approve the district (PLDA 2019l).

In a statement summarizing the week of August 24th, the Association discussed another high-level meeting with several state political leaders, local business leaders, and local political leaders, among others, to discuss financial alternatives, including the possibility of a below-market interest loan from the Texas Water Development Board (PLDA 2019m). The Association also announced the lake associations for Lake Dunlap, Lake McQueeney, and Lake Placid were in the conversation, having meetings, to discover where “each lakes’ needs and interest align with the other, and where they might diverge” with “plans to continue these discussions, particularly in light of all the potential interest of the Water Board in our collective situation” (PLDA 2019m). This spirit of partnership was also shared by the Authority, which designated the lake associations as

points of contact in addition to supporting efforts made by the lake associations to find solutions that address each lake's best path forward to the replacement and repair of the dams (GBRA 2020a, 2021c, f).

The biggest news came just six weeks later, near the beginning of October, when the Association announced that the Authority's Board of Directors voted unanimously to approve and endorse a memorandum of understanding with the Association (PLDA 2019k). This memorandum of understanding was a broad stroke of a plan to fulfill the goals of the district—repairing the Lake Dunlap Dam and keeping it filled for generations to come (PLDA 2019k). The Association clarified that the next steps are “working with [Guadalupe-Blanco River Authority], our lawyers, and our advisors on the many details that we need to work through to turn the [memorandum of understanding] into a formal contract we can share with the voters...” which is underway (PLDA 2019k).

With the establishment of a formal relationship between the Authority and the Association, bureaucratic and engineering work being undertaken by the Authority, and a clear direction for the Association's advisory committee, the organizations entered a period of significant work. During this period, the Association continued contract negotiations with the Authority, using the previously established memorandum of understanding as a foundation for the formal contract, which would eventually need to be approved by the Texas Commission on Environmental Quality as well as the Attorney General's Office (PLDA 2020c). The Association also continued to work on various items required for the review and official formation of the water control and improvement district, including ensuring everything was in place for the deadline to file for the May 2, 2020, election (PLDA 2019k, 2020c).

Meanwhile, on January 28, 2020, the Authority published a market analysis that identified changes in property value across the Guadalupe Valley Lakes as a result of new prohibitions/restrictions put into place by the Authority and projections based on hypothetical assumptions that water control and improvement districts were established which negotiate repair of dams with repairs completed within three years and lake levels at previously established levels (Brown 2020). The analysis predicted an initial decrease in values of 28 percent for land, 33 percent for land in prohibited unsafe zones⁶, and 28 percent for lakefront houses—with the predicted delta value for January 1, 2025, as 10 percent for land, 10 percent for land in prohibited unsafe zones, and 0 percent for lakefront houses (Brown 2020). The analysis also identified Lake Dunlap lakeshore properties as having a total 2019 market value of \$270,851,301 across 569 property owners (Brown 2020). Dascher and Meitzen (2020) noted the benefit to county school districts as a result of the lakeside property tax—a tax base that was decimated by the initial failure event and had the potential to lower even more if the lakes were to be drained or the dams removed.

A couple of weeks later, at 5 PM on February 7th, 2020, the Creation Order for the Lake Dunlap Water Control and Improvement District was approved by the Texas Commission on Environmental Quality (PLDA 2020b). The district is located within Comal and Guadalupe counties and has a population of approximately 1,375 residents (TWDB 2021). The order also named a temporary board, with some members also being Association board members who had led the district creation effort (PLDA 2020b). The Association noted that, moving forward, the Association needed to detach from the work

⁶Prohibited unsafe zones are those designated by the Guadalupe-Blanco Authority, with consultation, and approved by a court order, that are deemed unfit for activity on or in the water.

of the District and “return to its longstanding, community-focused mission” (PLDA 2020b).

The Association indicated that the next step was for registered voters of the district to vote in the May 2, 2020, election to ratify the District’s creation order, authorize the District to levy a tax, and vote for board members to fill the seats of the District, all details which would emerge by the March 18th Town Hall Meeting (PLDA 2020b). Yet, while the Authority and Association moved rapidly to prepare voters, and other items, for the May 2, 2020 election, the pandemic struck just before the March 18th Town Hall meeting and, ultimately, resulted in the vote being postponed to November 3rd, 2020. (PLDA 2020a, b).

Building a Solution—Getting the Vote

In the meantime, contract negotiations between the Authority and Association were finalized with both boards approving the final terms and sending them to be reviewed by the Texas Commission on Environmental Quality and the office of the Attorney General (PLDA 2020a). The Authority agreed to contribute 100 percent of the gross hydroelectric revenues from Lake Dunlap for the life of the 30-year-loan, which is an average of \$750,000 per year, with the expectation that the modern dam technology would be able to increase those revenues, valued at approximately \$21 million (PLDA 2020a). The Authority also contributed the entire cost of the engineering, valued at approximately \$3 million, for the design of the Lake Dunlap Dam (PLDA 2020a). The Association stated that “before we put in a dime [Guadalupe-Blanco River Authority] has stepped up and committed well over \$24 million...” with the expectation that the District

would levy taxes against property owners to pay the remaining balance (estimated at \$4 to \$6 million at the time) (PLDA 2020a).

The Committee went on to create the Restore Lake Dunlap organization, a political action committee, to influence voters. Since the Association is unable to directly engage in political activities, they created the political action committee as a completely independent organization unaffiliated from the Association, with the goal to work parallel to the Association in the passage of the relevant ballot measures in the November 3rd vote (PLDA 2020a). The political action committee organized neighborhoods to get out the vote, disseminated information regarding the vote, conducted email and mail campaigns, and organized meetings, all in support of the ballot measures which would support the replacement, repairs, and ongoing maintenance of the Lake Dunlap Dam (PLDA 2020a).

Any registered voter that was registered at an address within the new District's boundaries would be allowed to vote on the approval of the district, the associated propositions, and the board of directors (PLDA 2020a, c). According to the Association, "the rule of thumb is that if the property touches the lake, it is in the district; if it doesn't, it is not" (PLDA 2020a, c). At the ballot box, any voter with a voter registration address that matched a property within the District's boundary was given a ballot that included the propositions (PLDA 2020a).

In August 2020, the Authority applied for financial assistance through the Texas Water Development Board's Clean Water State Revolving Fund (TWDB 2021). Totalling \$120 million, the application combined the spillgate replacements and repairs at Lake Dunlap, Lake McQueeney, and Lake Placid under a single project called the "Guadalupe Valley Hydroelectric System" (TWDB 2021). Each proposed water control and

improvement district would provide tax-supported revenues to pay the debt service for their portion of the financing if approved by voters in the upcoming election. (TWDB 2021). Six days before the election, on October 28th, 2020, the Texas Commission on Environmental Quality approved an order authorizing the District to enter into a contract to levy a contract tax (TCEQ 2020). This enabled the District to levy two taxes, the contract tax and the maintenance and operations tax, and allowed the Authority to receive the tax payments “to finance, reconstruct, and maintain dams and facilities to restore the water within Lake Dunlap and to collect taxes for debt...” (TCEQ 2020). However, none of this would matter if the District was not approved by voters.

Finally, on November 3, 2020, registered voters in Comal County, Guadalupe County, and the City of New Braunfels cast their ballots on the three propositions: Proposition A regarded the approval of the creation of the Lake Dunlap Water Control and Improvement District, Proposition B set an upper limit on the maintenance and operations tax at ten cents per \$100 total assessed property value, and Proposition C selected board members for the District (Table 4).

Table 4: Lake Dunlap Water Control and Improvement District Election Results. Results from Comal and Guadalupe counties (November 3rd, 2020). Sources: Comal County 2020, Guadalupe County 2020

<u>Propositions and candidates</u>	<u>Comal County (Precincts 302 & 304) votes (% total)</u>	<u>Guadalupe County (Precincts 117 & 208 & 213) votes (% total)</u>	
PROPOSITION A			<u>Total votes (% total)</u>
For	249 (88.6%)	484 (91.7%)	733 (90.6%)
Against	32 (11.4%)	44 (8.3%)	76 (9.4%)
PROPOSITION B			
For	219 (79.4%)	471 (89.4%)	690 (85.9%)
Against	57 (20.7%)	56 (10.6%)	113 (14.1%)
PROPOSITION C			
For	210 (77.5%)	473 (89.9%)	683 (85.7%)
Against	61 (22.5%)	53 (10.1%)	114 (14.3%)
J. Raymond Harmon	111 (22.4%)	377 (22.5%)	488 (22.5%)
Doug Harrison	112 (22.6%)	336 (20.1%)	448 (20.6%)
Laurence F. Johnson	100 (20.2%)	322 (19.2%)	422 (19.4%)
Harry Alvin Moeller	80 (16.1%)	330 (19.7%)	410 (18.9%)
Vernon Gary Schaub	93 (18.8%)	310 (18.5%)	403 (18.6%)

All the propositions were overwhelmingly confirmed by voters (Canterberry 2020, TWDB 2021). As a result, the Lake Dunlap Water and Control Improvement District was confirmed, the maintenance and operations tax were limited to ten cents per \$100 total assessed property value, and the first board of directors for the District was selected (PLDA 2020a, Lake Dunlap Water Control and Improvement District 2022).

One month after the vote, in December 2020, the Texas Water Development Board's governing board approved the Clean Water State Revolving Fund financial assistance totaling \$40 million in bond funding (GBRA 2021f, TWDB 2021). As a result of this approval, alongside all three propositions approved by voters, the District was officially approved and could levy a contract tax as well as a maintenance and construction tax against members within the boundaries of the District for the purposes of passing the tax onto the Authority for payment of the financed debt and future maintenance and operations (TCEQ 2020).

Building a Solution—Resolution of Lawsuits

Although tenuous, the legal proceedings allowed the community to express their authority over the actions of the water level of the lakes—an action which wields immense power, and breadth of that power, in its ability to impact and disrupt people’s daily lives, community, and local economies. The court affirmed the people’s rights to intervene in these actions with the resolution of both lawsuits which, although not entirely satisfied, in many aspects achieved beyond the desired results.

The Skonnord suit was settled on July 30, 2020—resulting in a cancellation of the full trial which was scheduled for October 2020 (GBRA 2020c). As part of the settlement, the Authority agreed to only drain what is necessary to replace the dams and only just prior to the work (GBRA 2020c, b). Additionally, the Authority agreed to commit revenues from the sale of hydroelectric power at each lake to the water control and improvement district of that lake in perpetuity (GBRA 2020c). After the completion of the project, the Authority agreed to continue to perform operations and maintenance of the dams. (GBRA 2020c).

Just weeks later, on August 20, 2020, the Williams suit was mostly dismissed when the court ruled in favor of the dismissal of all but two claims, which the court found appropriate to be taken up by the appeals court (GBRA 2020d). However, the court warned that, if the two claims were returned, they were likely to be dismissed (GBRA 2020d). The Authority’s General Manager stated that the “results should encourage the lake residents to work with [Guadalupe-Blanco River Authority] to find a sustainable solution...” and that “[i]t is our firm belief that the viable way forward is to follow the path we are taking with the three Water and Control Improvement Districts (WCIDs) that

have recently been created” (GBRA 2020d).

Nearly one year later, on July 7th, 2021, the Fourth Court of Appeals decided that the plaintiffs in the Williams case lacked legal standing to sue the Authority (GBRA 2021f, Kless 2021). The judge ruled that the damage to aesthetic and recreational value concerned itself with injury to the community at large, which is different from the particularized injury required of personal loss/injury they would have to prove they suffered at the hands of the Authority in order to continue the suit (GBRA 2021f). A lawyer for the plaintiffs expressed their disagreement with the ruling stating “it’s very brief and it doesn’t even refer to the basis of our lawsuit... The court took an instructive case as opposed to an applicable case and went off on the decision” (Kless 2021). The lawyer went on to express interest in proceeding with the case in a different court stating that, if they were not successful, they could go to the Texas Supreme Court on an application for review (Kless 2021).

The final resolution came nearly one year later, on June 6th, 2022, when the Texas Supreme Court denied the plaintiff’s petition to review, affirming the decision by the Fourth Court of Appeals and making the dismissal of all claims against the Authority final and immediate (GBRA 2022g). The Authority’s General Manager stated that:

“We are pleased with today’s timely and decisive decision from the Court of Appeals... The decision further demonstrates that cooperation and collaboration is the path forward for the Guadalupe Valley Lakes. The collective effort continues to yield results: Construction is underway on the Lake Dunlap dam with Lake McQueeney and Lake Placid to follow, thanks to the formation and voter confirmation of Water Control and

Improvement Districts (WCIDs)” (GBRA 2022G).

Current Status of Lake Dunlap

The Texas Water Development Board approved their commitment to financial assistance to the Authority for repairs to Lake Dunlap Dam with the Authority selecting Zachry as the contractor for construction (TWDB 2021). The project will be implemented via a contract between the Authority and the Lake Dunlap Water Control and Improvement District (TWDB 2021). The Texas Water Development Board provided the Authority with authorization to issue the formal notice to proceed on Friday, May 14, 2021 (GBRA 2021a, 2021f). According to the Guadalupe-Blanco River Authority (2021a):

“Construction will include the replacement of the three bear-trap style crest gates with new hydraulically-actuated steel crest gates. Replacement of the gates will also include structural modifications to the existing spillway structure, upgrades to the mechanical system, upgrades to the electrical distribution power, improved backup power, enhanced instrumentation and controls, improved headwater and tailwater measurement, new video surveillance, the addition of a supervisory control and data acquisition interface, as well as the hardening of the existing earthen dam.”

The Authority is now in the construction phase⁷ to replace, rehabilitate, and update Lake Dunlap Dam (TWDB 2021, TCEQ 2022b). The Authority has provided regular updates through a combination of press releases, websites, and other media—such

as gylakes.com which hosts information regarding the state of affairs for all the lakes and dams in the Guadalupe Hydroelectric System—and even regularly releases videos with the Executive Manager of Engineering, Charlie Hickman, providing construction updates (GBRA 2020a; 2021a, b; Lake Dunlap Water Control and Improvement District 2021; GBRA 2022c, d;). According to the first of these videos, released in October 2021, the construction of the temporary pump station to allow continued water supply operations throughout the duration of the project and the emergency spillway have been completed, and the process of removing the gates to pour concrete and receive the new gates is underway (GBRA 2021b).

According to the newest update, in March 2022, all primary demolition work of the first spillgate has been completed, and they have completed the construction of the emergency spillway—including the addition of 6,000 cubic yards of riprap materials downstream to prevent erosion in case the emergency spillway is engaged—which would decrease the risk of losing work that has been performed if a flood event is to occur during construction (GBRA 2022d). They are still in the process of hardening the embankments that form the dam outside the river channel and constructing the new spillway. The hardening of the embankments will require additional concrete pours and leveling (GBRA 2022d).

The Authority also strengthened the center pier (Figure 5), making it stronger and taller, to accommodate the large hydraulic cylinders used to operate the gate (GBRA 2021b, 2022d). The construction of the new spillgate requires dewatering the area below

⁷There is additional information about Lake Dunlap Dam, and the other dams in the Guadalupe Valley Hydroelectric System, in Appendix II.

the existing concrete, excavating about 6 meters into the mud of the river channel, and

installing a concrete bulkhead about six meters upstream to form a maintenance dewatering system (GBRA 2021b, 2022d). While the previous dam design did not allow for maintenance on the upstream side of the spill gates without completely dewatering the lake, the new maintenance system includes a dewatering system that employs a bulkhead to allow Authority operators to dewater the upstream area and complete maintenance (GBRA 2022d). This process will be repeated on the other gates (GBRA 2022d).

The project timeline is estimated at 24 months, pending weather events and other delays, and is expected to be completed in mid-2023 (GBRA 2021f, Texas Commission on Environmental Quality 2022b).



Figure 5: New construction, Lake Dunlap Dam. A photo of construction on the Lake Dunlap Dam. May 26th, 2022. Photo by Andrew Adams

Current Status of the rest of the Guadalupe Valley Lakes

As of November 2020, communities in the Guadalupe Valley Lakes Region have created and confirmed two new water control and improvement districts in addition to

Lake Dunlap Water Control and Improvement: the Lake McQueeney Water Control and Improvement District and the Lake Placid Water Control and Improvement District (Dascher and Meitzen 2020, TWDB 2021). The process and terms for both lakes were very similar to the agreements made, and processes undertaken, between the Preserve Lake Dunlap Association and the Authority. The Authority was able to secure \$40 million in bond funding for both water control and improvement districts, \$80 million total, via the Texas Water Development Board's Clean Water State Revolving Fund, at below-market interest rates (GBRA 2021f, TWDB 2021). The publication of the Senate Bill 8 *Report of the Repair and Maintenance Needs of Lake Wood and Lake Dunlap Dams on the Guadalupe River* in November 2021 revealed that the listed plans for the replacement and rehabilitation of Lake Dunlap Dam will also be the same as what is to be done at Lake McQueeney and Lake Placid dams (TWDB 2021). The design phase of the engineering of both the Lake McQueeney and Lake Placid Dams replacement was expected to be completed by November 2021 with the construction to begin in April 2022 (Friends of Lake McQueeney 2021, Lake Placid Water Control and Improvement District 2021, TCEQ 2021f; 2022b). However, the Authority was required to obtain additional permits (wetland mitigation requirements, environmental requirements, and cultural resource requirements) for Lake McQueeney and Lake Placid, permits not needed for Lake Dunlap, which delayed the construction (Lake Placid Water Control and Improvement District 2022). As it stands, the Authority states they may be able to begin the 60-day general contractor bid process sometime in summer 2022 (Lake Placid Water Control and Improvement District 2022).

Meanwhile, on August 3rd, 2021, another failure occurred when a large tree hit

the spill gate at the Lake Gonzales Dam while the gate was partially lowered (GBRA 2021c). While the tree passed through the gate within minutes, hours later, when operators tried to raise the spill gate to its normal position of 3.7 meters, the spill gate would not rise and, within five minutes, had lowered to a fully down position (GBRA 2021c, d).

Just months later, on October 14, 2021, the Authority partially lowered the spillgates of the Lake Placid Dam to pass heavy rainfall with flows exceeding 425 cubic meters per second, and the spill gate became unresponsive, ultimately dropping to a fully down position (GBRA 2021e). An evaluation report by Black and Veatch noted “permanent and significant deflection, or warping, in the upstream leaf of the spillgate” (GBRA 2021e).

While some communities, such as Lake Dunlap, Lake McQueeney, and Lake Placid, have the tax base and development to support the creation of water control and improvement districts to pay for the replacement, repair, and maintenance of the dams, other communities do not have the tax base or development (Brown 2020, Dascher and Meitzen 2020, GBRA 2021a). In addition, there is a lack of existing state or federal funding assistance since the dams are not flood control structures (Dascher and Meitzen 2020). To date, Lake Wood and Lake Gonzales are partially dewatered, and, although Meadow Lake is at normal levels, all three are without prospect for dam replacement or repair without the support of state and federal funding assistance and stakeholder partnerships (Dascher and Meitzen 2020; GBRA 2020b; 2021a, c, d; TCEQ 2022b). As the Senate Bill 8 report stated:

“... the availability of funding has a direct impact on the ability to move

forward with design, construction, and installation of necessary replacement gates. Ultimately, these steps will be needed... to restore the dam[s]” (TWDB 2021).

Due to the recognized risks of dam failures, some lakes being partially dewatered, and some with destroyed and/or damaged spillgates, all the lakes have some combination of prohibited and/or restricted areas (Independent Expert Panel 2019, GBRA 2020b, TWDB 2021, GBRA 2022e). These prohibited and restricted areas are temporary safety measures, recommended by the expert panel that have been “implemented by court order until replacement gates can be constructed or dams decommissioned” (TWDB 2019).

IV. METHODS

Introduction

This study takes a qualitative approach to understanding how people relate to water and how that relation may impact them, or, as a result of those relations, they may impact the world around them. I employ phenomenological interviewing, in a series of interviews, to gather data about participants' lived experiences with water and dam failure. I then code the interview data to identify significant information, discuss it in the form of themes, and present a theory that encompasses what was learned.

This chapter begins with a review of the theoretical foundations that craft cogency for the employed methodology and subsequent analysis. The foundations of this study include a review of the constructivist ontology, a derivative of contemporary American philosophy, which employs a constructivist metaphysic and epistemology; tenants of post-structuralism and affective geography; and the hydrosocial movement in geography. This is followed by an overview of the methodology—qualitative research, phenomenological interviewing, and coding. The chapter continues with an overview of the processual methodology—including the recruitment of participants, phenomenological interviewing, and coding—and ends with a review of study limitations.

Philosophical Foundations

I took a constructivist ontological approach in this research, invoking metaphysical and epistemological constructivism. This philosophy is in the vein of contemporary American pragmatism—the basis of which extends from Baruch Spinoza's

(1600s) extensive work in affects—and evolved through pragmatism and classical American philosophy derived from the philosophies of Charles Sanders Peirce, William James, and John Dewy (Stuhr 2000, McDermott and Anderson 2007). Within contemporary schools of this philosophy, researchers employ a constructivist metaphysic in which people are akin to permeable membranes—flowing through the cosmos as the cosmos flows through them, impacting and being impacted, and filtering their experience (McDermott and Anderson 2007). This ontology, or way of being, is a product of one’s experience and interactions with the world and is a constitution of constructed relations in a reality that is “evolutionary, developmental, and processive rather than static or complete in anyway...” (McDermott and Anderson 2007). McDermott notes (2007):

“... all events, all decisions are pregnant with connections, many of which show themselves only subsequent to the human plan enacted. It would be far better if we were to develop an epistemology which accepted surprise, novelty, and potential mishap as permanent ingredients of human inquiry. In so doing, our decisions would be more tentative, less absolute, and consequently truer to the actual situation in which we find ourselves.”

The resultant constructivist epistemology is understood as one *knowing* from these constructed relations—a process that is constantly ongoing and in a state of transformation (McDermott and Anderson 2007). McDermott notes (2007):

“Classical realist epistemology held that the world exists as an object for us to ‘learn about.’ Once we knew the laws and principles governing reality, we could then follow them in a series of applied strategies, so as to effect salutary results. Recent science, however, is not simply realist or

*descriptive. To the contrary, it is intrusive and constructive, ...
[exemplifying] our capacity to transform reality...*”

According to McDermott, what we know about the world is our interpretation of it, and that interpretation occurs through our bodies via a relation to things (2007). It is not possible for the establishment of our knowledge about our experience without relation. Thus, “things” are everything—they are the embodiment of our relations—a representation of the interpretation we have constructed at this moment (2007). In this sense, everything is a verb, and nouns do not exist.

The significance of this constructivist ontology and epistemology is that it validates and expands the space in which affective relation building, and, ultimately, knowledge construction, are occurring. This new space, an affective space, allows water to exist as an object in multiple spaces: (1) as a chemical compound in physical, *natural* spaces and (2) as an object of abstraction, a thing, which meaning and knowledge can be constructed of by individuals within affective spaces. However, how can that information be extracted and transformed into data that is useful?

Post-Structuralist Geography and Affective Space

The study of affect in academia has recently reached a turning point, “like the other ‘turns’ that academic fields have undergone in recent decades—the linguistic turn, the cultural turn, and so forth—this focus on affects consolidates and extends some of the most productive trends in research,” opening new avenues for study (Clough and Halley 2007). As Clough and Halley note of this *turn* (2007):

“The challenge of the perspective of the affects resides primarily in the

synthesis it requires. This is, in the first place, because affects refer equally to the body and the mind; and, in the second, because they involve both reason and the passions. Affects require us, as the term suggests, to enter the realm of causality, but they offer a complex view of causality because the affects belong simultaneously to both sides of the causal relationship. They illuminate, in other words, both our power to affect the world around us and our power to be affected by it, along with the relationship between these two powers.”

Within the context of geographic research, emotional geography and affective geography straddle these worlds of causality. According to Pile (2010), whose research explores the nuance of how emotions are understood in emotional geography and affect is understood in affective geography and their underlying conceptual influences, there are three key areas of agreement between both approaches: (1) a relational ontology that privileges fluidity, (2) a valuation of proximity and intimacy in their accounts, and (3) a methodological emphasis on ethnographic methods. However, Pile goes on to recognize the issue in the study of emotional and affective geographies as being with “the presumed relationship—or non-relationship – between thought and affect in emotional and affectual geography” (Pile 2010). Pile goes on to explain (2010):

“Emotional geography ensures that there is no split between thought and affect. It is argued that there is no straightforward correspondence between affect, the thought and its representation. Nonetheless, emotional geography fails to account for the relationship between them – and this failing is strongly associated with emotional geography’s turn away from

its anti-humanistic psychoanalytic roots towards a cognition-centered approach, underpinned by phenomenology. This is especially evident in those places where emotional geography ignores the dynamics of the unconscious.

Affectual geography radically splits affect from thought, and thought from its representatives. In so doing, it constructs affect as the pure non-representational object: it cannot be known, grasped or made intelligible. The means through which affect might make itself known, whether via feelings or emotions or representations, are thereby rendered opaque. Nonetheless, contradictorily, affect can be consciously and deliberately engineered, but no account of how this is possible is given. Without a theory of affect itself – or of how affect circulates, gets transmitted or becomes contagious – affectual geography can (ironically) only deal with its surface expression.”

The development of affective geography is enlightened when it is aligned with a theory of affect itself, such as the aforementioned philosophy, and is further advanced by tenants of post-structuralist geography. One of the common features of post-structuralism and human geography is an interest in *relationalism* (Murdoch 2006). Yet, again, there is a conflict. In this case, it is a conflict in the heterogenous relations (Murdoch 2006).

Murdoch (2006) states:

“... It will be shown that post-structuralism’s interest in heterogenous relations—that is, in mixture of the natural and social and the human and non-human—can help human geographers to reach across the human-

physical divide (see Murdoch, 1997; Massey, 1999a; Whatmore, 2002). Moreover, it is argued that a concern for heterogeneity easily translates into a concern for space as these sets of relations necessarily bring together social and natural entities within specific spatial formations (Thrift, 1996)."

In the case of post-structuralism, the conflict is between "the sub-disciplinary division between *human* and *physical* geography [which] has often prevented the discipline from entering fully into a relational mode of thinking" (Murdoch 2006). As a result, geographers have cordoned themselves into areas of research where human geographers focus on *social* relations and physical geographers focus on *natural* relations (Murdoch 2006). However, the discipline has theoretically advanced to the point of encouraging post-structuralist relational thinking (Murdoch 2006):

"It is argued that relationalism opens geography up to the dynamic and complex process of change. Thus, it is shown that space can no longer be seen as simply a 'container' of heterogenous processes; rather, space is now thought to be something that is (only provisionally) stabilized out of such turbulent processes, that is, it is made by heterogenous relations."

Murdoch (2006) goes on to argue that it is the heterogeneity of natural and social relations, as a "mingling of various entities in complex assemblages, networks and/or systems," and the "centering" of relations "in subject positions" which "can lend entities a stability that begins to look like a clear distinction between the entity and relation..." as a position which overcomes previous issues. Murdoch (2006) suggests that because of this additional distinction, which is named *interactional/indifference*, that:

“[S]ome entities (usually, but not always, humans) acquire the ability to reflect upon the relations that comprise or surround them. Through processes of reflection, bodies are made to move, relations are made to change, and new classifications are made to come into existence. Given the significance of reflexive action, it has been suggested that modes of subjectivity might be thought of as ‘reflexive relationalities’ (or perhaps ‘relational reflexivities’) so that reflections upon action can never be fully distinguished from the heterogenous relationships that facilitate action... In conclusion, then, we can suggest that post-structuralism in geography is not simply a theoretical endeavor. It is a way of shifting spatial imaginaries so that new forms of geographical practice come into being. From a post-structuralist perspective, no longer should geographical practitioners be detached from heterogeneity... They should be subsumed within complexities and multiplicities of various kinds...”

One of the ways affect has been advanced in geography is through the study of semiotics (Kockleman 2016). Kockleman (2016) advanced semiotics in affective geography by putting semiotics to work with weight unto causal and comparative grounds of physical forces and phenomenological experience, allowing the development of a system of “gradients,” “grading,” “degradation,” and “grace.” Adams (2021) advanced Kockleman’s (2016) work and brought it to the world of water by considering the linguistics of the Texas State Water Code in terms of semiotic gradients. Gu et al. (2015), while not necessarily recognizing affective relations with objects, moved the pedagogy toward successfully understanding affective relations by connecting affect as

attitude, emotions, and ethics through the hypothesis “water knowledge has a significant effect on water behavior... [Thus, water emotion, water responsibility, and water ethics] [have] a significant effect on water behavior.”

Another way the study of affect, perhaps indirectly, has been advanced in the pedagogy is through the hydrosocial movement in geography (Linton and Budds 2014, Bergmann et al. 2020). This movement advances the relational-dialectical movement in geography by connecting the naturistic and social aspects of the water cycle into a new concept, the hydrosocial cycle, in which water and society make and remake each other through their interaction (Linton and Budds 2014). Linton and Budds focus on constructed political agency as a result of the hydrosocial cycle (2014). Others, such as Bergmann et al., have advanced this work to bring it closer to the theoretical foundations of this study. According to Bergmann et al. (2020):

“To strengthen the claim for attributing agency to nonhuman objects, we adopt insights from cognitive science to extend the concept of political agency beyond the confines of human intention. Instead of focusing on the constraining material characteristics of the nonhuman within a large-scale relational framework, we argue in support of a distributive understanding of agency based on the co-constitutional essence of the mind itself (Shapiro 2011). Specifically, we integrate insights from embodied cognition into the established framework of the hydrosocial cycle (Linton and Budds 2014) to argue that residents’ experiences within an active material world help explain the creation of certain flood risk perceptions. In other words, human intention or agency comes into

existence through a co-constitutional process involving brain, body, and elements of a wider environment.”

Another study that advanced the pedagogy is Smith et al. (2018) whose research team studied how participants’ trust, perceptions, and affective relations in water reuse, particularly water reuse technology, are methodologically influenced and captured. Smith et al. (2018) discuss *causal views* (“which holds that trust in the overseeing organizations ultimately determines how people process and interpret risk-related information”) versus *associationist views* (“which holds that both trust and risk perceptions are independently influenced by underlying attitudes”), stating of the associationist view:

“The underlying attitudes in the ‘associationist’ view are linked with affective (emotional) reactions... It has become associated with the ‘affect heuristic’, which holds that people’s willingness to accept a given hazard is determined by an emotional response (affect) which precedes the cognitive evaluation of information (Finucane et al., 2000; Fife-Schaw et al., 2008). In a similar vein, studies have argued that the ‘experiential system’ (based on affective reactions, associations, images) is much more important than the ‘analytical system’ (based on logic, reasoning, evidence) in shaping acceptance of new technology (e.g. gene technology) in the minds of the lay public (Connor and Siegrist, 2010). As a result, some have called for more in-depth explorations of how these emotional reactions shape responses to ‘alternative’ water systems, including reuse (Mankad, 2012). Following the associationist model discussed above, this may pre-determine, to some extent, an individual’s acceptance of recycled

water, which in turn affects how they process and interpret information related to the scheme and the overseeing organisations.”

For the purposes of this study, affective space may be defined as the space within which impersonal forces grant agential capacity to the object of water with which people are powerful enough to impart and impact the construction of affective relations, and, ultimately, construct knowledge of. Within the context of the ontological purview and the study of post-structuralism and affective geography, the phenomenological interviewing methodology creates an opportunity to explore affect in a way that has not been conceptually done—overcoming issues with consideration for heterogeneity and representation of affect—making the participants expressions in the phenomenological interviewing processes the action of expressing affect in relation to the object of water.

Qualitative Research

Qualitative research is “composed of empirical data, research methods, and a conceptual framework based on a theoretical argument” and draws on methods “aimed at recognizing ‘the complexity of everyday life, the nuances of meaning-making in an ever-changing world and the multitude of influences that shape human lived experiences’ (DeLyser et al., 2010, p.6)” (Hay and Cope 2021). It is understood that the “scholarly endeavor of knowledge production is ongoing” and that there will be a lacuna in produced academic knowledge (Hay and Cope 2021). This lacuna, or gap, can be filled in various ways, from conducting research in new social or physical settings, conducting research that makes use of new analytical or methodological tools, or including new conceptual lines from other bodies of research that “can produce effective new insights

into the issue being studied” (Hay and Cope 2021).

Unlike quantitative research which requires that results are generalizable across large sample sizes, in qualitative research, validity is more dependent on the richness of information and meaning and upon researchers’ abilities versus the size of the sample (Patton 2002, Hay and Cope 2021). Additionally, it is vital that qualitative research ensures rigor and trustworthiness by making the research be evaluated and being clear about limits on the transferability of the research (Hay and Cope 2021).

Phenomenological Interviewing—Theory

Interviewing in qualitative research is an intensive form of research that provides in-depth perspectives. The addition of questionnaires, or surveys, provides a framework for in-depth interviews and allows “key themes, concepts, and meanings to be teased out and developed...” (Hay and Cope 2021). The method of phenomenological interviewing emphasizes the “exploration of the meaning of people’s experiences in the context of their lives” through a specialized phenomenological interviewing process (Seidman 2019).

Seidman (2019) recommends a series of three interviews. The first interview establishes the context of the participant’s experience through an exploration of their life history up to the present (in this study, it is an exploration of participants’ life history with water as an object up to the day before the dam failure). The second interview allows participants to reconstruct the details of their experience within the present context of the area of study in which it occurs—such as a time-bounded event (in this study, it is an exploration of their lived experiences from the day of the dam failure and subsequent

events through the day of the interview). The third interview offers participants the opportunity to thoughtfully reflect on the meaning of their lived experiences in a focused manner (in this study, it is a reflection on the object of water via a water object survey).

The spacing of the interviews “allows for a sense of mutual engagement... [and allows] each interview to provide a foundation of detail which helps illuminate the next” (Seidman 2019). However, the method of phenomenological interviewing is an emergent method, and thus, protocols are not set in stone, with the opportunity to mold the methodology to fit your topic of study and available resources (Seidman 2019). Seidman (2019) notes that the goal of the interviews is more important than the format.

There are four main themes in the phenomenological interviewing process (Seidman 2019). The first theme is recognizing that phenomenology accentuates the transitory nature of human experience and that the interviewing process creates the opportunity for participants to reconstruct and reflect on the essence of their lived experiences. The second theme is that it is necessary to strive to understand participants’ lived experiences from their subjective points of view. The interview process should encourage the subjective reconstruction of their lived experience. The third theme is the recognition that the lived experience of human beings “is made up of the many constitutive elements that are part of our experience that flow together, undifferentiated while we are in the stream of action,” and that the accessibility offered through shared language “provides the rationale for taking seriously the words our participants use...” (Seidman 2019). The fourth theme is that the constitutive elements of the participants’ lived experiences are put into context through the interviewing process which “allows us to put behavior in context and provides access to understanding their action” (Seidman

2019).

Part of establishing validity within the phenomenological interviewing process is to design interviews that “strive for a rational process that is both repeatable and documentable” (Seidman 2019). It is impossible to entirely remove the researcher from impacting how participants reconstruct their experience since researchers are engaged in the interviewing process and subsequent work with the materials in selecting, interpreting, describing, and analyzing it. Therefore, it is important to recognize that the interaction is inherent in the nature of interviewing and that the researcher as *human interviewer* is an instrument in the research (Seidman 2019). This recognition qualifies the researcher as a “marvelously smart, adaptable, flexible instrument who can respond to situations with skill, tact, and understanding (Lincoln & Guba, 1985, p. 107)” and strengthens the validity of the research through the recognition that the resultant product is a function of the participant’s interaction with the researcher within the boundaries of the study process (Seidman 2019). Seidman argues that it is through this recognition of that “interaction and affirming its possibilities can interviewers use their skills... to minimize the distortion (see Patton, 2015, pp. 430, 471) that can occur because of their role in the interview” (Seidman 2019). Some researchers, such as Lincoln and Guba (1985), argue for the notion of “trustworthiness,” versus “validity,” which is informed by “credibility,” “transferability,” “dependability,” and “confirmability” (Seidman 2019).

Qualitative Coding—Theory

Upon the completion of in-depth interviewing, such as the phenomenological interviewing process, the researcher treats the resultant interview transcripts as data (Hay

and Cope 2021). According to Hay and Cope (2021), the most common method of presenting interview data is through “a literal description of the themes that emerged in the interview.” Reducing the data into themes can be achieved through the process of coding (Seidman 2019, Haye and Cope 2021, Saldaña, 2021).

Coding is an inductive, theory-building process that transforms interview data into theory by employing a system to reduce the data and identify themes and patterns (Seidman 2019, Hay and Cope 2021, Saldaña 2021). The goals of coding are to (1) define what is happening in the data, (2) organize codes to form elements that explain the data, (3) create categories/codes by defining what is in the data, and (4) prompt additional analysis (recoding/identifying additional themes) (Charmaz 2006, Saldaña 2021). It is important to reduce the data inductively—meaning “researchers should not address the material with a set of hypotheses to test or with a theory developed in another context to which they wish to match the data” (Seidman 2013).

There are multitudes of forms and varieties of coding methodology (Charmaz 2006, Hay and Cope 2021, Saldaña 2021). According to Hay and Cope (2021), not every section of the text needs to be coded—while some sections may be coded multiple times. In the vein of coding in grounded theory and phenomenology, it is commonly held that there can be multiple cycles of coding (pre-coding, first-cycle coding, and second-cycle coding) (Charmaz 2006, Seidman 2019, Saldaña 2021).

Whereas the coding process in constructivist grounded theory prefers an ongoing process of coding during and between interviews, so that each subsequent interview is refined and the subject of inquiry becomes more focused, the coding process in the phenomenological interviewing process does not begin until after the end of the

interviews (Charmaz 2006, Seidman 2013). Seidman (2013) proposes avoiding any in-depth analysis to avoid “imposing meaning from one participant’s interviews on the next.”

The pre-coding process may occur during the interview and/or transcription process (Charmaz 2006, Seidman 2013, Saldaña 2021). This process consists of marking items that are of interest and noting observations while they are fresh in memory—they are quick, informal, and reflexive (Hay and Cope 2021). This allows the researcher to become acquainted with the data and provides direction for second-cycle coding (Hay and Cope 2021).

The first-cycle coding process is open for researchers to select any number of coding methods. Due to the nature of my study, which employed the phenomenological interviewing method and an exploration of affective relations with the object of water, it was meaningful to select a method of coding which actionized the interview data while reducing the interpretation of the subjectivity of participants’ expressions of lived experience. Thus, I used line-by-line *process coding*, also called *action coding* or *gerunding* (Charmaz 2006, Saldaña 2021). According to Saldaña (2021), both ontological research questions, such as those that “address the nature of participants’ realities,” and epistemological research questions, such as those that “address theories of knowing and an understanding of the phenomena,” are addressed by process coding. This style of coding is stylistically inspired by the tenants of “In Vivo” coding and uses the participant’s exact words to reduce the amount of interpretation by the researcher while attuning the researcher to the participants’ perspectives and actions through the use of gerunds (Charmaz 2006, Saldaña 2021). As Saldaña (2021) notes:

“Process Coding uses (gerunds) (‘-ing’ words) exclusively to connote action in the data (Charmaz 2002). Simple observational activity (e.g., reading, playing, watching TV, drinking coffee) and more general conceptual action (e.g., struggling, negotiating, surviving, adapting) can be coded as such through a Process Code. The processes of human action can be “strategic, routine, random, novel, automatic, and/or thoughtful” (Corbin & Strauss, 2015, p. 238)... Process Coding is appropriate for virtually all qualitative studies... Processes are also embedded within “psychological concepts such as prejudice, identity, memory [and] trust” ... (Willig, 2015, p. 146)... Like In Vivo coding, Process Coding is not necessarily a specific method that should be used as the sole coding approach to data, though it can be with small-scale projects.”

The second cycle coding process is also open for researchers to select any number of methods. As suggested by Seidman (2019), conducting focused coding as second-cycle coding allows the researcher to recognize what text is essential to the study and is an appropriate method for phenomenological interview data. This step reduces the interview data into manageable material which can be further analyzed for thematic connections (Seidman 2013). Charmaz (2006) provides a clear description of second-cycle coding:

“Focused coding is the second major phase in coding. These codes are more directed, selective, and conceptual than word-by-word, line-by-line, and incident-by-incident coding (Glaser, 1978). After you have established some strong analytic directions through your initial line-by-line coding, you can begin focused coding to synthesize and explain larger segments of data...”

There are numerous ways the coding process can be completed—from inputting the interview materials into a CAQDAS software, such as NVivo, to working with data using pen, paper, and scissors on a large surface, to inputting the data into word processing softwares, such as Microsoft Office, to code (categorize/label) the data (Seidman 2013).

Once the pre-coding, first-cycle coding, and second-cycle coding processes are completed, the goal of the researcher is to analyze the results. The researcher may also engage in a cyclical process of collecting data, coding, and analytic memo writing (Saldaña 2021). Analytic memos are notes the researcher writes to themselves which “documents reflections on: your coding processes and code choices; how the process of inquiry is taking shape; and the emergent patterns, categories and subcategories, themes, and concepts in your data—all possibly leading toward theory” (Saldaña 2021). Analytic memos “serve [a]s an additional code-, category-, theme-, and concept-generating method” (Saldaña 2021). The researcher may opt to focus on select themes and concepts which came from the work and present them organized by theme or by participant (Seidman 2013). Ultimately, the resultant analysis product is a single-sentence theory composed of a rich statement that is accompanied by a compelling narrative that expands the meaning (Saldaña 2021).

Recruitment of Participants

I recruited participants via purposive sampling based on their common experience of living in the Lake Dunlap community when the Lake Dunlap Dam failed in 2019 and continuing to live there through the subsequent response—at least through the time when

the participant processes concluded in December 2021. With purposive sampling, there are not strict rules concerning saturation; instead, the validity of the sample size is related to the scope, nature, and intent of the research (Patton 2002, Hay and Cope 2021). For this study, participants were found who (1) lived on waterfront property on Lake Dunlap, (2) lived on non-waterfront property on Lake Dunlap, (3) lived on either waterfront or non-waterfront property near Lake Dunlap (that is, the Lake McQueeney community which is directly downstream from Lake Dunlap Dam), and (4) voted differently (yes/no) on the November 2020 propositions regarding the establishment of the Lake Dunlap Water Control and Improvement District which would, if passed, result in the restoration of the dam. Monetary compensation was not provided to participants for volunteering in this study. However, as a show of gratitude, participants who completed the study received a book (*Paddling the Guadalupe* by Wayne H. McAlister).

I employed recruitment methods via phone, email, and postal mail. I contacted multiple homeowners' associations via phone and email with requests to disseminate an invitation to participate in the study to their listservs. These organizations indicated they had taken the first steps to achieve this. However, the homeowners' associations ceased all contact and never disseminated an invitation. I believe that pending legal cases, which some of the homeowners' associations members were actively participating in, may have been the cause for ceased communications.

After the failure of this recruitment method, I proceeded to invite members of the Lake Dunlap community to participate in the study via postal mail. I used the Guadalupe County Independent Appraisal district website, the names and addresses of individuals contacted were sourced and subdivisions were identified. I exported the data as a .CVS

file into a Microsoft Excel workbook. I cleaned the data to remove partial entries, repeated entries, and unqualified entries (that is, entries classified as easements or commercial leaseholds). I then exported the data into JMP software (JMP Statistical Discovery LLC 2022), and a random sample of 300 entries was selected. An invitation to participate was sent to all 300 addresses.

A total of seven households responded to the postal mail invitation to participate. Through an academic relationship, one additional individual indicated their willingness to participate. Of the eight respondents, a total of five individuals ended up participating and successfully completing the study. Two of these participants represented individuals living on waterfront property at Lake Dunlap. Another two of these participants represented individuals living on non-waterfront property at Lake Dunlap. And one of these participants represented individuals living at either waterfront or non-waterfront property near Lake Dunlap (that is, Lake McQueeney).

Phenomenological Interviewing—Process

As the study was designed at the height of the pandemic, all methods were intentionally designed to avoid in-person contact. Although authorities in phenomenological interviewing suggest adherence to a three separate interview process (Seidman 2019), it is an emergent method that is not set in stone (Seidman 2019). Seidman (2019) offered that the second and third interviews may be combined (Seidman 2019). Accordingly, I combined the second and third interviews due to time constraints, scheduling, and an attempt to gain additional participants.

Instructions for the phenomenological interviewing process were presented to

participants in the initial invitation materials. At the beginning of the first interview, all participants had the opportunity to review the informed consent document with me. In order to participate, all participants were required to give their verbal consent to the informed consent document as well as consent to being audio and video recorded.

The first interview explored participants' life history relevant to the object of water and was scheduled for 90 minutes (Appendix III, Appendix IV). I asked that participants recall their histories with water, from as far back as they were able, and share their experience and knowledge of water (chronologically, from as early as they could recall through just prior to the dam failure). I asked questions such as: what are the most significant stories you can recall which involve water; what was it like consuming water in your household as you grew up; what stories did your parents/family/others tell you about water? (Appendix III, Appendix IV).

I scheduled the second and third interviews for 120 minutes and focused on the details of the participants' lived experience with the dam failure event and subsequent response (Appendix III, Appendix IV). For the second interview, I asked that participants recall their lived experiences with the Lake Dunlap dam collapse and subsequent events (through the passing of the legislation which allowed for the restoration of the dam). I asked questions such as: for what use was the dam originally built; describe the day the dam collapsed, from the moment you woke up until you went to sleep; how did you vote on the bills related to the dam collapse in November 2020 (Appendix III, Appendix IV).

I attached a subsequent Water Object Survey (Appendix III, Appendix IV) to the end of the final interview. The Water Object Survey acted as an additional tool using a series of factual questions and descriptive propositions for participants to reflect on the

meaning of their constructed affective relationships with water. The water object survey was composed of two portions: (1) a scientific and water literacy survey and (2) an abstract water survey. The first portion of the survey was structured and closed, asking questions and providing answer choices for participants to select from. The scientific and water literacy survey is based on the National Science Board's scientific literacy survey and builds on questions contemporary water resources researchers are interested in (general science principles, water science/principles, water use, conservation, and water reuse) (Glick 2019). The second portion of the survey was semi-structured and asked participants to go deeper into their constructed affective relations with the object of water through the use of open-ended questions (that is, policy, infrastructure, organizational awareness, information access, rights, power, responsibility, accountability, drinking water preferences, authority, and ownership).

To end the phenomenological interviewing process, a debriefing period was included as an opportunity for participants to ask any additional questions and make any additional comments. The data collected from these interviews was transcribed, edited, and proofread before proceeding to the coding process.

Coding—Process

In accordance with Federal and institutional policy, all interview materials, including unedited, automated transcriptions, produced using Zoom's live transcription feature, and audio and video recordings were stored securely in an institutional restricted access drive. Transcription accuracy and anonymization of all participants occurred upon the completion of all interviews, which marked the conclusion of gathering data via

interviewing and interaction with participants.

Since I used the phenomenological interviewing method, the pre-coding process occurred after the conclusion of all interviews during the transcription and anonymization process. Throughout the transcription and anonymization process, I began pre-coding by marking quotes that were rich and significant and writing analytic memos. Once the transcriptions were processed for accuracy and anonymized, they were stored on the researcher's computer—in the local drive within Microsoft Word documents. The interviews were split into two columns to begin the coding process. The first-cycle coding consisted of a line-by-line process coding of all participants' first interviews. The second-cycle coding consisted of focused coding of the first interview, second interview, and water object survey. I made analytic memos throughout all interviews. I based coding decisions on an emergent conceptual framework that was used to construct themes and craft a theory—all accompanied by a compelling narrative.

V. RESULTS AND DISCUSSION

As the lacuna of this study is the conceptual and theoretical approach, there is an openness within which I can explore participants' affective relations—giving me latitude in selecting and presenting themes. As the chapter progresses, there will be discussion on the three themes deemed central to developing an understanding of the affective relations participants hold with the object of water, a summary of the produced theory, and, finally, a brief on the limitations affecting this study.

Four of the five participants wholly participated in the interview process via video teleconferencing software. One of the five participants participated in the interview process via a combination of phone call and video teleconferencing software (the participant called me from their cell phone, and I recorded the interaction via video teleconferencing software). This study was approved by the Texas State University Institutional Review Board (#7817).

In the process of anonymization, I removed all personal discussion that was captured by the audio and video recording after the conclusion of the interview. All material removed was non-relevant to the study as the participant expected that the interview and survey had concluded. The only additional alteration to the transcripts during the anonymization process was to the second interview of participant four (Participant 4, Interview #2) in which I anonymized the name of the participant's neighbor. I made no other alterations. I did not include the results of the full interviews as an appendix to preserve the identity of participants who live in a small community.

The first cycle coding consisted of *in vivo* style line-by-line process coding (Tables 5 and 6). My process coding was stylistically inspired by the tenants of *in vivo*

coding to focus on using the language of the participant with limited interpretation, so I named it *in vivo process coding* (Tables 5 and 6).

Table 5: Examples of Coding Style. Three styles of coding. The *in vivo* coding style uses the exact participant language. The process coding style *actionizes* participants' language. My style of process coding *actionizes* participants' language while also trying to use the participants' exact language.

General Example of In Vivo and Process Coding		
Text to code: "I went to the bathroom upstairs. It was the first time I had used the stairs in years."		
<i>Example: In Vivo</i>	<i>Example: Process Coding</i>	<i>Example: In Vivo Process Coding</i>
Bathroom upstairs	Using upstairs bathroom	Using the bathroom upstairs
First time	Using the stairs	Using the stairs for the first time in years
In years		

Table 6: Example of My Process Coding. A sample of how I executed the process coding. The left column is actual interview data. The right column is an example of how I executed the process coding.

A sample of interpretation in my process coding:	
<p>P1: We went fishing a lot in the gulf. We would go out spend the day at the beach, sometimes overnight camping, and fishing and crabbing and all the things that you would do if you were a beach bum.</p>	<p>Fishing in the Gulf Spending the day at the beach Camping overnight Fishing and Crabbing Being a beach bum</p>

The goal of my coding methodology was to approach the transcripts with an open attitude and seek what emerged as important and of interest from the text. I underwent a cyclical process of coding, analytic memo writing, and coding. This organized the codes into elements that explained the data and allowed me to form categories. I obtained the initial categories through the first-cycle process coding of all first interviews and focused coding of all second interviews.

The mining of this data for analytic ideas to pursue in subsequent coding and analysis resulted in the identification of the following categories:

- (1) where participants were born impacting where they lived;

- (2) what water activities participants participated in impacting where they lived;
- (3) how family history impacted where they lived;
- (4) how all the preceding answers impacted their desire to restore the dam;
- (5) similarities in how they consume water—for drinking, cooking, cleaning, and other home activities;
- (6) similarities in experiences with conservation (some participants having experience living in Europe *and* identifying similar lived experiences with conservation);
- (7) how organizations, the community, and individuals played a role in restoring the lake;
- (8) how participants managed information received about the event and interacted with the community; and
- (9) emergency response to keep community safe—being non-existent; Multiple mentions of no alarms going off and nobody coming to the community to alert of emergency or any sort of protocol

I worked with these categories to write analytic memos which led me to focus on and develop the most salient categories into central themes. Some categories, such as (5), (6), (8), and (9) were removed. Eventually, I developed a strong sense of three themes:

- (1) *The object of water and physical location* which explores how participants came to live in the Lake Dunlap community prior to the dam failure;
- (2) *The object of water and restoring the lake*, which explores how participants view their role, and the communities, in restoring the lake; and

(3) *The object of water and accountability* which explores how participants view the role of organizations in restoring the lake and accountability for various forms and functions of the dam, lake, and the water itself.

In the discussion of the results below, I present vignettes using the participants' exact language to provide context to the participants in the presented discussion.

Theme I: The Object of Water and Physical Location

After conducting process coding and analytic memo writing of the first interviews of all participants, it became immediately clear that family and/or recreation, or a mixture of the two, were the driving forces behind all participants arriving at the Lake Dunlap community. These elements compose the central theme (Table 7).

Table 7: Theme I. Significant elements in the coding process that led to the development of the central theme.

	Elements	Central Theme
Theme I	Where I was born	Participants family history, recreation, and building family intertwined significantly with the object of water to impact their decision in which physical location they chose to settle in
	Play with water	
	Parental influence	
	Significance of family	
	Selecting the Lake Dunlap community	

All participants, either directly or indirectly, had a strong connection to recreation which they referred to in their choice to integrate into the Lake Dunlap community. Two participants were born on the coast and described their experience growing up as “[being] pretty much... a fish from that point on” (Participant 1, Interview 1) and “[growing] up pretty much surrounded by water” (Participant 2, Interview 1). Both had extensive lifestyles interacting with water in various recreational ways throughout their childhood and adulthood. Two participants were born around San Antonio (Participant 4, Interview

1; Participant 5, Interview 1). Participant 4 described their experience with water recreation as limited to playing in the sprinklers, using a slip-n-slide, and occasionally swimming in pools at apartment complexes (Interview 1). Participant 5 described their experience with water recreation extensively. From swimming in the springs of New Braunfels to watersports and downhill skiing (Interview 1). Participant 3 was born in the desert (Interview 1). A note of interest is that Participants 1, 2, 3, and 5 all mentioned that they participated in water skiing. In the case of Participant 4, who had never experienced living in a community culture that stressed the importance of rivers and had very little exposure to water recreation growing up, came to Lake Dunlap with their husband who worked in recreation on rivers every summer (Interview 1).

All participants, either directly or indirectly, had a strong connection to family which they referred to in their choice to integrate into the Lake Dunlap community. Three out of five of the participants had a direct connection with their chosen community via family history. Of those three participants, two had a family history dating back to the previous generation, their parents in both cases, who owned property on Lake Dunlap (Participant 2, Participant 5). Of those same three participants, one had a family history dating back to the previous generation, their parents, who owned property on Lake McQueeney (Participant 1). The two other participants who did not have a direct connection with their chosen community via family history (Participant 3, Participant 4), integrated themselves into the Lake Dunlap community directly as a result of their immediate family. In the case of Participant 3, who had two kids at the time they were looking to find a place to live, came to Lake Dunlap due to its central location between Austin and San Antonio and the good school districts. Participant 4, who was indifferent

to living by the river with water access, came to Lake Dunlap because their husband desired to live by the river with water access.

In conclusion, recreation and family impacted participants' relations with the object of water in significant ways. While only Participant 4 did not have as extensive of a recreational relationship with the object of water, they came to marry someone who did, and only proceeded to develop that relationship between water, recreation, and family throughout adulthood—to the point that their lifestyle in recreation, today, is of significant importance in many of the decisions they made regarding dam failure. As a result of that journey, these relations came to intertwine with family—through their husband and through their child whom they raised in the community—participating in numerous recreational and lifestyle activities.

All other participants had strong affective relations between the object of water and recreation which started from a much younger age and continued into adulthood. Of these four participants, three had historical family relationships which brought them to the Lake Dunlap community growing up. These affective relations with the object of water, recreation, *and* family became intertwined and strengthened as a result—clearly impacting their decision to integrate their selves and their new families into the Lake Dunlap community.

Included below are vignettes crafted from participants' own words which speak to the elements of the presented theme. The vignettes are shared to provide context, a sense of process and time, and as a way to clarify participants' intentions.

Participant 1

I was born on the coast [of Texas]. So, from the beginning, I had a great deal of experience with water, primarily [...] the ocean, right. [F]rom a very early time my family and I went to the beach a lot, but also, I grew up in a motel, [...] and because] there was a swimming pool my mother had us take swimming lessons. [F]rom the time I was about three, I was very much a swimmer. [I] pretty much was a fish from that point on. We went fishing a lot in the gulf. We would go out spend the day at the beach, sometimes overnight camping, and fishing and crabbing and all the things that you would do if you were a beach bum. [T]hree months out of the year my family had a place [at] Lake McQueeney—which is the lake below Lake Dunlap. So, from the time I was about six we would go to Lake McQueeney for the summer. And that's where I water skied. So, I water skied from that point on, all summer long, basically. [T]hat was a big part of my life, really, was water skiing. And [I] water skied in shows and waterskiing competition[s]... traveled all over to go to water ski tournaments. That's another piece of that. So, whenever I see a body of water, I immediately think about what it would be like to ski on it—would it be a good place to ski, or would it be really rough, and I don't want to ski it?

We have a place on [Lake McQueeney] that we've had for... It's not the house I grew up in on the lake, but it is a place my husband and I bought right after we got married. We've had that you know for 45 years. Every summer my two sons and I would come back to the lake, and we would spend the summer at the lake. We had a boat, so we skied all summer long, and I taught them how to fish. The Guadalupe, as you know, is fed with springs, and so there are places on the lake where you can go to the springs and dig in the springs. I showed them the springs and how that fed the lake. We would go up the river, what we called *up the river*, which would go up to the Dunlap dam, and then, if we were adventurous enough, we would portage the canoe around the dam and go on up Dunlap. Ya know, spent a lot of time on the Guadalupe—rafting, tubing... doing all the things that people do on the river. So, you know, I taught my sons all that that I have learned, and now they're teaching their kids that. So, I think, you know, that's my experience of growing up and spending, you know, basically my entire life on the lake, in the river, and my kids too. And now my grandkids.

Participant 2

[I am from] southeast Texas. Pretty close to the Louisiana border in a small town. So, arguably, a coastal community. And so, I grew up pretty much surrounded by water—bayous, rivers, ship channels. The Gulf of Mexico is 20 minutes by boat. Nearest bayou is probably 200 yards from my house. The nearest river was probably a quarter mile. For me, I was born there, so you kind of go with that [i]nteract wise... fish, hunt, you know, the recreational aspects of water. When I go back [to where I grew up] and visit, it's pleasurable thing to go out and go crabbing or go fishing or be out on the water with the family because that's brings you back to your childhood or brings me back to my childhood. I mean, we used to do watersports. Kayaking wasn't a thing when I was a kid. It was more about if you weren't in a boat, you were probably in a canoe. So, but I mean that's kind of a broad swath of what I think about water. It's not that I think... You don't explicitly think about water when you grow up around water. It's just part of the fabric of how you live. Until someone asks questions you don't think about those things.

We [used to have] a lake house [in the Northeast] as well as our main house. [I] grew up in the, near the coast, so having a water-based getaway is a, to me, a therapeutic relaxing type thing. When you're in [the Northeast,] the nearest beach, as they call it, the shore, is pretty—it's the Jersey shore. So, it's very expensive very busy. Not the type of relaxing beach getaway that I was used to. [My wife and I] both enjoy the outdoors, and the alternative was a lake, so rather than going to the coast we went inland and found lakes. And kind of, that was a good getaway, so it's more toward the mountains and lakes. More relaxing; more elbow room; quieter; and it was it was actually the best, the best move, so it was still our getaway. But then, when we moved back to Texas, you know our main house is a lake house so it's kind of the best of both worlds now. And truth be told, we actually also own a condo [on the Texas coast]. So, again, water.

[H]istorically, living in Austin of course you, you know New Braunfels because of the river, and so, we would go to travel down in New Braunfels by the river. Then you get through, and you go back to Austin. You don't think about New Braunfels as a town. You feel like it as just a tourist destination. I was a tourist. So, fast forward—I met my wife, she's from San Antonio. My mother-in-law's house was their lake house, but then she moved into that house full time. When her father was alive that was their full-time house. So, coming to New Braunfels and seeing New Braunfels as a city, as opposed to just a tourist destination, it was very nice. And Austin has obviously evolved over the years. Evolved into a city I would not care live in. But New Braunfels has grown, and it's still growing, but it's still a town that has a nice feel... has a nice vibe. It's a good place. San Marcos, I'll admit I'm also a graduate of Texas State when it was Southwest Texas, so I mean I knew San Marcos. San Marcos was neat, but it didn't have the same city feel. So, New Braunfels has a different feel. So, me and my wife and my in-laws experience this part of the river because we're on the east side of town, as opposed to the west side were all the tourists go. So, you know, Lake Dunlap is East of the city. We are downstream of the city. So, this area was appealing in the sense that (a) it's the Guadalupe, (b) it's clean, but (c) it's less populated. We don't have the tourist problem that central New Braunfels or West New Braunfels has. It was nice from that aspect. But having family next door... Not everybody feels it probably a blessing live next to family, but I'm one of those that to me it's a blessing to live next door to family. So, my reason to be here is different than somebody else, just like *Oh, I wanna live in New Braunfels*. We have a family connection and had the opportunity to buy the property next to my mother-in-law and build a house here.

Participant 3

[I grew up in] a desert—West Texas. Not much rain. And the only lakes there were built for water—water consumption. And a lot of water wells everywhere. [I] probably started with playing in the sprinkler which only was turned on to water the grass. Or playing in the water if you were washing the car or vehicle or something like that. Or going to one of these lakes—swimming and fishing and water skiing—what have you. [I] grew up [waterskiing]. [We] spent our life on the lake fishing and being bored and what have you. Just everyday stuff every day.

[M]y dad was in the oil field. And I grew up in the oil field until about two years after high school. I switched from the old field to construction. OPEC was trying to regulate the pumping and the price. And so, when they opened the wells the oil fields in the United States couldn't compete and they just shut down. So, it was a major migration out of the, out of West Texas where most of all fields were back then. And in the process, I moved here to work in San Antonio and Austin area in construction.

As far as New Braunfels goes, I talked to a few people. And one of the best advice I got was, I had two kids at the time, was to find a place that I wanted to live at. Go ahead and move there and find [a place to live]. The other thing is New Braunfels had one of the best school districts back then. Of course, there's usually a lot of work in Austin and San Anton. I figured San Marcos wasn't that good school district because they kind of rotate young teachers in and take the old ones and let them get out and go somewhere else. So, we decided New Braunfels. Mainly because that's where we wanted to live and play and raise our kids. And then I drive either south or north to work.

Participant 4

I'm from... south-east of San Antonio. It's a rural area, so we had a lot of land. [There was not a lot of water nearby]. Our water was pumped in from, I guess, the city, but like... We were told that there were like natural springs in on, you know, on the property and stuff like that. But I don't, like, we never dug it up or nothing. I think that's pricey to do, so we never dug up the springs or with the water that was underneath. Because some people out there would have wells. [W]e played with water outside, in sprinklers, and we drink out of the water hoses and do slip-and-slide and have those little on the ground pools. But yeah, like a lot of folks that we were friends with had tanks. Like fishing ponds. You can go fishing in them. I didn't.... My mom wouldn't allow me to swim in them, but like you could... They had them stocked and stuff like that. And they were used for cattle. [My mom] said they were too dirty [to swim in]. And plus, now looking back, they were standing water. But, I mean, back then a lot of people did, but my mama just said no, not to do it. I can't say that I did much with water. I mean, outside of using it; cooking it; drinking it; bathing in it. I know my apartments had pools. Maybe I went in occasionally but not regularly. And that was that... I had just finished my undergraduate degree, so I was just working a lot back then, you know, there was not really a lot of time to use it recreationally.

I moved to New Braunfels. I moved here in 2000. And moving here in New Braunfels was a different experience because they're all about the rivers. You know, like that's a lot of our commerce. And I'd never had lived in an area where, you know, the rivers were so important. Like we have Schlitterbahn, but we also have the rivers. You know, at the time, my husband, you know, he works every summer on the river doing something with tubes, or parking, or whatever. So, that's like a big thing down here. That was very different. And then when we were looking for places he wanted to live here because the river was close by. Because we have access down at the... We're not on the water, but we have like access at our subdivision area. I mean, you used to be able to see the river from my front door, but they built the house[s] now. But yeah, like that was one of his... because he's all about... he was all about the river and stuff like that. That was like his selling, that was his selling point. Me? I could've take[n] it or leave it. I just, it didn't matter. I mean, if it was it was, if it wasn't it wasn't, but he's the one who wanted to live here because of that.

I've been here since... I've been in this house by the dam since '04. [We used Lake Dunlap] for fishing; BBQ; picnicking; swimming. We would swim in it. I would take my daughter's girl scout troop down there. Do fishing lessons; teach them how to make fires... She's old now, but when she was little that's what we used to do with the little troop. So, we used it a lot for recreation.

Participant 5

[I was born in San Antonio, and] we would go to swimming pools and [the] city park. And also, to some commercial swimming pools. We went to my father's ranch north of Laredo which had several fishing ponds on it for my father to go fishing. [M]y father purchased or owned a small boat... And we went fishing on the Texas coast. Saltwater. I was catching Perch off the pier. [T]he trip going to the ranch I would've probably been about six years old. And, uh, then the other thing we did from San Antonio, we would come to the pool... The spring-fed swimming pool in New Braunfels, and swim in that pool as well. And before that in the wading pool. Which is still there! [T]his is Landa Park in New Braunfels.

The next thing that occurred, uh, was that when I was 14, actually 13 years old, my parents bought a lakefront property on Lake Dunlap. [My history with New Braunfels and Lake Dunlap goes back to the 1950s]. Me and my father fished in Lake Dunlap. He bought a little larger engine though which allowed us to water ski behind this little boat. So, we swam in Lake Dunlap all the time. And water skied on Lake Dunlap all the time. [After I started going to college,] more often in summertime I'd be back down here. Though the last summer I was at school, I worked at the Katie gas field outside of Houston and made trips to Galveston and other parts of the coast.

[Eventually, I] made my way around [the urban Northeast]. I didn't do too much waterboarding up there, but I did go down and see the coast. Let's see... wait a minute... I end up with a friend with a sailboat. We would go sailing, a small sailboat, would sail on the edge of the Atlantic. I also started skiing!

[I] always wanted to come back. I didn't want to stay in [the urban Northeast]. My dad had purchased a new boat, so there was offshore fishing, and the job opportunities were just better here in Texas. So, I ended up in Houston and then I was transferred to Dallas [before coming back down to New Braunfels.] [The house I have now] is on the same property. That camp house [my parents bought in the 1950s] is still here. And the waterfront property, yes, is the same property. But there's more of it than there was then. But anyway, yes, it's the same waterfront property.

Theme II: Restoring the Lake / Getting the Vote

After conducting process coding and analytic memo writing of the first interviews of all participants, and focused coding of the second interview and water object survey, I identified elements that represent the affective relations with the object of water and restoration of Lake Dunlap (Table 8).

Table 8: Theme II. Significant elements recognized in the coding process used to develop the central theme of restoring the lake.

	Elements	Central Theme
Theme II	Reaction to dam failure	A desire to return the physical landscape to its previous state as a lake drove people to support individual and organizational roles in accomplishing this—even if it conflicted with their interests
	Individual response	
	Community response	
	Finding solutions	
	Getting the vote	
	My vote	

All of the participants were affected in various ways when the dam failed. When the dam failure first occurred, Participants 1, 3, and 4 noted the immediacy of the affect and effect. Participant 1 noted that “... it was traumatic in the sense that... it was totally unexpected and, so, in many ways I would say it was unpredictable and also unexplainable... So you’re trying to make sense of it, and you can’t” (Interview 2). They also noted the influx of water downstream in the Lake McQueeney community where they lived (Participant 1, Interview 2). Participant 3 noted that the effect on the water level was immediate, stating, “when the water went down, the lake, it sucked the water out of that top aquifer because it’s so shallow” (Interview 2). They mentioned that many people were immediately without water in their wells and went on to state that “a lot of the [people struggling when the dam first failed] are still hurtin’” (Participant 3, Interview 2). Participant 4 noted that, when it happened, all the activity that typically occurs in the late spring and summertime immediately ceased (Interview 2). They noted that some

people still fished in the river bend, but for the most part, there was no activity and it was sad—a quiet which persists to this day (Participant 4, Interview 2).

No individuals who responded to the invitation voted against the three November 2020 propositions (that is, all participants were in favor of establishing the Lake Dunlap Water Control and Improvement District with the goal of restoring the Lake Dunlap dam, and all participants eligible to vote, voted in favor). Participants who were ineligible for the vote (Participant 1 and Participant 3) supported the restoration of the lake and would have voted in favor of the propositions to establish a water control and improvement district to levy a tax to rebuild the dam if they were eligible to vote.

Participant 1 maintained the knowledge passed to them by their son concerning the inevitability of the dam's failures and stated "he approached it more from a scientific perspective as opposed to as much of an emotional perspective and said, '...there is no choice as to whether it has to be done, it has to be done'...[T]hat was his opinion. Which I believed and trusted..." (Interview 1 and 2). Participant 3 supported efforts to restore the dam through the time the leading committee stated that it would only be waterfront owners who would be eligible to continue the fight, stating, "Once it got to that point, it was out of my hand... We're just trying to help each other right here and let the others take care of it and fight a good fight" (Interview 2).

Table 9: Participants' Residence and Vote. Participants' location of residence and how they voted. All who were eligible voted in favor of all three propositions on the November 2020 ballot. Proposition A regarded the approval of the creation of the Lake Dunlap Water Control and Improvement District, Proposition B set an upper limit on the maintenance and operations tax at ten cents per \$100 total assessed property value, and Proposition C selected board members for the District.

Participant	Location of Residence	Lake Dunlap Water Control and Improvement District Propositions
P1	Waterfront - McQueeney	ineligible to vote
P2	Waterfront - Dunlap	voted in favor
P3	Non-Waterfront - Dunlap	ineligible to vote
P4	Non-waterfront - Dunlap	voted in favor
P5	Waterfront - Dunlap	voted in favor

Participants who were eligible to vote mentioned their reasons for supporting the vote. In the case of Participant 2, they stated, “this is a lake house with no lake, and you kind of [have to] get past your emotions and have to focus on the future being *this is Lake Dunlap, we need to get it back to a lake*” (Interview 2). While they recognized issues with the return of the lake, such as a return to uncontrollable noise at any hour of the day or night, they also considered the feeling of being in a lake home as well as the economic value of designing and constructing a lake home that does not have a lake in their evaluation of its return (Participant 2, Interview 2).

In the case of Participant 4, they stated, “I want the water back. I want to go fishing again. And I like going, like we used to go there all the time to go swimming with the kids; have barbecues; just hang out. And I haven't done that since it happened” (Interview 2). In opposition to Participant 2, who viewed excessive noise and the bustle of the lake lifestyle as a con, Participant 4 welcomed this, stating “It was just kind of sad... [i]t's been real quiet these past couple years without water in the lake. You just don't have the hustle and bustle anymore” (Participant 4, Interview 2). For Participant 4,

a return of the lake means a return of the social culture around the lake, without which they were sad, in addition to the opportunity to participate, again, in physical and social activities on and around the lake, within their community. In the case of Participant 5, they said there was no reason that made any sense to not restore the lake and stated, “The lake is a very, very special asset. It just can’t be duplicated... You either want a lake or you don’t is what it really comes down to... If you just look at the calculation about how much tax I’m going to be paying and how much more the land is going to be worth, it’s a no-brainer” (Interview 2).

All participants who were eligible to vote mentioned opposition to the vote by those who might be opposed to the affordability of the tax increase (Participant 2, Interview 2; Participant 4, Interview 2; Participant 5, Interview 2). Of all participants who were eligible to vote that mentioned opposition to the restoration of the dam based on the affordability of the tax increase, only Participant 4 mentioned a personal concern with the increase in taxes, stating, “I wanted to see how [voting in favor of the propositions] was gonna affect my property taxes—if they were going to become astronomical or, you know, is it something I can manage? I’m a single mom...” (Participant 4, Interview 2). Participant 4 mentioned opposition due to “emotional reasons because they’d like the peace and quiet” that comes with the lake being a river (Participant 4, Interview 2). Participant 5 mentioned opposition by way of (1) a belief that the Guadalupe-Blanco River Authority ought to be paying for the restoration of the lake instead of property owners (of this reason, Participant 5 noted it is likely the number one reason for opposition) and (2) that some people just don’t want to pay taxes, saying, “You’ve heard of anti-vaxxers, well there’s anti-taxers too” (Participant 5, Interview 2).

Participants viewed how the propositions came to be on the ballot and all were, ultimately, in favor of it (resulting in the creation of a water control and improvement district that would tax those in the district to pay for the dam repairs) with some variation. Participant 1 attributed this outcome to influential individuals, political will, and a sense of urgency as Lake Dunlap was left without water (Participant 1, Interview 2). Participant 2 attributed it to the Preserve Lake Dunlap Association and Preserve Lake Dunlap Association leadership, which exercised a willingness to cooperate with the Guadalupe-Blanco River Authority versus suing them (Participant 2, Interview 2). Participant 3 attributed success to the wealthy people who were afforded the opportunity to exercise their voice and power in more vast ways and the committees they created (Participant 3, Interview 2). Participant 4 attributed success to the Preserve Lake Dunlap Association because they “got the ball rolling” (Participant 4, Interview 2). Participant 5 attributed the success to a combination of the Preserve Lake Dunlap Association and other skilled knowledgeable, well-educated, logically thinking people with good minds taking the correct steps (Participant 5, Interview 2).

In conclusion, all participants expressed a desire to return the physical landscape to its previous state as a lake. This drove them to support individual and organizational roles in accomplishing this—even if it conflicted with their interests. For some participants, restoring the lake put them in precarious financial positions which scared them. For others, restoring the lake meant impacts to their ability to connect with the lake in aesthetic and experiential ways. However, all participants overcame these positions in favor of restoring the lake because their affective relations with the object of water in connection to their family history, recreation, and social/community culture were stronger

than their affective relations in opposition.

Included below are vignettes crafted from participants own words, from their first and second interviews—combining relevant interview data from both the interview portions as well as the water object survey—which speak to the presented theme. I share the vignettes as a means to provide context, a sense of process and time, and as a way to clarify participants’ intentions.

Participant 1

[When the dam failed,] it was traumatic in the sense that, first of all, it's like seeing a bridge collapse. If you've seen those, you know, on television or on the Internet: where one-minute cars driving across and the next minute there is just a giant hole there right—it's because it happens so quickly, and it happens with a type of infrastructure we never ever expect to fail. Right. So that's the trauma part of it—is that it was so totally unexpected, and so in many ways I would say it was unpredictable and also unexplainable. You try to rationalize why something happened, or how did this happen, or... because you're trying to figure out how to not have it happen again. And when this situation occurred, it was... *not sure how it happened, why all the sudden did that gate just totally go.... there was no flood, there was no increase in rainfall, there was no weather event, nobody ran into the dam... It just failed.* Right? So, then you're trying to make sense of it, and you can't.

[When the dam failed,] I immediately called [my son], and I said, "*Get on the websites and look at these reports and tell me what you think.*" And so, he was really, more my trusted source of information. He attended the meetings that they held afterwards, that were the briefings that the [Guadalupe-Blanco River Authority] did, and that was very helpful because he approached it more from a scientific perspective as opposed to as much of an emotional perspective. And he was the one that just said, "*You know, there is no choice here. Now, there's a choice in the type of locks you replace it with, and there's a choice of who you hire to do the engineering, but there is no choice as to whether it has to be done, it has to be done.*" [T]hat was his opinion. Which I believed and trusted, but some of my friends didn't. They didn't have the benefit of having someone like our son [an engineer and hydrologist]. And I don't know whether they did or did not read all the reports coming out when the engineers got in and started looking at it and what they were saying. I don't know if they did or not, or whether they were just reacting emotionally to the fact that the dam failed, and nobody had told them there was a possibility. There was some of that.

There were several key individuals at Dunlap that were influential and trusted in the community. And I will say, early on they hired a [public relations] firm. So, they were smart enough to raise the money to hire a [public relations] firm to tell the story to all of the individuals affected by the creation of the water district, why it was necessary to create the water district, levy the tax, and give it to the [Authority]. Those are the three pieces. And I'm not sure I know all of the influential people that were involved in it, but I know a couple, and I think that was their key to their success. They got early success in creating the will, the political will, to get it passed. It took us longer at McQueeney, but now we didn't have a damn failure. So, all the water hasn't run out of our lake yet. Right? I mean there's a difference when you get up in the morning and there's no water out there. All of a sudden, the sense of urgency is there, and that's what had happened at Dunlap. So, I think that was another key reason why they were able to get it organized and passed pretty quickly.

There was opposition initially, and I would characterize it this way, so the opposition was initially: why should we have to pay for what we think was [the Authority]'s failure? They should be the ones that have to pay. And [the Authority] had started a process of building a brand-new corporate office building in New Braunfels, to the tune of I don't know how many millions, which the opposition used that as their rationale that [the Authority] actually had the money to pay to replace the dam but wasn't going to use it. That wasn't going to ever be enough money to pay for replacing the dam, but it was very unfortunate that [the Authority] had chosen that moment to launch their plan to build a new building. So, the opposition initially was: why should we have to pay for what we think is [the Authority]'s fault? But that was quickly sort of addressed by this group of influential citizens at Dunlap. Who said, you know, we can argue that all day long, but our dam is broken. So, let's move forward with getting the dam fixed, and this would be the quickest way to get it done. And then, if we want to turn around and sue [the Authority], we can. So, that was their rationale: get it fixed, get it fixed as fast as you can get it fixed, and reserve the right to take legal action against [the Authority] at some point in the future.

Participant 2

We had not built our house yet[, so] we were still out of state [since] we had not moved back to Texas yet. We were supposed to close on the construction loan to start the building of our house [t]wo days before the [d]am failed. So, that morning we got a call from my mother-in-law who lives next door to tell us the dam failed. So, she was obviously pretty upset because it's, you know, it's her backyard. I had to be selfish with my thoughts—*okay, is this going to affect the building of our house?* [W]ithin an hour we had a call from our builder. He was like *what do you want to do*. I said, *well is this going to affect the building of the house*. So, he just said *no, it shouldn't affect the building*. I said, *well then let's just giddy up, let's keep it moving because we're moving, we're building, so if this isn't going to affect your build let's go*. I just figured that at some time, someone's got to figure out how to fix it. So, that was kind of the day of events. It wasn't like a, you know, crying or anything. It was more of an anxiety of *is this going to affect us, if so, how? And if not, okay*.

The emotional dilemma for a lot of us here was around just peace and quiet. There's a mentality right now within the residents that view the dam failure as both a pro and a con. Right now, we don't have a lake, but we have a river. Without a lake you don't have the traffic and the noise and the disruption to your enjoyment because as a lake it's always ski boats, fishing boats, SeaDoos. [T]here's a tranquility of things because we don't have that traffic, and we know that when we get the lake back we're going to have the traffic and the noise. [T]here is a part of you that wants to invest and bring your lake back, but you realize that when you bring your lake back it means all of the bad things about having the lake come back. And with, you know, with that becomes more abuse and pollution of the of the waterway when you have more traffic. And, so, the dilemma came became *do we really want to pay for it and then get back to this high traffic high noise time* because sometimes when you're here in the summertime, weekend, or whatever... You can't just sit there and relax and enjoy the water because it's just skiers and it's the noise factor.

[I credit] the [Preserve Lake Dunlap Association] leadership [as being responsible for getting the propositions on the ballot]. It was an association of Lake Dunlap residents and people who use Lake Dunlap to come together and start creating ideas... how, how can we like... there's *the cant's* and the *legal bullshit* and there's the *what can we do*. They had the right people to come to the table. [I]t became pretty clear that suing [Guadalupe-Blanco River Authority] was not going to get us a solution. So, it was more focused on solutions than excuses after a few months. I don't know the timeline, but it took a few months to actually get past the legal bullshit and all the other *we're not gonna do this*. Then [the Authority] was basically holding McQueeney hostage saying that they were going to drain McQueeney for safety reasons because of Dunlap. And McQueeney has more money, as far as their residents go, and a little more political clout, and McQueeney then sued [the Authority] and held strong on their lawsuits—said you will not release out dam until you have a solution to fix. I'm kind of rambling here, but McQueeney's lawsuit, I think, prompted [the Authority] to deal with Lake Dunlap a little bit better because we were trying to hold our hand out and say *let's find a solution*. Whereas McQueeney was going after them through the legal process. So, the [Preserve Lake Dunlap Association] had recommended to all of the members, like, let's go the route of not suing them. We can't stop McQueeney, but we're not gonna do what McQueeney's doing. Let's focus on a partnership somehow with [the Authority]. Then figure out what is the right solution, funding, and everything else. That's probably the broadest summary of how things were.

It's a tough pill to swallow when you consider that we are going to tax ourselves to fix something that should have been fixed by the entity managing the dam. But you kind of have to just get past that and focus on the solution. Yes, this is a river. It's dammed up. It's been dammed up it's been end up for 90 plus years. In a natural state we wouldn't have dams. [However,] the reality is we were building a lake house on a lake that wasn't a lake. It was a river. It still is a river today.

So, you kind of get past your emotions and have to focus on the future being *this is Lake Dunlap, we need to get it back to a lake to get it back to a lake you need to have the funding to fix the dam and an entity to manage that*. And to get it back to a lake, you need to have the funding to fix the dam and an entity to manage that. Then let's have a [water control and improvement district] which we have local membership in partnership with [the Authority]. So, I think [Preserve Lake Dunlap Association] did the most work for it. [Preserve Lake Dunlap Association] did the most to spell out the cost and the liabilities.

Participant 2

They had like a short version of [frequently asked questions] for people who had basic questions. That was great. I'm a little more detail orientated person, so I need more information. So, the next version of the [frequently asked questions] is probably 15 pages, whereas the summary version was two. And in that was a lot of the detail around the liability; the true cost; and just how the process would work. I felt better about it and voted for it.

We voted [in favor of all three propositions which would bring the lake back], and we're happy that it's going to come back. We are the [water control and improvement district]. I'm looking at my house and my neighbor's house. We are the only ones paying the tax. The people across the street don't pay the tax. They couldn't vote for it. Only we voted for it, so when we went into vote to the polling station they verified who you are and where you live; where you're licensed; where you're voting; registration; car driver's license is registered and to be registered at your waterfront property. And to be waterfront property, you were able to vote, so we were the ones who voted for it only and we are the only ones paying for. [T]here's a financial aspect too. You know, losing you build a lakefront home on a river... You don't have a lake, you don't have a lake house... Therefore your investment goes down. Then to repair those things we have to tax ourselves, which means a further investment. And we have to tax ourselves to do something that the [Guadalupe-Blanco River Authority] should have done on its own. And I'm not going to get emotional or bitched up like some people might... like you may have some people who get all cranked up about [the Authority] and whatnot. To me it's just part of... That's not constructive so just kind of just move on. It's an interesting story in the sense that the property... the riverfront owners are the ones funding the dam. As opposed to investing in something we enjoy, we invest in something that everyone can enjoy.

I think some neighbors actually didn't vote for it, and probably for financial reasons, as well as for emotional reasons because they'd like the peace and quiet. We didn't like the price tag, but it's part of living here and doing what you can to put it back together. And we'll deal with the noise and other inconveniences later on, but at least we'll have our lake back.

Participant 3

[W]ith [the] dam breaking, you know, the water was going to go down. [T]hen all of a sudden... I mean, that night, people were out of water everywhere. So, they were having to carry water, borrow water from people with deeper wells, and get with the water districts out here and put in community water meters. It was like that evening people were having trouble with their water wells. When the water went down, the lake, it sucked the water out of that top aquifer because it's so shallow. If you were in that top aquifer, which a lot of people trying to save money they just drill a shallow water well [and] call it good. Matter of a fact, my next-door-neighbor is still tied onto my water. Been a long time now. [The] first [order of] business for everybody was to get water again for their homes, livestock, whatever they need water for. So, there was wells being dug, there was meters being set where there wasn't any. We were visiting back and forth across fences and walking up and down the street talking to everybody. Seeing who needed what. Trying to help out people. Second thing would be [resolving issues surrounding property] taxes and land rights.

They were fighting for the [new] land that was there, and [to] not infringe on what they've lost because then people started going down the river and using the lake bottom for their own pleasure. Then the landowners started getting in fights. Law enforcement had to get involved. And it was it was too many unanswered boundaries and laws pertaining to it. And landowners were laying claim to their new land and the Guadalupe River Authority saying *no it's not*. But by the deed, it says it is. The tax breaks were only for the people that were on the water, not for... If you lived across the street, they didn't want to give them any tax break. And as soon as the water comes up the taxes are gonna probably go sky high, a lot higher than they were to begin with.

It's just that everything was changing so fast, as they went, they were learning because they'd never been through it before. So, there [is] truth in everything, you know, and then as things progressed it changed, and changed again, and changed again. I just sit back watching them. I never got involved other than just sitting back and listening to [my trusted source] talk about it because he was on top of all the committee's... going to all the meetings. [I]t was changing daily depending on the needs and the directions these committees were going. Because a lot of things they started out they thinking they could do, they couldn't do legally. And couldn't request it. So, they had to back up, take another avenue, and they're... It just kind of looks like a big family tree, you know. You start at the bottom where the root and then it just takes off in all directions, and then you keep the routes that are working and discard the ones that are not.

[T]here's a lot of wildcatters out there doing their thing, and everybody was trying to get something done. Trying to get help. Trying to get anything they could done. There was some disagreements with people. That's why I think there was so many different committees going different directions—because you picked the one that you believed in and went with it. [The people who own the nice, multi-million-dollar homes,] they have the louder voice, the most power and money—and they were creating the biggest attractions. At first, when they were first trying to form the committee's, they were all trying to get everybody on em. And they were all telling everybody that anybody affected one way, or the other, were not only welcome but were trying to get em to join a committee and fight with em. And they invited everybody at first and they included everybody that was affected. And then it, over time, it started honing in. And with the direction they were trying to go and in the goals that they were trying to meet, it ended up just the waterfront property owners on that committee that was pushing with the best results.

[I] don't live on the water. I lost a lot of contact when they finally got the committee's down to where they wanted them, and they dropped everybody except the lakefront property owners. So, after that decision was made up pretty much, I don't know anything that they've done other than what came across the media or what they wanted you to know. Once it got to that point, it was out of my hands. And I was, I was not hurting. And I was busy. And I took care of my neighbor. Still, taking care of him and his family. And so... We're just trying to help each other right here and let the others take care of it and fight a good fight. So, we've had our... We're fighting our own fight. We couldn't get involved with the other stuff—just didn't have the time. A lot of the [people struggling when the dam first failed] are still hurtin'. Those... The poor people are kind of hanging it out there.

Participant 4

[When the dam failed,] I was shocked. And then I went down to where we have our subdivision... that we have, like a little spot that the homeowner association has that I was able to look at, and it was kind of wicked. Well, what happened, when it immediately happened, is like, all the activity that went on in the river... Because during the summertime and late spring it's really bustling out there like jet skis boats all that kind of stuff... All that was no more. People were still fishing down at the river bend area, but for the most part like I didn't see anyone go fishing; no water recreation... It was just kind of sad. I mean a lot of folks moved out here because of... Like in this... subdivision, a lot of people have boats around here. I mean, they're all about the water. That's why they moved down here. That's why we had moved down here. So, it was kind of sad, I guess, because that's part of the attraction over here. I mean, that's a good part of the attraction. I had heard that some people along the river, which I don't know I had just heard, that they were wanting to put up their houses up for sale, and, you know, most of us that don't live along the water are not going to do that. But... Yeah, that's how it affected us. It's been, and it's been real quiet these past couple years without the water in the lake. You just don't have the hustle and bustle anymore.

The only [solution] I heard, and it was consistent even before I saw in the papers, they were like *well, we need to have a new, modern dam... The dam is old... It was built long time ago*. It was the 20s or 30s. It was long ago. I think must have been built probably during that act they did to help people get out of the depression... But anyway that's the only thing I heard—that there had to be a new dam.

I would say that [Preserve] Lake Dunlap [A]ssociation probably had a big, big hand in it. They really got on the ball when it happened. Because it affects not only our enjoyment living in here, but like it does affect our... Like my property taxes went down a lot this year and I really think it's because of the dam [failure].

I wanted to see how [voting in favor of the propositions] was gonna affect my property taxes—if they were going to become astronomical or, you know, is it something I can manage? I'm a single mom, so... Because I remember it was like 10 cents, or something... I want the dam fixed. I belong to the Lakewood Shadows subdivision. And we have access to the waterfront. We have a homeowner's association, so there's a little bit of land down on... right at the end of Zip Road that we have access to. All of us do. So, I don't know... maybe that put me in the vote? I don't know, but I remember it was on there because I was like *well yeah I'm going to do this*. And I researched it even beforehand because every time they mess around property taxes, I get real nervous. I voted in favor. It was on the ballot. I want the water back. I want to go fishing again. And I like going, like we used to go there all the time to go swimming with the kids; have barbecues; just hang out. And I haven't done that since it happened.

[People probably voted no] because property taxes. If it's the people on the river, those folks own very expensive homes, and if you have a home like that you must have a salary to match. Maybe that doesn't intimidate them. Maybe the ones that are retired on the lake... Maybe if... IF that even intimidated them... I can't even say that because some people are better off in retirement than when they're working. If it was anybody, it has to be the folks like me who are a little nervous about it affecting their property tax. Because you know you can go from, you know, \$1,500 to \$2,500 and that would be scary. And you know, like, the only reason I knew is because I researched it. They really should have sent fliers out, probably, to explain it—to dummy it down for us a little bit.

Participant 5

I [had] a friend who's here and liked to fish, and he had his [recreational vehicle] parked here in my yard. We were both [outside]. I mean, all of a sudden... [I] did see it go down. The ball started rolling quickly. I already... Then there was also a public meeting that [Preserve Lake Dunlap Association]. I believe that was after the board meeting, but anyway I just started attending meetings, you know, and getting hooked into all the all of the information channels. I'm summarizing for you, but it really it just kind of went on from there. You know, the first public meeting there were about 600 people showed up at the convention center. And [Guadalupe-Blanco River Authority] was there.

My understanding is that... It's been over five years now, but that after the Lake Wood... I think this is where [J.] Harmon found out what needed to be done. I knew what had needed to be done because of meeting I'd been in. [Preserve Lake Dunlap Association] had attended the meetings with [the Authority] to talk about what needed to be done. That was like I say five, four or five, years ago. Something like that. I know that for a fact because I was talking to some of the leadership of the Citizens United for Lake Placid that before one of the court hearings, I was attending the court hearings... And they were telling me that these meetings had taken place and that [Preserve Lake Dunlap Association] had been there. [A]pparently the day the dam failed, when J. [Harmon] found out about it he called Doug Harrison, and they were over at [the Authority] talking to them the next day.

J. [Harmon] recognized, and Doug Harrison recognized, I think immediately what needed to be done. They didn't know the... We didn't know the name yet. We knew it was a special taxing district, but we didn't know the right name for it. The other big stroke that occurred, Doug Harrison brought into a special district attorney from Austin. Great guy. Highly knowledgeable—years and years of experience. I don't know how many hundreds of utility districts he's set up and it's a lot. He probably knows people at [Texas Commission on Environmental Quality] by their first name. Because he deals with them all the time. Because the [Commission] oversees all these municipal utility districts and these [water control and improvement districts] and all kinds of special districts.

You've got three very strong executive types on the [water control and improvement district] board. And then they had committees working for them on the various aspects. They also serve on the committees. All volunteers. The only paid is for the attorney. And they said they had a petition signing to get people to sign to get enough signatures to get it on the ballot. But then they, [Preserve Lake Dunlap Association], did a committee and the committee divided everything up into captains' areas of different parts and we had signs. Man, they plastered signs up all over everywhere. There was a major effort, going out door to door and I did participate in that. And a couple of meetings. And by then, Covid was going, so I was not going to all the meetings. At my age, it wouldn't be a good idea for me to catch it. And by the end we had sold this pretty well. There were some maybes. And the major landowners, they also ended up generally supporting it. What I'm trying to lead up to is—the amount of work, the things that have been accomplished over the last couple of years... People [t]hat were not involved in these kinds of things don't realize what all has to be done, and all the details that have to be picked up along the way. And, uh, you know, it's something that I take a small amount of pride in that they can take... Doug Harrison in particular... And J. Harmon... They can take a lot of pride in what they accomplished. So, anyway it's a real tribute to what knowledgeable, logically thinking people can accomplish, you know, because I promise you that what has been done was the right thing to do. [W]e've done pretty well really. And, you know, being able to deal with challenges is very important. And it turns out there are a lot of skilled, knowledgeable, well-educated people in the world, and with good minds. And they get all together and decide they're going to do something, well, they can make things happen big time, and actually change the world.

[Figuring out who could vote and who could not] was one of the most confusing things of all. In the first place, the district has to get defined, you know, the boundary. It's got a boundary. Doesn't matter whether you're a renter. It doesn't matter whether you're a squatter. It doesn't matter whether you're a property owner. None of that matters. The only things that matters is where you're registered to vote.

[Defining the boundary] was part of the discussion among [Preserve Lake Dunlap Association] and the attorney... That was a big discussion. What should be included? There were people wanting to include a bunch of other stuff, you know, which is great because then they have to pay for it. But then they might vote against it too. But for me, I say the community was involved.

Participant 5

And there was a lot of comment about it, yeah. But there was quite a discussion. But the decision, ultimately, was made by the people forming the district, and that was, you know... The proper choice was properties that touch the lake. I think the proper decision was made by the proper people.

I voted in favor. It's a no brainer for me. I mean, of course you would do it. Yeah, it raises my taxes, but what's the land worth without the lake? [Laughs]. It's practically worthless without the lake. The lake is a very, very special asset. It just can't be duplicated. There's no... I'm not worried about a few bucks in taxes. Like, I mean, if you're really poor, I guess. But hey, the people around this lake are already paying plenty in taxes. This value... This land's valuable and they pay plenty in school taxes especially. So, hey, they... It probably raised my taxes 10% overall. So, what the hell is another 10% one way. If you can afford to pay the other 90, you can afford to pay the 10.

Probably the number one reason [people voted against it] would be that they think [Guadalupe-Blanco River Authority] ought to be paying for it instead of the property owners. You either want a lake or don't you is what it really comes down to. I mean, a lot of people on the Facebook page, they would eventually say that, you know, if you put the pencil to it; if you just look at the calculation about how much tax I'm going to be paying and how much more the land is going to be worth, it's a no brainer. It's obvious that this should be done. There was no reason that made any sense not to do it. You know, there's some who say *well, there's some people that are kinda poor and they might not be able to pay their taxes*. Ehh, well that's a very minor number of people. Most people that own this land got plenty of money is the truth of the matter. More than me too. A lot more. Anyway, there are people still... I don't know they're just some people that are... You've heard of anti-vaxxers, well there's anti-taxers too. They don't want to pay taxes. I'm different, I like to pay. You get what you pay for.

Theme III: Constructed Knowledge and Water Resources Management

I identified a third theme concerned with associated with authority, responsibility, and water resource management from five elements (Table 10). This theme deviates from the prior two in that it does not interplay with the object of water as heavily as the prior two themes. The focus of this theme lends itself more to how participants constructed knowledge to attribute blame based on their awareness of risks, and how the failure and subsequent processes impacted their approach to water resources management.

Table 10: Theme III. Significant elements recognized in the coding process used to develop the central theme on water resources management.

	Elements	Central Theme
Theme III	Awareness of issues	Participants formed different perspective frames of authority, responsibility, and water resources management based on the information they interacted with and accepted
	Attribution of blame	
	Organizational power	
	Individual power	
	Changes/impacts	

As soon as the dam failed, participants had varying levels of involvement in the response and subsequent processes. Participant 1 was the only participant that did not live on Lake Dunlap. They lived on a waterfront property on Lake McQueeney which is directly downstream from Lake Dunlap. Thus, they were ineligible to participate in the many routes of solution. However, they noted that the dam failure got a lot more people involved and engaged, stating, “They were taking it all for granted until the dam failed, and now all the sudden everybody shows up at the meetings. Everybody has a voice, you know, and I consider all that healthy” (Participant 1, Interview 2).

Participant 2 became involved in seeking information to develop their understanding of the issues by reaching out numerous times to locals leading the efforts, and stated, “[I]n my case, it would be to go to the [water control and improvement district] with my questions and, likely, considering who runs it, I will be either getting my

answer or getting direction on where to focus my question” (Participant 2, Interview 2).

Participant 3 took the position that once the committee was formed, and they realized they were not even allowed to go vote, that even if they wanted to get involved, they were left out of the decision and could only get as loud as anybody else—stating, “Yeah, I’d say you can get as loud as anybody. Just depends on how much time you want to spend on it. The more time... the more you can tell, the more you can sway other people to think about other things or the way they think about it” (Participant 3, Interview 2).

Participant 4 did not involve their selves in the process, outside of voting, stating, “The dam is purely recreational. I mean, I love to have it back, but I wouldn't have invested time into it. They might have had more time to invest in it; more resources obviously. I imagine a lot of the retired folks got very involved in it because they have a lot more time to you know walk that pavement...” (Participant 4, Interview 2).

Participant 5 immediately became involved in the response by engaging in social media, re-joining the Preserve Lake Dunlap Association, and attending numerous public meetings (Participant 5, Interview 2). Through this, and their previous experience, they were able to develop a very clear understanding of the misconceptions surrounding the issues—such as the value of the water in Lake Dunlap to the Authority and the value of the dam to the Guadalupe-Blanco River Authority—enabling them to recognize that in order to get solutions the community needed to treat the Authority as a friend versus an enemy (Participant 5, Interview 2).

Participants varied in their level of attribution of blame for the dam failure toward the Guadalupe-Blanco River Authority. Participant 1 found some blame legitimate, particularly concerning a lack of individual and community awareness of the risk that the

dams presented in their severely damaged, yet continually operational, state (Participant 1, Interview 2). Participant 2 claimed that the Authority not only neglected their response to the failure but also failed to fulfill their responsibilities in managing the dams, stating, “[Y]ou either maintain it or you don't. Telling us doesn't do anything. You tell the state. If you need more resources to maintain the dam to keep it safe. Luckily, no one was killed. Someone could have been killed” (Participant 2, Interview 2).

Participant 3 attributed “a lot of it” on the Authority and noted that they could have prepared for the failure, that they waited too long to do anything, and that they should have put more money into maintaining the dams if they wanted to keep them (Participant 3, Interview 2). Participant 3 went on to say, “Now, they’re having to wait till the dams fail and you get floods downstream [to get inspections and find out] exactly how neglected the dam really was” (Participant 3, Interview 2). Participant 4 did not take a stance in attributing blame to any individual or organization (Participant 4, Interview 2). Participant 5 refrained from attributing blame and focused on describing the complex story of how the events came to be and the subsequent responses (Participant 5, Interview 2). Participant 5 has been involved in water resources management in the area for many years and had an awareness, years ago, that these dams were severely damaged, and their replacement was inevitable (Participant 5, Interview 2).

As a result of the failure and subsequent processes undertaken by individuals, organizations, and the community, many participants experienced changes in how they view their power to change issues in water resource management. Participant 1 noted that they could be more involved than they have been, stating, “I’m going to get more politically involved in the governance, the policies, that govern water in Texas”

(Participant 1, Interview 2). Participant 2 noted that their power as an individual is limited, but when they are allied with an organization, such as the Lake Dunlap Water Control and Improvement District, there is much more opportunity to express power alongside others (Participant 2, Interview 2). Participant 2 also noted that, while they experienced changes as a result of the dam failure, they were also at a point in their life where they were “trying to find a way to give back [to local topics] and whether it’s time or effort [or] volunteering”—it is a path they are interested taking (Participant 2, Interview 2).

Participant 3 noted that individuals have the power of their voice and to get involved in making a difference, but that it will “take somebody with a lot of spare time for research and going to meetings” to be effective (Participant 3, Interview 2). Participant 4, specifically referencing the dam failure, acknowledged that they do not have the knowledge of water to participate and create change because they did not put in the time (Participant 4, Interview 2). For Participant 4, the dam was purely recreational, and they acknowledge that if the issue was more severe in the sense of it affecting people’s livelihoods, such as an effect on their drinking water, they would have put in the time to effectively impact the solution (Participant 4, Interview 2). Participant 5 took the position that individuals are not necessarily so powerful, stating, “[A]s far as an individual being able to go and say you’re going to do this... That doesn’t... That’s not the way it works” (Participant 5, Interview 2). Participant 5 noted that having knowledge can make a difference, but “I’m [still] just one cog in the wheel...” (Participant 5, Interview 2).

In conclusion, participants formed different perspective frames of authority,

accountability, and water resources management based on variations in the knowledge constructed by each participant. These variations in constructed knowledge occurred because of differences in their constructed affective relations with information as a result of diverse exposure to information, exposure to more accurate information, and time available to explore any information. For some participants, attribution of blame to the Guadalupe-Blanco River Authority was appropriate whereas others limited their attribution of blame to the Authority, and some withheld all attribution of blame.

Some participants were aware of the risks prior to the dam failing while most were not. Many of those who were unaware of the risks saw that as the most damaging aspect in their perspective of the Authority. All participants were affected by the amount of time they had to engage with information. This made evident that the more time you have, the more involved you can be, granting the additional opportunity to gather information and construct new knowledge, giving the power to see things more clearly, granting the opportunity to share that clear message with others, and, ultimately, impact solutions. However, as varied as the constructed knowledge of each participant was, they all came to the same conclusion: restore the lake.

Included below are vignettes crafted from participants' own words, from their first and second interviews, combining relevant interview data from both the interview portions as well as the water object survey, which speak to the presented theme. The vignettes are shared to provide context, a sense of process and time, and as a way to clarify participants' intentions. This theme had the least amount of data available to pull into vignettes, and as a result some of the vignettes are not as robust as previous themes. However, I still found it important to bring this discussion to the study as it highlights

how differently people construct knowledge yet can arrive at the same conclusion to take action and restore the lake.

Participant 1

There was a lot of blame being attached to the [Guadalupe-Blanco River Authority] for the failure. I think some of that blame was legitimate. Particularly since they didn't tell anybody that they knew the dams were at risk, but whether you could actually blame them for it, I don't know about that. And I don't think I could point a finger to say you know *oh this person over here in [Guadalupe-Blanco River Authority]—you're to blame for this because you didn't do something.* I can't do that. You can't blame any one person in the [Guadalupe-Blanco River Authority] or any group of people in the [Guadalupe-Blanco River Authority]. Overall, I can blame them for not sharing the knowledge they had about the condition of the dam. They knew that—it came out in the testimony.

[Highly educated and powerful individuals who live in the Lake Dunlap community are] also the reason why some of the other smaller lakes in that five lake [region] have not [found solutions], they just don't have the same population base. They're more rural farmers, and they just don't have that group of powerful people. They will eventually get there I'm sure, but it's going to take them a lot longer.

[This process impacted my community because] I think it got people a lot more involved and engaged in it which is probably the best outcome we could have had. They were taking it all for granted until the dam failed, and now all the sudden everybody shows up at the meetings. Everybody has a voice, you know, and I consider all that healthy. [I] will tell you there is a very organized effort to change the leadership in the [Guadalupe-Blanco River Authority]. So, that would mean changing how their appointed, and so right now they're appointed by the governor. So, there is a very active movement going on to change that process, so that they're not appointed by the governor. That they're elected—like you were a school board.

[As an Individual] I'm probably in a position that I can do more than what I am doing, but it's because of my relationship to [a university] that I have to be careful about being politically active. [I] think that for me personally, is that I'm going to get more politically involved in the governance, the policies, that govern water in Texas. Yeah. You can't just trust other people to do the right thing. You have to encourage them.

Participant 2

[As soon as the dam failed,] [Guadalupe-Blanco River Authority] was already claiming no responsibility for the fact that they get money but didn't manage or maintain the dam. So, other than that noise, I'll call it noise... [a]nd then [the Authority] doing their bullshit about not being responsible and not having any money... It became painfully obvious pretty quick that [the Authority] was neglecting their response—or not fulfilling their responsibilities as the management of the dam. And, you know, [t]hey collect revenue from whatever power was being generated from the from the dam before, as well as collect money from the sale of water from the river. We had already known about some issues. Then it became more... [w]e were now realizing the bullshit they did with Lake McQueeney beforehand and Lake placid, and I think it's wood—Lake Wood? Which was the two years before then, when [the Authority] did the same thing, like *Oh, the dams old and we don't have the money*. Even though they've been making money on the water, they say *Oh, we don't make money on the dam*. Okay, but the [the Authority] makes money off of the water. And you're paid and commissioned by the state to manage the dams... And so, they started kind of weaseling through different sort of legal maneuvers.

I'm saying this obviously kind of jaded because when you're a property owner and you're being faced with this, and the entity which is responsible to manage it by the state is saying, *well, we didn't know or we told you so*. It's like, well, what do you mean you've told us so... you either maintain it or you don't. Telling us doesn't do anything. You tell the state. If you need more resources to maintain the dam to keep it safe. Luckily, no one was killed. Someone could have been killed. When the dam failed it pushed a lot of water down the river. There could have been someone there at the dam when it happened. It wasn't. The dam didn't fail during this during a flood. It wasn't like a storm hit and caused the dam to fail. It failed unprovoked basically. So, there was a lot of flood of emotions of *why aren't they taking responsibility, why are they creating solutions*. They basically were what I call full of can'ts—*can't do this can't do that, can't, can't, can't, can't, can't*. They were not providing solutions on what they could do, or would do, to fix it.

To me, there's politics and political theater. How things should get done, and then the noise that has to happen around things to get it done. Unless you draw attention to a problem, it probably isn't going to be solved. So, some of the lawyers getting involved were distraction. It was theater. It was chest pounding. It was threatening. As opposed to constructive. Yeah, there are some maybe powerful people, but I think it was matter of the right people focusing their efforts toward the right council members, state representatives, state senators, as well as even U.S. senators and U.S. representatives to try to get more attention on this and see *okay what can we do to fix this*. And it wasn't trying to point fingers and saying *we need we need money*... I think the [Preserve Lake Dunlap Association] had the right access to the right people and chose the right path because the legal, just suing people, doesn't fix matters. So, I think the right people, it was just the right people getting involved and the right people asking the right questions. How to construct the right rules around the [water control and improvement district] to see what will they do what and then what part [the Authority] should do and what part the [water control and improvement district] should do? How will the funding be calculated? How will the funding be collected? I think it was the right local people working through the right city, counties, and state entities to get this on the right path.

[As an individual,] I'm probably not individually very powerful. But being a member of an organization, and now being a co-owner, I don't know how you consider us to be with the [water control and improvement district], I guess, we were all members of our contributors to the [water control and improvement district]... So, policy to me, in general, national politics are great and they're a horrible distraction, but I think most people have to get involved locally to do anything. So, screaming at the sky is not going to help matters. Just focus on the local. Whether it's local county, local state, local city, or entity that's where I'd focus on. So, if I had any issues with things, I would start with my local most local organizations first and then work upward or outward as I had to.

Participant 2

So, in my case, it would be to go to the [water control and improvement district] with my questions and, likely, considering who runs it, I will be either be getting my answer or getting direction on where to focus my question.

And has my position changed since the dam failed? Yes, is the short answer, but I don't think the dam failing was the reason. It brought it more to the forefront for people, but I just think as a human being I've grown more interested in getting involved in local topics. Not to run them or author them, but just to try to help them. I'm not running for public office, it's just more or less trying to find a way to give back and whether it's time or effort, volunteering—whatever... That's where my head is right now. It's not a direct affect from the dam failing. It's just the way my life has evolved.

Participant 3

All six of these dams are old, are there right at 100 years old. They've been great. They served their purpose, but you just can't leave them for 100 years without being ready to do something for failure. These things, the gates operate on a hinge with pins in them. These pins are like four-inch diameter solid steel hardened steel rods. And the hose that are in that four-inch pin are like two-inch-thick steel, hardened, and there's like four on the frame and three on the gate in several places. And they're just worn down. They look like a camshaft in an engine there. But more than a third of it, for some places, it was a third only a third of the metal left. And just after these years without being replaced.... which they should have been replaced years ago, and just never did it... just kept going. Waited too long. So, I don't know if anybody was at fault at anything. I put a lot of it on Guadalupe River authority. They should have put more money into maintenance maintaining these dams. If they wanted to keep them. Either that or put some money and replace them. Now, they're having to wait till the dams fail and you get floods downstream. Those are the people that hurt the worst—the people that are downstream from a dam failure. And as far as being directly affected by the water being dropped. But a lot of people really hold it against Guadalupe river authority for not doing their job correctly.

And later on third-party independents that came in and would do dam inspections. And finding out exactly how neglected the dam really was. All the metal parts on the gates and everything were at least two thirds of the way eaten through from 100 years of wear and tear. And these six lakes are all the same. Built pretty much all the same time. Now three of them are dry. The third lake down, we're the first one, the third lake down just went down about 5/6/7 weeks ago. And then the first one that went down, which is the last lake on the chain, Wood down by Gonzales. And they haven't done anything to fix it, but the people that live on down there, they don't have the power and money. People that have places on this lake on the water, a lot of them are from Houston. These are summer homes, weekend homes. So, they immediately went to the state. Immediately went to their congressman, their representatives... I mean, they went and talked to everybody—judges. It seemed like the Guadalupe river authority had a bad name because they let it let it go so long without any attention. They were doing some maintenance, but they weren't replacing the parts that needed to be replaced.

[As an Individual] I think you've got the power of your voice to get involved and make a difference. But it's gonna take somebody with a lot of spare time for research and going to meetings. And you gotta... I don't know anything about it. And then I know, you know, a lot for what I need to know, but I don't know what happened in the committee meetings. I didn't... I didn't know what.... You're not allowed to go and vote. All the votes that they had on what they're gonna do, and what avenue they were going to take, when they were going to do it... And they don't let it out to public once they've got the committee's kind of [settled] after about a year of juggling around, so if you want to get into public life... Yeah, I'd say you can get as loud as anybody. Just depends on how much time you want to spend on it. The more time, the more you know more, the more you can tell, the more you can sway other people to think about other things or the way they think about it.

Participant 4

Well, if [the educated and powerful individuals in my community] have political power around here, that probably had 100% to do with [being able to restore the dam]. If they had money and connections, yeah.

[As an individual] I have.... I wouldn't... I don't have the knowledge of water that much to change anything about it. In all honesty, would this be like a priority-priority? No. I mean, I'm talking about in regards to the dam. We really don't have to have a dam. If it was an issue with our drinking water, then I would have been more involved in that because that affects the livelihood of people around here; my family. The dam is purely recreational. I mean, I love to have it back, but I wouldn't have invested time into it. They might have had more time to invest into it; more resources obviously. I imagine a lot of the retired folks got very involved in it because they have a lot more time to you know walk that pavement...

Participant 5

I've done so much that I try to get into the details—it's difficult. Once I knew what had happened.... [Guadalupe-Blanco River Authority] pretty promptly announced what had happened once they figured it out. They didn't know what had happened either. They just saw the lake going down and they didn't know what had happened until they reviewed their... They've got security cameras, and they reviewed the security cameras and saw that the gate had blown off the back of the dam. They knew then. And of course, they announced that and as far as all the details, I just... I knew very well once the gate failure was known what was gonna need to be done, and started plugging into the social media, especially Facebook. I was on Facebook, but I was not a member of the Lake Dunlap / New Braunfels Facebook group, and I joined it very quickly. And I knew that I needed to get back involved with [Preserve Lake Dunlap Association]. They had a board meeting scheduled and had one just a day or so later, but it was so soon that they really didn't know what [to do at that point].

Oh, there was a lot of misinformation about what value the lake had for [the Authority]. [T]hat probably the crux of the matter is, you know, where [the Authority] gets their money from, and you know, the... where the value of the water come from. [A] lot of people thought they were selling Lake Dunlap water. And it's true that they sell water out of Lake Dunlap, but it's not actually Lake Dunlap water. It's Lake Canyon lake water is what it is. It's kind of hard if you haven't got used to the idea. There's... The water is stored somewhere and then it's transported. It's transported through the river system. But it's not actually Lake Dunlap water. Lake Dunlap's not a water reservoir. It's strictly a hydro dam. So, there are different types of water rights. People confused about what water rights are, and who owns them and why. Just a lot of, again, trying to establish why [the Authority] should pay for rebuilding the dam, but the simple truth is [the Authority] doesn't need the dam. The only thing it did was bringing in hard money from hydro and that really is not profitable. Not enough to justify spending \$35 million to rebuild the dam. Probably the most extreme [thing people were saying], one guy... There was kind of some dust or something sprayed, flew out when the gate failed, and his theory was that [the Authority] had destroyed the dam deliberately.

You know, this is going to be a cooperative effort with [the Authority]. We need to be friends with them, not enemies. And people work themselves up. But anyway, one of the things they did is they were telling the governor he ought to abolish [the Authority]. They are telling the governor he ought to fire all the [the Authority] directors. They got nowhere with that, by the way. The governor's office sent out a letter that was public, that they need to go back and talk to the [the Authority] directors. He had appointed them, and they were to deal with them.

[As an individual] I'm well aware of what's involved with regulation, governments, and, you know, special river authorities and all of that. You know, as far as an individual just being able to go and say you're going to do this... That doesn't... That's not the way it works. But I, in particular, because of the stuff I've worked on and be, you know... I know how to pull the levers of power, even then I'm just one cog in the wheel though. But I can make a difference. I'm sure I can make a difference. How much? Uh, in the battle with New Braunfels Utilities on their releasing phosphorus, you know, in their wastewater. I was a pretty big cog in that wheel. But this dam, you know, I was just a cog in the wheel. Ahh, I've taken care of a few things and, you know, contribute to the overall success.

Theory

Once the pre-coding, first-cycle coding, and second-cycle coding processes were completed, and initial categories were established, I further analyzed the results using analytic memos to generate three substantive themes and develop an understanding of the elements contributing to them. I presented the results organized by theme which were accompanied by compelling narratives in the form of vignettes. Ultimately, this led to a single-sentence theory presented as a rich statement. The subsequent theory is (1) participants' affective relations with family history, recreation, and the building of family intertwined significantly with the object of water to impact their decision in which physical location they chose to settle in; (2) a desire to return the physical landscape to its previous state as a lake drove people to support individual and organizational roles in accomplishing this—even if it conflicted with their interests; and (3) participants formed different perspective frames of authority, responsibility, and water resources management based on their differences in constructed knowledge.

Study Limitations

There were multiple limitations that impacted this study.

Much of the literature on pragmatism and classical and contemporary American philosophy, so-called *philosophy Americana* by some in the field, is explicitly composed of the “male, white version” of the philosophy—excluding truth and reality from diverse perspectives born of societal experience (Anderson 2006). A goal of objectifying affective relations to enable exploration of affective spaces is to enable the expansion of

study, so that over time, and with more inclusion, the constitution of *philosophy Americana*, as practiced by people, can be represented with more accuracy and precision.

Another limitation is in the study design. Originally, I designed the study with the intention of more closely following the tenants of constructivist grounded theory (Charmaz 2006). This would have resulted in multiple sets of phenomenological interviewing, over a longer period, with each set informed and impacted by the previous. However, due to time and cost limitations, this was not feasible. These impacts disallowed the exploration of sets of phenomenological interviews against each other thus disallowing a longitudinal exploration of participants' constructed affective relations with the object of water (Charmaz 2006, Seidman 2019, Hay and Cope 2021). A study design that followed the tenants of constructivist grounded theory more closely would have allowed a more cohesive exploration of the affective relations network related to the object of water and aided in strengthening the veridicality of the claims as discussed in the analysis/results.

Another impact was the pandemic, which disallowed me from going door to door to seek participants, an action that may have resulted in additional participation and perhaps more diverse participation.

It must be stated that in this type of research, in which the researcher is an instrument of the interviewing tool, there is variability from interview to interview and participant to participant. I noted the potential for this and worked to maintain a cohesive execution. However, my tone and language were not exactly similar for follow-up questions.

The nature of the study design makes it such that the results are not generalizable. Rather, the outcomes fit within the boundary of the study design as tied to the meaning-making process the research and participants simultaneously engaged in. The theoretical subjugation of information to materiality within affective space is critical to allowing researchers to extract and handle this data. This subjugation is expressed through the “actor” treatment of participants’ expressions. It follows that the scale of relativity is the container of this study and that participants were not prompted to communicate beyond what information was received. Further, the interweaving consideration of variables within this container ensures the bias is relative to the contents, further distinguishing the container and indicating that this is indeed a snapshot of the utilization of affective space. Further studies may investigate additional themes across specific contexts in and out of water, enabling researchers to study and observe the ebb and flow of how individuals are interacting with water within affective space and perhaps even allowing the formation of understanding for how connections with other objects may be structured. Additionally, studies that follow up with participants to garner their thoughts about how their use of affective space has been thematically reduced and quantified, possibly to determine future outcomes, will add an important element to representation which will further strengthen the method.

Finally, as this is a master’s thesis, which must be finished for me to move onward to my Ph.D. program, the time limitation only allowed for a few themes to be completely worked through. It is entirely possible to continue working with the materials and discover additional themes and/or process them in new ways.

VI. CONCLUSION

I took a constructivist ontological approach in this research, a derivative of contemporary American philosophy, invoking metaphysical and epistemological constructivism. The significance of this constructivist ontology and epistemology is that it validates and expands the space in which affective relation building, and, ultimately, knowledge construction, are occurring. This new space, an affective space, allows water to exist as an object in multiple spaces: (1) as a chemical compound in physical, *natural* spaces and (2) as an object of abstraction which meaning and knowledge can be constructed of by individuals within affective spaces.

Within the field of affective geography, *affect* has been “translated into [a] number of different competing perspectives...” but central to them is an “impersonal autonomy” which may be considered as an “impersonal ‘force’ that precedes processes of cognition [which] provides us with the opportunity to explore the movements and consequences of these forces and how they impact on and shape” everyday life (Bissell 2021). My study carves a new path in affective geography through conceptual and theoretical alterations, inspired by tenants of post-structuralism, affective geography, and the hydrosocial movement in geography, which allow for the recognition of affective spaces in which agency is granted to abstract objects, such as water, with which people construct affective relations, and, ultimately, produce knowledge of. The consideration of affect in these terms, alongside methodologies such as phenomenological interviewing and qualitative coding, makes it possible for researchers to capture a snapshot of what affective relations individuals have constructed with objects, such as water, and interpret them.

To substantiate my argument, I analyzed qualitative interview data which captured constructed affective relations with the object of water from people who have experienced a dam failure in the Lake Dunlap community. My analysis suggests that (1) participants' affective relations with family history, recreation, and the building of family intertwined significantly with the object of water to impact their decision in which physical location they chose to settle in; (2) a desire to return the physical landscape to its previous state as a lake drove people to support individual and organizational roles in accomplishing this, even if it conflicted with their interests; and (3) participants formed different perspective frames of authority, responsibility, and water-resources management based on their differences in constructed knowledge.

This thesis cannot definitively prove theoretical frameworks that recognize affective spaces within which abstract objects are granted agency to impact affective relation building. However, the qualitative interview data within this theoretical framework are suggestive of the agential capacity of the object of water to impart and impact the construction of affective relations which, ultimately, impacts constructed knowledge and subsequent, major, geographic decisions, such as places of settlement, action to change physical landscapes, and perspective frames of water-resources management. This theoretical shift closes the gap between *natural* and *social* sciences and gives shape to developing an understanding of how affective relationships with objects impact people and the world around them. The subsequent theory based on the theoretical shift presented in this study is the recognition that affective spaces grant agency to objects with which people may construct affective relations, materialism as an element in the construction of knowledge, the heterogeneity of individual experience, and

power of the individual which allows a more authentic version of lived experience to be captured in data.

While there is a lack of research in this area, researchers have concluded that it is important for researchers to continue to cross-pollinate theoretical approaches to further understand affective relations (Smith et al. 2018). Future studies ought to make use of different theoretical foundations, methodological approaches, and explore a variety of objects and subjects to clarify the process.

In addition to the theoretical lacuna addressed in this study, the detailed description of events provides information that informs the dam failure phenomena and may be informative to environmental and infrastructure policy. It provides other communities facing dam failure with a baseline of understanding for issues and processes which may lead to resolution. The results highlight the social challenges of managing dam infrastructure by providing context for the content of affective relations with the object of water individuals' construct. It also adds to the literature that exemplifies differences in individual perspective frames on accountability in water resources management and infrastructure, and how those perspective frames may impact their positions and action. It provides an understanding of why these environments are important to human behavior and community and offers the opportunity to include in models these impacts to increase the efficacy of communication by those who own and operate dams.

While some communities, such as Lake Dunlap, Lake McQueeney, and Lake Placid, have the tax base and development to support the creation of water control and improvement districts to pay for the replacement, repair, and maintenance of the dams,

other communities do not have the tax base or development (Brown 2020, Dascher and Meitzen 2020, GBRA 2021a). To date, Lake Wood and Lake Gonzales are partially dewatered, and, although Meadow Lake is at normal levels, all three are without prospect for dam replacement or repair without the support of state and federal funding assistance and stakeholder partnerships (Dascher and Meitzen 2020; GBRA 2020b; 2021a, c, d; TCEQ 2022b).

APPENDIX SECTION

Appendix I: Dams of the Guadalupe Valley Lakes Region

Appendix I: Information on all six reservoirs and dams, owned and operated by the Guadalupe-Blanco River Authority, which constitute the Guadalupe Valley Lakes Region (data from GBRA [2018a] and National Inventory of Dams [2022]). NID ID = National Inventory of Dams Identification Number. TCEQ = Texas Commission on Environmental Quality.

Reservoir name	Dam name	Public water supply ?	NID ID (Federal ID)	TCEQ assessment unit	Latitude	Longitude	Number of spill gates	Hazard category
Lake Dunlap	TP-1 Dam	Yes	TX01602	AU1804_04	29.65399	-98.0663	3	High
Lake McQueeney	McQueeney Dam	Yes	TX01601	AU1804_03	29.59436	-98.0407	3	High
Lake Placid	TP-4 Dam	Yes	TX01600	AU1804_02	29.54845	-97.9996	2	High
Meadow Lake	Nolte Dam	Yes	TX01599	AU1804_02	29.52883	-97.9395	3	High
Lake Gonzales	H-4	No	TX01912	AU1804_05	29.49582	-97.6245	2	High
Lake Wood	H-5 Dam	No	TX01913	AU1804_01	29.46836	-97.4921	2	High

Appendix II: Financing and Repair Timeline

Appendix II: Financing and timeline information for dam replacement and repair at all six dams in the Guadalupe Valley Lakes Region. Sources: Texas Commission on Environmental Quality 2022B

DAM NAME	FINANCING STATUS – FOR REPLACEMENT AND REPAIR	REPAIR TIMELINE
Lake Dunlap Dam	A Water Control and Improvement District has been formed and authorized to fund required replacements and hardening, and ongoing operations.	Construction began in 2021, with completion projected in 2023.
Lake McQueeney Dam	A Water Control and Improvement District has been formed and authorized to fund required replacements and hardening, and ongoing operations.	Construction is scheduled to begin in 2022 with completion projected in 2024.
Lake Placid Dam	A Water Control and Improvement District has been formed and authorized to fund required replacements and hardening, and ongoing operations.	Construction is scheduled to begin in 2022 with completion projected in 2024.
Nolte Dam (Meadow Lake)	Continued operations paid for from Guadalupe-Blanco River Authority's contract revenues from hydroelectric generation. No prospect for replacement or repair.	Due to replacement costs and insufficient revenues to cover expenses, continued operations and maintenance are unsustainable.
Lake Gonzales Dam	Continued operations paid for from Guadalupe-Blanco River Authority's contract revenues from hydroelectric generation. No prospect for replacement or repair.	Due to replacement costs and insufficient revenues to cover expenses, continued operations and maintenance are unsustainable.
Lake Wood Dam	Continued operations paid for from Guadalupe-Blanco River Authority's contract revenues from hydroelectric generation. No prospect for replacement or repair.	Due to replacement costs and insufficient revenues to cover expenses, continued operations and maintenance are unsustainable.

Appendix III – Interview Questions: Participants living on Lake Dunlap

Meeting I: Interview Questions

1. *Intro: For this first interview, I really want to get to know your history with water, so your focus is just on sharing stories. I'll help guide you through your history with water from as far back as you can to just prior to the dam failure.*
 - a. In what year were you born, and where? How long did you live there?
 - i. For each place lived:
 1. How long did you live there? What was it like? How did your family drink water in your household while y'all lived there? How did your family use water in your household while y'all lived there? What do you remember about water there? How did it affect you?
 - b. What stories did your parents/family/others tell you about water?
 - c. What is your profession? Your educational level?
 - d. What is your recreational experience with water?
 - e. How did you end up at or near Lake Dunlap area? Specify where (waterfront, non-waterfront).
 - f. How did you use Lake Dunlap prior to the dam failure?
 - g. At any point from your childhood until just before the dam failure, what are the most significant stories you can recall which involve water?

Meeting II: Interview Questions & Water Object Survey

1. *Intro: For the first part of this meeting, I am interested in your personal experience with the dam failure; how it was managed immediately and through the following year and a half. There will also be questions about water science & infrastructure and other, more abstract, questions about your relationship with water. My goal is to gain a better understanding of your relationship with water; how you interacted with information throughout this process; and how your experience with the dam failure created or altered your knowledge of water.*
 - a. Describe the day the dam failure occurred—from the moment you woke up until you went to sleep—I will help focus and guide you
 - i. Who did you contact after the dam failed? What conversations did you have?
 - ii. What internet sites did you access after the dam failed? Did you interact by reading other's comments or posting any of your own?
 - b. What sources did you begin to trust and regularly access? How did you originally find these sources?
 - c. How did the dam failure affect you? What was the effect of the failure—on your home? Your business? Your community?
 - d. What solutions to the dam failure circulated? Which gained the most traction? Were there divisions in the community about how to proceed? How did you try to overcome these divisions? What divisions remain?
 - e. On November 3rd, 2020, there was a vote on three propositions regarding the future of the dam and Lake Dunlap. The three propositions on the ballot were described as follows: "Proposition A would officially form the Lake Dunlap [Water Control & Improvement District (WCID)], which is the first step in allowing the residents to tax themselves to rebuild the dam. Proposition B would set an upper limit on the WCID maintenance and operation tax rate at \$0.10 per \$100 valuation, and Proposition C would give the WCID the

authority to levy a tax to repay bonds issued by the GBRA for the dam construction up to \$40 million.”

- i. What organizations, individuals, and agencies do you credit as being responsible for getting the three propositions on the November 3rd, 2020 ballot?
- ii. Did you vote in the election (for / against / abstain) for these three propositions? If so, how? Why?
 1. What are your thoughts about individuals who voted differently than you on these measures? What may be some of the reason they did such?
- f. What are your thoughts about individuals who voted against these measures for economic reasons (e.g. simply unable to afford the additional taxes)?
- g. A report released in 2020 by the Guadalupe County Appraisal District indicated that lakefront house values would drop 28% in 2020 and 2% in 2021 (Brown 2020). After that, it indicates an increase of 10% per year from 2022-2024. Have appraisal values affected you? How?

2. *Scientific and Water Literacy*

- a. Do you or your household actively attempt to conserve water? If so, what methods do you use to conserve water? [Araya et al. 2020]
- b. I will provide the definition: “Water recycling is reusing treated wastewater for beneficial purpose.” I will then state: “For each statement about recycled water, please tell me if it is true or false. If you do not know or are not sure, just say so.” [Glick et al. 2019]. You may describe how you came to that conclusion after providing an answer.
 - a. Recycling water is more expensive than removing salt from seawater.
 - b. At least one of the largest ten cities in the U.S. uses recycled water for drinking water.
 - c. At least one of the largest five cities in Texas uses recycled water for drinking water.
 - d. The United States recycles roughly 10% of the water it uses.
 - e. There are documented cases of people becoming sick because of using recycled water that has been treated to meet standards and regulations.
- c. From the list of potential water contaminants below, rank them in order of most concern to least concern [Glick et al. 2019].
 - a. Metals (arsenic, lead)
 - b. Pharmaceuticals
 - c. Human waste/sewage
 - d. Pesticides/agricultural chemicals
 - e. Industrial waste
- d. How much do you feel you know about global warming—a lot, a moderate amount, a little, or nothing?
- e. How strong are your opinions on the issue of global warming—extremely strong, very strong, somewhat strong, not too strong, or not strong at all?
- f. How important is the issue of global warming to you personally—extremely important, very important, somewhat important, not too important, or not at all important?
- g. Considering global warming—How does it connect with water? This can be in general, or directly relate to Lake Dunlap

3. *Water Object Survey*

a. General

- i. How do you drink your water (filter through fridge, tap water, bottled water, combination)? Why?
- ii. How do you cook with water? Why?
- iii. How do you use water for recreation? Where? Why?
- iv. How do you use water beyond drinking, cooking, and recreation?

b. Policy [general, water]

- i. In consideration of rights to water, it typically falls under one of two categories, or a mixture of the two, which are (1) water is a human right or (2) water is a property right. What does the former mean? What does the latter mean? Which do you align with (it is okay if it is a mixture)? Describe how.
 - i. Does the federal government recognize water as a human right, a property right, or a mixture?
 - ii. Does the state government recognize water as a human right, a property right, or a mixture?
 - iii. Does the Guadalupe Blanco River Authority recognize water as a human right, a property right, or a mixture?
- ii. When it comes to water, what organizations or agencies do you think offer you the most benefits, and what are they?
- iii. How do you stay aware of potential governmental action which would affect your interaction with water?
- iv. What interactions do you have with water that you are most concerned about being altered in a negative way?
- v. How do you know if a body of water / stream is public (state or federal) or private?

c. Infrastructure

- i. Who owns the dam?
- ii. Why was the dam originally installed?
- iii. What was the dam's function before its failure?
- iv. What is going to be the function of the dam once it is restored?
- v. Who owns the lake?
- vi. Who owns the water in this lake?
- vii. Where does the water in the lake come from? What is it used for?
- viii. Where does the water from your tap come from? Trace it as far as you are able from your spout to the source.
- ix. If you were invited to visit your local wastewater treatment center for a tour of the facility, including the laboratory, would you be interested?

d. Organizational Awareness

- i. What local (public or private) organizations/agencies are involved in water? How?
- ii. What state (public or private) organizations/agencies are involved in water? How?
- iii. What federal (public or private) organizations/agencies are involved in water? How?
- iv. Who is responsible for the water quality of your drinking water?
- v. Who is responsible for the water quality of the water in Lake Dunlap?

- vi. How would you know if there is an issue with the water quality of Lake Dunlap?
- vii. How would you know if there is an issue with the drinking water quality from your tap / whatever source you get your drinking water from?
- e. Information Access
 - i. In general, what sources of information do you get the most out of?
 - ii. Relative to water, what sources of information do you get the most out of?
 - iii. Before the dam failure, who did you exchange the most information with about water?
 - iv. After the dam failure, who do you exchange the most information with about water?
 - v. How do you access information regarding water? May vary depending on consideration (e.g. recreational, policy, criminal).
 - vi. Have you used social media to talk about water, or access other's expressions relative to water?
- f. Abstract (rights, power; responsibility; accountability; authority, ownership)
 - i. What stories have you heard about tap water? How have they influenced your drinking decisions? *Or* What stories have you heard about water which influence your drinking decisions?
 - ii. If a recipe calls for water, does it matter if it will be boiled / baked / cooked in your selection of where it comes from (i.e., using filtered water for a pre-mixed drink packet vs. tap water for boiling pasta)? How? Why? [*Would you treat it differently prior to its use? Such as: using filtered instead of tap, using bottled instead of tap, using tap, not minding any of the above. And why? Such as: 'keep filtered water in the fridge and want it cold'; 'it's going to be boiled anyway, so tap'; 'filtered water for everything—including boiling pasta'*]
 - iii. To what extent are you as an individual powerful enough to change policy related to water? Has the dam failure and subsequent events impacted your position on this?
 - iv. There are a lot of highly educated and powerful individuals who live in this community (including lawyers, PR firm executives, and scientists). If they did, how did those roles play into the success of Lake Dunlap restoring the water and a new dam?
 - v. If there was a change in your drinking water quality—who would be accountable? If there was a change in the water quality of Lake Dunlap—who would be accountable?
 - vi. How have the subsequent processes your community undertook impacted your approach to issues with water?
 - vii. What do you need to visually see to describe Lake Dunlap as healthy? What other sense factors inform you of the lake's health?

Appendix IV – Interview Questions: Participants living near Lake Dunlap

Meeting I: Interview Questions

1. *Intro: For this first interview, I really want to get to know your history with water, so your focus is just on sharing stories. I'll help guide you through your history with water from as far back as you can to just prior to the dam failure.*
 - a. In what year were you born, and where? How long did you live there?
 - i. For each place lived:
 1. How long did you live there? What was it like? How did your family drink water in your household while y'all lived there? How did your family use water in your household while y'all lived there? What do you remember about water there? How did it affect you?
 - b. What stories did your parents/family/others tell you about water?
 - c. What is your profession? Your educational level?
 - d. What is your recreational experience with water?
 - e. How did you end up at or near Lake Dunlap area?
 - f. How did you use Lake Dunlap/Lake McQueeney prior to the dam failure?
 - g. At any point from your childhood until just before the dam failure, what are the most significant stories you can recall which involve water?

Meeting II: Interview Questions & Water Object Survey

1. *Intro: For the first part of this meeting, I am interested in your personal experience with the dam failure; how it was managed immediately and through the following year and a half. There will also be questions about water science & infrastructure and other, more abstract, questions about your relationship with water. My goal is to gain a better understanding of your relationship with water; how you interacted with information throughout this process; and how your experience with the dam failure created or altered your knowledge of water.*
 - a. Describe the day the dam failure occurred—from the moment you woke up until you went to sleep—I will help focus and guide you
 - i. Who did you contact after the dam failed? What conversations did you have?
 - ii. What internet sites did you access after the dam failed? Did you interact by reading other's comments or posting any of your own?
 - b. What sources did you begin to trust and regularly access? How did you originally find these sources?
 - c. How did the dam failure affect you? What was the effect of the failure—on your home? Your business? Your community?
 - d. What solutions to the dam failure circulated? Which gained the most traction? Were there divisions in the community about how to proceed? How did you try to overcome these divisions? What divisions remain?
 - e. On November 3rd, 2020, there was a vote on three propositions regarding the future of the dam and Lake Dunlap. The three propositions on the ballot were described as follows: "Proposition A would officially form the Lake Dunlap [Water Control & Improvement District (WCID)], which is the first step in allowing the residents to tax themselves to rebuild the dam. Proposition B would set an upper limit on the WCID maintenance and operation tax rate at \$0.10 per \$100 valuation, and Proposition C would give the WCID the

authority to levy a tax to repay bonds issued by the GBRA for the dam construction up to \$40 million.”

- i. What organizations, individuals, and agencies do you credit as being responsible for getting the three propositions on the November 3rd, 2020 ballot?

4. *Scientific and Water Literacy*

- a. Do you or your household actively attempt to conserve water? If so, what methods do you use to conserve water? [Araya et al. 2020]
- b. I will provide the definition: “*Water recycling is reusing treated wastewater for beneficial purpose.*” I will then state: “*For each statement about recycled water, please tell me if it is true or false. If you do not know or are not sure, just say so.*” [Glick et al. 2019]. **You may describe how you came to that conclusion after providing an answer.**
 - a. Recycling water is more expensive than removing salt from seawater.
 - b. At least one of the largest ten cities in the U.S. uses recycled water for drinking water.
 - c. At least one of the largest five cities in Texas uses recycled water for drinking water.
 - d. The United States recycles roughly 10% of the water it uses.
 - e. There are documented cases of people becoming sick because of using recycled water that has been treated to meet standards and regulations.
- c. From the list of potential water contaminants below, rank them in order of most concern to least concern [Glick et al. 2019].
 - a. Metals (arsenic, lead)
 - b. Pharmaceuticals
 - c. Human waste/sewage
 - d. Pesticides/agricultural chemicals
 - e. Industrial waste
- d. How much do you feel you know about global warming—a lot, a moderate amount, a little, or nothing?
- e. How strong are your opinions on the issue of global warming—extremely strong, very strong, somewhat strong, not too strong, or not strong at all?
- f. How important is the issue of global warming to you personally—extremely important, very important, somewhat important, not too important, or not at all important?
- g. Considering climate change—How does it connect with water? This can be in general, or directly relate to Lake Dunlap/McQueeney

5. *Water Object Survey*

- g. General
 - i. How do you drink your water (filter through fridge, tap water, bottled water, combination)? Why?
 - ii. How do you cook with water? Why?
 - iii. How do you use water for recreation? Where? Why?
 - iv. How do you use water beyond drinking, cooking, and recreation?
- h. Policy [general, water]
 - i. In consideration of rights to water, it typically falls under one of two categories, or a mixture of the two, which are (1) water is a human right or (2) water is a property right. What does the former mean?

What does the latter mean? Which do you align with (it is okay if it is a mixture)? Describe how.

- i. Does the federal government recognize water as a human right?
 - ii. Does the state government recognize water as a human right?
 - iii. Does the Guadalupe Blanco River Authority recognize water as a human right?
 - ii. When it comes to water, what organizations or agencies do you think offer you the most benefits, and what are they?
 - iii. How do you stay aware of potential governmental action which would affect your interaction with water?
 - iv. What interactions do you have with water that you are most concerned about being altered in a negative way?
 - v. What current water policies are the most ineffective? How? Why do you support these positions?
 - vi. What current water policies are the most effective? How? Why do you support these positions?
 - vii. How do you know if a body of water / stream is public (state or federal) or private?
- i. Infrastructure
- i. Who owns the dam?
 - ii. Why was the dam originally installed?
 - iii. What was the dam's function before its failure?
 - iv. What is going to be the function of the dam once it is restored?
 - v. Who owns Lake McQueeney?
 - vi. Who owns the water in Lake McQueeney?
 - vii. Where does the water in the lake come from? What is it used for?
 - viii. Where does the water from your tap come from? Trace it as far as you are able from your spout to the source.
 - ix. If you were invited to visit your local wastewater treatment center for a tour of the facility, including the laboratory, would you be interested?
- j. Organizational Awareness
- i. What local (public or private) organizations/agencies are involved in water? How?
 - ii. What state (public or private) organizations/agencies are involved in water? How?
 - iii. What federal (public or private) organizations/agencies are involved in water? How?
 - iv. Who is responsible for the water quality of your drinking water?
 - v. Who is responsible for the water quality of the water in Lake McQueeney?
 - vi. How would you know if there is an issue with the water quality of Lake McQueeney?
 - vii. How would you know if there is an issue with the drinking water quality from your tap / whatever source you get your drinking water from?
- k. Information Access
- i. In general, what sources of information do you get the most out of?

- ii. Relative to water, what sources of information do you get the most out of?
 - iii. Before the dam failure, who did you exchange the most information with about water?
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- i. What stories have you heard about tap water? How have they influenced your drinking decisions? *Or* What stories have you heard about water which influence your drinking decisions?
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 - iii. To what extent are you as an individual powerful enough to change policy related to water? Has the dam failure and subsequent events impacted your position on this?
 - iv. There are a lot of highly educated and powerful individuals who live in this community (including lawyers, PR firm executives, and scientists). If they did, how did those roles play into the success of Lake Dunlap restoring the water and a new dam?
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 - vi. How have the subsequent processes your community undertook impacted your approach to issues with water?
 - vii. What do you need to visually see to describe Lake McQueeney as healthy? What other sense factors inform you of the lakes health?

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