THE JORDAN RIVER BASIN

"The Jordan River carries a flow equal to only 2 percent of the Nile's, is no more than 340 kilometers long, and is an unimpressive, muddy brown strewn compared to the serenely rolling river that spreads its wide expanse through the heart of Cairo" (Bulloch and Darwish 199, 28).

The Jordan River, a relatively small river basin in comparison to the Nile, is shared by five riparian states and flows from Mount Hermon down to the Dead Sea. While the Jordan River may not be the most impressive when it comes to size or length, it has a great potential for conflict as populations continue to rise and the river begins to run dry. The Jordan River basin is a major area of concern as three of the five entities that share the transboundary waters of the Jordan are expected to experience "absolute water scarcity" by 2025 (i.e., they will be unable to provide enough water to sustain their currently growing populations) (Seckler, Barker, and Amarasinghe 1999).

Due to the arid nature of the region, these co-riparians are all experiencing serious water deficits (Phillips et al. 2007, 16). In 2010, much of the Jordan River basin experienced one of its hottest and driest years on record (Garcia-Navarro 2010,1). As Israel's top rabbis begged for divine intervention, the price of fruit and vegetables skyrocketed as a result of farmers being charged more for exceeding their water quotas (Garcia-Navarro 2010, 1). After nearly seven years of drought, the general fear was that these water scarcity realities may be here to stay.

As the available water resources of the region continue to diminish, Israeli and Palestinian representatives continue to engage in final status negotiations for the Israeli and Palestinian occupied territories, which are expected to result in another influx of refugees and immigrants to the area. The question is, will the Jordan's riparians respond to the influx in population in the
same way they did in the 1950s when they unilaterally developed their water resources resulting in all-out water conflict, or will they engage in the multilateral basin-wide management of their scarce resources to achieve greater water security throughout the region.

**GEOGRAPHY AND HYDROLOGY OF THE JORDAN RIVER BASIN**

The Jordan River basin has a catchment area of roughly 17,300 square kilometers (Elhance 1999, 87). The river originates from a group of springs located on the western and southern slopes of Mount Hermon, which to flow south for 228 kilometers until the river meets the Dead Sea (Elhance 1999, 87; Murakami 1995, 69; Murakami and Musiake 1994, 118). Within its basin, "there is no unclaimed water, no untapped stream or virgin spring or undiscovered groundwater" (Ward 2002, 189). While the Jordan's historic natural flow is estimated to be between 1,470 and 1,670 million cubic meters (mcm) per year (Rumman 2010, 253), today its annual flows are estimated to have dropped to only 70,000 mcm as a result of massive diversion schemes for irrigation (Bromberg 2008, 3).

The headwaters of the Jordan River originate in southern Lebanon as the Hasbani River, in northern Israel as the Dan River, and in Syria as the Banias River (Rumman 2010, 253). The annual average flows of the Hasbani, the Dan, and the Banias Rivers are 160, 260, and 160 million cubic meters per year respectively (Rumman 2010, 253). The upper Jordan River is then formed a few kilometers south of Israel's northern border at the point where the three rivers merge. On average, these springs provide close to 50 percent of the flow of the upper Jordan River with the rest of the river's flows supplemented with winter rainfall runoff (Elhance 1999, 89).

The upper Jordan River flows south through the Huleh Valley until it reaches Lake Tiberias, also known as Lake Kinneret or the Sea of Galilee, which acts as the main natural storage reservoir of the basin and occupies an area of 166 square kilometers (Elhance 1999, 91; Elmusa 1997, 55). From here, it flows south for 10 kilometers until it merges with the Yarmouk River, its main tributary. This river forms a border 40 kilometers long between Syria and Jordan before it becomes a border between Jordan and Israel (Elhance 1999, 89; Elmusa 1997, 57-58). The Yarmouk discharges between 400 and 500 million cubic meters per year into the Jordan River; however, its flows have also been drastically reduced over the years due to multiple water diversions in Syria and Jordan (Pearce 2006, 170; Kliot 2000, 192). The lower Jordan River forms a border 40 kilometers long between Jordan and Israel before it becomes the border between Jordan and the West Bank (Elhance 1999, 89).

The Jordan River continues to flow south through the Jordan Valley and into the Dead Sea, the saltiest and lowest body of water on earth (Amery and Wolf 2000, 7). As a result, the Dead Sea is becoming saltier and lake levels are falling at a rate of up to two meters per year (Elhance 1999, 90).

This reduction in surface waters has led the Jordan River riparians to over-pump groundwater from the aquifers located in the West Bank and in Israel's coastal plain to meet their growing water demands (Solomon 2010, 401). The Middle East and Northern Africa have the least actual renewable water resources per capita in the world; however, the countries in this region withdraw the highest percentage of their total renewable water resources compared to other regions in the world (MENA Development Report 2007). As Solomon points out, "by 2000, the people living in the heart of the [Jordan River] basin were withdrawing 3.2 billion cubic meters of water, well in excess of the 2.5 billion cubic meters that is recharged each year by natural rainfall" (2010, 401).

As mentioned above, the Jordan River basin is shared by five riparians: Lebanon, Syria, Israel, Jordan, and the West Bank (Phillips et al. 2007, 16). The basin is located in a predominantly arid climate with over half of Jordan, Israel, and Syria receiving less than 250 mm of precipitation per year (Amery and Wolf 2000, 7). The current population in the Jordan River basin is roughly 12 million people (Solomon 2010, 401); however, as the population swells in coming years, demands on the basin's increasingly scarce water resources are expected to mount. Additionally, the water quality of the Jordan River continues to decline as a result of increasing pollution from human—mostly agricultural and waste disposal—activities (Elhance 1999, 91). The future of the Jordan River basin's water resources does not look promising. Moreover the basin has a long and volatile history that has already witnessed armed conflicts between its riparians over securing the Jordan's flows. There is no wonder that "today, the Jordan remains the likeliest of all the river systems of the Middle East to cause a new conflict, not only because it is shared by [five] . . . mutually antagonistic states but also because it is over-exploited, of low quality and capable of
improvement only by complicated and extensive joint action" (Bulloch and Darwish 1993, 36).

**Jordan**

Jordan is 80 percent desert and ranks among the nations with the scarcest available renewable water resources per capita in the world (Murakami 1995, 167; Simon 1998). The amount of available water resources in Jordan amounts to far less than most countries in the Middle East and is expected to drop to less than 125 cubic meters per person per year in the next 25 years (Mohsen 2007, 28; Shuval 2000, 609). This is considered to be the Minimum Water Requirement (MWR) for human survival (Shuval 2000, 609). Jordan's population has been growing at a rate of 3.7 percent per year, mainly due to migration from the West Bank and the Gaza Strip, and is expected to reach 7.9 million by 2010 (Simon 1998; Murakami 1995, 167; Lowi 1993a, 158). If living standards are to remain the same, water demand will double during this time period. However, as living standards rise, the demands on the water supply will be even greater (Lowi 1993a, 158). The main surface waters in Jordan are the Jordan, the Zarqa, and the Yarmouk rivers. Due to diversions and over-pumping by Syria and Israel, these waters have become increasingly unreliable (Mohsen 2007; Ward 2002, 189). The Zarqa, which is the only river that flows entirely within Jordan, has been seriously impacted by pollution from nearby industry in Amman (Mohsen 2007). As a result of these reduced surface flows, Jordan relies on groundwater resources to sustain its population (Mohsen 2007).

The struggle for Jordan merely begins here though, as they must also deal with Saudi Arabia overdraining water from the Disi aquifer on the border between the two countries (Elhance 1999, 91, 107; Bulloch and Darwish 1993, 24). This underground aquifer can produce up to 100-120 million cubic meters per year at safe yield which could then be pumped to Aqaba and eventually to Amman and Zarqa. However, Saudi Arabia began pumping water from the aquifer in 1983 at a rate of 25 million cubic meters per year and is reported to have increased their withdrawals to 250 million cubic meters per year (Elhance 1999, 107). At this rate, this resource may be completely exhausted within 25 years time (Elhance 1999, 107). As populations continue to rise in Jordan, this may result in a more antagonistic situation as Jordanians seek out alternate drinking supply sources for Amman (Bulloch and Darwish 1993, 25). Despite the potential for conflict to arise over the Disi aquifer, Jordan is merely buying time by draining their underground sources. As these water resources are further depleted, Jordan will need to transition toward more sustainable water management strategies if it plans to sustain its growing population (Murakami 1995, 169).

**Lebanon**

While Lebanon's capital was once known as the "Paris of the Middle East," its national economy and infrastructure were left in ruins after the 1975 civil war (Elhance 1999, 98). Despite Lebanon's struggles at home, it holds a "highly valuable comparative advantage over the other riparian states sharing the Jordan Basin as it is the only water-rich, and perhaps, water-surplus state located close to the basin" (Elhance 1999, 99). However, being home to the headwaters of the Hasbani and the Litani Rivers has also made Lebanon a territory of interest to its less water-endowed neighbors, leading to armed conflict with Israel on multiple occasions. Although it is more than likely that water was merely a secondary cause for the conflict rather than a cases belli in itself.

**Syria**

While Syria, unlike its neighboring riparians, is still expected to have significantly more water at its disposal than the Minimum Water Requirement in the next 25 years (Shuval 2000, 609), its water resources are unevenly distributed across its territory (Elhance 1999, 98). The majority of Syria's population is concentrated in the western region where the water resources are more plentiful, while the more arid eastern region is sparsely populated (Elhance 1999, 98). Unlike Jordan and Israel, however, Syria has access to additional water sources outside the Jordan River basin, namely the Orontes River and the Euphrates-Tigris system (Elhance 1999, 98). However, both of these rivers originate outside Syrian territory, in Lebanon and Turkey, making Syria vulnerable to the water schemes of its upstream riparians (Elhance 1999, 98). Syria depends mainly on the Euphrates for its water, so its main concerns are over relations with Turkey (Sosland 2007; Bulloch and Darwish 1993). As Turkey continues to alter the flow of the Euphrates and as Syria continues to face an ongoing food deficit for its ever-expanding population, many of the major cities in Syria will have to start rationing water to deal with water scarcity (Sosland 2007; Bulloch and Darwish 1993; Gleick 1993). If water shortages continue, all additional sources of water supply, such as the Yarmouk and Jordan, will become increasingly more important to Syria as it strives to achieve water security to meet the needs of its growing population (Bul(och and Darwish 1993). In fact, Syria has already made several
The territory of the West Bank comprises mostly hilly regions in the north, west, and center; valley lands in the east; and desert in the south (Elhance 1999, 110).

Israel

While the state of Israel came into being in 1948, its quest for water security in the region began much earlier as Zionist leaders identified the need to secure water resources to meet the water, and agricultural, needs of a much larger Jewish state (Elhance 1999, 107). For the first two decades after its founding, Israel, as the most downstream riparian in the Jordan River basin, asserted its prior use rights through substantial settlement activity and water withdrawals within the occupied lands (Elhance 1999, 108). However, Israel's main concern has always been over water security as it is surrounded by unfriendly Arab countries that could easily sabotage water supplies if they did not remain safely within Israel's borders (Pearce 2006, 171; Gleick 1993). While many argue that water had nothing to do with the Six Day War, Pearce observes that: "Before the war, less than a tenth of the Jordan River's basin was within Israel's borders; by the end, the basin was almost entirely controlled by Israel" (2006, 168). Knowing that almost a third of Israel's water supply is tied to the territory it occupied after the Six Day War, it is difficult to pretend that the creation of more secure access points to water supplies did not play a more significant role in the Israeli-Arab conflict of 1967 (Simon 1998). Even so, Israel, like Jordan, is expected to reach the Minimum Water Requirement in the next 25 years (Shuval 2000, 609). Unlike Jordan, however, Israel also has access to multiple underground aquifers—two in Israel and two in the West Bank that have been severely over-exploited (Seekler, Barket and Amarasinghe 1999; Lowi 1993b). Aquifers on the coast are experiencing saltwater intrusion from over-pumping and those in the West Bank, while becoming more polluted over time, have also been the center of several disputes over whether this water should rightfully be in the hands of the Palestinians (Postel 1993; Starr 1991). Israel is home to a growing population with increasing demands for fresh water, and Israel has managed to develop some hugely successful water-saving strategies that are now being used throughout the world (Simon 1998).

The West Bank

The territory of the West Bank comprises mostly hilly regions in the north, west, and center; valley lands in the east; and desert in the south (Elhance 1999, 99). Until its occupation by Israel in 1967, the Palestinian people relied upon rain-fed agriculture to meet their growing needs (Elhance 1999, 99). While there were only a few wells drilled in the West Bank prior to the 1967 occupation, by June 1967 there were 314 wells in the western slopes and the Jordan Valley (Elhance 1999, 99). However, the Israelis placed stringent restrictions upon Palestinian water use and irrigation development after the occupation, which have seriously limited development activity throughout the Palestinian territories—namely, the West Bank and the Gaza Strip (Elhance 1999, 99). While the Palestinians' access to the surface waters of the Jordan River has been relatively non-existent since the 1967 occupation, the underlying aquifers in the West Bank have acted as an additional source for conflict between Israelis and Palestinians for decades. While the aquifers located in the West Bank are recharged predominantly by the rains falling over the Palestinian-occupied territories, 80 percent of these flows end up flowing naturally westward where they are extracted largely from within Israel's pre-1967 borders (Rabbo 2010, 154; Bulloch and Danish 1993 44). Thus, the Israelis have control over the majority of the surface and ground waters of the Jordan River basin, including the flows in the occupied West Bank, which leaves the Palestinians at a serious disadvantage when it comes to their water security and ability to meet growing water demands for economic development (Abdeen 2010, 67). For example, the average Israeli consumes roughly 350 million cubic meters (mcm) of water a year while the average Palestinian uses only 100 mcm per year, the minimum water requirement for domestic, urban, and industrial use (Abdeen 2010, 67; Rabbo 2010; 154). In addition to poor access to water resources throughout the Palestinian territories due to Israeli restrictions, shortages in drinking water can also be attributed to the fact that 70 percent of the available water resources are used by the agricultural sector and an average of 44 percent of the water supply is lost in the system as a result of faulty infrastructure due to leakage and unregistered connections (Rabbo 2010, 155).

Despite continued political instability throughout the Palestinian occupied territories, if an independent Palestinian state does emerge as a result of the peace negotiations, it will most certainly demand a fair share of the Jordan's flows as well as the right to an increased share of the water stored in the aquifers in the West Bank (Elhance 1999, 107). Enduring peace throughout the region would have significant implications for the sharing of the Jordan River basin's water resources as water demands would likely increase throughout the region as a result of an influx of refugees to the area—and growing water scarcity due to climate change. Despite the growing demands, peace throughout the region may in fact lead to increased water security throughout the basin as Jordan River riparians would be more likely to engage in more sustainable, basin-wide management of the Jordan's flows when they are no
longer having to play the zero-sum game and outcompete their water-hungry neighbors.

HISTORY AND HYDROPOLITICS OF THE JORDAN RIVER BASIN

Hydropolitics in the Jordan River basin can only be understood when it is recognized that Israel's survival is dependent upon its ability to control the flows of the Jordan, just as Egypt's survival is dependent upon the flows of the Nile. While Israel only has to share the flows of the Jordan with four riparians, it is surrounded by antagonistic states that would not hesitate to sabotage Israel's water supplies if they did not remain safely within its borders. The most powerful riparian, both economically and militarily, Israel is the only downstream nation that has been able to physically change its riparian position in a basin by occupying upstream territories by force (Sosland 2007; Elhance 1999, 109; Bulloch and Darwish 1993, 41). Even before the war of 1967, Israel has not hesitated to "warn its neighbors that any attempt by them to significantly alter the flow of the Jordan River would invite a military response" (Elhance 1999, 108).

The independent Jewish state of Israel was created in 1948. It was realized early on that the success of this new nation would depend on its ability to exploit the Jordan Valley's then untapped water supply, electric power, and agricultural potential (Amro 2006; Lowi 1993b). Following the Arab-Israel war of 1948-1949, Israel and Jordan experienced massive influxes of immigrants and refugees and found their resources strained considerably. As a result, they both became independently engaged in the creation of national water schemes (Amro 2006; Lowi 1993a, 80). Throughout this period, the Jordan River basin riparians were frequently engaged in armed hostilities over objections to both the unilateral attempts of Israel and Jordan to tap the Jordan River's resources as well as Israel's pursuit of development projects in contested territory (Lowi 1993a, 80). In 1951, Israel began to drain the Huleh Lake and marshes to increase the flow of the upper Jordan. The drainage project ended up spilling over into the demilitarized zone agreed upon in the 1949 armistice agreement and as a result, Israeli and Syrian troops engaged in fi ghts (Bulloch and Darwish 1993, 33). "The Huleh drainage drew the attention of the Arabs to the importance of water in their conflict with Israel and led to the realization that upstream countries had their hand on the water tap, and might be able to exploit this form of pressure" by diverting the headwaters of the Jordan away from downstream Israel (Bulloch and Darwish 1993, 33).

Israel, incessantly aware of its vulnerable riparian position in relation to its hostile upstream neighbors, was "determined to change the hydrological map so that it could control its own resources and ensure supplies for all the Jews who wanted to settle in Israel" (Bulloch and Darwish 1993, 33). To achieve this desired level of water security, Israel began the creation of a National Water Carrier, a large pipeline capable of carrying over 493 million cubic meters of water per year from Lake Tiberias down to Rosh Haayin near Tel Aviv. Years later, with the aid of extensions, the carrier was able to bring water from the north and central regions to the country's urban centers and to agricultural settlements as far south as the Negev Desert (Pearce 2006, 170; Amro 2006; Dolatyar and Gray 2000, 105). This carrier allowed Israel to increase the amount of cultivated land from 1,600 square kilometers in 1948 to over 4,000 in 1980 (Amro 2006). However, by constructing this carrier, the Israelis were seen as hijacking the waters of the Jordan River as they unilaterally constructed this diversion without seeking agreement from their Arab neighbors (Zeitoun 2008, 68; Pearce 2006, 167).

In 1953, in an effort to retaliate against Israel's unilateral attempts to divert the Jordan's flows, Syrian artillery shelled the construction and engineering sites for Israel's National Water Carrier which were located behind the town of Tiberias (Amro 2006). Israel was then forced to move the main pumping station to a more secure location. At the same time, Jordan was becoming increasingly concerned about decreases in the flow of the Jordan River downstream as a result of the Israeli water project upstream (Lowi 1993a, 80). In order to thwart any increasing conflict in the area, in 1953, President Eisenhower stepped in and appointed Eric Johnston to mediate between Israel, Syria, and Jordan and to negotiate an agreement for the sharing of water resources within the basin (Phillips et al. 2007, 18; Elhance 1999, 112). The idea was to "lessen the possibility of conflict in the region by promoting cooperation and economic stability" (Bulloch and Darwish 1993, 52). One of the key objectives of the agreement was to guarantee the availability of water for the irrigation of crops by the riparian states, with less emphasis placed on meeting domestic (and industrial) needs (Phillips et al. 2007, 19).

As Johnston was working to negotiate his own proposal for sharing the water resources between the co-riparians of the Jordan River basin, he considered several other plans, namely the Main Plan (1953), the Arab Plan (1954), and the Cotton Plan (1954) (Phillips et al. 2007, 20). The Main Plan was to build several dams in the upper and middle reaches of the tributaries of the Jordan which would also be linked to irrigation schemes throughout the basin. The Main Plan also envisaged the use of Lake Tiberias as a storage reservoir. However, unlike the other proposed plans, the primary goal
of this plan was to optimize the use of water for irrigation in the basin as a whole, regardless of political boundaries (Phillips et al. 2007, 20). In contrast, the Arab Plan would have strategically placed irrigation and hydroelectric schemes on the Yarmouk and Jordan Rivers above Lake Tiberias to avoid the use of Lake Tiberias as a storage reservoir due to its control by Israel and its potential for high evaporation rates (Phillips et al. 2007, 20). Despite many differences between these two plans, they both emphasized the need to use all of the Jordan's available resources exclusively within the Jordan River basin (Phillips et al. 2007, 22). In contrast to the other two plans, the Cotton Plan included the flows of Lebanon's Litani River in its proposal, which increased the total available resources to be allocated within the basin, and also considered the transfer of the Jordan River's water resources outside of the basin (Phillips et al. 2007, 22).

Johnston's initial instructions for negotiating an agreement were as follows: (1) the Litani River was not to be included because it flows entirely within Lebanon and is not a part of the Jordan River basin, (2) out-of-basin transfers could be permitted in some cases, and (3) a form of joint management of water resources should be sought (Phillips et al. 2007, 23). The key elements of Johnston's final plan as outlined by Phillips et al. were: (1) no consideration of the uses of the Litani River, (2) the optimization of the use of the Jordan River basin waters within the basin itself, but no specific objection to out-of-basin transfers by Israel for their National Water Carrier, (3) the development of hydroelectric facilities as feasible, (4) the allocation of 35 mcm per year to Lebanon from the Hasbani River, (5) the allocation of 132 mcm per year to Syria from the combined flows of the Yarmouk, Banias, and Jordan Rivers, (6) the allocation of 760 mcm per year to Jordan from the Jordan and Yarmouk Rivers, (7) the allocation of the remaining flows to Israel, and (8) the creation of a neutral authority to oversee the water allocations to the co-riparians (2007, 26).

The Johnston Plan of 1955 recommended 52 percent of the water to be allocated to Jordan, 36 percent to Israel, nine percent to Syria, and three percent to Lebanon (Bulloch and Darwish 1993, 52). Nevertheless, both Israel and the Arab states rejected the plan, asking for larger shares (Amro 2006). Even though the plan was rejected, Israel and Jordan managed to follow an unwritten agreement that each country would not exceed its share according to the plan (Amro 2006; Simon 1998).

Despite Johnston's efforts, conflict erupted in the area once more in 1964, when Israel completed its National Water Carrier which was capable of diverting 60 percent of the water that once reached the lower Jordan River (Friends of the Earth-Middle East 2006; Dolatyar and Gray 2000, 104). "This project is one of the very few examples in the world where water is being diverted from an international river basin by one riparian state to areas outside the basin, without the consent of other riparian states and peoples sharing the basin" (Elhance 1999, 115). In response to this unilateral plan, the Arab nations agreed to engage in an "all-Arab" plan to divert some of the headwaters of the upper Jordan that would deprive Israel of 35 percent of their carrier's anticipated source of water (Wolf 2003; Simon 1998). This would have resulted in a reduction in almost half of the water that was supposed to be transported by the National Water Carrier (Simon 1998). Israel saw this as a major threat to its national security and launched a series of tank and air strikes to destroy the diversions being built in Syria in 1967 (Solomon 2010, 402; Dolatyar and Gray 2000, 105; Simon 1998; Wolf 1993).

Twelve months later, the Six Day War erupted. It was fought mostly over land and security issues, but it was fueled by problems over water (Pearce 2006; Dolatyar and Gray 2000, 105; Simon 1998). This war, between Israel, Syria, Egypt, and Jordan, began due to the Egyptian president Nasser's re-blockade of the Suez Canal, Israel's only shipping route to the Red Sea and Indian Ocean (Solomon 2010, 402). As Arab forces assembled along every Israeli border, Israeli forces launched a surprise attack both on the ground and from the air destroying the much larger Egyptian-led air force (Solomon 2010, 402). Israel also managed to drive Jordanian troops out of the West Bank, and sent the Syrian troops retreating to Damascus, abandoning Golan Heights in the process (Solomon 2010, 402). Whatever the cause of the Six Day War, the result was that Israel had achieved a much greater degree of water security because it now occupied the West Bank, which gave it control of the western aquifer, and the Golan Heights, which gave it control over the headwaters of the Jordan River (Pearce 2006, 168). Thus, by the end of the war, the Jordan River basin was almost entirely controlled by Israel (Pearce 2006, 168).

Israel was not the only riparian engaging in water diversion schemes in an effort to improve its water security: Jordan too was eager to develop its agricultural potential and so began the design of a canal to divert the flows of the Yarmouk in 1957. The construction of the East Ghor Canal began in 1962. It was only one part of a much larger scheme known as the Greater Yarmouk Project (Murakami 1995, 296). This much larger project would have also involved the construction of two dams on the Yarmouk (Mukheiba and Maqarin) for water storage and hydropower, the construction of a 47 kilometer West Ghor Canal that would connect with the East Ghor Canal, and construction of several other dams and pumping stations that would increase Jordan's ability to tap its limited water development potential (Murakami 1995, 296). However, when the Six Day War began in 1967, only
20 percent of the Great Yarmouk Project was completed (Murakami 1995, 297) and two of the most important projects out of the scheme, the Mukheiba and Maqarin dams, had to be abandoned as a result of the war (Murakami 1995, 297). Much of the system was put out of commission in 1969 as a result of military raids by Israel (Murakami 1995, 297). In the wake of the 1967 war, the Palestinian Liberation Organization (PLO) engaged in an intensive campaign against Israeli settlements in the Jordan Valley. After an unsuccessful military campaign against the PLO, Israel decided to destroy Jordan’s irrigation system in an effort to pressure Jordan to curtail the Palestinian Liberation Organization’s violent campaign in the Jordan Valley (Murakami 1995, 297). The conflict over the East Ghor Canal was arbitrated by the United States and resulted in the East Ghor Canal being repaired in exchange for Jordan’s pledge to terminate any PLO activity within Jordan’s territory (Murakami 1995, 297). By 1978, the construction of the East Ghor Canal, Jordan’s national water carrier, was completed and water from the Yarmouk River could then be diverted to meet the growing agricultural demands throughout the Jordan Valley (Murakami 1995, 78). This canal, which now extends for 96 kilometers, was renamed the King Abdullah Canal in 1987 (Pearce 2006, 170; Shuval 2000, 612; Bulloch and Darwish 1993, 35; Lowi 1993a, 155). The construction of Jordan’s national water carrier resulted in a substantial increase in Jordan’s total irrigation capacity in the Jordan Valley (Lowi 1993a, 155).

Meanwhile, Israel’s increasing water demands made the prospect of gaining access to Lebanon’s Litani and Hashani rivers tempting. Israel invaded Lebanon both in 1978 and 1982, though the reasons given for the invasions by Israel were to eliminate terrorist groups or to create more defensible borders (Bulloch and Darwish 1993, 37). While Israel had to withdraw on both occasions as a result of international pressure, Israel held on to a 10 kilometer-wide Security Zone along its border with Lebanon that just happened to give Israel access to both rivers (Bulloch and Darwish 1993, 41). While the primary reason behind these invasions may be debatable, the outcome certainly changed Israel’s reign over the region’s water supplies.

The Maqarin Dam (also known as the Al-Wuheda or Unity Dam), was originally designed in 1957 as part of the Greater Yarmouk Project. This project was revived through a bilateral riparian agreement between Jordan and Syria in 1988; however, after initial work had been completed, Israel put a stop to the dam arguing that its rights as a co-riparian of the Yarmouk were not acknowledged (Murakami 1995, 78). Later, after the U.S. Department of State got involved in negotiations, the plan for constructing the dam on the Yarmouk was re-discussed once more by all of the Yarmouk riparians and the dam was scheduled for completion in 2008 (Fischhendler 2008, 96; Wolf 1996, 66). However, due to Syria’s unilateral efforts to tap the waters of the Yarmouk at a rate much higher than agreed upon in the Johnston Plan, there is a question as to whether the Unity Dam remains a smart investment given the anticipated decrease in average annual flows from this over-tapped resource (Kliot 2000, 196). It has been said that this proposed dam, if completed, “will probably take the last of the Jordan’s regular flow—the last of a river holy to Jews, Christians, and Muslims alike, which has watered civilizations for 10,000 years” (Pearce 2006, 170).

In 1994, the unwritten water agreement between Jordan and Israel that had evolved from the Johnston Plan of the 1950s was replaced by a water agreement within the Israeli-Jordan peace treaty that ended a state of war that had lasted almost half a century (Amro 2006; Ward 2002, 190; Poste! and Wolf 2001). “The treaty included an Israeli concession to supply an additional 50 million cubic meters of water per year to help meet water-famished Jordan's minimum needs, as well as commitments to cooperate on joint water resource development and to confront the challenge of regional scarcity” (Solomon 2010, 404). Interestingly enough, despite the open hostilities between these two countries for decades, experts from both nations had secretly been meeting for years to exchange information and coordinate water operations in what have become known as the "Picnic Table Talks," which aided in the timely achievement of the peace treaty (Solomon 2010, 405; Wolf 2000, 87).

In September of 1993, an unprecedented event occurred on the lawn of the White House; the PLO leader, Yasser Arafat, shook hands with his long-time adversary, the Israeli prime minister, Yitzhak Rabin, in what marked the start of the Oslo peace process (Solomon 2010, 404). The 1993 signing of the Declaration of Principles between the PLO and Israel (Oslo I) and the 1995 signing of the Oslo H Interim Agreement were the initial steps in an ongoing peace negotiation process between these entities (Zeitoun 2008, 64). The mediated negotiations of the 1990s focused on five issues including: the right of return of Palestinian refugees, the status of Jerusalem, territorial borders, the future of Jewish settlements in the West Bank, and water (Zeitoun 2008, 64). Oslo II was intended to be an interim agreement to be followed by a Permanent Status Settlement (Jayousi 2010, 43; Kerret 2010, 49). Article 40 of Oslo II outlined the basis for cooperation in the water and sewage sectors and was based upon the following objectives: Israel would recognize Palestinian water rights in the West Bank, both sides would engage in the development and coordinated management of additional water resources and systems, additional water allocations would be made available to the Palestinians for a variety of uses, and both entities would engage in the development of a permanent Joint Water Commission (Jayousi 2010, 43; Kerret 2010, 50).

Despite the collapse of the peace negotiations in 2000, several aspects of this agreement still hold. While Israel has recognized Palestinian water rights in the West Bank, specific allocations are to be negotiated as part of
the Permanent Status Settlement, which has yet to occur (Kerret 2010, 52). Moreover, the Palestinians have been hesitant to develop additional water resources until they have negotiated their rights to share Jordan River flows. In the meantime, Israel has moved toward the unilateral development of additional water resources through the construction of several desalination facilities along its coastline. While offering Israel greater water security, these unilateral efforts have also diminished the impetus for engaging in more cooperative water-development schemes throughout the basin. Despite the breakdown of the Accords, water officials from both camps have continued to coordinate over the management of their water resources through the ongoing efforts of the Joint Water Commission (Zeitoun 2008, 64).

In addition to the ongoing Israeli-Palestinian conflict, Israel and Lebanon almost engaged in their own water conflict in 2002 over unilateral attempts by southern Lebanon to divert a modest amount of water from the Wazzani Springs to serve several villages. Given that these springs feed the Hasbani River, which is responsible for providing one-quarter of the supply for the Jordan River, this unilateral diversion was considered as “a deliberate provocation that was a potential cause for war” by Israel’s prime minister Ariel Sharon (Solomon 2010, 405). International diplomatic intervention by the United States, the United Nations, and the European Union in 2002 averted an escalated conflict between the two riparians (Solomon 2010, 405). However, it was later determined that the small nature of the pumping station and diversion planned by Lebanon would not have adversely impacted Israel’s water supply (Amery 2002, 319). In fact, one of the reasons for this conflict was Lebanon’s unilateral attempt to utilize the waters of this transboundary spring. Israel considers it a “very dangerous precedent” (Amery 2002, 319).

Since Israel’s conflict with Lebanon in 2002, additional conflicts have erupted throughout the region as a result of changes in political leadership in Gaza and Lebanon. A Hamas-led government in 2006 “led to a freeze on the limited cooperation that did exist between Israeli and Palestinian water technicians” and resulted in a deduction of international donor projects aimed at developing the Palestinian water sector (Zeitoun 2008, xiv). Israel’s perceived vulnerability due to the Hamas-led government’s refusal to acknowledge the right of Israel to exist, led to “the Israeli assault on the main electrical power plant in Gaza in June 2006 [that] denied tens of thousands of people access to water” (Zeitoun 2008, xiv). During the conflict between Israel and Hezbollah in the summer of 2006, Israel damaged water towers of over 50 villages in southern Lebanon in an effort to assert its military superiority over these extremist groups (Zeitoun 2008, xiv). While these conflicts were mainly over terrorism, sovereignty, and national security, water was clearly identified as the Achilles heel of Israel’s neighbors.

Despite these conflicts since the collapse of the Oslo Accords, efforts to forge peace between the Jordan River riparians, and Israel and Palestine in particular, have been revived through the Annapolis, Maryland peace talks of November 2007 and the Direct Peace Talks of 2010. U.S. President Barack Obama and U.S. Secretary of State Hillary Rodham Clinton, still maintain that a Permanent Status Settlement is within reach. Palestinian, Israeli, and Jordanian water officials continue to discuss the merits of establishing a Jordan River Basin Commission for the multilateral management and development of the region’s water resources despite continued political instability throughout the area.

WATER SECURITY AND THE JORDAN RIVER BASIN

The Jordan River is a unique international river due to its deep-held resonance for Christians, Jews, and Muslims alike. Despite the relatively small size of the basin, it has been a site of great historical and cultural importance for thousands of years. However, “in recent years, all that saved much of the lower Jordan from becoming a desiccated channel has been the agricultural runoff, raw human sewage, diverted saline spring water, and contaminated wastes from fish farms that have been pumped into it” (Bromberg 2008, 1). This great tragedy has been exacerbated by decades of war and regional conflict that have ravaged the basin for the past 60 years.

The Jordan River, while only shared between five riparians, flows through one of the most water-scarce and politically volatile regions in the world. With very few alternative water sources to be had, much of the history of this basin over the past 10,000 years has been defined by riparian attempts to secure water rights to the Jordan’s flows. While the conflict of the past 60 years is predicated on territorial disputes between mutually antagonistic states, it has also been exacerbated by severe water scarcity throughout the region as well as the lack of a formalized, equitable water sharing agreement between the riparians. Additionally, the Jordan River basin is also characterized by strong power asymmetries between its riparians with Israel acting as the predominant hydro-hegemon in the basin. Israel’s military, technical, and economic superiority over its riparian neighbors in addition to its vulnerable riparian position have made Israel the Egypt of the Jordan River basin, ready to strike at its neighbors with due force at any perceived threat to its water supply.
What is going on today . . . and how could lead to conflict or cooperation—current state of water resources—drought, fires, desalinization/water conservation—are these leading to less cooperative efforts?

CLIMATE CHANGE AND DROUGHT

Politics— Hamas in Palestinian Territories and uprising in Jordan (after Egyptian revolution) what does this mean for the region? What would the end of protracted conflict in the region mean for the future of the Jordan River basin? As a result of enduring peace throughout the region, an influx of refugees (see Jordan and number of Palestinian refugees there) and a push for economic development are expected. Simultaneously, this increase in population is expected to result in increased demands for water resources that are becoming increasingly scarce as a result of climate change. Is desalinization just offering these countries a false sense of security or will desalinization and water re-use be the answers to solving the water woes of this water-scarce region?

Unilateral efforts in the past and the conflicts that resulted. What has ultimately occurred is that Israel has been able to change from being a downstream riparian to an upstream one . . . based on increasing its occupied territory as a result of the 1967 Six Day War. Israel remains the hydro-hegemon of the region and continues to be paranoid over water security matters. . . . see recent perceived threat by Lebanon.

Ongoing conflict—still no final status negotiations completed. . . . Water continues to be a principle topic for discussion. Syria's cooperation is contingent upon Israel giving up the Golan Heights, which will not happen any time soon. There is some possibility that Israel—Palestine- and Jordan might be able to come to some kind of cooperative basin agreement to improve water security throughout the region. Additional projects that offer some promise for regional water security include the Red-Dead Canal and the Peace Pipeline and other multilateral desalination investments.

WATER SECURITY: A CATALYST FOR WATER WARS OR BASIN-WIDE COOPERATION?

"Water will determine the future of the Middle East" (Bulloch and Darwish, 1993, 32).

"The red flag for water-related tension between countries is not water stress per se, but rather the unilateral exercise of domination of an international river, usually by a regional power" (Wolf 2003, 118).

Kofi Annan stated in 2000 that "fierce competition for fresh water may well become a source of conflict and wars in the near future" (Poste) and Wolf 2001. If the wars of the next century are going to be fought over water, the Middle East may well end up being a prime site for conflict to erupt. Aaron Wolf suggests that the likelihood for conflict increases significantly whenever two factors come into play. The first factor is that some large or rapid change has to have occurred in the basin's physical setting such as the construction of a dam, a river diversion, or an irrigation scheme, or in its physical setting, such as the formation of new international rivers as a result of changes in national boundaries (Wolf 2003). The second factor is that existing institutions are unable to absorb or effectively manage the change. This can happen when there is no treaty actively delineating the water rights and responsibilities of each nation (Wolf 2003).

In the case of the Jordan River basin, multiple river diversions by all parties have resulted in reduced surface flows in the region. This, in combination with the relatively new national boundaries and the absence of a treaty, make the Jordan River basin a very likely site for water conflicts to take place. The Nile River basin, on the other hand, is shared by ten riparian states, many of which only became independent nations within the latter half of the twenty-first century. The post-colonial era was marked by many of these relatively new nations asserting their sovereignty through unilateral projects including the constructions of dams, river diversions, and irrigation schemes, often with complete disregard for the water rights of neighboring riparians. While historically there have been several bilateral agreements allocating the Nile's flows, the NBI has yet to achieve a consensus over the water rights and responsibilities of each of the riparians. This combination of increasing water demands, the sheer number of players in the Nile's water negotiations, and the power relations present in the basin make the Nile River basin another likely site for water conflicts to occur.

While the ultimate achievement of water security does not have the potential to lead to conflict, the individual steps taken by riparian states to achieve water, and national, security can be a cases belli. What are some examples where unilateral actions to achieve water security have led to conflict? Aswan High Dam, Sinai Pipeline, National Water Carrier, etc.

While the discussion above leads us to believe that water wars, as a cause of war unto themselves, are unlikely and that Israel and Egypt's continued warnings of war should anything happen to their water resources are merely paper tigers. . . . I would argue that as water resources become increasingly scarce in the Middle East, as populations continue to grow either through high birth rates or immigration, the impacts from global climate change become more acute, and the political climate continues to shift in an effort to achieve
economic development throughout the region, the stresses on the region’s water resources are going to be intensified and may well become a catalyst for armed conflict to erupt once more.

It all depends on how water security is achieved. Hydro-hegemons—Israel and Egypt... is that what led to conflict over water resources? The general trend is for nations to undertake water projects unilaterally... and ultimately, in a transboundary situation, this leads to conflict... and while water security may be achieved, it may be achieved at the cost of national security as relations with other riparian states become more volatile. Over time, as water resources become increasingly scarce, there is the potential for basin-wide cooperation as riparian states become more aware of their interdependence on their shared resources for regional security, economic development, and long-term water security.

However, despite these dire predictions, water security can be achieved through cooperative efforts leading even the most violent of neighbors to join forces in conserving their water resources.

Also have to consider what might happen if peace comes to the region and this new wave of democracy that appears to be spreading across the Arab world.... Will it lead to more immigrants, more pressure on providing food, jobs and economic prosperity... greater need for water resources in the region. ... the only way to deal with this while maintaining water security for the future is going to be through the development of effective basin-wide cooperative management institutions.

CONCLUSION

The threat of future water wars is imminent. We are currently facing an unprecedented demand for freshwater resources that we simply do not have (Gleick 1993). Global climate change is expected to result in rising temperatures that will have the effect of both increasing water losses to evaporation as well as increasing water demands from a more thirsty population (Gleick 1993). From 12 climate models, it is predicted that we will see a 10-30 percent decrease in runoff in the Middle East by 2050 (Milly, Dunne, and Vecchia 2005). If these predictions turn out to be correct, we will have a major water crisis on our hands and the threat of a water war may again become a reality.

Nonetheless, it is in the face of these challenges—rising water demands, decreasing available supplies, and increasing environmental degradation and water quality concerns—that the desire for water security may well become the catalyst for cooperation between riparian states trying to co-exist in transboundary basins. The creation of basin-wide cooperative water management solutions that combine the building of desalination plants and hydropower facilities in water-rich areas; the widespread implementation of water re-use, water-use efficiency, and conservation measures; and the facilitation of regional cooperative solutions and institutions, have the potential for averting imminent water wars and creating win-win solutions for riparian states attempting to achieve regional security in the face of water scarcity and political unrest.

Desalinization

Due to the fact that 98 percent of the world's water is seawater, the most obvious long-term solution to alleviate the water scarcity in the Jordan River basin is desalinization (Mohsen 2007; Simon 1998). Two-thirds of the world's desalinization plants are already located in the Middle East and this number is expected to rise (Bulloch and Darwish 1993). Desalination is appealing because the majority of nations with serious water deficits border the sea making the conversion of saltwater a very accessible solution (Simon 1998). Currently, desalination plants are extremely costly to run and depend on a constant supply of energy, usually in the form of coal or oil, to produce only a limited amount of freshwater (Simon 1998; Bulloch and Darwish 1993). As more research is done, desalination plants are now being combined with renewable energy sources in an effort to reduce the use of fossil fuels (Pearce 2006; Simon 1998). The use of solar-powered desalinization plants in the Middle East, where there is an abundance of untapped solar energy from the sun’s rays, may be the most appealing solution for the water scarcity problems in the region (Mohsen 2007; Simon 1998). While desalinated water is becoming relatively inexpensive so that it can be used for drinking water and municipal use, the majority of the water used by humans is for agriculture and industry (Simon 1998). Currently, desalinated water remains too expensive for these uses so we must look elsewhere if we want to find a more feasible short-term solution to water shortages.

Water Conservation

In order to conserve what water resources we have left, it has been argued that consumers need to be charged the “actual” cost of water based on the amount used (Simon 1998). When people are being charged for water on a “more use/more pay” basis, they are much less likely to waste it (Simon 1998). Higher prices would provide people with the incentive to conserve (Simon 1998). The most widely used irrigation method is surface irrigation with an efficiency rate of only 40-50 percent (Bulloch and Darwish 1993). However, in Israel, farmers have been able to double their production rates over the past 20 years by using the same amount of water (Simon 1998). They are able to do this because they have developed drip irrigation, which has a 90 percent...
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efficiency rate (Simon 1998; Bulloch and Darwish 1993). Drip irrigation and micro-sprinklers, another new development out of Israel, have dramatically increased the efficiency of irrigation in the region by reducing the amount of water lost through evaporation (Simon 1998). The sharing of these new technologies has great potential as a means for cooperation between water-scarce nations in the Middle East.

Regional Agreements and the Creation of Effective Institutions for Transboundary Resource Management

From 1986 to 1991, Turkey's President Turgut Ozal lobbied a project called the "Peace Pipeline" that would involve two pipelines transporting water from the Seyhan and Ceyhan rivers in southern Turkey down to Syria, Jordan, Saudi Arabia, and other Gulf States (Mohsen 2007, 35; Lowia 1993, 159; Starr 1991). While this project could have led to peace and cooperation in the region, it was rejected because of water security issues and financial reasons (Starr 1991). Southern Arab states did not want to rely on states upstream for their water as it would give them too much power over their water supply (Mohsen 2007; Starr 1991). It was also estimated that the price of water delivered through such a pipeline would exceed the costs of local desalinated water (Starr 1991).

An alternative regional-scale project involves the voluntary trading of water permits between nations (Fisher 2006). This allows parties to have short-term access to other parties' water supplies at a set price. This project provides a win-win situation for buyers and sellers as the buyers are able to get water that they value higher than the money used to buy it and sellers receive money that they value higher than the water they traded in return (Fisher 2006). This notion is very appealing because it allows for more flexibility with regard to water allocations as it can benefit all parties involved even in times of drought (Fisher 2006). However, before such a project can get underway, a certain degree of trust must be developed between participating parties.

- Cooperation and conservation are vital if we are going to win the fight against water scarcity without "water wars." If the nations in the Jordan River basin can cooperate with regard to conserving this vital resource, it is likely that cooperation on other issues may soon follow. We need to stop ignoring the water scarcity issue and take action to conserve this precious resource before it is too late. "No one likes limits, particularly when it comes to water, when every rainstorm, indeed every twist of the tap, brings an illusion of abundance. If there is not enough water now, it is tempting to think, there must be a dam to be built, a glacier to be towed, an ocean to be desalted, a river to be moved—some way to harness technology and in-

genuity to fill the void ... Certainly that has been the history of the human experience with water, particularly over the past century, as the damming of rivers, the construction of aqueducts, and the mining of aquifers have defied nature to bring water where it is needed, in the United States and around the world. The idea that the future might bring more such triumphs is hard to shake, and indeed it may be possible one day that seawater can be desalted cheaply enough to make it a greater part of the world's water equation, or that the waters of a vast river may be successfully rerouted from one part of a country to another (Jehl 2003; xvii).

In this case, the real "silver bullet" is not going to be the creation of additional supply, although that will be one part of the equation. It will be the change in behavior of riparians in international basins toward the multilateral pursuit of regional water security through the development of basin-wide cooperative management solutions and institutional frameworks to achieve more sustainable and equitable management of depleted river flows.

I propose that ultimate water security can only be achieved in such settings when sought multilaterally through the development of basin-wide cooperative management solutions and institutional frameworks.

*The Nile River Basin portion of the chapter was jointly written by Teagan E. Ward and Hilary L. Roach. The Jordan River Basin portion was exclusively written by Teagan E. Ward

REFERENCES


