Section II: Water & Agriculture

Less water is in use today in the United States, than 30 years ago—in total, as well as per capita. This is a result of the contraction of economic activity, the obstruction of bringing new water resources to the dry West, and the dramatic increase in U.S. imports of virtual water in the form of foreign-produced goods and food.

A leading component in the decline of U.S. water use is the fall of water usage for irrigated agriculture—much of it in the Southwest. From 1950 to 1980, total U.S. water use across the conterminous 48 states increased from 201 million acre feet per year (MAFY) in 1950, up to 482 MAFY in 1980, and then declined to a level of 459 MAFY as of 2005. From 1950 to 1980, the volume of water used in irrigated agriculture rose from 100 MAFY to 168 MAFY, and then began its decline. By 2005, there were 143 MAFY in use for irrigation. The area of irrigated farming rose from 25 million acres in 1950, to 58 million acres in 1980, but since then has gone nowhere. This process is now beyond the breaking point.

The following describes the crisis in the main southwestern regions and shows how the annual delivery of 52 MAFY to the region by NAWAPA XXI will solve it. Afterward, additional uses of NAWAPA XXI water deliveries and water extensions are reviewed, as well as the policy changes needed to make efficient use of this increased water supply.

Part 1: Water Basins Intersected by NAWAPA XXI: The Crisis and the Solution

The Southwestern states, in the area once called the Great American Desert, by definition, receive scarce rainfall. The resulting run-off produces only three major river systems: the Colorado, the Rio Grande (Rio Bravo) and the San Joaquin/Sacramento. The other rivers and streams are much smaller in volume and catchment area.

Soon after the storage and management installations on these three major river systems were completed in the 20th century, the entire flow—no matter how well regulated—was still insufficient to meet economic need. Today their reservoir content is dropping. At the same time, ground-water depletion in the region, starting decades ago, is now acute.

These conditions were all anticipated by mid-century policy makers, who had built the systems with the intention of adding to them, by creating new sources of water. At that time, proposals were made to augment the limited Western surface and ground-water supplies through large scale desalination and inter-basin transfers. But, for reasons discussed in the introduction to this report, these proposals were blocked, and, as a result, every region is now in crisis.

NAWAPA XXI will change the context of each river basin, by linking them with a much bigger ocean cycle of precipitation, currently limited to the Western Slopes. Calculation of the river runoff amounts for the northern rivers which intersect the collection area, shows that 20% of the surplus water will deliver approximately 77 MAFY from the Rocky Mountain Trench, with approximately 52 MAFY to be delivered to the U.S. Southwest. In the following in-depth discussion of the crisis facing this region, those numbers are divided and examined by basin distribution. The overall flow of water, once the system is in place, can be regulated through its system of impoundments and releases, to satisfy whatever seems the optimum trade-off at the time, between building up reservoir levels, and releasing for irrigation.

Colorado Water Resources Region

The entire Colorado River Basin average run-off, from its headwaters to its salty delta, is far below what is required. It is long since over-subscribed and completely over-allocated.

The Colorado River has the largest catchment area of the three major river systems of the desert Southwest. In the 1920s, plans were initiated for basin-wide management of its 11 MAFY flow (mean annual discharge, 1922-2000), to best serve its seven basin states. The ensuing system of dams—the Hoover, Glen Canyon, and other installations—was fully built up for reservoir storage of 61 MAF. The 1922 Colorado River Compact set water-sharing between states, at 7.5 MAFY each, for the Upper and Lower Colorado regions. The fact that the total allocation exceeded the mean average river flow by 4 MAFY, didn't matter in the early decades, as the use in the Upper Basin was far less than the Lower. But long before 2000, the Upper

Basin came to require its full allocation, and now seeks more.

The states of the Lower Colorado Basin have been severely short of water for decades, utilizing some 1.3 MAF a year more than their 7.5 MAFY share of flow, under the 1922 Compact.

As of 1998, the populations of California and Arizona were respectively 45%, and 60% dependent on ground water for domestic water needs. These percentages are greatly increased in the Lower Colorado Basin region of those states. By 1995, this was seen in calculations of water use to be 103% of the total renewable supply[1] in the region, a percentage which would be far greater today if basin data were made available.[2] Pumping costs have soared, given the increasing depth of available water, and subsidence is a problem.

Significant amounts of Arizona farmland have been abandoned for lack of sufficient, reliable water. The Imperial Valley agriculture water rights are now approved for sale for domestic use by San Diego. In Arizona, there were 862,000 irrigated acres in 2008, an area which has been diminishing due to both lack of water, and pressures of urbanization. Throughout the aquifers of southwestern Arizona, an alluvial area, there has been a drastic increase in the depth needed to reach water below land surface. The aquifers are depleting. In some wells in the Tucson area, water levels have fallen more than 200 feet in the past 50 years. Land-surface subsidence is occurring at many locations. In West Phoenix, some places have dropped 18 feet. In Elroy, Arizona, by 15 feet.

Adding chaos to the scarcity of water, is the endangered fish and marine animal issue. In Arizona, the humpback chub (and the Kanab ambersnail) have been designated as endangered, and their habitat protection has been added to the equation for how to allocate scarce water.

As of 1984, the annual renewable water supply in the Lower Colorado basin was 6.1 MAFY. NAWAPA XXI would bring a continual supply of 18 MAFY to the basin, increasing the renewable supply by 157%. These newly delivered waters will be available for irrigation without the pumping costs, and will be sufficient to irrigate up to 2.11 million acres, increasing the total by about 223%.

California Water Resources Region

Measured by volume of water run-off, the California Water Resources Region is the largest of the three Southwestern desert river systems. It consists of the Sacramento River (17 MAFY, mean annual flow for 1949 to 2000), the San Joaquin (3.4 MAFY, mean flow for 1930-2000), along with other surface run-off. Its combined volume was successfully organized in most of the state, according to the designs of The California Water Plan, begun in 1957. The Central Valley Project and the State Water Project aqueducts were world models of water infrastructure; these two water systems together have 26 MAF of reservoir capacity. However, as the post-war hydrologists foresaw, without water augmentation, the state's surface and groundwater resources would become insufficient. There has been a severe water shortage for several decades, resulting in aquifer depletion, water trade-offs, salination, subsidence, farmland loss and related conditions. In certain coastal areas, salt water intrusion into ground water is a problem.

Of the 50 major aquifers throughout the state, 11 were in serious overdraft by the 1990s. Land-surface subsidence is common. In the San Joaquin Valley, large areas have subsided due to overdraft pumping. A drop of 29 feet was sustained at a location southwest of Mendota. In the Santa Clara Valley, subsidence of 12 feet is recorded. Davis, California has had 4 feet subsidence. The irrigated areas of the state are contracting, for lack of enough water. At stake are 7.5 million acres—the largest in all of the Western states (2008).[3]

Add to this situation, the interventions by anti-infrastructure political networks, to save endangered fish, causing regional water battles and water management chaos. The headline species include the splittail minnow (Sacramento Delta), Coho salmon, Shortnose sucker (northern California), and others.

According to the last available report on renewable

1. Renewable water supply is defined as total annual precipitation, minus evaporation, minus exports, plus imports. This amount is much more than the flow rate of the major rivers defining each basin.

2. Water availability data is from 30 years ago, when there was more water available (in groundwater, and less-used surface water) in the Southwest compared to today. The U.S. Geological Survey (USGS)—the Federal agency responsible for centralizing information on water use and availability—has ceased keeping systematic water availability information. The last water availability calculations made available are from 1984.

3. This number was given as 9.05 in the USGS data of 2005, which is the number used in the complete 2005 agricultural land analysis below.

water supply including ground and surface water, the 1984 U.S. Geological Survey, the available renewable supply in the California basin was 83.6 MAFY. It is estimated that NAWAPA XXI would bring an additional supply of 10 MAFY to the Southern California region of the California Basin, increasing the renewable supply by 12%, and irrigating up to 3.3 million acres.

As described below, an extension to the original NAWAPA design, could deliver a roughly equal amount for the Sacramento and San Jaoquin valleys, supplementing the Lake Shasta and Owens Valley supply systems, and irrigating another 3 million acres, while removing pumping costs to farmers.

Rio Grande Water Resources Region

The Rio Grande Water Resources Region is a tightly integrated system of surface run-off, in direct hydraulic connection to basin aquifers—all of which are used up. The river flow is only 0.7 MAFY (mean annual average, 1917-2000). The reservoir storage capacity is 20 MAF, but far more water has long been needed. Treaty commitments for water sharing between the U.S. and Mexico have been impossible to honor.

90% of the population of New Mexico is dependent upon ground water for drinking water. Albuquerque relies for its drinking water on alluvial aquifers, which is a precarious situation. Land-surface subsidence is about a foot at Albuquerque, and 2 feet in the Membres Basin of New Mexico. For the state of Texas, ground water dependency is 45% , but the percentage is much higher and closer to New Mexico's average for the West Texas agricultural region, associated with the Rio Grande.

Besides agricultural use, river water is channeled off for industrial, residential and other purposes by both nations. This means the water is not going into recharge of aquifers underlying the river, which are also in use for economic activity. In 1968, for example, the course of the river between the central business districts of Ciudad Juarez, Mexico and El Paso, Texas was converted into a lined canal, which prevents any re-charge water going into the ground-water system along that stretch. Yet, the aquifers are the source of drinking water for Ciudad Juarez, and for half of the supply to El Paso.

The annual renewable water supply in the Rio Grande Basin was, as of 1984, 6.1 MAFY. Calculation by the authors found that water use, as of 2005, was 113% of this 1984 amount.[4] 1.1 million acres of irrigated land on the U.S. side of the river, and additional irrigated land in Mexico are at stake. Adding to the water problem, is the contrived issue of river habitat for the endangered fish species, the Rio Grande silvery minnow.

NAWAPA XXI would bring an additional supply of 16 MAFY to the basin, increasing the renewable supply by at least 262%. The waters brought by NAWAPA XXI to the Rio Grande Basin on the U.S. side of the Rio Grande in Texas and New Mexico will irrigate up to 10 million acres, in effect increasing the total acreage of farmland by 1000%.

Great Basin Water Resources Region

The Great Basin Region has no single prominent river system, as do the other Western water resource regions; it is a closed basin characterized by streams with no outlet to the ocean, which form many lakes, such as the famous Great Salt Lake, Mono Lake, and Pyramid Lake. Rainfall and run-off variability, as well as inadequate volume, are all limiting factors for economic activity in this region.

Although potentially rich, especially for fodder crops, agriculture has been very delimited in this area. Water rights given out for agriculture use long ago exceeded the supplies. In the 1990s, markets set up for sale of water rights, transferred water use out of farming, and into supplying urban areas. In Nevada, where land farmed has been almost entirely irrigated, the area has dropped by half, from merely 1.3 million acres in 1972, down to 0.685 million in 2008. In Utah, irrigated farmland fell from 1.4 million acres in 1972, to 1.1 million in 2008.

The annual renewable water supply in the Great Basin in 1984 was 11.2 MAFY. NAWAPA XXI will add 6 MAFY to the basin, increasing the renewable supply by 53% percent. Of the 6 MAFY which NAWAPA XXI will bring to the Great Basin, 4 MAFY will be available for Nevada. This is enough to increase irrigated land by

4. In 1975, the USGS explicitly forewarned of the consequences of limited water in the Rio Grande Water Resources Region. Based on its surveys up to that time, the USGS said that no more population influx, nor expansion of economic activity, should take place in the Rio Grande basin, unless and until new volumes of water were secured, and new sanitation systems put in place. The engineers' warnings were ignored. The maquiladora cheap labor system was imposed after NAFTA (1992), and now the region is called the Disease Belt of Texas, with high rates of hepatitis, diarrhea and, in the 1990s, cholera.

1.37 million acres, a 238% increase for the state. 2 MAFY will be delivered to western Utah, irrigating up to .54 million acres, a 45% increase for the state.

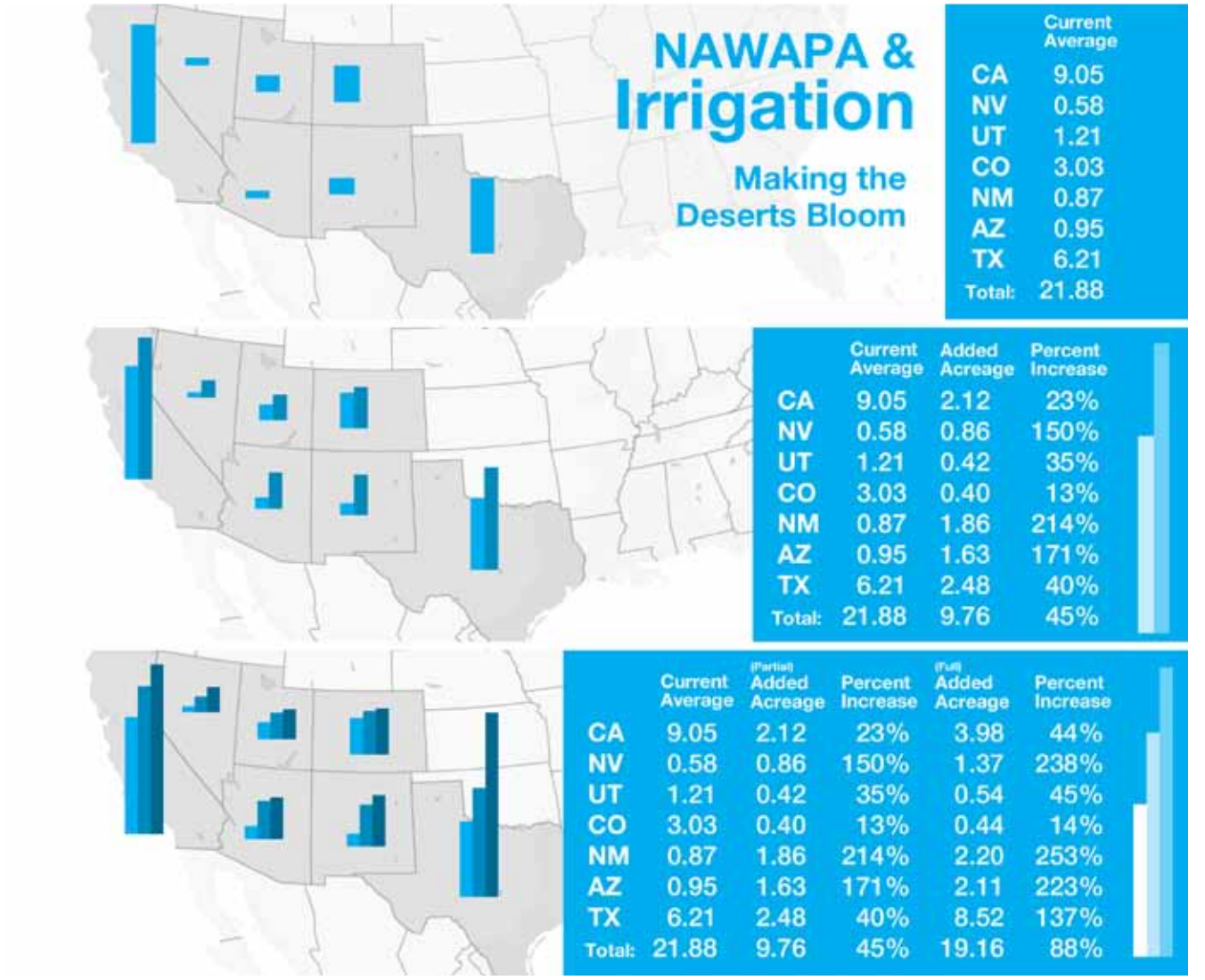
State by State Irrigation and Reservoir Capacity

In addition to a basin distribution of the 52 MAFY to be added to the annual supply, a state by state breakdown has been made. Making use of the application rates—-water required to irrigate an acre of crops—for the different states, an approximation is given here of how many acres of farmland will be irrigated. These amounts are based on the following additions of MAFY: NV 4, UT 2, AZ 12, CA 12, NM 8, TX, 12, CO 2.

The first map presents the current irrigated acres of land in these states, as of 2005. Given the current ratios of industrial to agricultural use, the second map demonstrates the newly created farmland for each state. If newly added water were to go entirely to agriculture, irrigated farmland would nearly double, as seen in the third map.

A total of 32 reservoirs will be created throughout the Southwest, creating a total of 233 MAF of storage capacity. The open bodies of water will add sufficient moisture to their surrounding vegetation to alter evapotranspiration, and in combination with land cover changes, will change local climate, and initiate new precipitation trends or accelerate existing ones.[5]

5. Engineering our Southwest Biosphere: http://larouchepac.com/node/17652



Southwest NAWAPA XXI Reservoirs

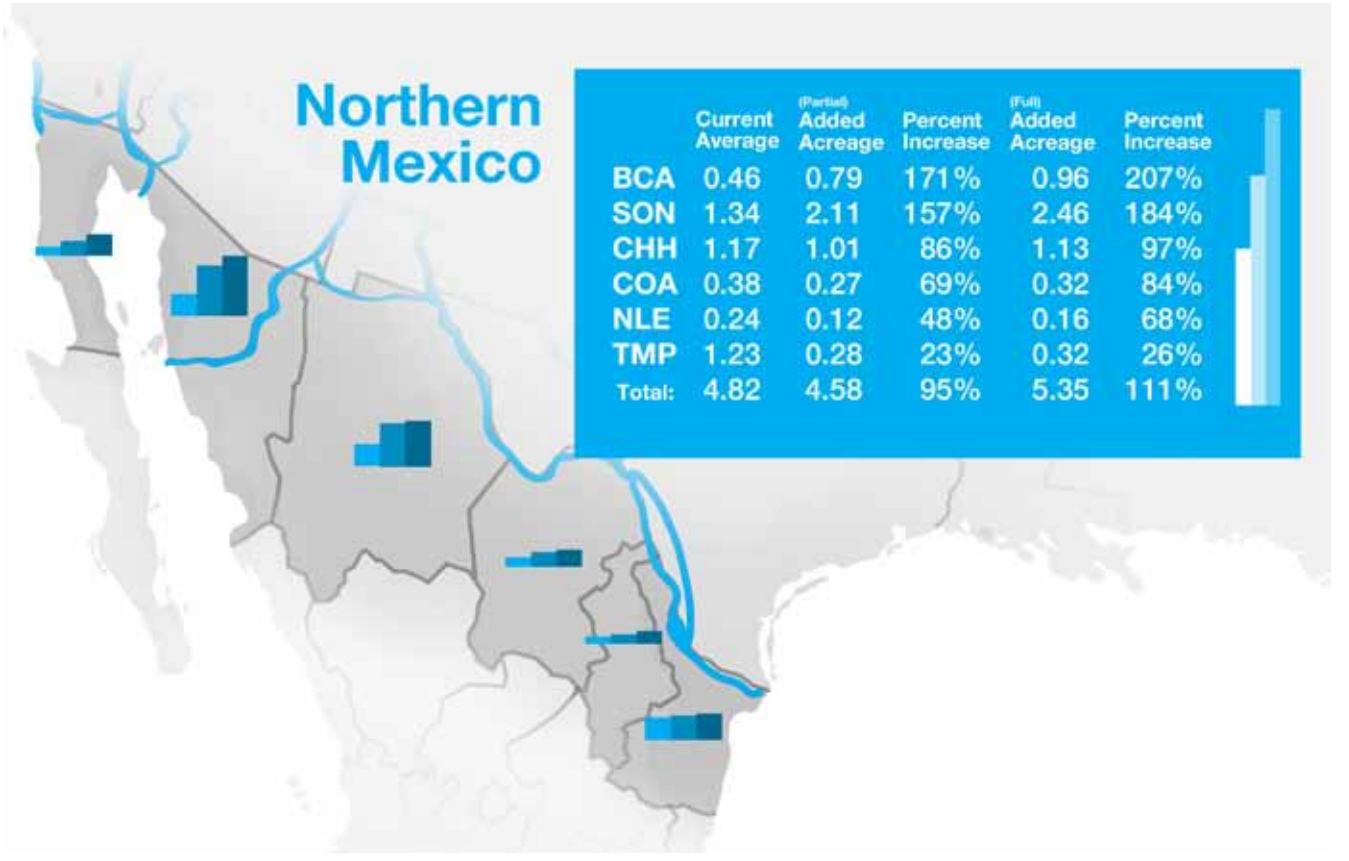
State	Reservoirs	Elevation (ft.)	Storage (MAF)
Utah	Sevier Bridge	5014	70,000
	Muddy River	5000	300,000
	San Rafael	4950	1,400,000
	Fremont	5000	4,900,000
	Escalante	5010	700,000
	Grand Gulch	4910	1,100,000
Arizona	Lake Navajo	4800	128,000,000
	Navajo Creek	5000	400,000
	Oak Creek	3700	500,000
	Wickenberg	3000	700,000
	Hassayampa	1800	170,000
	Papago	1150	350,000
	Ajo	1000	800,000
	Desert	600	200,000
	Verde	3000	2,400,000
	Carrizo Creek	5000	5,00,000
	Cedar Creek	5000	1,100,000
	Black River	4980	5,600,000
	Eagle River	4970	2,300,000
	Blue Creek	4960	1,100,000
New Mexico	San Francisco	4955	4,600,000
	Lake Geneva	4950	17,100,000
	Pecos River	4000	34,800,000
	Springer	5000	2,100,000
	Roy	5200	600,000
Nevada	Lake Nevada	5000	7,300,000
	Lake Vegas	4200	7,100,000
California	Panamint El Capitan Morena	2050	4,000,000
Colorado	Purgatoire River	5000	1,200,000
	Colorado	5500	1,000,000

Source: Roland Kelly, systems engineer for Ralph M. Parsons, 1964.

Mexico

Northern Mexico is in a similar dire situation with respect to water, as that described above for the U.S. Southwest. Under the North American Free Trade Agreement (NAFTA), Mexico has, in fact, been exporting vast amounts of water to the United States, in a way not even contemplated by accountants and free-trade ideologues, seen, for example, by the production of Heinz ketchup and other food products, which has moved from California to Tijuana.

Water flowing in Mexico is exported as skyrocketing Mexican exports of vegetables, citrus, and other food; as water used in assembly of industrial goods in Mexico's maquiladora border sweatshops for re-export to the United States; as water used in supporting and raising the 10 million Mexicans who've fled to the United States to escape the desperate impoverishment of the NAFTA period in Mexico. With these exports, Mexico generates the foreign exchange to pay its gigantic (and largely illegitimate) foreign debt. And with them, the United States buys cheap. "NAFTA water" it no longer produces and uses in industry and



agriculture in the U.S. productive economy.[6]

Renewable water supply in northern Mexico is currently 7.7 MAFY. NAWAPA XXI will nearly triple the available water, bringing 20 MAFY divided by state in the following way: 4.3 to Baja California, 9.5 to Sonora, 3.6 to Chihuahua, 1.1 to Coahuila, .8 to Nuevo Leon, and .7 to Tamaulipas. These increases would increase irrigated farmland by the following acreage.

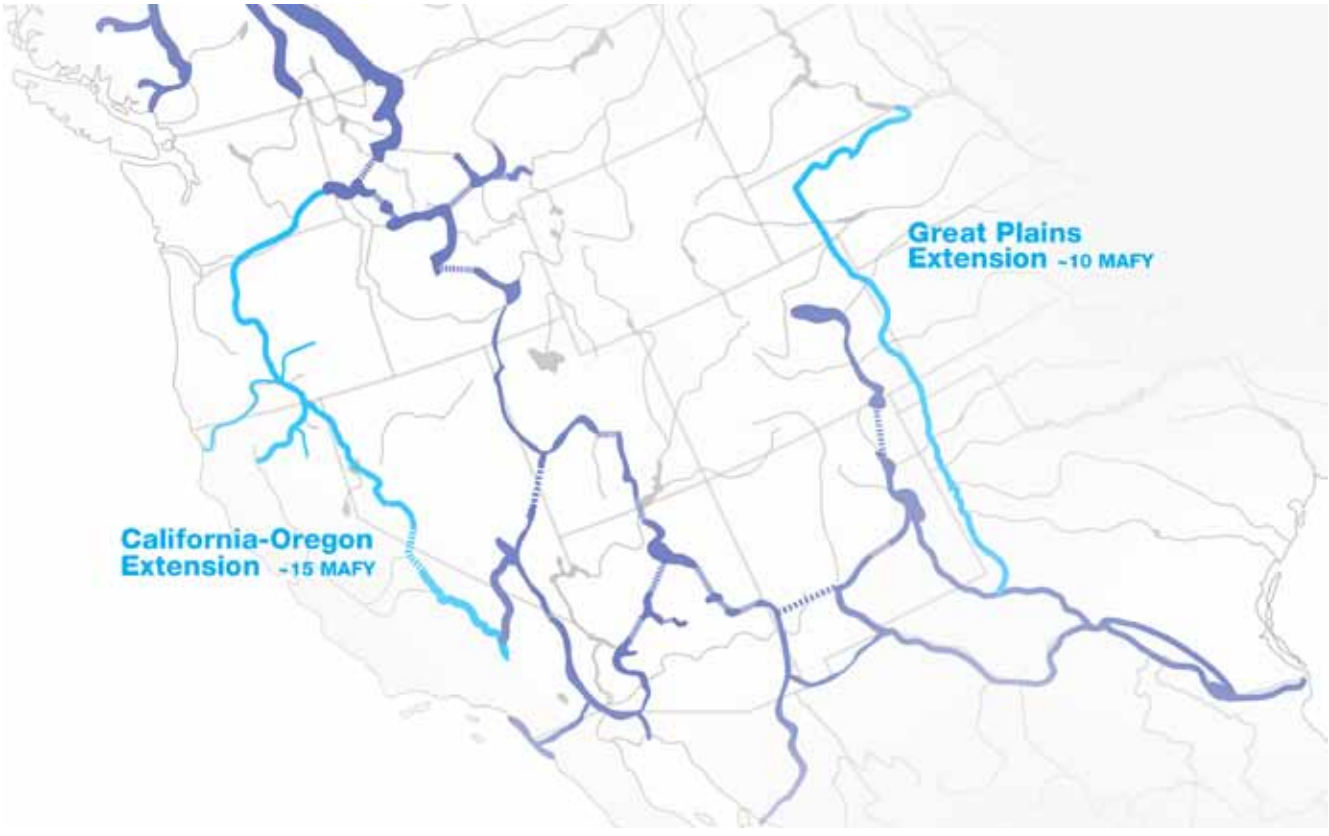
Part 2: Additional Water Control and Delivery Systems and Water Uses

Additional water delivery systems have been proposed. Building either of the following water extensions for the United States would greatly augment the total water management capability of the original NAWAPA design to deliver water where needed, on demand, as well as diverting flood waters.

California-Oregon Extension. By either increasing the total collection by 1%, or utilizing nuclear power instead of hydro for 2.5 GW of the needed pumping requirements in British Columbia or Idaho, 15 MAFY could be added to the outflow of the Rocky Mountain Trench, which supplements the Columbia River. This added flow could be used in a plan designed by U.S. economic consultant Hal Cooper. The water would be pumped into the Deschutes river above the Dalles Dam and brought through Oregon, with branches serving needs in the region, until finally a) linking with the Shasta Lake supply system supplementing and augmenting the existing water supplies of the northern California water system for fishing, farming, and other needs of the population, b) adding water to the Owens River and Lake Owens, restoring the previous agriculture in the Owens Valley, and c) linking up with the Panamint Reservoir of the original NAWAPA design.

Great Plains Extension. In 1967 R.W. Beck Engineers designed a plan to deliver 10 MAFY to the Great Plains by diverting Missouri flood water just down-

6. *EIR*, May 9, 2003, "Vernadsky and the Biogeochemical Development of N. America's Desert."



stream from Fort Randall Reservoir, at an elevation of approximately 1,250 feet above sea level. The flows would be lifted 3,000 ft through a series of dams and canals 200 miles up the Niobrara River in Nebraska to northwestern Nebraska, before flowing along a 940 mile canal through eastern Colorado, western Kansas, western Oklahoma, and western Texas, irrigating 6-10 million acres along the way, and ending near Pecos River in New Mexico. This system could be slightly adjusted from its original design to intersect the Colorado distribution segment of NAWAPA XXI, or its Pecos River irrigation canals.

Western Canada and the Dakotas

By way of the Great Lakes Seaway Canal, 4.4 MAFY of water will be delivered to Alberta, 7.6 to Saskatchewan, and 7.6 to Manitoba, while the Dakota Canal, which branches off of this canal, will receive 11 MAFY.

This water could be used for irrigating up to 10 million acres in Canada and 4 million acres in the Dakotas. Other possible uses for the water could include energy development in western Canada and the Dakotas, as in the Athabasca tar sands development, and oil and gas production in the Bakken formation. Water could also be utilized for uranium and coal mining activities.

The Dakota Canal will follow the continental divide, and therefore as it enters the Minnesota River at Browns Valley, will be able to distribute water down various directions off of the ridge of the continental divide, and could be designed to prevent flooding in the Minnesota and the North Dakota flood plain.[7]

The water for the Great Lakes Seaway will be much more than a water delivery canal, however, as the seaway will have a tremendous effect on the resource and industrial development of British Columbia and the prairie provinces. A group of graduate students who produced a 180 page study in 1966 on the economic impact of NAWAPA in BC,[8] described it in the following way, paraphrased here.

The existence of an inland waterway system, in regions where the lack of major transportation routes is presently a constraint, could change the whole econ-

7. Interview with MN hydrologist Ed Ross, http://larouchepac.com/node/16650

8. "NAWAPA: An Impetus to Regional Development in British Columbia," University of British Columbia, April 1966.

omy. Tapping the interior of Canada by an economic transportation mode with long distance, bulk cargo characteristics, would allow the shipping of wheat, oil, iron ore, timber, and other specialized bulk cargoes, such as chemicals, to both Eastern and Western world markets. International shipping which found it more advantageous to use a Canadian seaway than the Panama Canal would contribute to the Canadian economy. The water transport route for BC's forest products would allow more flexibility of choice. Bulk cargo could be loaded at interior ports for all parts of the world. Newsprint could be made at the cutting site, avoiding transshipment costs, or timber could be transported for secondary processing. The 32 GW of cheap and available power in BC will attract material-oriented industries such as chemical and metal groups. Other industries such as food, wood products, mining, and others, will also be attracted by the cheap power.

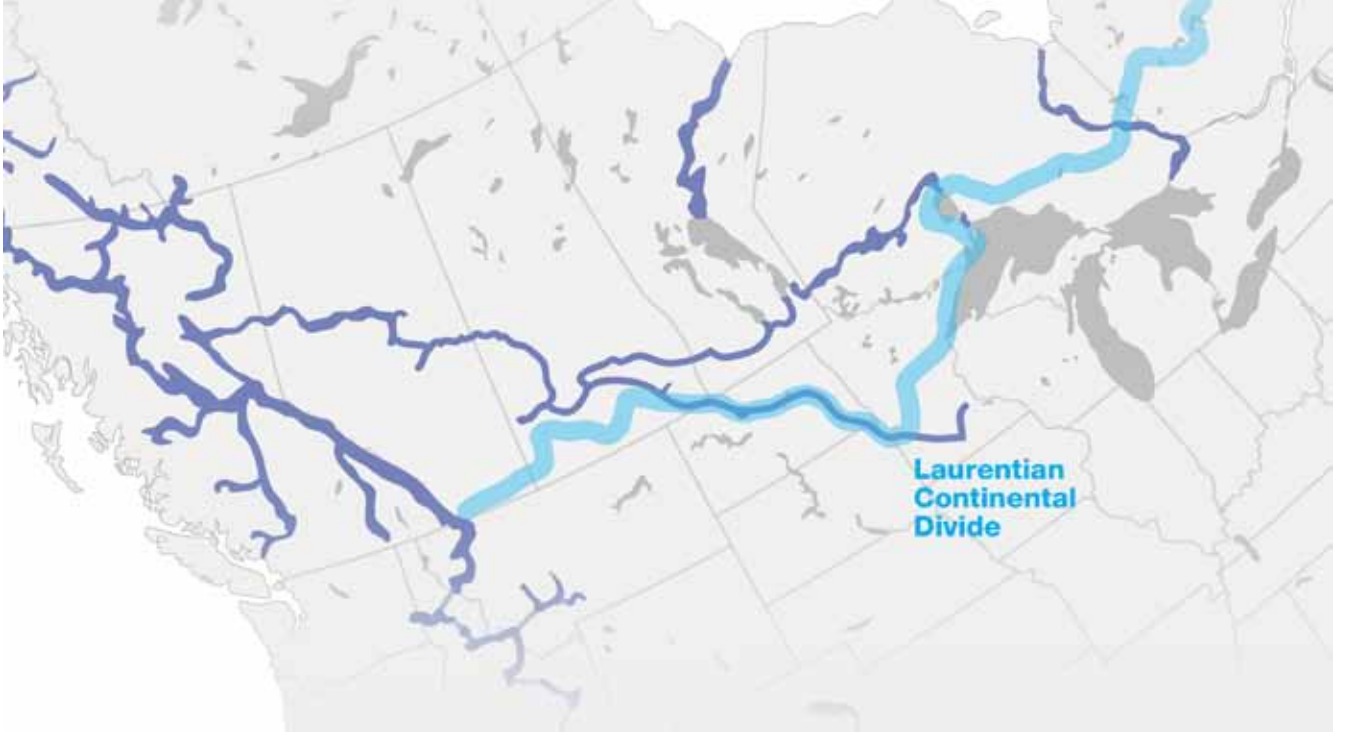
Recreation: A fuller study of the waterways and reservoirs created by NAWAPA XXI by the three governments involved may find that the increase in recreation alone would be sufficient reason to carry out its construction, as the number of new state, county, and municipal public parks would reach well over 300, the recreational fishing industry would boom, and recreational shoreline would, judging from Lake Powell's 1,800 miles of shoreline, be multiplied well over ten times its current amount.

Part 3: Securing Newly Irrigated Farmland

Water Infrastructure

Land has been taken out of agricultural production due to residential sprawl, lack of water, or environmental litigation. This acreage lost to farming is quantified, by state, in the National Resources Inventory, kept by the NRCS—National Resources Conservation Service (formerly the Soil Conservation Service) of the U.S. Department of Agriculture. There exists much new land to be opened up. This may include Bureau of Land Management (BLM) land.

NAWAPA XXI's water would be distributed through existing irrigation systems, which will require upgrades, as well as newly created systems. More production means more hauling, which means more rail, especially in the Southwest. Increased farm production means increased farm labor. Former farmers may be brought back to re-invigorated farm land. And for the opening of new farmland, something akin to a new Homestead Act may be needed.



The Return to Parity Pricing and Food Security

To fully make use of the water provided, overhaul of the current speculative systems which are strangling food production is required.

1. WWII experience: Parity pricing for farm commodities was introduced as policy by the 1930s FDR Administration, and during WWII was key in nearly doubling the output of many basic commodities, despite military service of farm workers. Farm commodity prices were kept in the range of 80 to 110% of parity. Over the next 20 years the parity policy was phased out[9], with the "free market" taking over. Over the last 40 years, the number of family-farm operations has plunged, and the population of rural farm counties has fallen. The general level of the potential productive agriculture landscape has decreased, despite specific gains in certain technologies (e.g. plasticulture, drainage tiling).

2. The founding of the North America Free Trade Agreement (NAFTA) and the World Trade Organization (WTO): NAFTA, founded in 1992, undercut agriculture drastically. Mexico has been forced into hunger and import-dependency. This policy was imposed worldwide through the "Uruguay Round" of the UN General Agreement on Tariffs and Trade Talks (GATT), 1986 to 1990, which culminated in the 1995 founding of the WTO. The tenets of the WTO include that no nation dare keep food reserves (because this distorts "market functioning"), and that private cartels of corporations have the right to control science, research, and food seeds, in the name of "intellectual property" and "patent rights."

3. Cartelization of Agriculture: Over the past 50 years, a number of commodity cartels have come to exert extreme control over agriculture, food processing and distribution. They have imposed vast patterns of monoculture, "enclave" farming,[10] etc. Existing anti-trust laws on the U.S. books would end these practices, if implemented.

4. The impact of biofuels on food production: The imposition of now large-scale corn-for-ethanol by the "alternative fuel" wing of the speculative market, has warped the Midwest of the North American continent. Instead of corn for livestock and other food uses of all kinds, the corn state farm capacity—formerly a mixed livestock, diversified region—has been forced into monoculture by Monsanto, DuPont, Syngenta et al., all for the purpose of more gasoline blends, instead of for a productive landscape.

A successful operation of NAWAPA XXI demands: a) a shutdown of the speculative practices in food, which can be dried up in large measure through the much needed reinstatement of the Glass-Steagall Act, b) a return to parity pricing, and c) a food reserves program.

9. It is still calculated, by law, by the USDA, for all the relevant commodities; it is impressive that many grains, meats and other products whose prices have soared in recent years, are not giving the farmer a price to cover his costs of production, which are soaring far more. The National Farmers Union, the National Farmers Organization, and others, republish the USDA parity calculations for today.

10. For example, setting up neo-plantations for export, such as African fruits and vegetables to Europe; or horticultural exports from northern Mexico to the U.S.

NAWAPA 1964

Released on Thanksgiving 2011, the LPAC-TV documentary "NAWAPA 1964" is the true story of the fight for the North American Water and Power Alliance. Spanning the 1960s and early '70s, it is told through the words of Utah Senator Frank Moss. The 56-minute video, using extensive original film footage and documents, presents the astonishing mobilization for NAWAPA, which came near to being realized, until the assassination of President Kennedy, the Vietnam War, and the 1968 Jacobin reaction, killed it

... until now.

http://larouchepac.com/nawapa1964