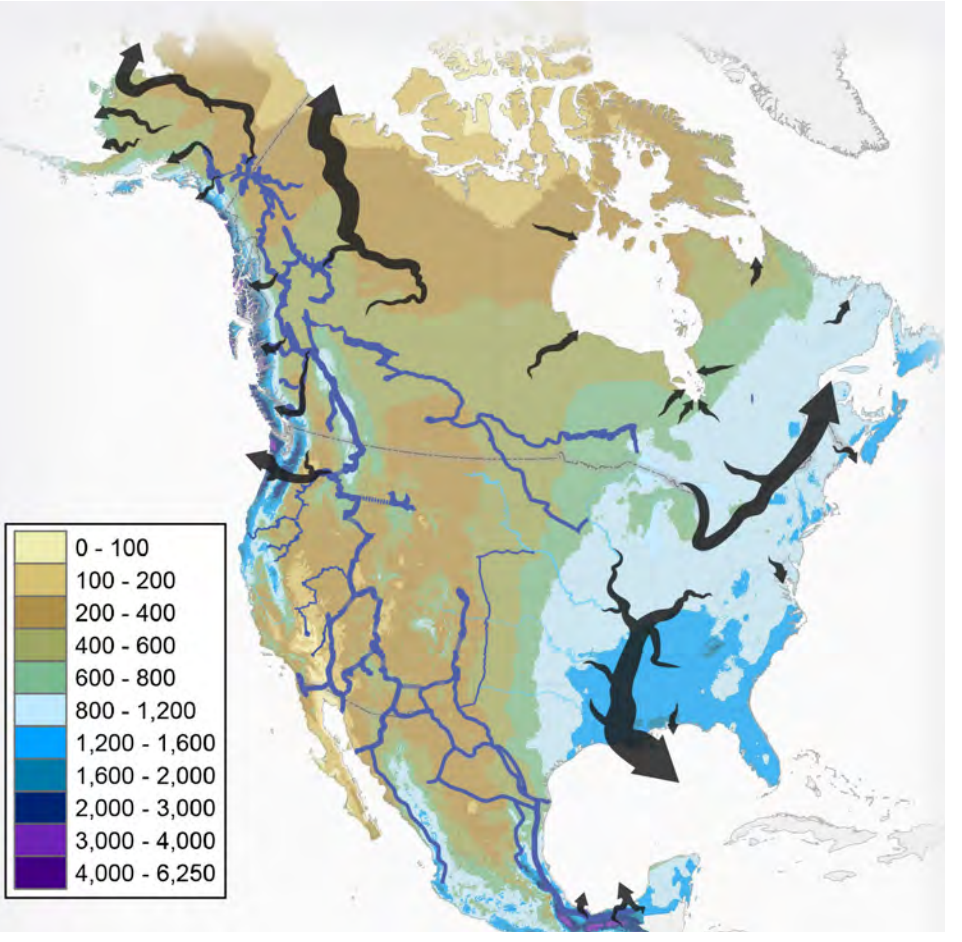
Continental Water Management:
A Promethean Task

by Jason Ross

Among the great Promethean projects of our era is the planned and updated North American Water and Power Alliance (NAWAPA XXI), a proposed treaty agreement between the three nations of North America to jointly construct a system for the collection, regulation, and distribution of water. This continental system of water management would significantly increase overall biospheric and economic productivity by partially correcting the poor geography of the North American continent, and it would represent a decisive break from the anti-human environmentalist cult belief that any changes to "nature" made by man are inherently sinful.



Water routes of the North American Water and Power Alliance, superimposed upon a map of rainfall patterns and river flow across the continent. The disparity of moisture levels leads to astonishing inefficiencies in the utilization of the continent's land and water.

Just as Franklin Roosevelt's physical-economic New Deal programs, such as the Tennessee Valley Authority, Rural Electrification Agency, and Grand Coulee Dam made possible higher levels of actual economic productivity (as opposed to the purely monetary financial activity of gambling, whether in Las Vegas or on Wall Street), NAWAPA XXI represents, today, a powerful vision: a rejection of the Wall Street and Green ideologies, and a specific, powerful project with massive economic dividends that will employ and improve the skills of millions of workers. Agricultural land will more than double in some states, overall living standards will increase, advances in industries for the project (nuclear power, tunnel boring, large-scale earth moving) will flow to all areas of the world's economy, and a currently largely unskilled generation of North Americans will have the opportunity to gain experience while participating in something worthwhile.

Had NAWAPA been built half a century ago when it was proposed in 1964, the extreme drought currently decimating agricultural potential in California would not be a problem, as the enormous water storage potential of the system's reservoirs would serve to even out wet and dry years. *Today, we are still the victims of nature; tomorrow, we will increasingly be its masters.*

The Productivity of Water

The value of any product in an economy depends on its context, and water is no exception. Due to the unfortunate geography of the North American continent, a great deal of water and land are wasted, falling far short of their potential to participate in both the broader biosphere and in human economic activity.

The three primary limiting factors for biospheric productivity (as measured by photosynthetic carbon incorporation, for example) are: sunlight, water, and temperature. The frigid temperatures and long, dark winters of the northern reaches of the continent severely limit the biospheric potential there, while the productivity of the Great American Desert, with plenty of plant-supporting sunlight and warm temperatures, is stymied by a lack of water. Dry land lies unused, and a large percentage of the water falling on the northern and western regions of the continent flows swiftly back to the ocean, unused by life on land.

Let us now quantify these qualitative characterizations. By combining rates of photosynthesis with studies of water flow, it is possible to determine the amount of plant growth per amount of water. This analysis reveals that every volume of runoff water in Alaska, Yukon, and British Columbia supports only *one-fifth* the photosynthesis of that same volume of water in the U.S. Southwest and northern Mexico. That is, each volume of water in the Southwest is currently five times more productive than the same quantity of water in Alaska.[1]

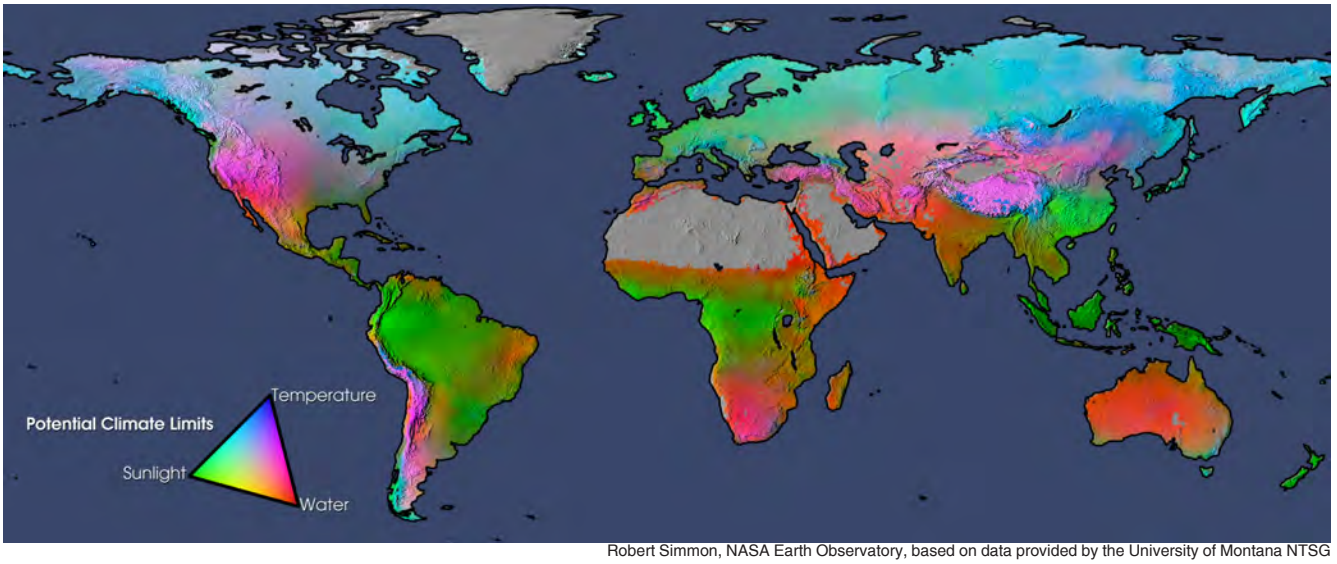
Now that we can compare *current* productivities of water already in these regions, what would be the effect of relocating water to different regions? To determine this, the relative importance of the three primary factors of sunlight, temperature, and water must be considered. Since water is not the limiting factor in the northern part of the continent, decreasing the amount of water there will have much less impact than increasing the amount of water in a dry region. That is, relocating the proposed amount of water from the northwest will have almost no impact on the biospheric productivity of that region, while it will have a dramatic impact on the dry regions it is brought to.

Benjamin Deniston, based on figures from R.J. van der Ent et al., doi:10.1029/2010WR009127

The regrettable geography of North America. The arrows on this map indicate the flow of atmospheric moisture. Unlike our more fortunate neighbors in South America, where westward-flowing precipitation can move deep into the continent, the central mass of North America, lying farther from the equator, has eastward-flowing winds bringing water from the oceans, but this water does not get far into the western part of the continent, due to coastal mountain ranges.

Under current conditions, each cubic kilometer (km^3) of runoff water in the northwest is associated with one million tons of carbon being incorporated into plantlife, a figure known as net primary production (NPP). In the southwest, the figure is five million tons per km^3 of water. Assuming the water re-routed to the southwest will be just as biologically productive as current water, the over 100 km^3 of water brought by NAWAPA XXI can be expected to increase biological productivity by over 500 million tons per year, which would *double* the biospheric productivity of the region. Across the entire continent, NAWAPA XXI brings the potential for an increase of 10–15% in the productivity of the North American water cycle. It would be absolute foolishness not to take advantage of the opportunity to increase the productivity of the continent in this way.

1. Photosynthesis can be measured by the mass of carbon newly incorporated into living matter, in tons of carbon per square kilometer per year. This is referred to as "net primary productivity" (NPP). NASA provides values of NPP for the entire planet throughout the year. The northwest portion of the continent (Yukon, Mackenzie, Fraser, Columbia, and north half of the Pacific Seaboard) has an NPP to water ratio of 1 million tons of carbon per cubic kilometer of runoff water, per year. The Southwest basins (Great Basin, Colorado, Rio Grande, El Salado, and the corresponding southern region of the Pacific Seaboard) and High Plains Basins (Nelson, Arkansas / Red, Missouri, and the Texas Seaboard) have an average NPP ratio of about 5 million tons of carbon per cubic kilometer per year.



Robert Simmon, NASA Earth Observatory, based on data provided by the University of Montana NTSG

Limits to biospheric productivity. The colors on this map indicate the extent to which sunlight, temperature, or water limit the productivity of the land. By moving water from regions of plenty to regions of scarcity, life increases.

It is also necessary to take into account the role of plant life recycling water, by transpiration. To put this in context, note that every year, 40,000 km^3 of water from the oceans falls as precipitation on land, while 73,000 km^3 enter the atmosphere from land, and then fall again on land. This means that the water falling on land as rain, primarily came from land, not the oceans. Of this 73,000 km^3, some comes from simple evaporation (from rivers, lakes, streams, and soil) while the rest comes from transpiration (evaporation from plants). Recent estimates, based on isotopic fractionation of water molecules, suggest that over 80% of the water entering the atmosphere from land comes from plants.[2] What will this mean for the continent as we wilfully redirect water flows and make deserts bloom? Every volume of water introduced directly by NAWAPA XXI will fall again as rain multiple times before making its way back to the oceans, its use being extended and multiplied by life.

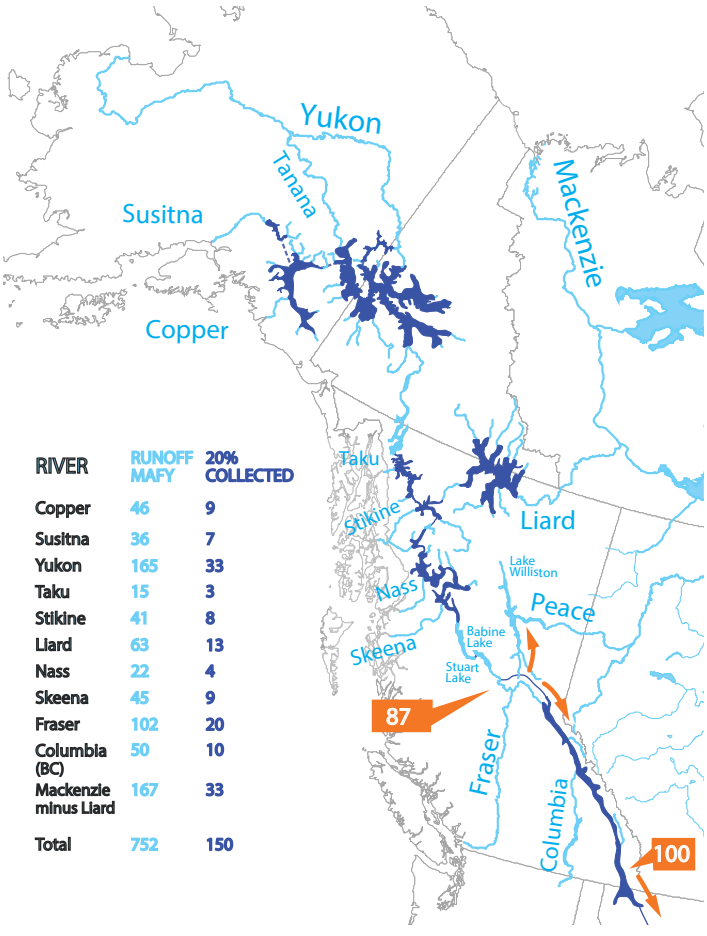
All told, this means the transformation of the continent's climate and biosphere, far beyond adding irrigation water for cropland. The weather-moderating and moisture-enhancing effects of NAWAPA XXI will spread beyond the regions directly receiving the redirected water.

NAWAPA XXI System Overview

That said, how will this water distribution be brought about? First, some details are needed on the wide discrepancy of rainfall distribution on the western part of the continent, due to the particularities of the Pacific Ocean weather system. The area stretching from Alaska and Yukon down to Washington State has forty times the annual river runoff of the Southwest and northern Mexico. Through a system of man-made canals and utilization of helpful continental topographical characteristics, a 2,000-mile reservoir system can collect and distribute runoff in the most efficient manner possible. The design proposes incorporating roughly 20% of the runoff of each northern river into the system to be collected for distribution. And unlike the original 1960s NAWAPA proposal, which released a portion of the collected water through hydro plants to generate the electricity to pump the remainder through the mountains, the use of nuclear power means that all the water collected will be available for delivery.

The collections from the Susitna, Copper, Yukon, and Taku Rivers (see map) are pumped from 2,100 to 2,400 feet into the Stikine Reservoir, which receives water from the Liard Reservoir, before joining with the Nass and Skeena Reservoirs, themselves flowing into Babine Lake and Stuart Lake at 2,330 feet elevation. If 20% of each river's annual mean runoff is collected, approximately 87 million acre feet per year (MAFY) would flow out of Stuart Lake into a man-made canal. Of the 87 MAFY flowing out of Stuart Lake, some 70 MAFY will be pumped into the Rocky Mountain Trench Reservoir, while around 17 MAFY will be diverted into Lake Williston for the Prairie Canal, where it will join the 33 MAFY collected from the Mackenzie basin streams. In the Rocky Mountain Trench, 20 MAFY will be added from the upper reaches of the Fraser River, and 10 MAFY will be added from the up-

2. The ratios of oxygen-18 to oxygen-16 and hydrogen-2 to hydrogen-1 are different in water that has transpired from a plant and water that has simply evaporated. Thus, measuring isotope ratios in atmospheric moisture provides a means of estimating the relative contributions from plant transpiration and evaporation. See "Terrestrial Water Fluxes Dominated by Transpiration," Jasechko, et al., *Nature*, April 18, 2013, as cited in Benjamin Deniston, "The End of the Green Paradigm: Texas to California with NAWAPA XXI", in press.



RIVER	RUNOFF MAFY	20% COLLECTED
Copper	46	9
Susitna	36	7
Yukon	165	33
Taku	15	3
Stikine	41	8
Liard	63	13
Nass	22	4
Skeena	45	9
Fraser	102	20
Columbia (BC)	50	10
Mackenzie minus Liard	167	33
Total	752	150

Map of the collection system of NAWAPA XXI, including annual runoff in millions of acre feet per year (MAFY), and the proposed collection volumes of 20% of that total.

per Columbia. The 100 MAFY flowing out of the Rocky Mountain Trench will be pumped through the Sawtooth Lift in Idaho and diverted multiple ways throughout the Southwest and northern Mexico. Once the design phase is completed and construction begins, it is feasible to adopt an accelerated timetable and apply new technologies, to bring pieces of the system online only years after it begins, with the main trunk line completed in ten to fifteen years.

Once the completed NAWAPA XXI system is built, water will be able to be delivered to every major river system and region of the continent west and north of the Mississippi. All of the plans will form an interconnected grid across the continent which will be managed as a single system.[3]

Nuclear desalination facilities along the completed NAWAPA XXI irrigation systems will augment the effect of the canals by recycling water more quickly, as well as increasing the total amount of water available. The completed system will allow for wide-scale biospheric engineering and directed water recycling, creating a broader hydrological effect than the direct water contributions from the distribution system itself. Scientific institutions which study the effect of moisture in arid regions toward effecting changes in local climate and weather patterns, will collaborate in planning specific types of land cover for specific regions, and enacting other techniques of weather modification. Reservoirs will also be maintained to maximize aquaculture.

The Needed Mission

There can be no equivocation on pursuit of NAWAPA XXI. While the current drought condition underscores the long-term necessity of this project, the more fundamental fact remains: the natural course for the human species is to develop and implement new technologies to improve living standards and move towards the ultimately achievable goal of a society in which all people have the opportunity to contribute something of lasting, durable value with their lives. On the path towards securing a lasting, efficient, physical immortality for all, greening and improving the continent with NAWAPA is an obvious step.

3. This is a very brief overview of the project. Readers are encouraged to consult the *21st Century Science & Technology* Special Report "Nuclear NAWAPA XXI: Gateway to a Fusion Economy" for more details. Available at: http://21stcenturysciencetech.com/Nuclear_NAWAPA.html