Cadillac Desert

Marc Reisner

3/5/02

First Causes

- 1/4 million dams in the U.S. over last 100 years
- Ignoring the earthen dams- 50,000 remain
- Subtract small dams leaves 2,000 really big dams
- They are 60 stories high or four miles long,..
- They contain enough concrete to pave an interstate highway end to end..

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An archaeologists view

- These are the dams that will make archaeologists blink!

- Did our civilization fall apart when they silted up?
- Why did we feel so compelled to build so many?
- We know surprisingly little about vanished civilizations whose majesty and whose ultimate demise were closely linked to liberties they took with water. *Reisner*

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The beginning

- The great white winter of 1886, a parabolic curve of rushing frigid air from the artic ran over the plains. The windchill approached 100 below, and
- Trapped for weeks,months, pioneers literally lost their minds, starving…..
- Cows were found piled by the hundreds at the corners of fenced quarter sections, all facing southeast. (enough cows died to feed the entire nation for a couple of years)
- Bankrupt cattle barons dismissed thousands of hands
- As soon as the frigid cold was gone, the droughts followed, with temperatures as high as 118 in Colorado in 1888.
- By 1890, the 3rd year of the drought, the people of the
- plains states began to turn back east.
- Tens of thousands went to wetter Oklahoma to the land that federal government usurped from 5 indian tribes.

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The rains came

- While the drought was happening in the plains, in the east it was pouring continually for weeks.
  - On the Allegheny River, Pennsylvania, sat a big earthfill dam built 37 years earlier, it was the largest dam in the world.
  - Rains rose in the reservoir and turned the dam into “cream of wheat”, On May 31 the dam dissolved….sixteen billion gallons of water dropped like a bomb on the town below. Before anyone had time to flee, Johnstown was swallowed by a 30 foot wave, the dead eventually counted as 2,200 - more casualties than the San Francisco earthquake and fire, and nine times as many as the Chicago fire. The only disaster in American History that took more lives was the hurricane of Galveston, Texas eleven years later.

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The rapid rise of irrigation

- The federal irrigation movement began in the early 1890’s,
  - Most good sites were simply gone
  - Pioneers had successfully ventured into Oregon, Washington and California,
  - Homesteads were already situated on natural streams
  - In the 1870’s and 80’s hundreds of irrigation companies ceased to survive after 10 years.
  - The 8th National Irrigation Congress of 1898, a Colorado legislator likened the American West to a graveyard, littered with defunct irrigation corporations.

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The Wright Act

- California attempted to rescue the farmers, by establishing irrigation districts, whose sole function was to deliver water to barren land.
  - They issued bonds that wouldn't sell, building reservoirs that wouldn't fill, allocated water unfairly, distributed it unevenly
  - In 1894 the federal government introduced a bill offering up to a million acres of land to any state that promised to irrigate it.
  - 16 years later, the Carey Act caused 288,553 acres to come under irrigation throughout 17 states in the West.
  - John Wesley Powell, a midwesterner, knew that all the private intiative in the world would not make it bloom.

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Theodore Roosevelt

- Returned from the west convinced that "vast areas of public land which can be made available for.....settlement" but he added "by building reservoirs and main-line canals impractical for private enterprise."
- The American West quietly became the first modern welfare state.
- The Reclamation Act of 1902 was a sharp left turn in American politics.
- The only way to prevent more cycles of disaster was to build a civilization based on irrigated farming.

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The Reclamation

- By June 17, 1902 the Reclamation Act became law.
- The underlying problems were politics and money. Under the terms of the Reclamation Act, projects were to be financed by the Reclamation Fund, which would be filled initially by revenues from the sale of federal land in the western states and then paid back gradually through sales of water to farmers
- (farmers, under the law, were exempted from paying interest on all repayment obligations, which of course is an indirect burden on the general taxpayer which has amounted to a subsidy of ninety cents on the dollar).

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Rules

- “The engineers who staffed the Reclamation Service tended to view themselves as a godlike class performing hydrologic miracles for grateful simpletons who were content to sit in the desert and raise fruit.”
- The soil turned out to be demineralized, alkaline, boron-poisoned; drainage poor that turned land into swamps; and markets for the crops didn’t exist.
- The Reclamation Act gave everyone up to 160 acres (a man and wife could jointly own up to 320 acres)
- But all depended on irrigated land.

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The first reform

- A $20 million loan from the Treasury to the bankrupt Reclamation Fund to keep the program from falling on its face.
- It was funded in 1910, the same year Section 9, an ill advised clause that promoted the construction of new projects where they couldn't work was repealed.
- Congress quickly began writing Omnibus authorization bills, in which bad projects were thrown in with good ones. The reforms began to concentrate on making bad projects work - "bailing them out"

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1924

- The reclamation program changed the repayment period from 20 years to 40 years. What turned out from there was the biggest problem of 20th century agriculture: huge crop surpluses.
- Production and prices reached record levels during WW1, when the war ended, production remained high, but crop prices did not. The value of crops grown on Reclamation land fel from $152 million in 1919 to 83.6 million in 1922 - leaving farmers in default.
- Prices of land pre-project years valued at $5-10 an acre was suddenly worth fifty times that. By 1927 1/3 of the farmers sold their land….. To buyers that were usually wealthy speculators who received tax breaks from Congress. One of those sales were the Salt River Project in Arizona was all but taken over b speculators.

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Subsidizing by hydro

- Reclamation is measured not in engineering units but in homes and agricultural values… The service regarded itself as an engineering outfit.
- Reforms extended payment period to now fifty years, setting water prices according to the farmers "ability to pay, using hydroelectric revenues to subsidize irrigation costs.
- Herbert Hoover, A Californian and an engineer elected in 1932, free wheeling, free-spending patrician. A period when a dozen dams were authorized in one single stroke.

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Economics

- Mattered little, if at all.
- If irrigation ventures slid into an ocean of debt, the huge hydroelectric dams authorized within the same river basin could generate necessary revenues to bail them out (or so was thought)
- The first and most fateful transformation was in the most arid and hostile quarter of the American West, huge desert basin transected by one comparatively miniature river: The Colorado.

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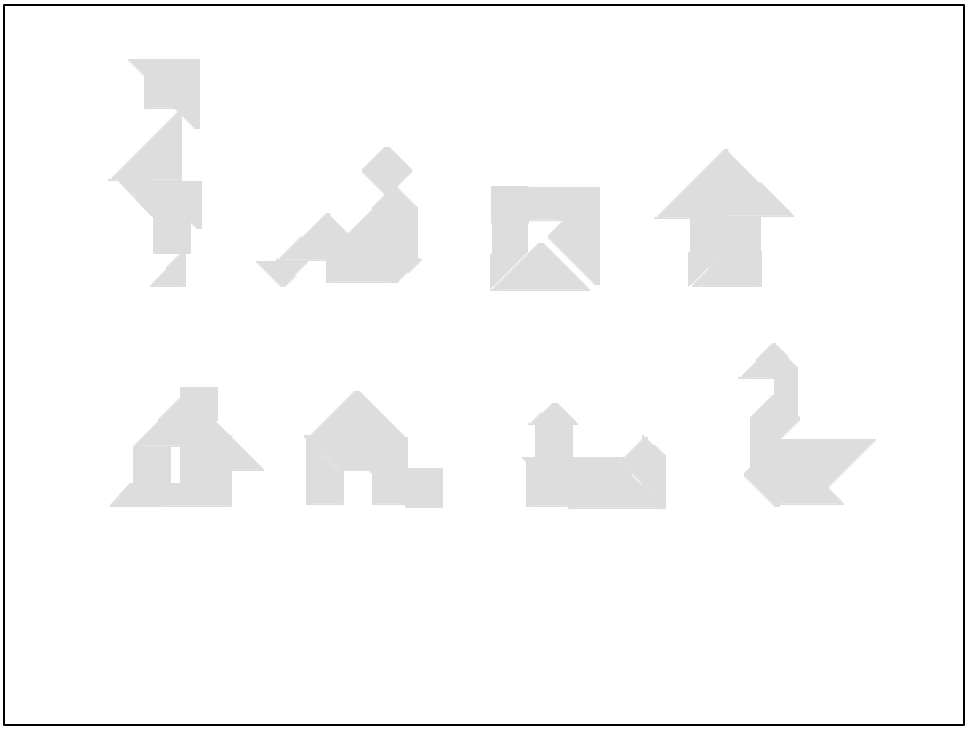

An American Nile

Marc Reisner

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Ours was the first and will doubtless be the last party of whites to visit this profitless locale. - Lieutenant Joseph Christmas Ives, on sailing up the Colorado River to a point near the present location of Las Vegas, in 1857

The Colorado River

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The Colorado is neither the biggest nor the longest river in the American West,…….
it is the most scenic

- The river system provides over half of the water of greater Los Angeles, San Diego and Phoenix.
- It grows much of America's domestic production of fresh winter vegetables;
- It illuminates the neon city of Las Vegas, whose annual income is one-fourth the entire gross national product of Egypt *(the only other place on earth, where so many people are helplessly dependent on a river's flow.*
- The greater portion of the Nile, however, still manages, despite
- many diversions, to reach its delta at the Mediterranean Sea.
- The Colorado, so used up on its way, trickles to reach its
- destination at the Gulf of California.

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Colorado River today

- Even though the Colorado resembles a river in its upper reaches and its Grand Canyon stretch - even as hydrologists amuse themselves by speculating about how many times each molecule of water has passed through pairs of kidneys - it is still unable to satisfy all the demands, so it is referred as “a deficit river”… as if the river was somehow at fault for its overuse.
- There are plans to alleviate the deficit by importing water from as far away as Alaska - 20 million people in the Colorado basin are faced with chronic shortages.
- The Colorado isn’t a big river and does not rank in the top 25. but its sheer orneriness provokes it as the greatest
- challenge to conquer.

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Sonoran Desert

- Southern California and Arizona, thousands of flat acres built by the Colorado’s ancient delta, fertile land where you could grow crops twelve months a year.
- All that stood in the way of cultivation was an annual rainfall of 2.4 inches, about the lowest in the United States.
- Turning the desert green was the next bi challenge.

3/5/02

1901

- Rockwood and Chaffey had cut a diversion channel, and a good part of the river was pouring over the fields in what had once been called the Valley of the Dead.
- Within eight months, there were 2 towns, 2,000 settlers and a hundred thousand acres ready for harvesting.
- By 1904 the channel had silted up, finally after much negotiation the Mexican gov't let developers cut still another channel below the border.
- Spring rains arrived 2 months early, and rain spilled out of the Gila River, just above the temporary channel, and continued back to its phantom channel (100 years earlier carved) the Alamo River.
- A 20 ft waterfall moved backwards toward the main channel, and by summer, the Colorado river was out of its main
- channel, and to the Salton Sea once again.

3/5/02

1907

- The river sent a record twenty-five million acre-feet - eight quadrillion gallons to the gulf, ripping up the railroads best efforts.
- The River was a rampant horse in a balsa corral, and to give the farmers some insurance against its countervailing tendency to dry up, was to build a dam, a huge dam.
- The only state that could use the water was California. Arizona, Wyoming, Nevada and New Mexico were still virtually uninhabited.
- But California contributed nothing to the river's flow
- Arizona and New Mexico very little; Wyoming
- and Utah about 1/3 and Colorado about 1/2

3/5/02

Colorado River Compact

- 1922
- under the guidance of Commerce Secretary Herbert Hoover
- 7 states divided the river arbitrarily at Lee's Ferry Arizona, a point just below Utah into two artificial basins.
- California, Arizona and Nevada were the lower basin - the other four states were the upper basin.
- Each basin allotted 7.5 million acre-feet.
- The remaining 1.5 million acre-feet were reserved for Mexico with a bonus of 1 million to the lower basin whose delegates threatened to walk out if they didn't get a better deal.
- But the average annual flow was nowhere near the 17.5 million acre-feet.

3/5/02

1930

- The American West had a population of 11 million people, about the population of New York State.
- Half were in California.
- Silicon valley was a stronghold of orchards and mountain lions.
- Electricity and telephones were unknown and didn't reach remote areas til the 1950's.
- However the greatest engineering feat was about to rise

3/5/02

Boulder Canyon Dam

- Six Companies bid $48,890,995.50
- The first eighteen months involved the construction of a new Colorado River.
- Four diversion tunnels were blasted through the rock of the box canyon, two on the Nevada side and two on Arizona side.
- Their diameter was large enough to accommodate a jumbo jet
- The task required the excavation of three and a half million tons of rock with enough dynamite to level Toledo.

3/5/02

1933

- The dam's size and weight would generate superpressures and insulating mass that would both generate and retain heat. Though the dam would appear solid, it would be, in reality, a pyramid of warm pudding.
- Left to its own devices, Boulder Dam would require 100 years to cool down.
- Frigid coolers were created by engineers to reduce the time to something like twenty months.
- 2 years of pouring, 220 cubic yards an hour, the dam was finally topped out. March 23, 1935 it stood 726 feet and 5 inches tall.

3/5/02

Electrifying California

- The dam during brief periods, could have electrified California,
- Nothing was more astonishing than the speed with which is was built, during the depression when plant after plant remained idle, and company after company went bankrupt, Hoover Dam was being built at breathtaking pace
- The first electrical power, from what was the largest power plant in the world, was produced in the fall of 1936.

3/5/02

Climate

- The most significant distinction between the East and West is the climate. Whereas the East generally gets enough rainfall to support agriculture, the West does not.
- Willamette Valley, a farmer can raise a number of different crops without irrigation;
- Two hours east, rainfall drops to 1/3 of what the valley receives; as well as climate far colder. Not only does a farmer in eastern Oregon have to irrigate, he als has an extraordinarily limited season of growth.

3/5/02

taxpayers

- Federal irrigation programs through which, he said, money was “taken from the pockets” of the taxpayers
- By 1950, California was already using its full 4.4 million acre-foot entitlement and planning more batteries for 700,000 more.
- The Bureau, having built Hoover Dam mainly for California’s benefit, was not embarking on the Central Valley Project, exclusively for California.
- A “cash register” dam was to be a dam with an overriding, if not a single purpose; to generate electricity for commercial sales.
- Electricity was to subsidize irrigation projects

3/5/02

Army Corp of Engineers

- The Army Corp of Engineer’s efforts to turn the lower river into a freeway for barges -- an obsession it has been pursuing on virtually every large river in the country.
- The creation of the Tennessee Valley Authority marked the first time a major river system was “viewed whole” even if the natural river virtually disappeared as a result.
- With river-basin accounting, one could take all the revenues generated by projects in any river basin - dams, irrigation projects, navigation and recreation features - and toss them into a “common” fund.

3/5/02

Hydro and dams

- Hydroelectic dams might contribute 95 cents of every dollar accruing to the fund, while the irrigation features might contribute a nickel (and cost three times as much to build and operate as the dams),
- But it wouldn't matter as long as the revenues came in at a pace that would permit the Reclamation Act's forty year repayment schedule, to be met, the whole package could be considered economically sound.

3/5/02

Colorado River Storage Project

- 1,622,000 kilowatts subsidized irrigation
- 85 cents of every dollar spent on irrigation features would be subsidized by power revenues.
- Every time they flicked a switch, electricity consumers in the region would be helping a farmer plant alfalfa at six thousand feet to feed a national surplus of beef.
- Most of the land that cost thousands of dollars an acre was not worth more than $50, being generou
- In the largest project of all, the Central Utah Project cost $4,000 an acre - six times the cost of the most fertile land in the world.

3/5/02

$2,000 an acre sold for $100

- "It wants to conserve the great natural supply of water which the Almighty placed there, for man to use, if he has the intelligence and the courage to use it" stated Joseph O'Mahoney of Wyoming.
- Glen Canyon would stretch back for nearly two hundred miles behind the dam, not counting the canyons and tributary streams.
- Conservationists at that time didn't count for much and the Sierra Club had just one full-time person.

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The Go-GoYears

Chapter five

3/5/02

Franklin Roosevelt

- Said he wanted to be remembered as the greatest conservationist and the greatest developer of all time.
- In a country with a population barely greater than Germany and with a land mass 15 times greater.
- FDR's conservation was not scientific, but instinctive.
- FDR thought up the Civilian Conservation Corps, (the most popular of all his programs)

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Interior Department

- Includes the Bureau of Reclamation,
- The Civilian Conservation Corps,
- The National Park Service,
- the Fish and Wildlife Service,
- And the Public Works Adminstration.
- The PWA was the catch basin of programs, it was also known as the Civil Works Administration.
- Above it it built dams

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Economic feasibility mattered little

- The Great Depression and the Roosevelt adminstration, together with the pyramid-scheme economics of the river-basin accounts, were more than enough to launch the federal dam-building program on a forty-year binge.
- The Dust Bowl also helped.

3/5/02

1910-1920's thru 1930's

- The teens and 20's were extraordinary and consistent rainfall. Millions and millions of shortgrass prairie used for livestock were converted to the production of wheat.
- But everyone knew the wet years wouldn't last.
- The first storms blew through South Dakota on Nov. 11, 1933

3/5/02

By nightfall

- ...some farms had lost nearly all of their topsoil.
- The sky seems to be one part dust to three parts air.
- A naked human tethered outside would have been skinless.
- Huge numbers of jackrabbits went blind.
- The storms continued through the spring and summer of 1934
- Dust was lifted high enough in the jet stream that carried it to Europe
- 756 counties and 19 states watched their world turn into the Sahara.

3/5/02

The Dust Bowl

- Triggered by the same fate of hope and drought that caused the plains to empty half a century earlier.
- The longest drought in the nation's history
- The virgin prairie, grazed well within its carrying capacity by thirty million buffalo, could probably have withstood the wind and drought; ravaged by too many cattle and plowed up to make way for wheat, it could not.
- If not the worst man-made catastrophe in history, and the quickest.
- By 1934, the National Resources Board reported that 35 million acres were destroyed; + 125 million debilitated.
- This sent 3/4 million itinerant paupers to California, Washington and Oregon.

3/5/02

Onward to California

- The San Joaquin Valley more specifically.
- By 1930, a million and a half acres were under irrigation, through 23, 500 well pipes that had sucked up groundwater than the prognosis for irrigation was terminal within 30-40 years.
- In some places the water table dropped nearly three hundred feet.
- Exhausting a hundred centuries worth of groundwater in a generation and a half, the farmers begged for relief.
- The next project to be undertaken was the Columbia River.

3/5/02

Pacific NW

- An accreted terrain- a landmass of exotic origin that migrated up from somewhere around the equator.
- After the glacier migration and the great flood that emptied Lake Missoula, left big channels “coulees”, the biggest of all - seven hundred feet deep, five miles across, more than fifty miles lone - called the Grand Coulee.
- In 1933 the Columbia was by far the biggest river anyone had ever dreamed about damming. Bigger than the Colorado, Snake, Clamath, and twice as big as the Rio Grande. It was the fourth biggest river in the North America.

3/5/02

Power potential

- For all its power potential, the idea of building a large hydroelectric dam at Grand Coulee was regarded by many people as insane. The NW had many smaller rivers that would be easier to dam.
- In 1930, The region had only 3 million inhabitants, and 70 percent being rural had no electricity.
- Even a tenth of the power potential of Grand Coulee could not be used, especially with Bonneville Dam going up downriver.
- In 1931 the Corps of Engineers announced the construction of a concrete dam at Grand Coulee via Roosevelt

3/5/02

Grand Coulee

- Would use more lumber - 130 million board feet - than any edifice ever built, but it was a tiny fraction of the dam's total mass, and none of it visible.
- The astonishing fact of Grand Coulee, is that people went out and built anything even without knowing how to do it. There were no task forces, no special commissions, Tremendous environmental impacts, but no environmental impact statements
- In the 19th century, aluminum had a street value close to gold --*It makes 12 times a much energy to produce a raw aluminum as it does to make iron, and since the process is electrolytic, it has to be done with electricity.*

3/5/02

westinghouse

- The westinghouse generators built for Grand Coulee were rated for a maximum output of 105,000 kilowatts each. For the entire duration of the war they ran at 125,000 watts, 24-hours a day.
- By the end of the war, Grand Coulee was generating 2,128,000 kilowatts of electricity. We were the biggest single source of electricity in the world.
- Grand Coulee, Hoover, Shasta and Bonneville, at the time they were ranked first, second, third and fourth in the world. 2 generators at Grand Coulee ran Hanford.
- In 1943 at the Hanford Reservation, the ultrasecret military installation along the Columbia River, were connected to the Manhattan Project and plutonium-29.

3/5/02

plutonium

- Eight plutonium production reactors at Hanford (still classified) is somewhere around fifteen or twenty megawatts each. It also produced sixty thousand aircraft in four years. We didn't outmanuever the axis powers in the war, but rather outproduced it.
- The main stem of the Columbia River did not have a single dam on it until 1933.
- These followed:
  - Bonneville 1938
  - Grand Coulee 1941
  - McNary Dam 1953
  - Chief Joseph Dam 1955
  - The Dalles 1957
  - Priest Rapids Dam
  - Chelan County PUSD 1961
  - Douglas County PUD 1967
  - John Day 1968
  - Thirteen tremendous dams in forty years on the Columbia
  - These were just the main-stem of the river.... 36 great dams on on and its tributaries - a dam a year. The Age of Dams

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Cheap electricity

- The dams produced so much cheap hydroelectricity that hundreds of thousands of people who flocked to the region during and after the war did not bother to insulate their homes.
- Insulation was expensive, electricity was dirt-cheap.
- In 1974, $196.01 worth of power from Con Edison in New York would have cost $24 if purchsed from Seattle Light.
- The Bonneville Power Administration - another product of the Go-Go years - launched a program of coal and nuclear powerplant construction.
- Of the 24 thousand-megawatt plants that were to be built under Washington Public Power Supply System - one a year - five were begun, only to be scrapped, half-completed.
- The cost of their construction, driven by inflation and hypeactive interest rates, drove electricity rates up, which drove demand down.
- $6 billion has been invested in nuclear power plants than may never produce a watt of power.

3/5/02

Emergency plan

- What had begun as an emergency program to put the country back to work, to restore its sense of self worth, to settle the refugees of the Dust Bowl, grew into a nature-wrecking, money-eating monster that our leaders lacked the courage or ability to stop.

3/5/02