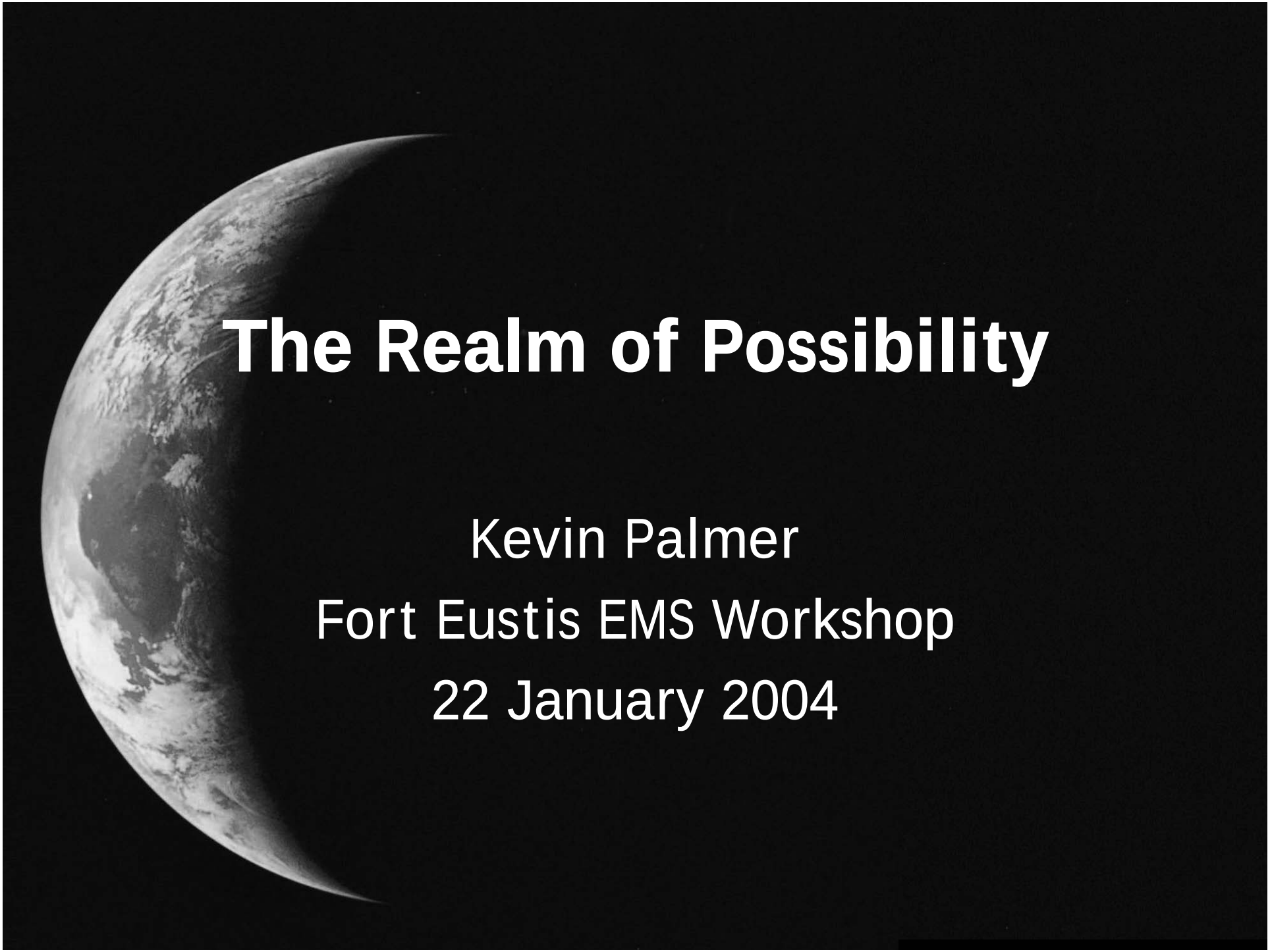
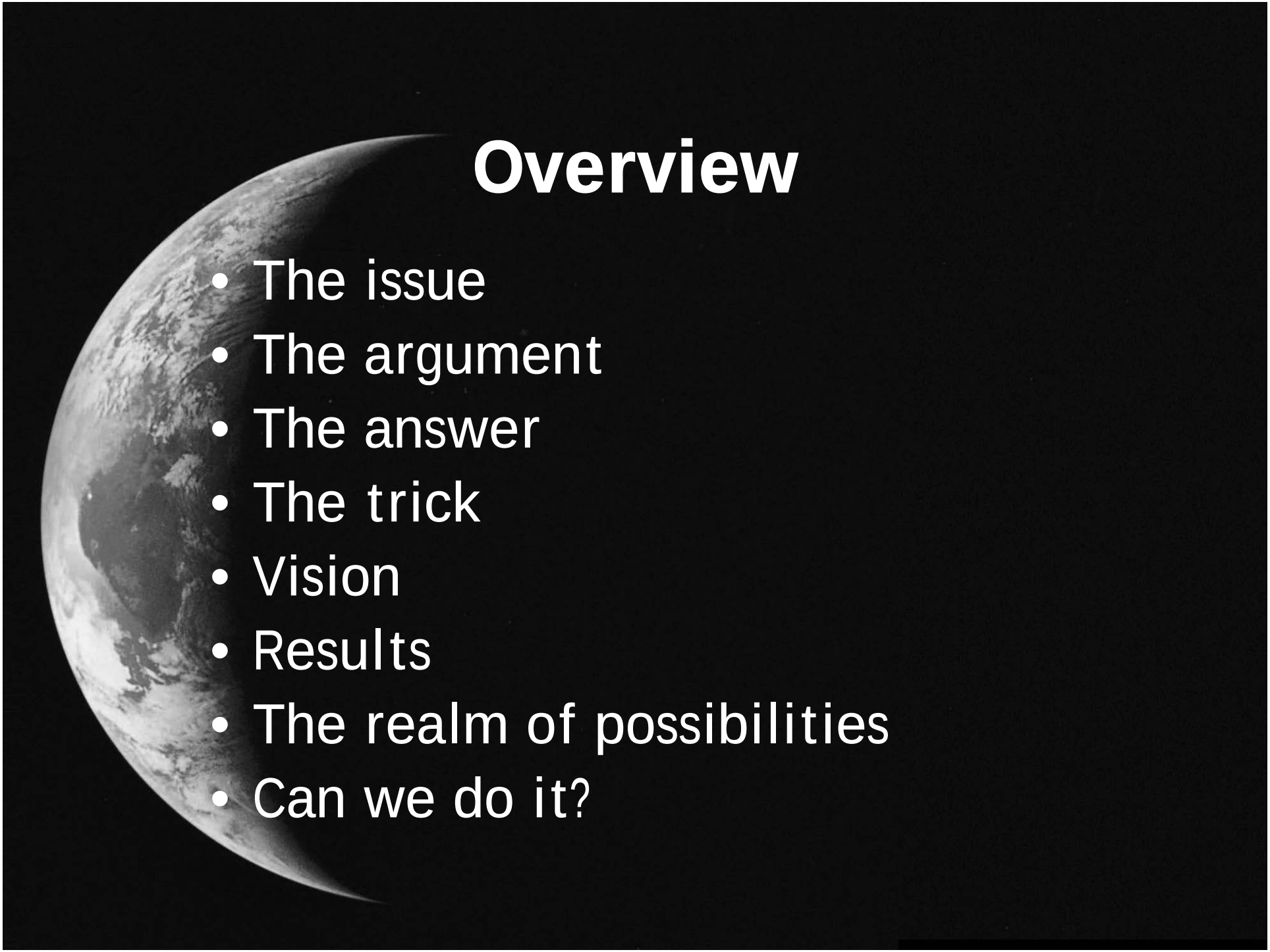


The Realm of Possibility

Kevin Palmer

Fort Eustis EMS Workshop

22 January 2004

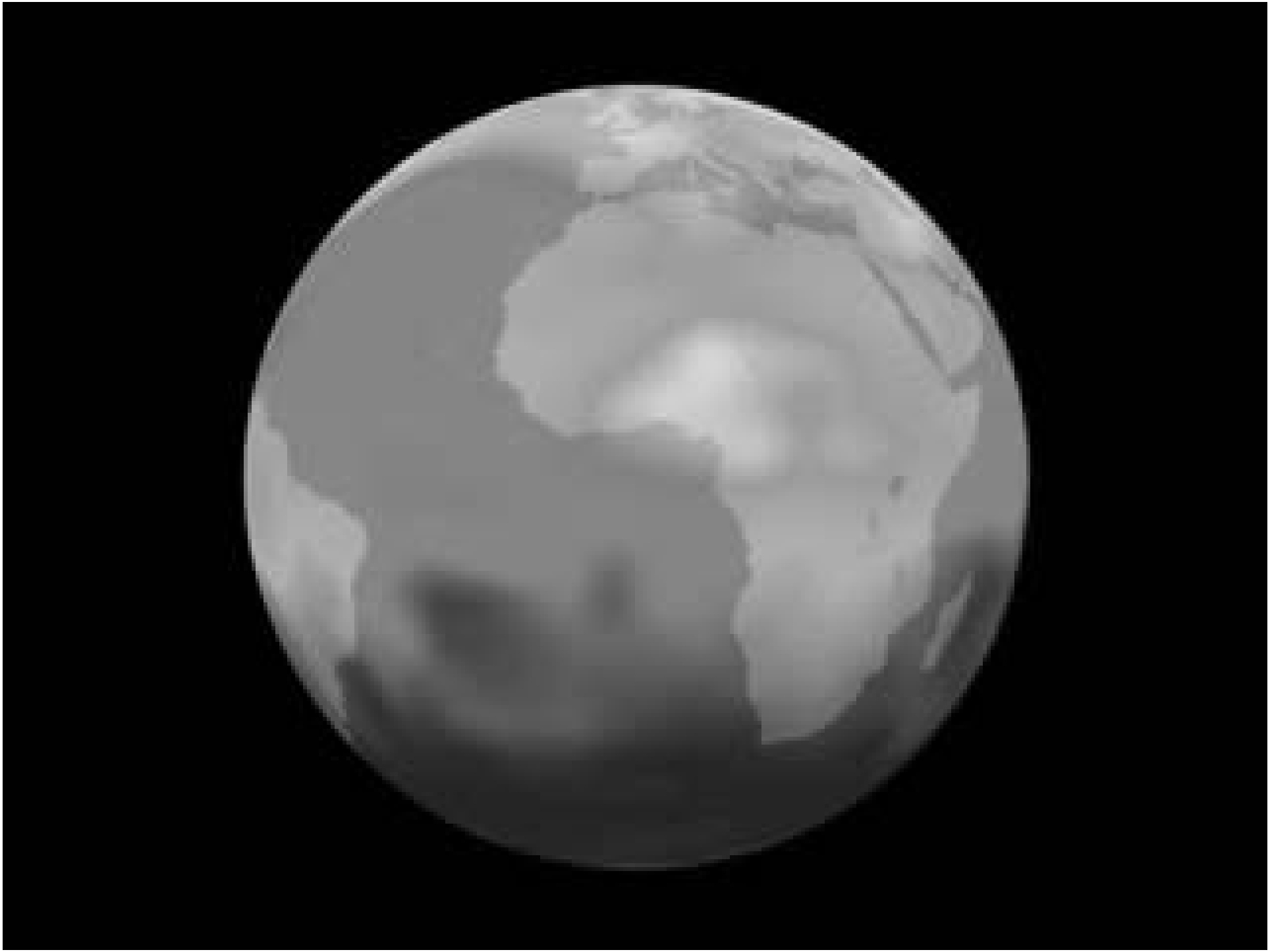


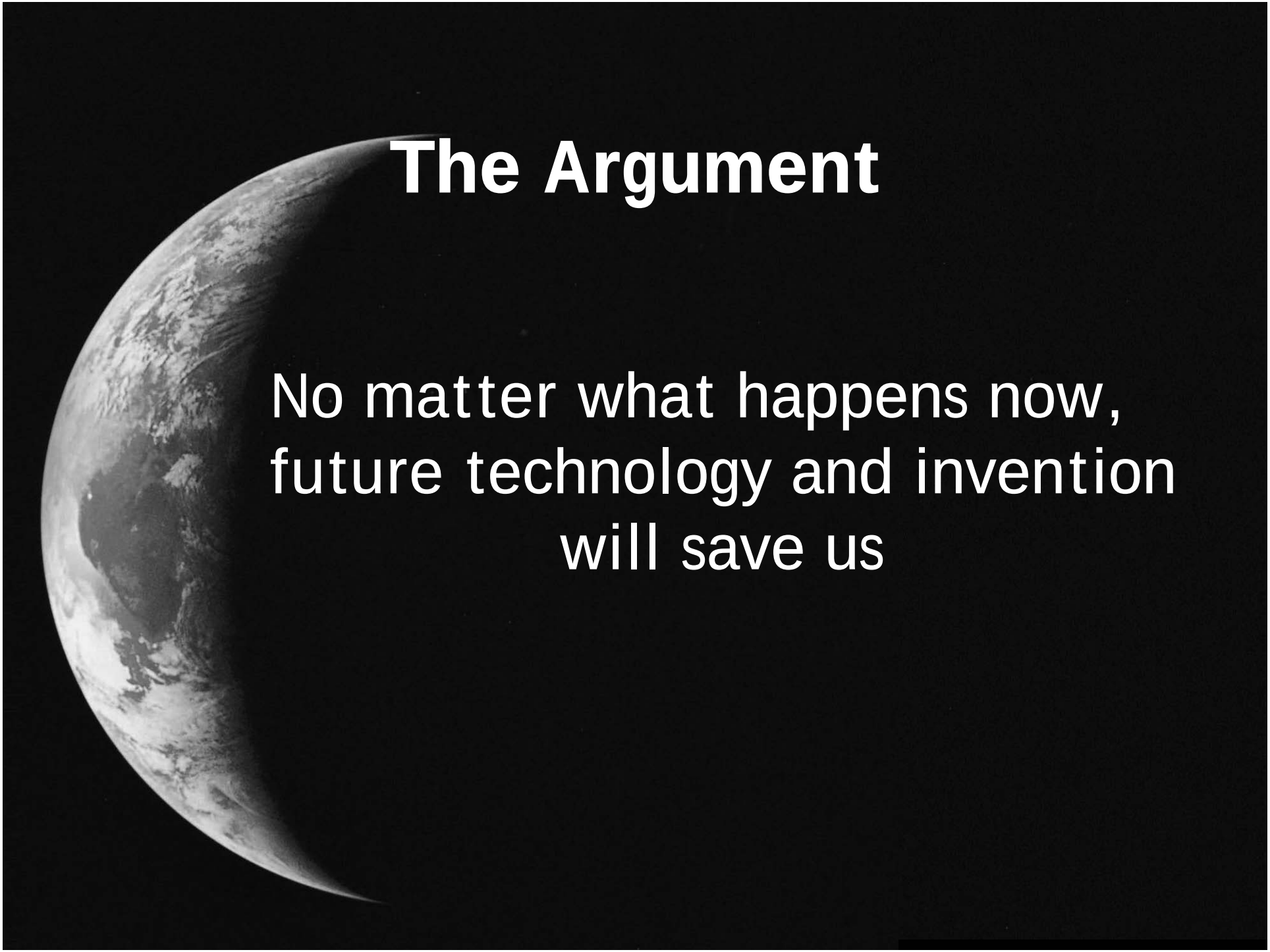
Overview

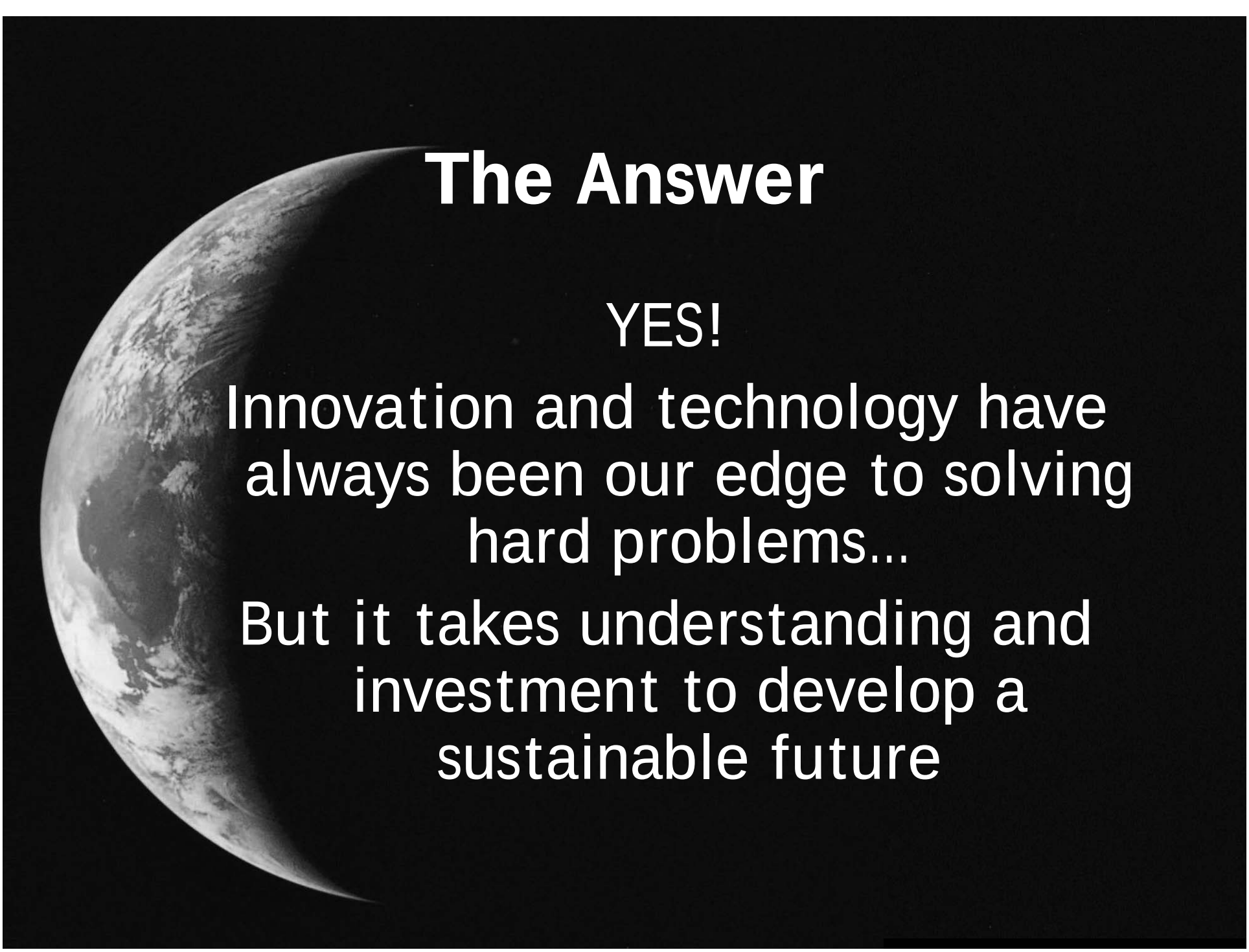
- The issue
- The argument
- The answer
- The trick
- Vision
- Results
- The realm of possibilities
- Can we do it?

The Issue

We're at zero balance on earths – we've only got one, no spares. *MG Lust, ACSIM*




The Argument
No matter what happens now, future technology and invention will save us


The Answer
YES!
Innovation and technology have always been our edge to solving hard problems...
But it takes understanding and investment to develop a sustainable future

The Trick

Is knowing:

- Which impacts can be prevented or decreased cost-effectively &
- When a technology is ready

The Other Trick

Is understanding that new technologies don't just happen. It takes:

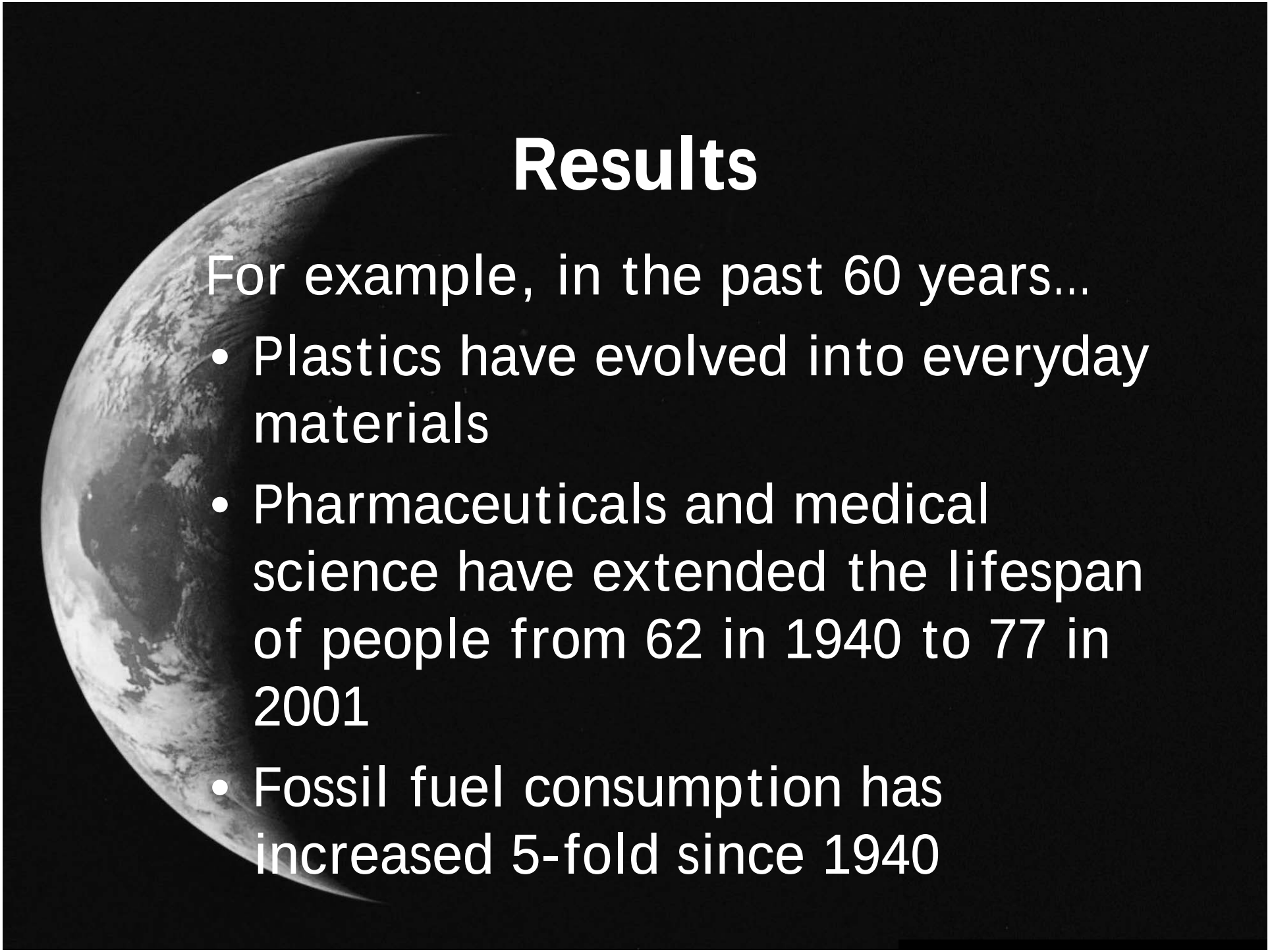
- Changes in mindset and problem-solving approaches
- A willingness to use future investments to obtain superior technologies
- Coordination with the markets we create and dominate
- Balance


Vision
It begins with the vision to understand that things can and should get better for the next generation.
We have always had visionaries who could see the future and set the world toward change

Visionaries

We have had visionaries who see the future, take Jules Verne for example. His 1863 book "The Earth to the Moon", predicted:

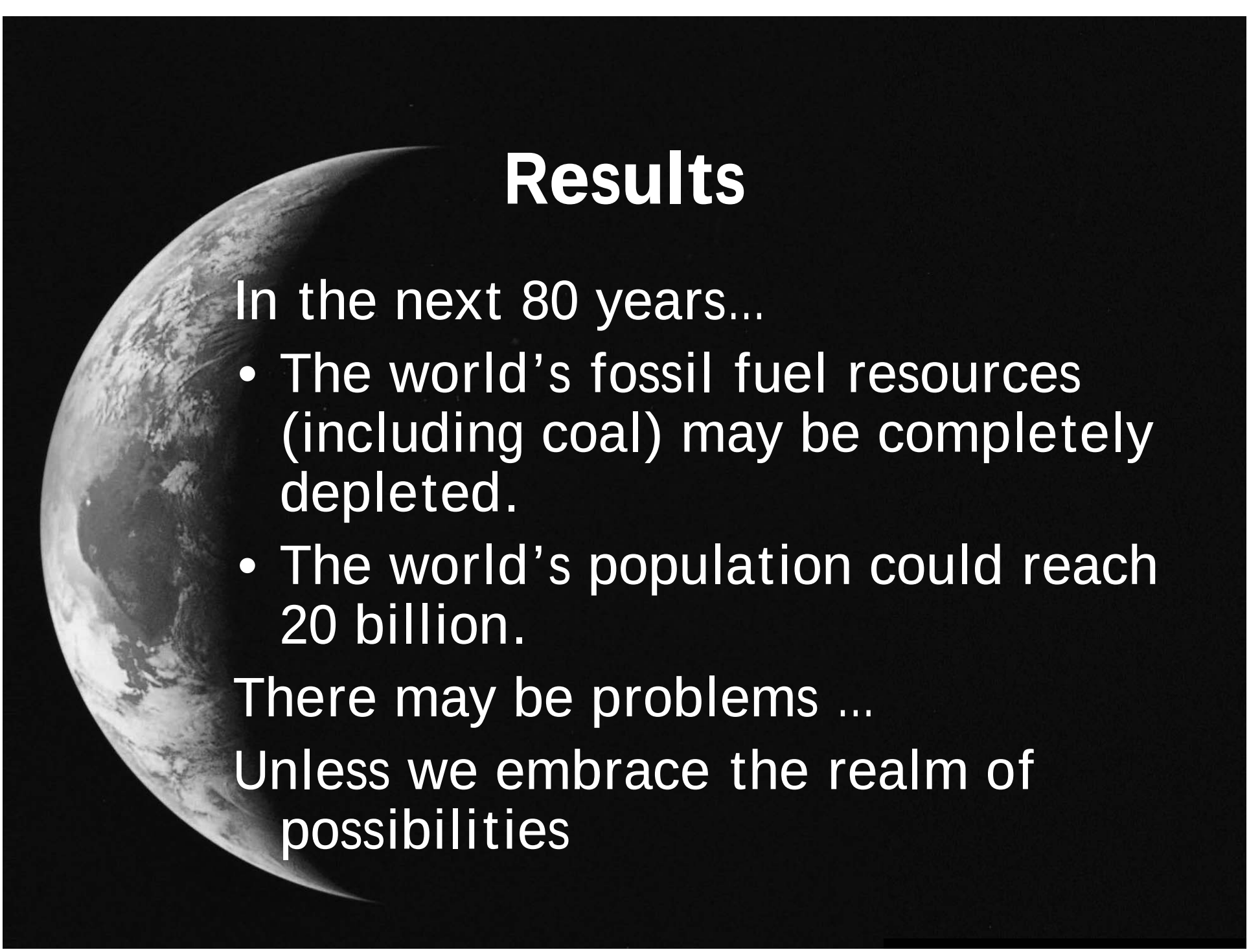
- The shape and size of the Apollo command module
- The number of crew (3)
- Launch from Florida near KSC
- A competition between TX and FL to be the launch center
- Weightlessness in space
- Splashdown in the Pacific



Results

For example, in the past 60 years…

- Plastics have evolved into everyday materials
- Pharmaceuticals and medical science have extended the lifespan of people from 62 in 1940 to 77 in 2001
- Fossil fuel consumption has increased 5-fold since 1940



Results

In the next 80 years…

- The world's fossil fuel resources (including coal) may be completely depleted.
- The world's population could reach 20 billion.

There may be problems …

Unless we embrace the realm of possibilities

The Realm of Possibilities

- Training support
- Infrastructure
- Procurement
- Community
- Transportation

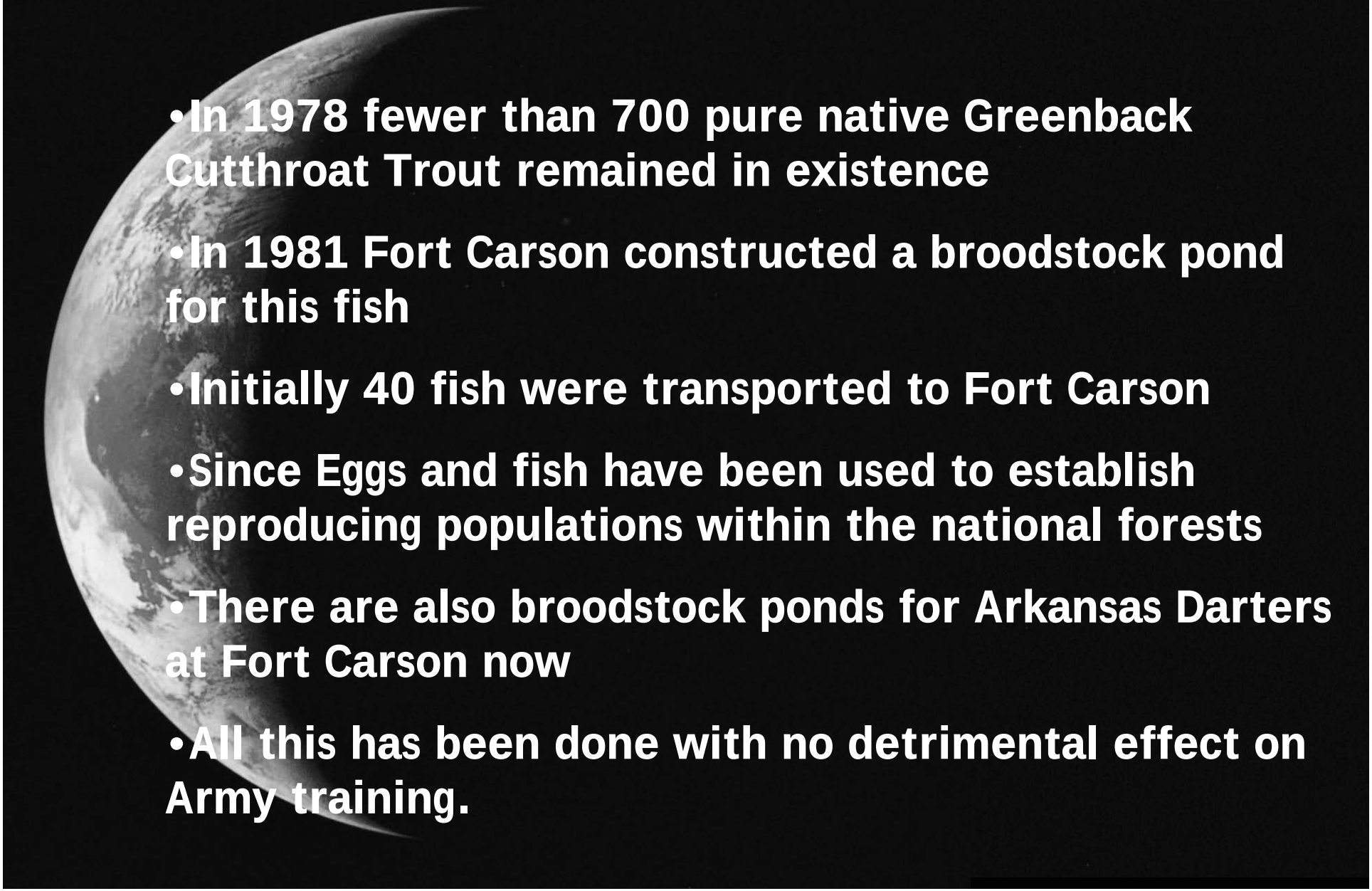
Training Support

- Land Mass: 8,228 acres
- Training Areas: 1,266 acres
- Ranges: 175 acres
- Airfield: 349 acres
- Paved Roads: 101 miles
- Rail: 23 miles
- Pier: 1,000 feet

Green Training

- Greenbelts
- Green Munitions – bullets, missiles, and grenades
- Virtual training
- Sustainable ranges – R&D with CERL and ATSC
- Zero Footprint Camp

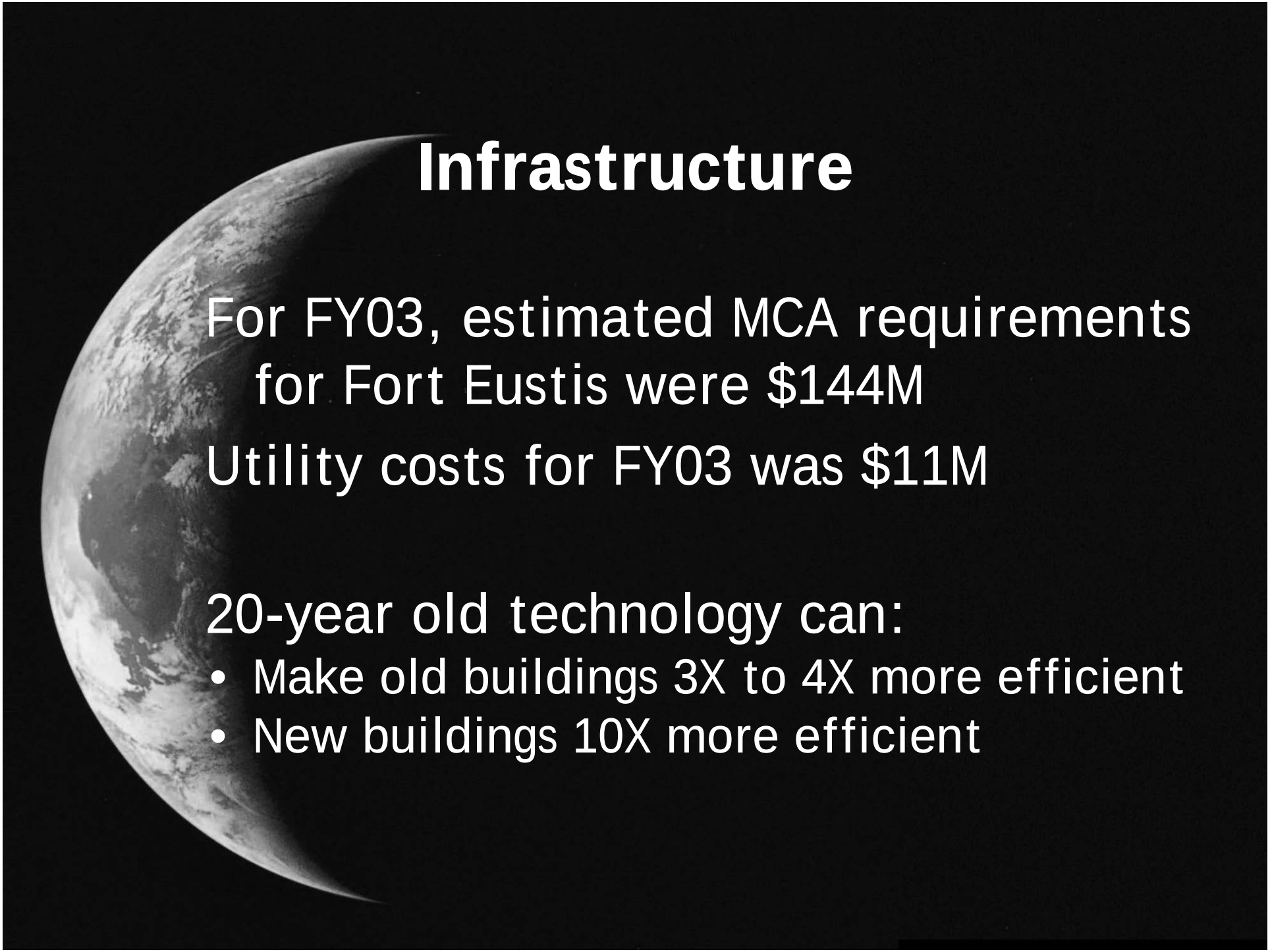
Fort Carson's Helping Wildlife



- In 1978 fewer than 700 pure native Greenback Cutthroat Trout remained in existence
- In 1981 Fort Carson constructed a broodstock pond for this fish
- Initially 40 fish were transported to Fort Carson
- Since Eggs and fish have been used to establish reproducing populations within the national forests
- There are also broodstock ponds for Arkansas Darters at Fort Carson now
- All this has been done with no detrimental effect on Army training.

Private Refuges – Wisconsin's Aldo Leopold Reserve

- Agriculture and Conservation Together Committee – a balance of conservation and farming to serve the entire community
- Private organization – overseeing wetlands and upland conservation projects
- Nationwide - Over 1.75 million acres



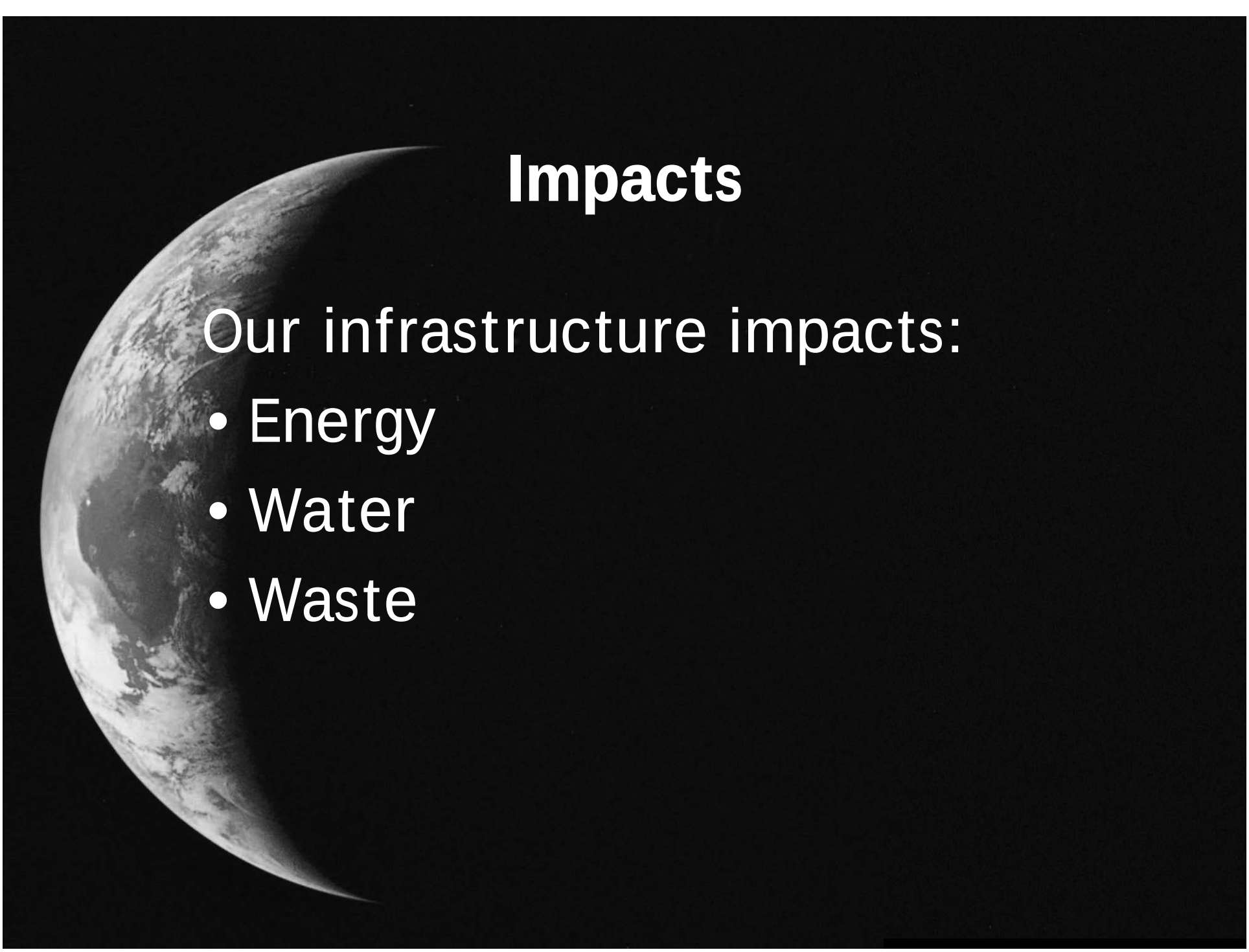
Infrastructure

For FY03, estimated MCA requirements for Fort Eustis were $144M

Utility costs for FY03 was $11M

20-year old technology can:

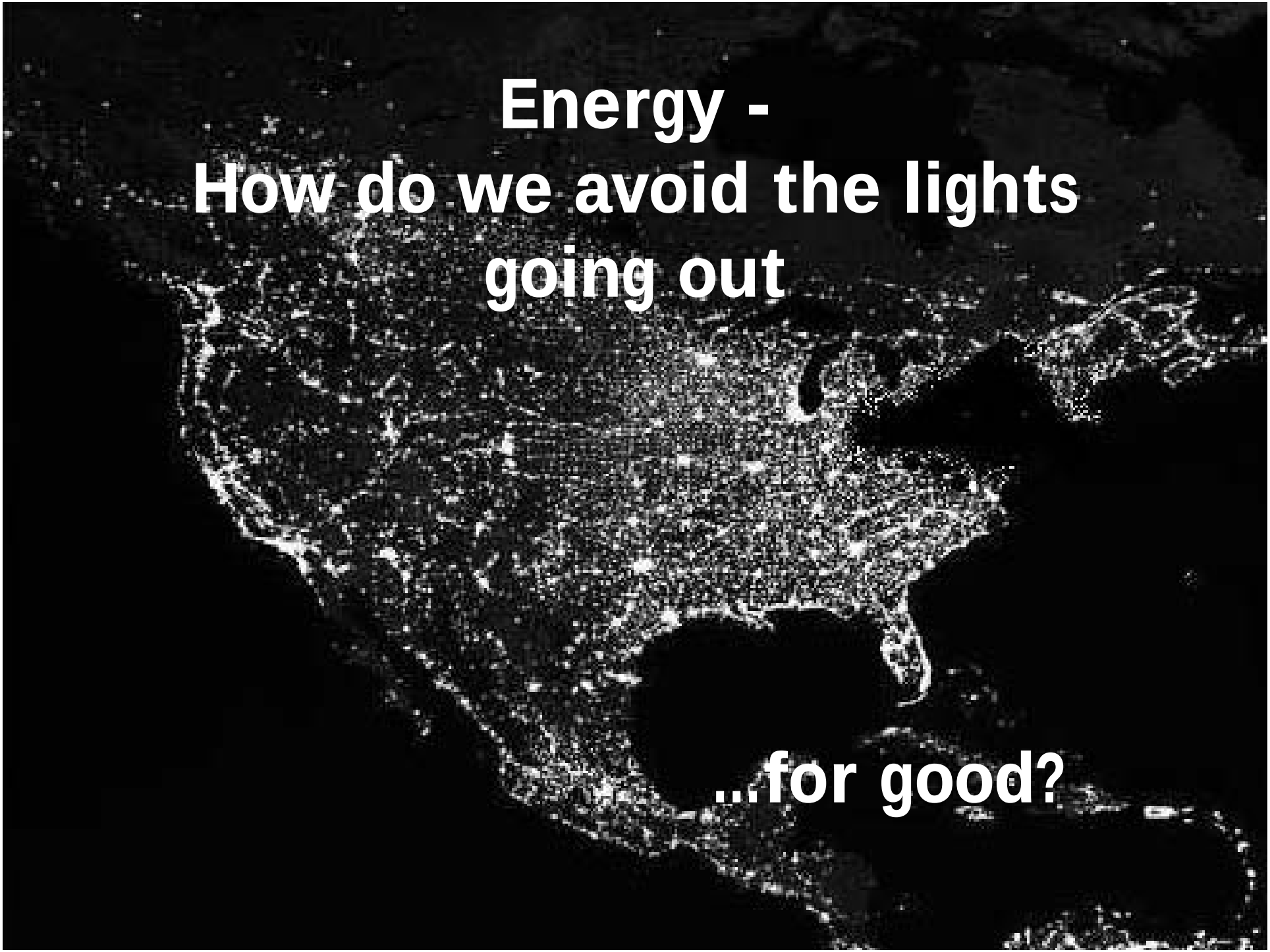
- Make old buildings 3X to 4X more efficient
- New buildings 10X more efficient



Impacts

Our infrastructure impacts:

- Energy
- Water
- Waste


Energy -
How do we avoid the lights going out
...for good?

Energy Consumption

We need to invest in new approaches to meet our energy need:

- Green power purchase
- Generating our own
- Conservation

Green Power Purchase

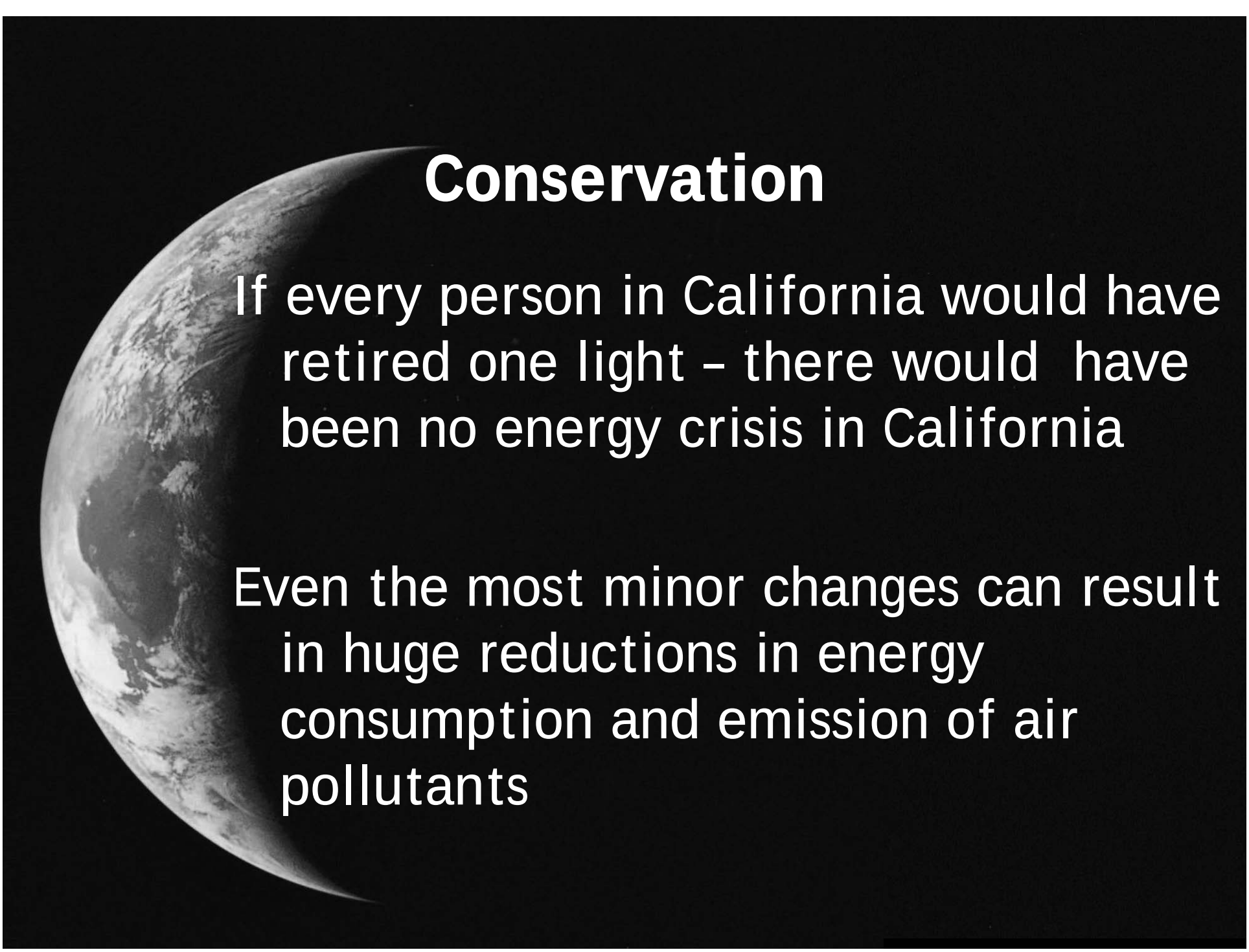
Several military and civilian installations purchase renewably generated energy:

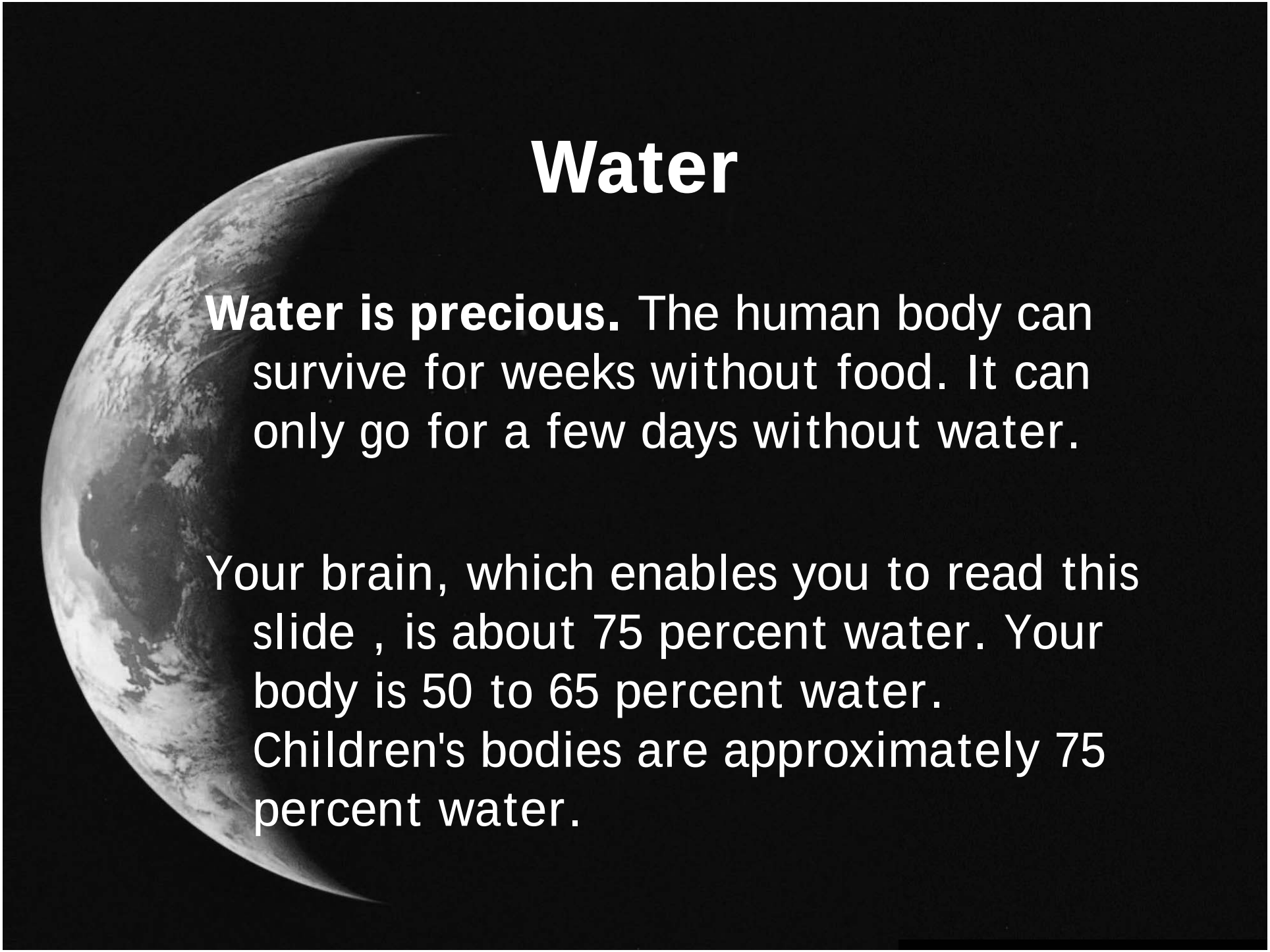
- Ft. Carson, Campbell, Bragg, Lewis, Hood
- Dyess AFB purchases 100% renewably (solar/wind) power

Generating Your Own

John F. Williams Federal Building in Boston, MA

- One of the largest operating solar arrays in the Northeast.
- Containing 372 solar panels and covers 3930 sq. ft.
- Offers an estimated savings of 28,014 kWh/year


Conservation
If every person in California would have retired one light – there would have been no energy crisis in California
Even the most minor changes can result in huge reductions in energy consumption and emission of air pollutants

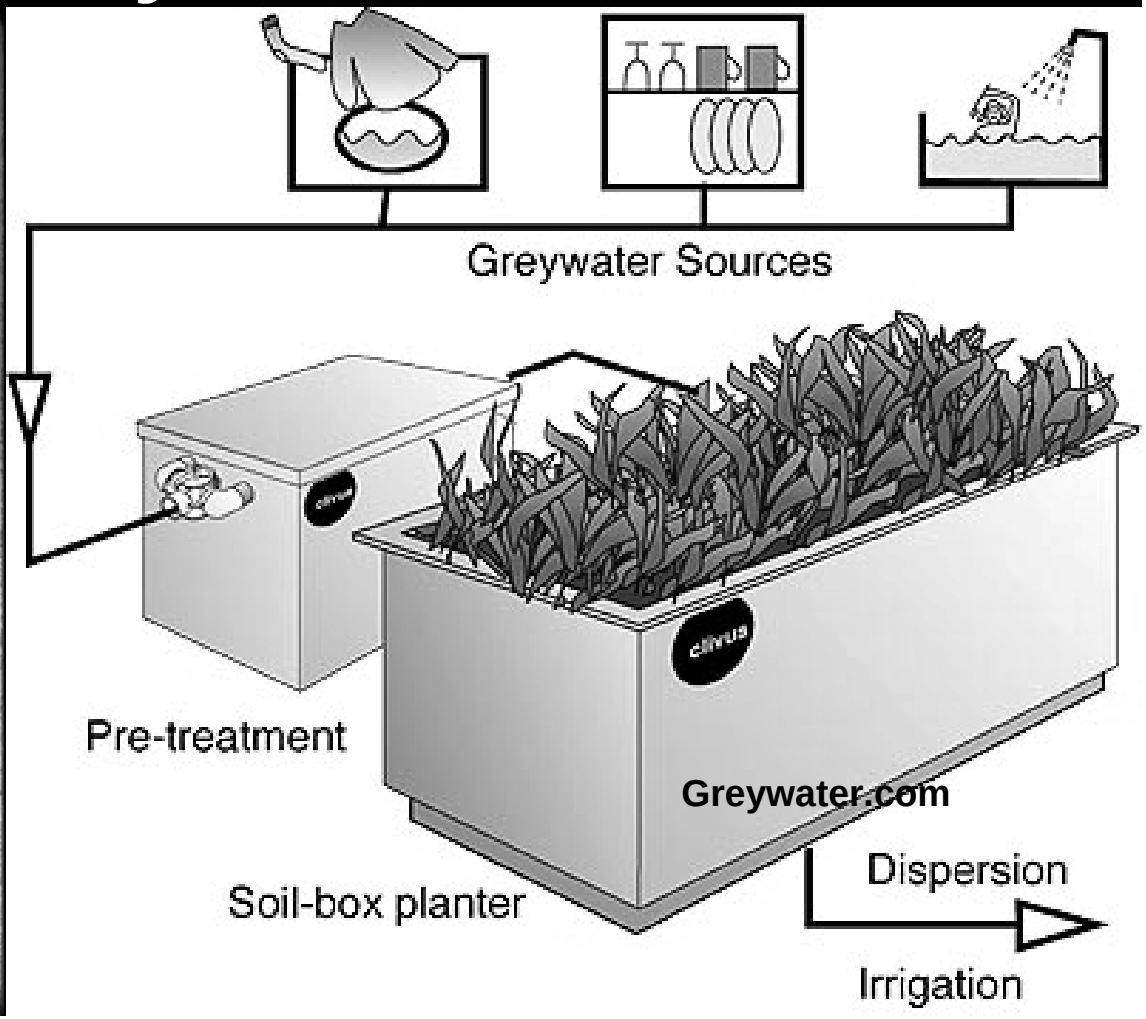


Water

Water is precious. The human body can survive for weeks without food. It can only go for a few days without water.

Your brain, which enables you to read this slide , is about 75 percent water. Your body is 50 to 65 percent water. Children's bodies are approximately 75 percent water.

Wastewater Technology is available to cascade water from higher to lower quality needs



How would you design a sewage plant if you had to live downwind?

Living Machines™ turn sewage into clean water and flowers.

Dr. John Todd

Waste

Building siting, design, construction, and deconstruction create costs and impacts for years

... waste, waste, waste

Fort Chaffee Building Deconstruction

- Partnership between Army and Habitat for Humanity
- Negotiated with Fort Chaffee Local Redevelopment Authority
- Over 600 large buildings (2 story WWII barracks)
- Large amount of salvageable siding, windows, doors
- Over 10 million board feet of old-growth yellow pine
- Value $20-40M

Build it Better: Bren Hall- University of California, Santa Barbara

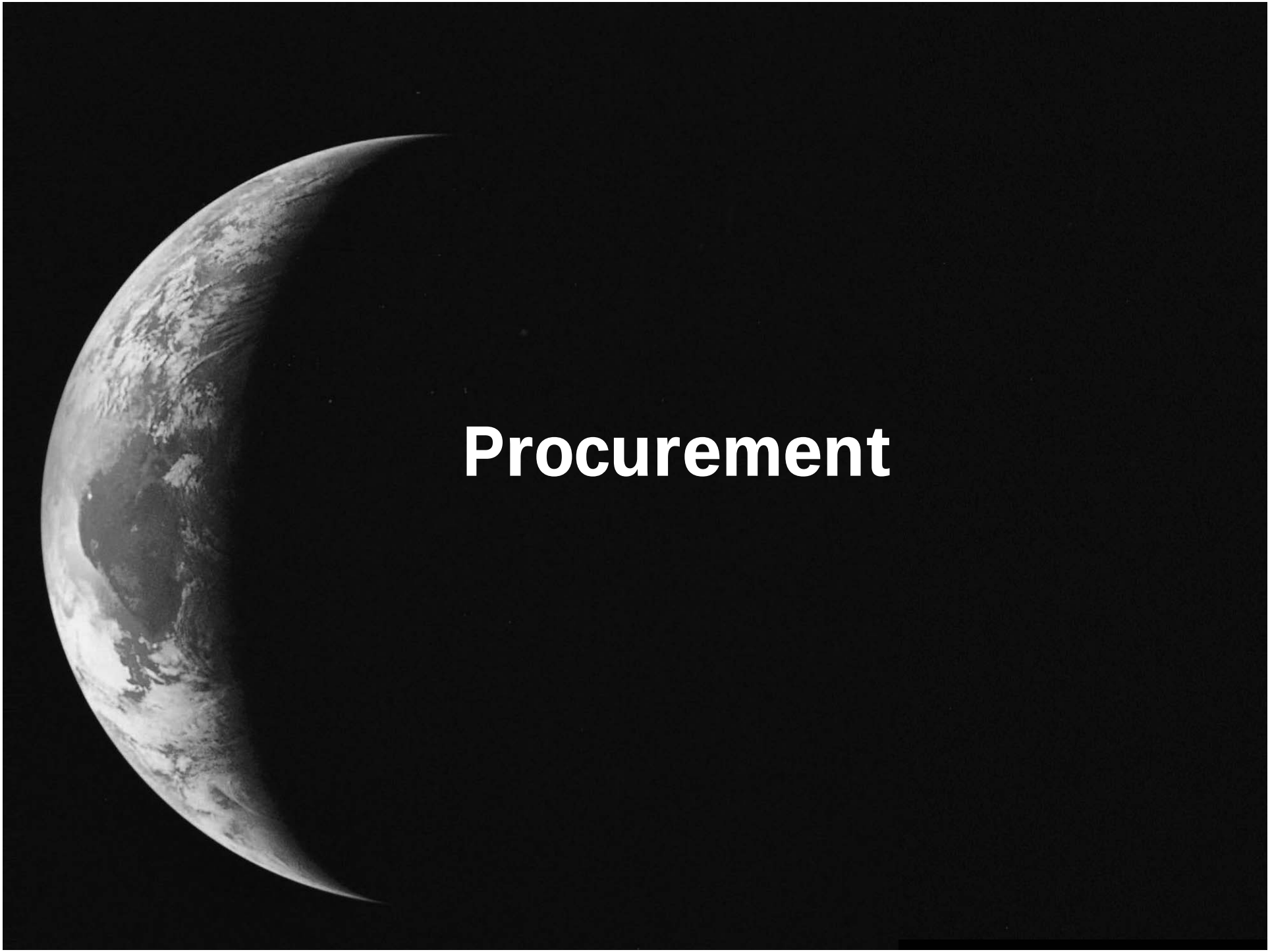
- 2nd LEED Platinum Rated Building in America
- Surpasses CA Energy Code by 32-40%
- 100% demolition waste recycled, 92% of construction waste recycled
- Generates 7-10% of its own energy on-site through a PV system
- Cost to “go green” was less than 2% of the total building cost.
- Construction materials were from 80%-30% recycled content, depending on the material
- Natural ventilation, energy efficient light, heating and cooling, recycled floors, air monitoring system
- Waterless urinals, low-flow water fixtures, green paints and adhesives, reflective paint on the roof

New Materials - Aerogel Insulation

- Super lightweight solid of 96% air
- Clear Windows with the energy efficiency of a solid wall
- Reduces noise twice as much as a double pane window

Ford Dearborne Plant

- Is investing an additional $8M in a green roof, porous pavement for parking lot (reduced cost), and a constructed wetland for landscaping.
- Savings will include elimination of a $40M storm water management system and $6M budgeted for landscaping.


Procurement

Step 1 - bauxite is mined in Australia

Step 2 - bauxite is trucked to plant for chemical processing 1 ton ore yields up to 1/2 of Aluminum Oxide

Step 3 - shipped to Norway for processing

Step 4 - oxide sits at smelter site for up to 2 months

Step 5 - 2-hour smelting reduces 1/2 of oxide into 1/4 ton of metal

Step 6 - metal ingot cured and shipped to Germany to be rolled

Step 7 - ingot is heated to 900°F and rolled into coil

Step 8 - coil is stored and cold rolled into sheet

Step 9 - sheet metal is shipped to England punched and formed into cans

Step 10 - can is washed, dried, primed and painted

Step 11 - can is lacquered and coated inside

Step 12 - cans are palletized, stored, and shipped

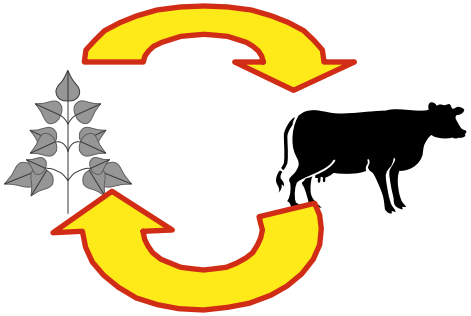
Step 14 - bottler cleans and fills with product

Step 15 - cans are packed in promotional boxes palletized and shipped to retailer

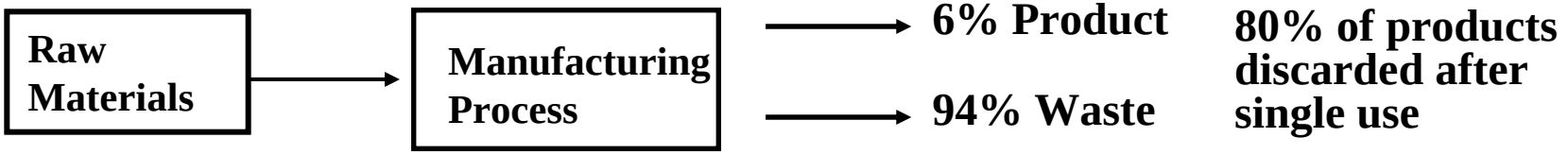
Step 16 - Can is purchased, contents consumed within a few minutes and is thrown away

Material Flows

In cyclical natural systems, waste does not exist. Waste = Food.



Linear Industrial Processes: Waste is created faster than it can be reconstituted to quality resources. Take-make-waste



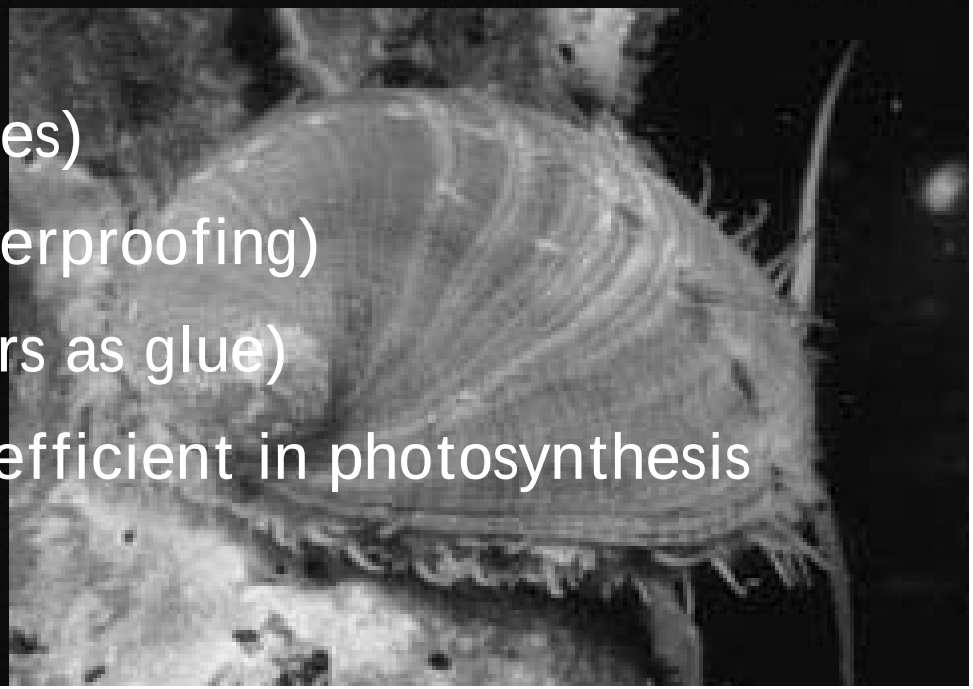
(Source: NAE / *Factor 4 p. xx, 1997)*

It is estimated that 99% of the original materials used in the production of, or contained in, the goods made in the US become waste within 6 weeks of sale.

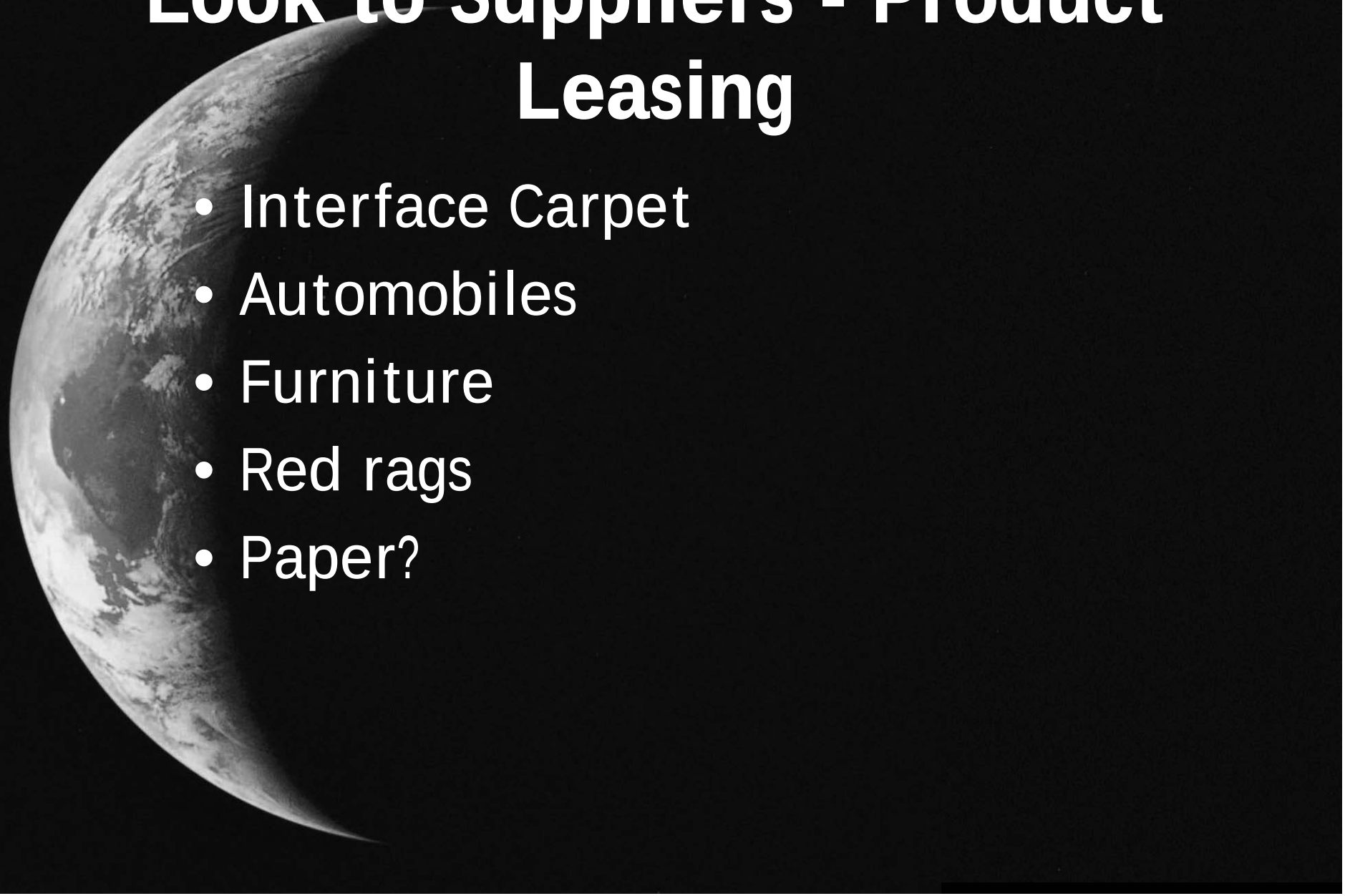
(Attributed to Paul Hawken, *Factor 4*, 1997)

One Solution – Look to Nature

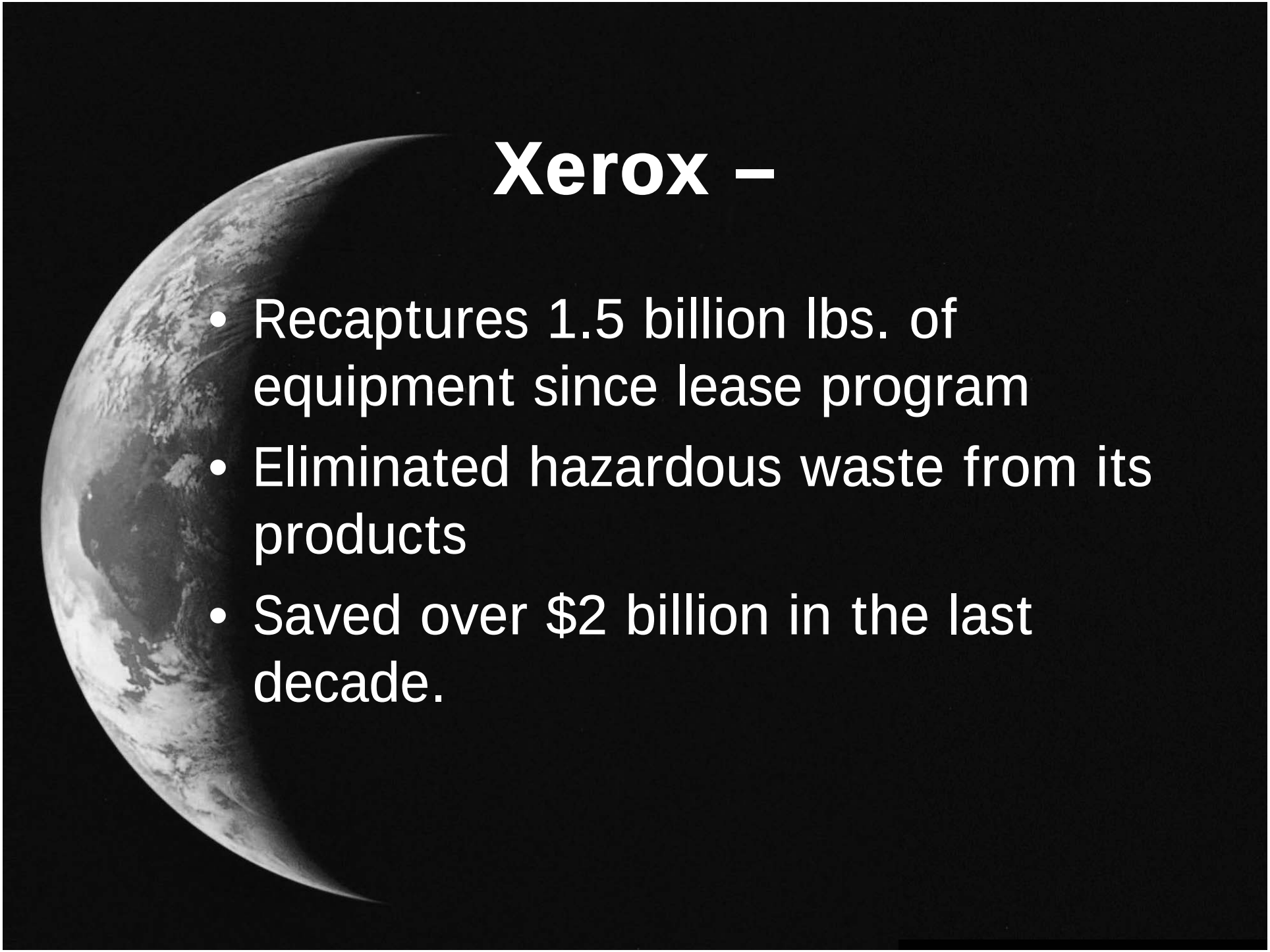
- Spider Web (thread strength)
- Slug mucous (adhesive)
- Abalone Shell (protective shell)
- Barnacle (adhesives)
- Lotus flower (waterproofing)
- Geckos (small hairs as glue)
- Pond Scum – 95% efficient in photosynthesis



Look to Suppliers - Product Leasing



- Interface Carpet
- Automobiles
- Furniture
- Red rags
- Paper?



Xerox –

- Recaptures 1.5 billion lbs. of equipment since lease program
- Eliminated hazardous waste from its products
- Saved over $2 billion in the last decade.

Look to Service Providers - Aggressive Waste Contracts

Rutgers Camden Campus recycles 20+ items through its contracted waste services. Accomplished by:

- Writing gradually more comprehensive contracts
- Obtaining input from service providers
- Off-setting costs. Recycling makes a profit

Candle Wax Rocket Fuel

- Paraffin-based fuel
- By-products are CO2, and water, not toxic materials
- Less money because it's cheaper to produce, and less harmful to the environment and workers

Fuel Cells – The small version

Bacteria-Driven Battery

- Microbial fuel cell powered by organic household waste
- Produces 8x as much energy as similar fuel cells and no waste
- Estimated cost - $15
- By next year, NEC plans to sell fuel cell- powered computers


Regional Development

Working with Community Towards Sustainability

New York City, the State, and Catskills Watershed

- **New York City has some of the cleanest drinking water in the world**
- **The water source is the Catskill Mountain Watershed (1,600 sq mi)**
- **In 1990 EPA mandated that all public supplies of surface water be filtered for microbes**
- **spend $4-$6 billion dollars to meet these mandates**

Approach

- NYC worked with upstate communities on land use, development planning, and agricultural best management practices that would improve water quality.
- Communities and NYC purchased select properties to be held undeveloped and in public trust.
- NYC spent $550 million to improve their water system, upgrade aging sewage treatment plants, and replace failing septic systems in the Catskill watershed area
- Another $278 million has been spent for conservation easements and partnerships to protect forest lands
- The state of New York is also contributing funds to these programs

Results

Water quality improved to the point where the investment in system upgrades for systems within watershed was unnecessary

Cost Avoided = $**6 Billion**

Open Space preserved = 258,716 acres

Total investment = $833 M

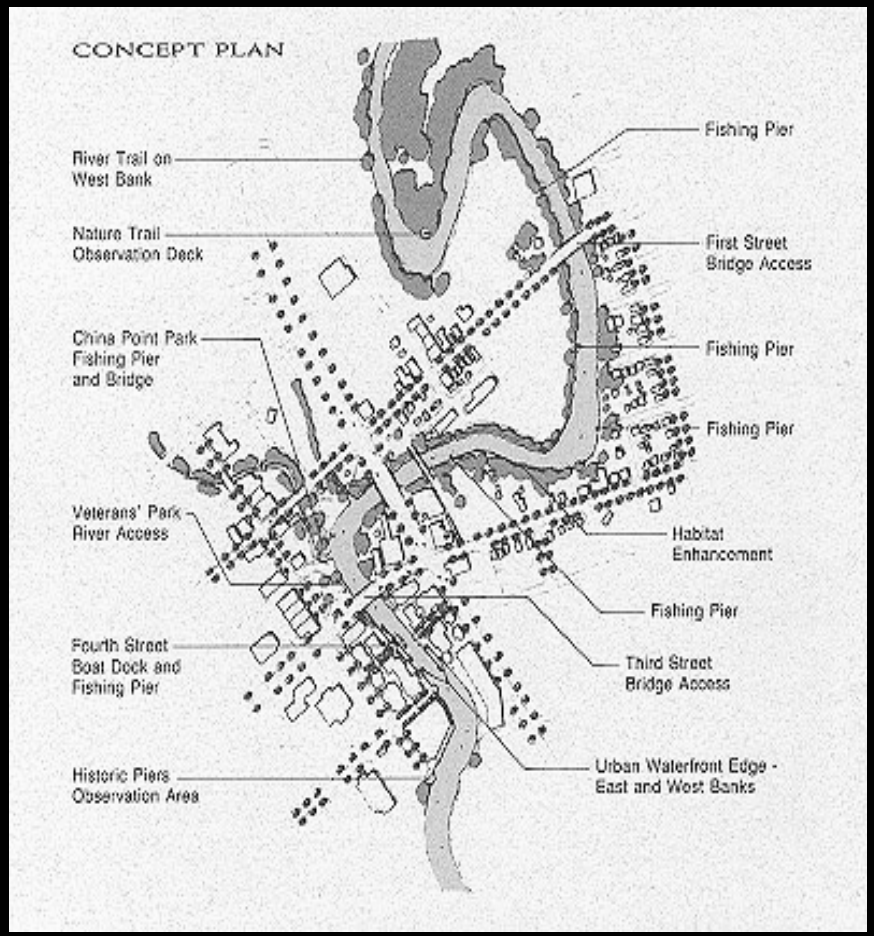
Napa California - How a town can live with a river and not get soaked

By the late 1980s, the Napa River was more of a liability than an asset:

- **frankly ugly**
- **extensive levee system**
- **periodic flooding still a major problem**
  - **$542M property damage since 1960**
  - **3 deaths during one flood**
- **dying downtown**

The Napa River flood control project

- Local community voted down 3 Corps proposals to straighten and channelize the river
- Community worked with the Corps to develop a precise definition of a “living river”
- Concept was to restore river and let it run free in original flood plain

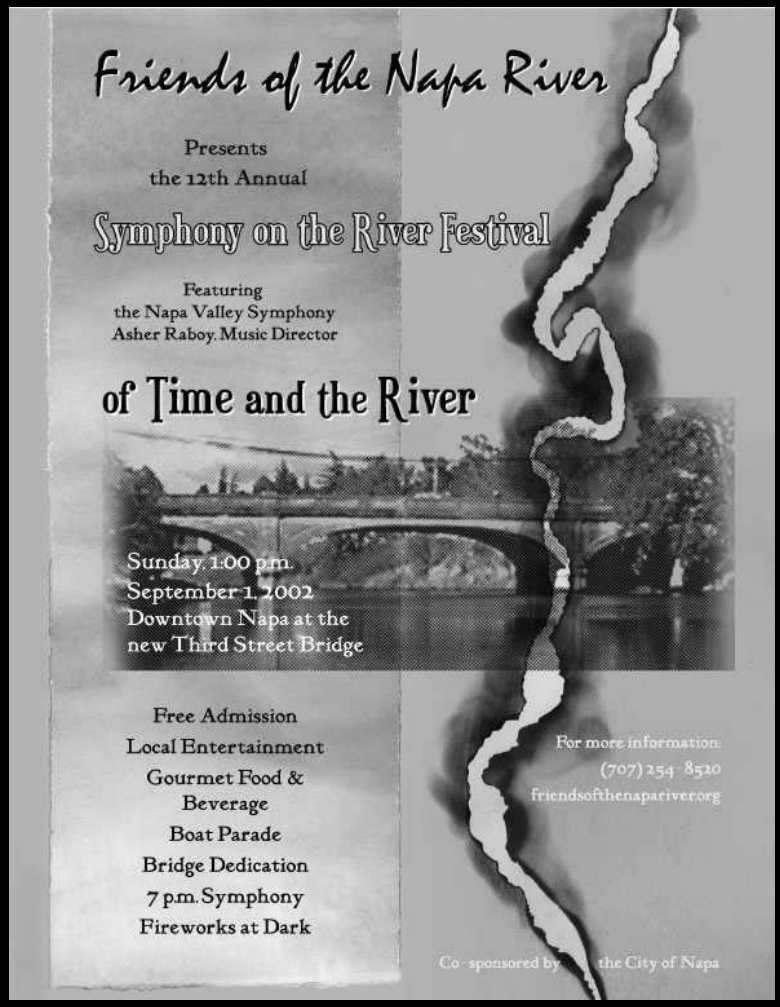


The Napa River “flood promotion” project

- Total cost: $240M
  GULP!
- County residents voted to raise sales tax $3.9M/year
- 300 people/businesses relocated
- 9 bridges removed; 5 replaced at higher locations

Results

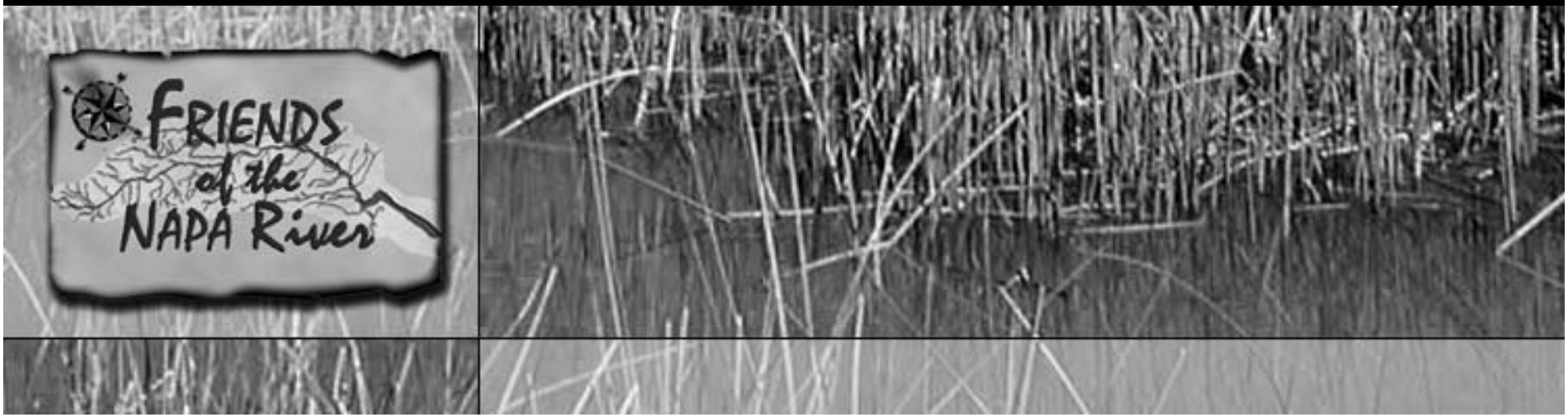
- Estimated $22M/year avoided flood damage to property
- Flood insurance rates reduced 20%
- Commercial real estate values up almost 20%
- A revitalized river and city



The Napa River flood promotion project

"The public can decide its own future…as long as you have a really *loud* public."

Karen Rippey
former officer Friends of the Napa River
current USACE Sacramento District employee



Transportation

There are over 600 Million Automobiles in the World Today

That number will rise to over 1.2 Billion by 2030

GM's Tactical Hybrids

- 40% better fuel economy than gasoline engines
- Stealth operations
- First mobile command center version with a Kevlar body, and a satellite communications center

Private Fleets of Fuel Cell Vehicles

UPS/Daimler Chrysler/EPA Partnership:

- Beginning in 2003
- First commercial fuel cell fleet in North America
- “Rolling laboratories”

Off-setting Travel

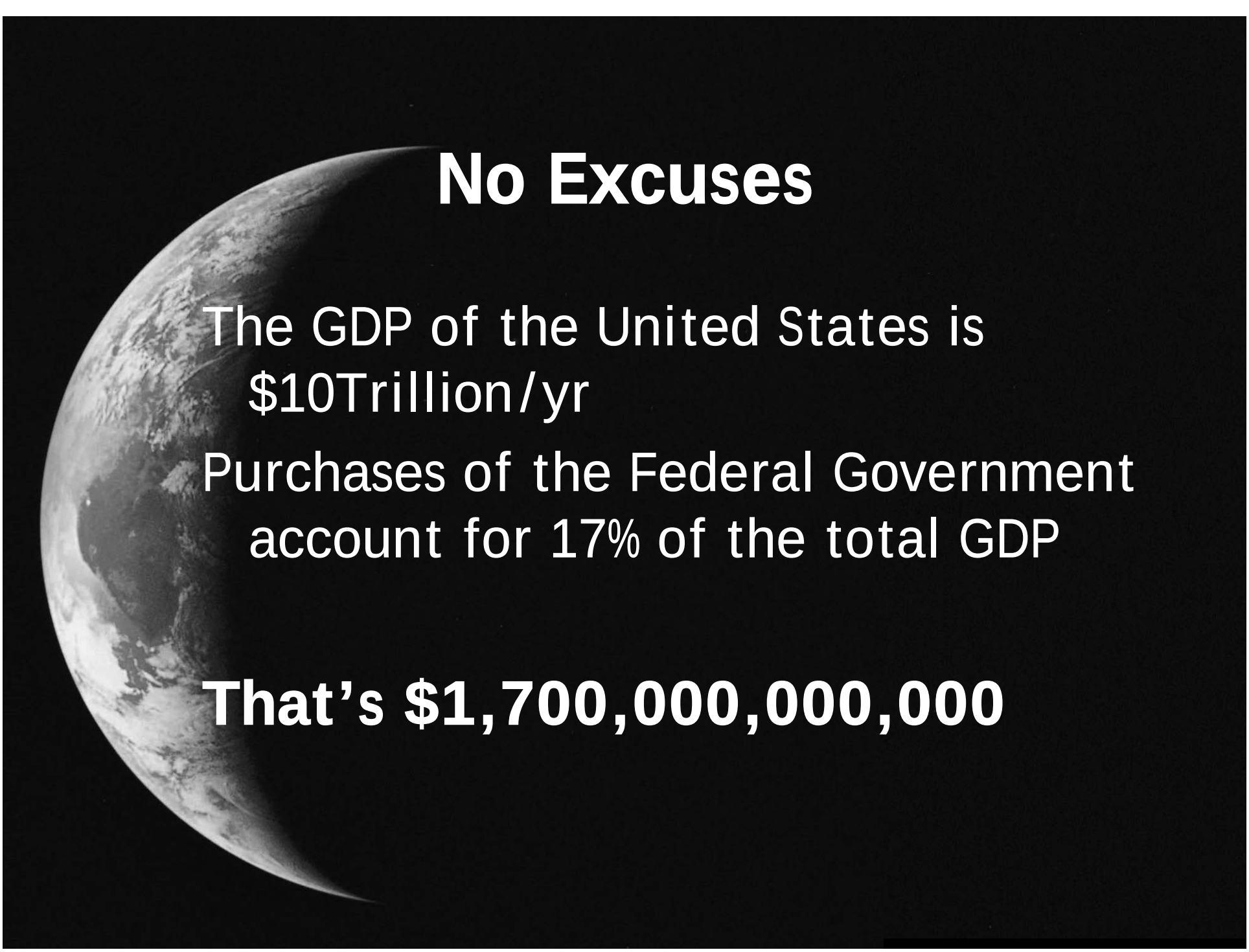
- Trees for Travel is an organization that will plant trees to offset the pollutants caused by air and vehicle travel.
- Voucher System - The new Mass Transit Voucher System requires government agencies to pay up to $65/month to cover the costs of employees who take mass transit or van pools to work.

New Fuels

Scott Air Force Base is scheduled to use Bio-based diesel fuel blends in 270 vehicles. Bio-based diesel fuel is:

- Composed of soy and other oils and can be blended with petroleum diesel.
- Reduces carcinogenic releases by 75-90%.
- Requires no vehicle modifications.
- Is bio-degradable and sulfur free.


Can We Do it?
Can the Government Change
and in the Process Help
Change Society?


No Excuses
The GDP of the United States is $10Trillion/yr
Purchases of the Federal Government account for 17% of the total GDP
That's $1,700,000,000,000

We Already Do it...

We do it all the time in system development:

- Global Position Satellite Systems
- Fuel Cells
- Solar Technologies
- Radar
- Laser

The Question

Do we want to leave the world a better place for them?

Unless...

"Someone like you
cares a whole awful lot
Nothing is going to get better
It's not..."

The Lorax
by Dr. Seuss