DAMS SECTOR PROFILE

The Dams Sector delivers critical water retention and control services in the United States, including hydroelectric power generation, municipal and industrial water supplies, agricultural irrigation, sediment and flood control, river navigation for inland bulk shipping, industrial waste management, and recreation. Its key services support multiple critical infrastructure sectors and industries. Dams Sector assets provide enough water for 130 million people, irrigation for 4 percent of cropland, and generate renewable hydroelectric power for 10 million homes.

Sector assets include dam projects (dams), navigation locks, levees, hydropower projects, dikes, hurricane barriers, tailings dams, and other industrial waste impoundments.

Critical Sector Dependencies and Interdependencies

Emergency Services

Law enforcement is among the **first responders during Dams Sector asset failure or disruption**, and their response capabilities can determine the extent of event consequences.

Food & Agriculture

About 60 percent of the country's farm exports travel through inland waterways for export overseas. **Four percent of U.S. cropland is irrigated by dams**.

Information Technology

Information technology systems **control critical processes, manage day-to-day operations, and store sensitive information** for the Dams Sector.

Transportation

The Nation's **12,000-mile inland marine network relies on navigation locks** to move valuable products throughout the United States.

Communications

Uninterrupted Internet and telecommunication networks are essential for employee communications and remote monitoring and control.

Water

About **70 percent of all freshwater used in the United States** comes from surface-water sources, including **reservoirs created by dams**.

Energy

More than **20 percent of coal** used to produce U.S. electricity is shipped via inland waterways that **rely on navigation locks**.

Nuclear

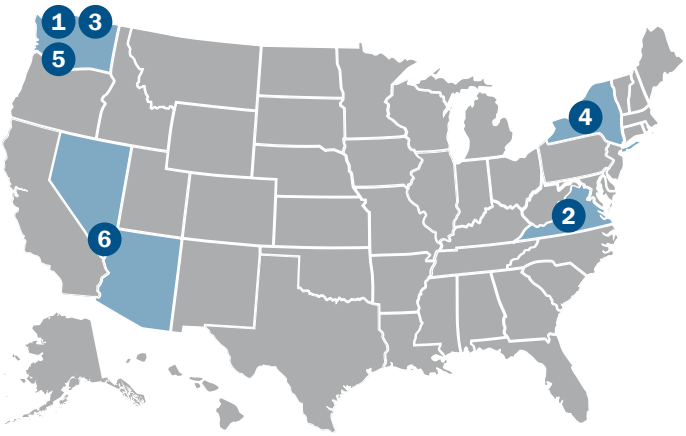
Dams may **store water for cooling operations** near nuclear facilities.

Chemical

Chemicals and fertilizers are major commodities **shipped via inland waterways**.

Dams Sector Facts

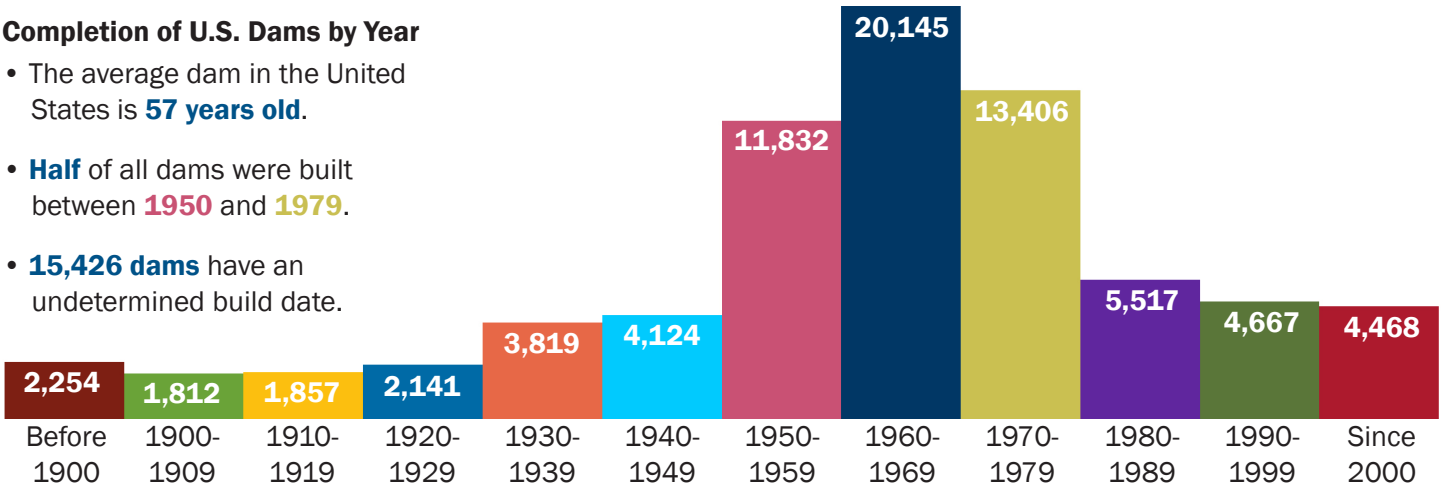
Largest Hydroelectric Projects



	Name	State	Installed Capacity (MW)
1	Grand Coulee Dam	WA	6,809
2	Bath County Pumped Storage Station	VA	3,003
3	Chief Joseph Dam	WA	2,600
4	Robert Moses Niagara Power Plant	NY	2,525
5	John Day Dam	WA	2,160
6	Hoover Dam	NV/AZ	2,080

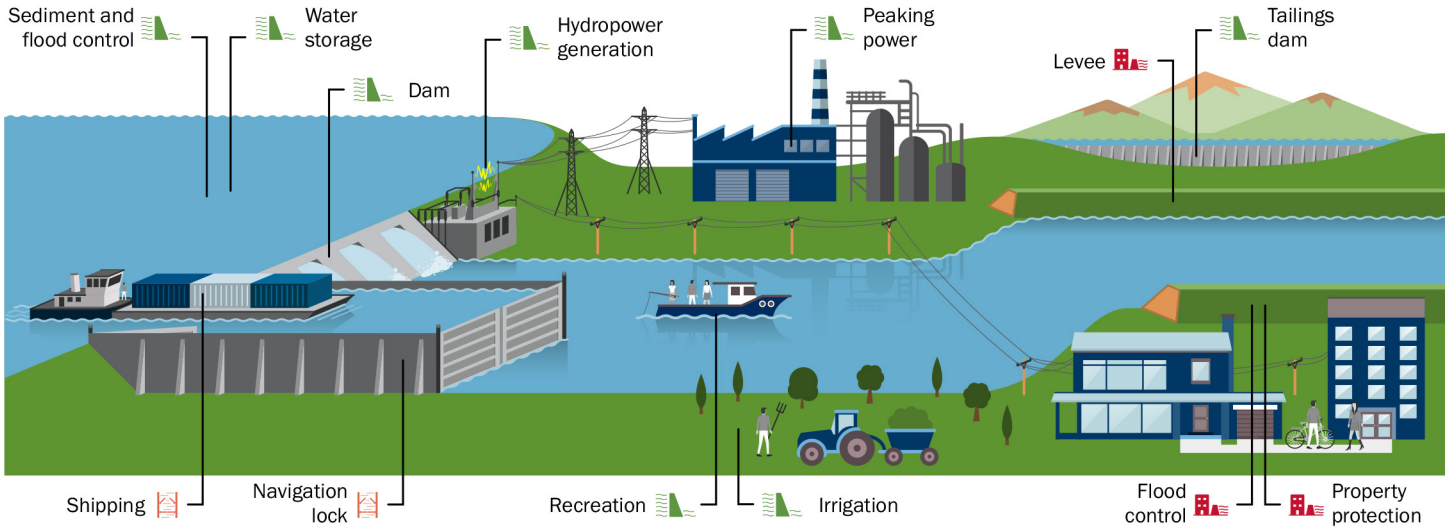
Completion of U.S. Dams by Year

- The average dam in the United States is **57 years old**.
- **Half** of all dams were built between **1950** and **1979**.
- **15,426 dams** have an undetermined build date.



The Dams Sector: Integral to Everyday Life

Dams Sector assets provide a wide range of economic, environmental, and social benefits, including hydroelectric power; river navigation; water supply for municipal, industrial, and agricultural uses; flood control; efficient water resource management in drought- and flood-prone regions; waste management; recreation; and wildlife habitat protection. Assets range from large hydroelectric dams and river/coastal levee systems that support and protect whole U.S. regions to small, locally owned dams and levees that support and protect individual agricultural communities.



DAMS

The purpose of a dam is to store water, wastewater, or liquid-borne materials for any of several reasons, such as flood control, human water supply, irrigation, livestock water supply, energy generation, containment of mine tailings, recreation, or pollution control. Many dams fulfill a combination of the above functions. While there are more than 91,000 dams in the National Inventory of Dams database, **there are more than 100,000 dams across the U.S. and Puerto Rico**.

Water storage and irrigation

Dams create reservoirs that supply water for many industrial, municipal, agricultural, and recreational uses.

Sediment and flood control

Some dams control sedimentation for environmental protection or regulate and contain water flow to reduce or prevent flooding.

Recreation

More than 262 million people visit at least one U.S. Army Corps of Engineers (USACE) facility each year.

Tailings

Tailings, or waste from mining, electric, and manufacturing industries, are collected and suspended in water, then settle out in an impoundment, or tailings dam. Tailings are often used as part of the structure itself.

Electricity generation

Hydropower dams produce 8-12 percent of the Nation's power needs accounting for 52 percent of U.S. renewable energy. The United States is one of the largest producers of hydropower in the world.

Renewable, clean energy

Without hydropower, the U.S. would have to burn an additional 121 million tons of coal, 27 million barrels of oil, and 741 billion cubic feet of natural gas combined.

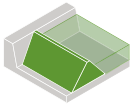
Peaking power

Hydroelectric projects can ramp up to meet peak demand.

Blackstart capabilities

Hydropower projects can quickly and efficiently start generating electricity to jumpstart restoration for other non-hydro generators after system-wide blackouts.

Embankment dams are the most common type of dam in use today. Materials used for embankment dams include natural soil or rock, or waste materials obtained from mining or milling operations.

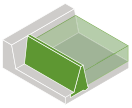


Earthfill:
compacted earth

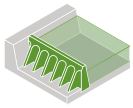
Rockfill:
compacted or dumped rock

Tailings dam:
industrial waste material

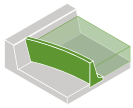
Masonry or concrete dams may be categorized according to the designs used to resist the stress due to reservoir water pressure. Three common types of concrete dams are:



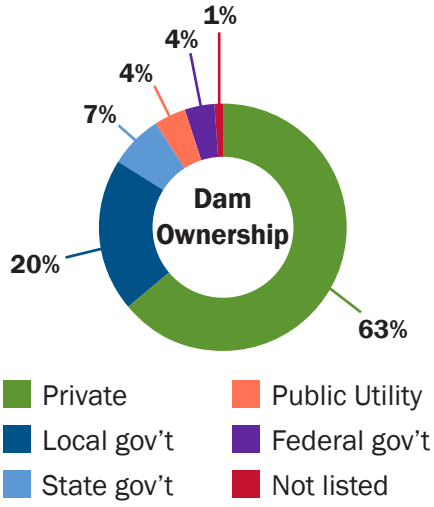
Gravity
The most common form of concrete dam. The mass weight of concrete and friction resists the reservoir water pressure.



Buttress
Mass of concrete is reduced, and the forces are diverted to the dam foundation through vertical or sloping buttresses.



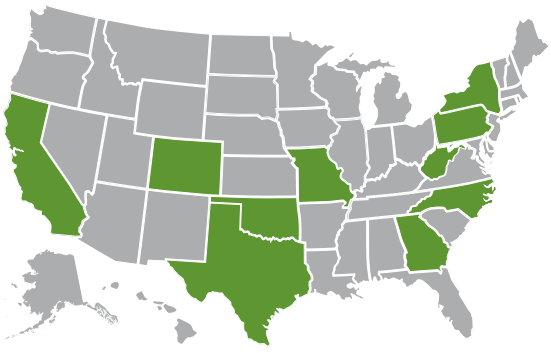
Arch
Typically thin in cross-section. The reservoir water forces acting on an arch dam are carried laterally into the abutments.



High hazard dams

High hazard dams are those where failure or mis-operation will likely cause loss of human life. Hazard classification refers to the potential consequences of a dam's failure, **not the condition of the dam**.

Top 10 states with the most high hazard dams

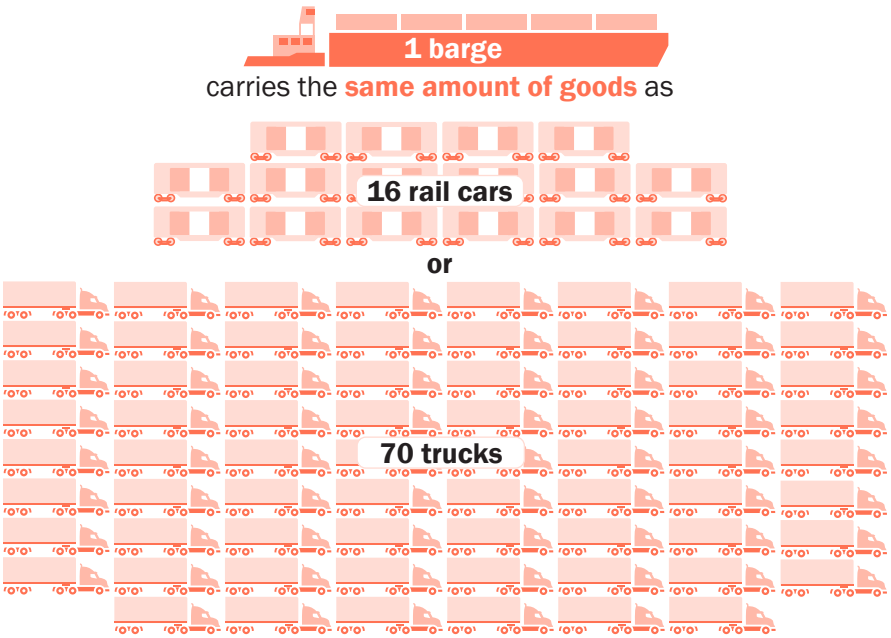


	State	# High Hazard Dams
1	MO	1,463
2	TX	1,411
3	NC	1,307
4	CA	805
5	PA	797
6	GA	630
7	CO	453
8	OK	449
9	WV	432
10	NY	424

NAVIGATION LOCKS

Navigation locks make inland waterways viable transportation corridors by allowing commercial and recreational traffic to move safely between river pools and harbors. The USACE oversees locks as part of a larger marine highway network that stretches across the country. **Navigation locks enable companies to ship large volumes of bulk commodities over long distances far more efficiently than via truck or rail, reducing shipping costs and greenhouse gas emissions.**

Efficiency of Inland Waterways



On a **single gallon of fuel**, a barge can move **1 ton of cargo 500 miles further** than trucks.

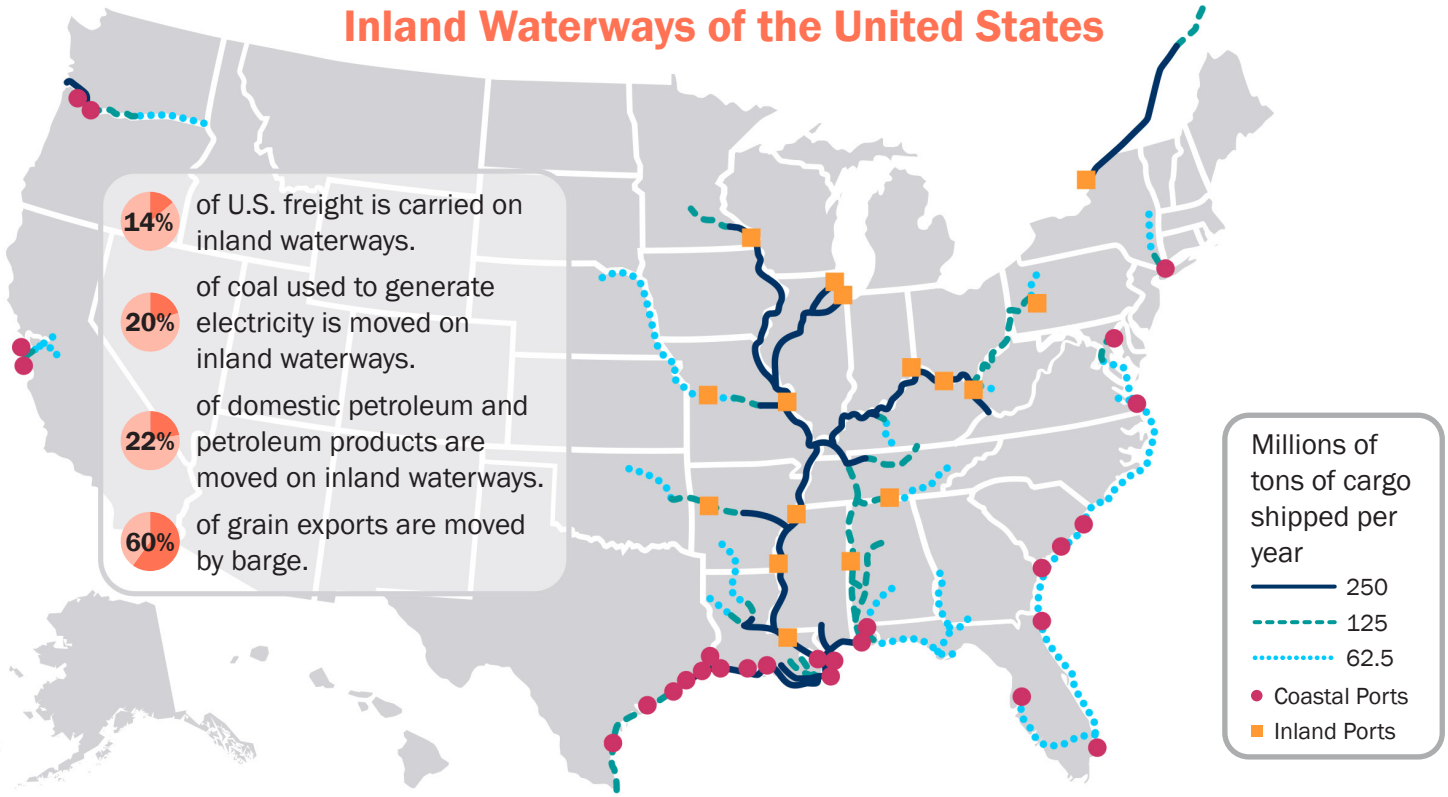
More than 514 million

tons of cargo (valued at more than **$134 billion**) was moved by inland marine network in 2019.

Waterways primarily move coal, petroleum products, and additional exports. Other major commodities include:

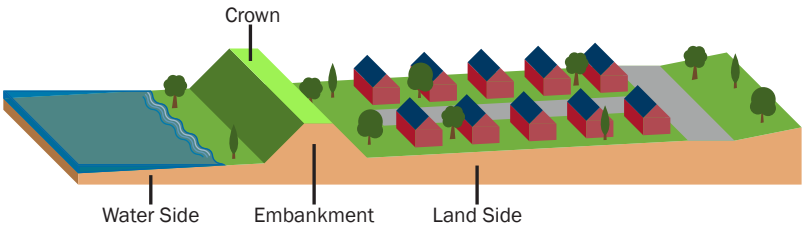
- **Aggregates** such as stone, sand, and gravel used in construction.
- **Chemicals** including fertilizers, metal ores, and minerals.
- **Grain** and farm products.
- Products, such as **steel**.
- Other **manufactured products**.

Inland Waterways of the United States



LEVEES

Levee systems, or "levees", are man-made structures that reduce risk by diverting the flow of water from floods and storm surges. Levees usually consist of earthen embankments or floodwalls in combination with other features, such as closure structures, pumping stations, and interior drainage works. **Levees help with flood control efforts on floodplains for millions of people and trillions of dollars in property across the Nation.**

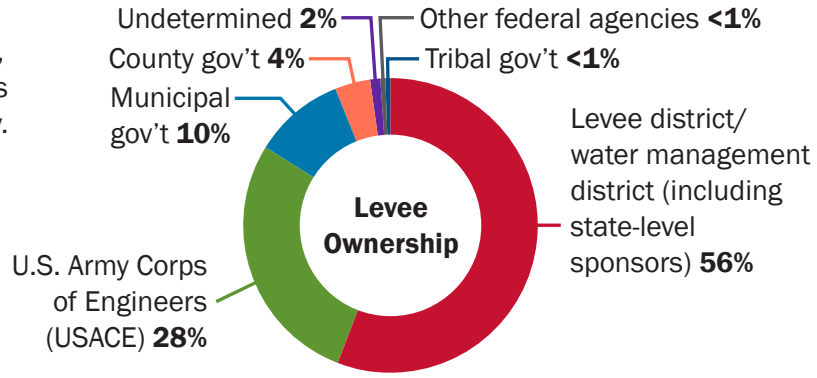


Though levees do not eliminate all flood risk, they are an important flood risk management tool that can **help reduce the frequency of flooding and provide valuable time for evacuations**.

Levees help reduce flooding of infrastructure critical to everyday life, including roads, hospitals, and police departments, as well as other resources critical to flood response, evacuation, and recovery.

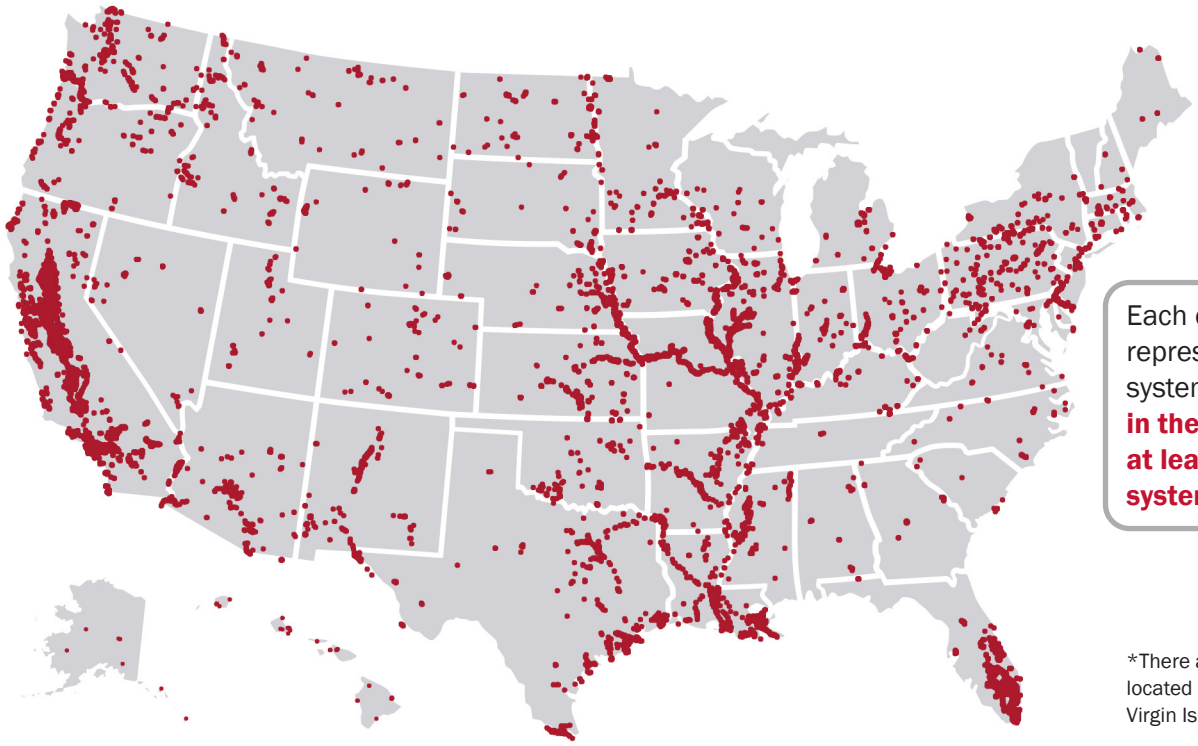
These infrastructure include:

- Agriculture farms and property
- Chemical plants
- Emergency medical services
- Entertainment venues
- Law enforcement
- Schools and universities
- Water supply
- Water treatment plants



This diagram represents levees that are currently populated in the National Levee Database. Efforts are underway to inventory and assess the condition of all levees in the United States

The current inventory of nearly 30,000 miles of levees in the National Levee Database, helps defend communities, critical infrastructure, and valuable property from flooding.



Each dot on the map represents a levee system. **Every state in the Nation has at least one levee system.**

*There are additional levees located in Puerto Rico, the U.S. Virgin Islands, and Guam.

ROLE OF GOVERNMENT IN DAM SAFETY AND SECURITY

Dams

Today, every state except Alabama has a dam safety regulatory program. Select states also oversee dam security.

State governments have **regulatory responsibility for 69 percent of the more than 91,000 dams** within the National Inventory of Dams (NID). These programs vary in authority, but typically the program activities include:

- Safety evaluations of existing dams
- Review of plans and specifications for dam construction and major repair work
- Periodic inspections of construction work on new and existing dams
- Review and approval of emergency action plans

Tailings dams, or impoundments, are primarily owned and operated by private industries and can be subject to federal and/or state regulations depending on type and size.

Federal Agencies

Federal agencies involved with dam safety or security:

U.S. Department of Agriculture	**Natural Resources Conservation Service** Provides technical and financial assistance for almost 27,000 NID dams and financial assistance for another 11,000 NID dams designed for agricultural water storage, sediment retention, and flood protection.
U.S. Department of Defense	**U.S. Army Corps of Engineers** Oversees 716 dams, 239 locks, 75 hydropower projects, and 2,220 levee systems and provides technical assistance to flood-risk communities and the military.
U.S. Department of Energy	**U.S. Department of Energy** Owns and operates 15 dams at three sites. **Federal Energy Regulatory Commission** Regulates 2,600 non-federal hydropower dams.
U.S. Department of Homeland Security	**Cybersecurity and Infrastructure Security Agency** Serves as the Dams Sector Risk Management Agency and collaboratively develops guidance, resources, and training for the Dams Sector. **Federal Emergency Management Agency** Leads the National Dam Safety Review Board and the Interagency Committee on Dam Safety and is the head of the National Dam Safety Program.
U.S. Department of the Interior	**Bureau of Reclamation** Maintains 475 dams and 348 reservoirs bringing water to more than 31 million people and operates 58 hydroelectric power plants producing enough electricity to serve 3.5 million homes. Other U.S. Department of the Interior agencies involved with dam safety and security include: Bureau of Indian Affairs • Bureau of Land Management • Fish & Wildlife Service • National Park Service • Office of Surface Mining Reclamation and Enforcement
U.S. Department of Labor	**Mine Safety and Health Administration** Regulates the safety of the 1,640 mining industry dams in its inventory.
U.S. Department of State	**International Boundary & Water Commission** Owns and operates dams and maintains more than 500 miles of levees and associated floodways along the lower portion of the Rio Grande River.

The NID lists **more than 91,000 dams in the U.S.**, of which the private sector owns 63 percent and state or local entities own 27 percent.

About **14 percent** of dams in the United States are owned or regulated by federal agencies.

The Federal Government owns and self-regulates only **5 percent of dams**, yet 80 percent of these dams are the largest in the U.S.

APPENDIX

Page 1: Dams Sector Profile

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Page 6: Role of Government in Dam Safety and Security

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