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CANAL DEVELOPMENT AND HYDRAULIC ENGINEERING:  
The Unique Role of the Lowell System

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Testimony in support of HR 4514  
before the  
Field Investigation Presentation  
of  
Subcommittee on National Parks and Recreation  
of the  
House Committee on Interior and Insular Affairs

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## I N T R O D U C T I O N

CHAIRMAN TAYLOR, MEMBERS OF THE COMMITTEE, HONORED GUESTS, LADIES AND GENTLEMEN:

I SPEAK TO YOU AS AN HISTORIAN AND TEACHER WHO HAS SPENT MUCH OF THE LAST FOUR YEARS STUDYING LOWELL AND ITS CANAL SYSTEM. AT BOTH THE UNIVERSITY OF PENNSYLVANIA AND BROWN UNIVERSITY, I RECEIVED ENTHUSIASTIC SUPPORT AND ASSISTANCE IN DEVELOPING COURSES ON THE HISTORY OF LOWELL. MY GRADUATE AND UNDERGRADUATE STUDENTS HAVE ENJOYED THE EXPERIENCE OF ARCHIVAL RESEARCH AND FIELD TRIPS TO STUDY THE PHYSICAL CITY. LOWELL CAN BE USED EFFECTIVELY AS A MODEL FOR THE STUDY OF INDUSTRIALISM, IMMIGRATION, CULTURAL ASSIMILATION, AND OTHER IMPORTANT ASPECTS OF THE AMERICAN EXPERIENCE. MUCH OF THE RESULTS OF MY OWN RESEARCH CAN BE FOUND IN THE MONOGRAPH ENTITLED "WATER POWER IN LOWELL, MASSACHUSETTS", WHICH I AM PLEASED TO SUBMIT TO THE COMMITTEE AS ADDITIONAL DOCUMENTATION FOR ITS CONSIDERATION WITH RESPECT TO HR 4514. ON THE BASIS OF THIS RESEARCH AND MY ACADEMIC EXPERIENCE, I OFFER THE FOLLOWING ASSESSMENT OF THE SIGNIFICANCE OF THE LOWELL CANAL SYSTEM.

THE LOWELL CANAL SYSTEM WAS ONE OF THE MOST IMPRESSIVE ENGINEERING ACHIEVEMENTS OF NINETEENTH-CENTURY AMERICA. TODAY, ALMOST ONE HUNDRED AND TWENTY FIVE YEARS SINCE ITS COMPLETION, THE CANAL SYSTEM IS PRACTICALLY UNCHANGED, A REMARKABLY WELL-PRESERVED MONUMENT OF OUR INDUSTRIAL HERITAGE. WITH PROPER INTERPRETATION, RESTORATION AND MAINTENANCE, LOWELL'S POWER CANALS CAN BECOME A GREAT EDUCATIONAL AND RECREATIONAL ASSET FOR OUR NATION. WE NEED A NEW TYPE OF NATIONAL PARK WHICH WILL DEMONSTRATE THE IMPORTANCE OF URBAN AND INDUSTRIAL DEVELOPMENT IN AMERICA. LOWELL, WITH ITS STILL-FUNCTIONING CANALS AND PROUD HISTORY AS A MANUFACTURING CENTER, IS THE PERFECT LOCATION FOR SUCH A PARK.

MOST HISTORIANS AGREE THAT THE TEXTILE INDUSTRY PROVIDED THE MAJOR IMPETUS FOR THE DRAMATIC ECONOMIC, TECHNOLOGICAL, AND SOCIAL CHANGES OF EARLY INDUSTRIALIZATION. LOWELL, ESTABLISHED FOR THE LARGE-SCALE MANUFACTURE OF COTTON TEXTILES IN 1821, SOON BECAME AMERICA'S FIRST GREAT INDUSTRIAL CITY. ITS RAPID GROWTH WAS DUE PRIMARILY TO THE TREMENDOUS POWER AVAILABLE FROM THE PAWTUCKET FALLS OF THE MERRIMACK RIVER. BY HARNESSING THE AVAILABLE RESOURCES OF WATER POWER, THE FOUNDERS OF LOWELL PROVIDED RELATIVELY INEXPENSIVE AND RELIABLE ENERGY TO DRIVE THE MACHINERY OF HUGE TEXTILE MILLS. THE POWER CANALS WHICH CARRIED WATER TO EACH MAJOR MILL COMPLEX IN THE CITY WERE THE PRODUCT OF ENGINEERING EXPERTISE AND YEARS OF DIFFICULT LABOR. WATER POWER WAS THE SOURCE OF LOWELL'S PROSPERITY, AND LOWELL WAS THE PACESETTER FOR A YOUNG INDUSTRIAL NATION.

THE CANAL SYSTEM IN LOWELL IS UNIQUE BECAUSE OF ITS HISTORICAL IMPORTANCE, ITS GRAND SCALE, AND ITS TECHNOLOGICAL COMPLEXITY. THOUSANDS OF AMERICAN AND FOREIGN VISITORS CAME TO SEE "THE LOWELL SYSTEM OF MANUFACTURE" BEFORE THE CIVIL WAR. THEY MARVELED AT THE UTOPIAN CONCEPTION OF A CLEAN

AND ORDERLY INDUSTRIAL CITY WITH ATTRACTIVE STREETS AND GLISTENING CANALS. THE BOARDING HOUSES NEAR THE CANALS HOUSED THE FAMOUS "LOWELL GIRLS", WELL-DRESSED OPERATIVES WHO RAN THE TEXTILE MACHINES IN THE TALL, WATER-POWERED MILLS. HERE THERE WAS NONE OF THE URBAN SQUALOR SO PREVALENT IN ENGLISH MANUFACTURING CENTERS. LOWELL MADE THE FACTORY SYSTEM ACCEPTABLE TO THE AMERICAN PUBLIC AND EVEN WON THE ENTHUSIASTIC PRAISE OF FOREIGN SOCIAL CRITICS LIKE CHARLES DICKENS AND MICHEL CHEVALIER.

THE CANALS WERE A CRITICAL PART OF THE CITY PLAN, FOR MILL SITES AND CANAL ROUTES HAD THE HIGHEST PRIORITY IN THE DESIGN OF THIS INDUSTRIAL COMMUNITY. AN EARLIER TRANSPORTATION CANAL, BUILT AROUND THE FALLS IN 1796, BECAME AN IMPORTANT PART OF THE POWER SYSTEM AS THE FEEDER FOR A GROUP OF CANALS RUNNING TO THE FIRST MILL YARDS. THE COMPLEXITY OF THE SYSTEM IS PARTIALLY A RESULT OF THE CURVING SHAPE OF THE ORIGINAL CANAL AND OF THE SHARP BEND IN THE RIVER BELOW THE FALLS. CANALS FAN OUT ACROSS THE LANDSCAPE TO REACH THE MILLS, AND THE ENTIRE SYSTEM OPERATES ON TWO LEVELS FOR MAXIMUM EFFICIENCY. THE NORTHERN CANAL, A MASSIVE STONE STRUCTURE COMPLETED IN 1848, CHANNELS ADDITIONAL WATER INTO THE SYSTEM AND IS AN IMPOSING SIGHT RISING ABOVE THE RAPIDS OF THE RIVER.

EUROPEANS PIONEERED IN THE DEVELOPMENT OF POWER CANALS AND OTHER AMERICAN COMMUNITIES HAD OPERATING CANALS AND WATER WHEELS BEFORE LOWELL, BUT NO ONE HAD ENVISIONED A POWER SYSTEM LIKE THE ONE BUILT ON THE MERRIMACK BETWEEN 1822 AND 1850. ENGINEERS IN LOWELL STUDIED THE WORK OF EUROPEAN AND AMERICAN HYDRAULIC EXPERTS; THEY ALSO CONDUCTED THEIR OWN SCIENTIFIC EXPERIMENTS AND APPLIED THEIR THEORETICAL AND EMPIRICAL FINDINGS TO IMPROVE THE OPERATION OF THE CANALS AND HYDRAULIC MACHINERY. JAMES FRANCIS, CHIEF ENGINEER, MADE THE LOWELL CANALS HIS OWN LABORATORY AND PUBLISHED AN INTERNATIONALLY-RESPECTED VOLUME, LOWELL HYDRAULIC EXPERIMENTS, IN 1855. THE MACHINE SHOP OF THE

PROPRIETORS OF LOCKS AND CANALS, UNDER HIS SUPERVISION, PRODUCED SOME OF THE FINEST HYDRAULIC EQUIPMENT OF THE AGE. AT LOWELL, SCIENCE, PERHAPS FOR THE FIRST TIME IN HISTORY, EXERTED A REGULAR AND PROFOUND INFLUENCE ON TECHNOLOGY.

THE DAM, GATE HOUSES, STONE-WALLED CANALS, TRANSPORTATION LOCKS, AND OTHER MAIN FEATURES OF THE EARLY SYSTEM CAN STILL BE FOUND IN LOWELL. THIS SUMMER THE HISTORIC AMERICAN ENGINEERING RECORD OF THE NATIONAL PARK SERVICE WILL SEND A TEAM OF ARCHITECTS AND HISTORIANS TO RECORD SELECTED STRUCTURES AND FEATURES OF THE CANAL SYSTEM AND TO PRODUCE AN HISTORICAL SURVEY OF ITS DEVELOPMENT AND SIGNIFICANCE. I WILL BE A CO-SUPERVISOR OF THIS PROJECT...

THE LOWELL CANAL SYSTEM MUST BE PRESERVED FOR FUTURE GENERATIONS TO STUDY AND ENJOY. AMERICA MUST LEARN TO PROTECT THE GREAT WORKS OF MAN AS WELL AS THE WONDERS OF NATURE. OUR INDUSTRIAL RELICS ARE VALUABLE LINKS WITH THE PAST, DIRECT RECORDS OF AMERICAN ACHIEVEMENT AND GROWTH. HERE IN THE CITY OF LOWELL WE HAVE A CHANCE TO SAVE A MAJOR WORK OF ENGINEERING. CREATE A NATIONAL PARK HERE AND LET PEOPLE TRAVEL THROUGH THE CANALS AGAIN BY BOAT OR WALK ALONG THEIR WALLS IN THE FOOTSTEPS OF EARLIER GENERATIONS OF INDUSTRIOUS AMERICANS.