STATE OF NEW JERSEY

SECOND ANNUAL REPORT

of the

COMMISSIONER OF CONSERVATION

for the Period

July 1, 1946 to June 30, 1947

MORGAN F. LARSON, *Commissioner*

January 15, 1948

"The earth and its resources belong of right to its people."—Gifford Pinchot

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Department of Conservation

MORGAN F. LARSON, *Commissioner*
PAUL P. WILLIAMS, *Deputy Commissioner*

DIVISION OF FISH AND GAME

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Council

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Joseph Ayers ..... Andover
Harrison Cook ..... Atlantic City
Arthur F. Foran ..... Flemington
Harold W. Laauwe ..... Paterson
Harold E. Longsdorf .. Mount Holly
W. Steelman Mathis ... Toms River
Marvin A. Spaulding ..... Trenton
Frank J. Valgenti, Jr. .... Madison

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George S. Curtis ..... Hawthorne
Harry L. Derby ..... Montclair
Edwin E. Dudley ..... Paterson
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Jacob Tanis ..... Augusta
Owen Winston ..... Mendham

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Rudolph S. Ayres ..... Haddonfield
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Wayne D. McMurray ..Asbury Park
Louis Schiavone ..... Jersey City

DIVISION OF SHELL FISHERIES

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William Gray ..... New Gretna
Dorsey Le Compte .... Pleasantville
Lemuel B. Newcomb ..... Vineland
E. Walter Parsons ..... Tuckerton
Roy Yates ..... Port Norris
Vacancy

DIVISION OF WATER POLICY AND SUPPLY

Howard T. Critchlow, Chief Engineer

Council

Thurlow C. Nelson, Chairman ... New Brunswick
George S. Burgess ..... Madison
Forster W. Freeman ..... Paterson
Max Grossman ..... Atlantic City
Kenneth H. Murray ..... Far Hills
Joseph H. Palmer ..... Tuckerton
John Roach, Jr. ..... Dover
Roswell M. Roper ..... East Orange
Herbert K. Salmon ..... Stanhope

LETTER OF TRANSMITTAL

To the Honorable Alfred E. Driscoll, Governor,
and Members of the Senate and General Assembly
of the State of New Jersey:

Pursuant to law, I have the honor to transmit herewith the second annual report of the Commissioner of Conservation for the year ending June 30, 1947.

Full resumption of certain activities curtailed by the War has been achieved and the Department is once again offering its facilities and services without restriction. Some of the accomplishments of the past year deserve particular mention.

In this critical period of the State's finances, encouragement is found in the increase of cash receipts over the preceding year—from $1,133,005 to $1,443,867. This is due mainly to an increased volume of business transacted by this Department, On the basis of total expenditures and receipts (see statement in this report) the Department is dependent on general State funds for 55 per cent of its cost of operation. If certain capital items are excluded for beach erosion control and the rehabilitation of the Delaware and Raritan Canal the Department is, from an administrative standpoint, 70 per cent self-sustaining, this compares with 59 per cent last year.

I feel that we cannot always justify the extent to which special services are expected of government, and if, what we offer is worthwhile and useful, those who receive it should be quite willing to pay for it. Consequently, I have reviewed the fiscal policy of several divisions and in some cases have recommended increased sources of income which are now in effect.

In matters affecting navigation we have made progress. Beach erosion control and the extension and maintenance of adequate waterways and channels are perennial problems and the solution of these perplexities is urgent because of the economic value of our New Jersey beaches and coastal waters. For nearly a decade the Federal government has been urged to take the sand dredged from Ambrose Channel and dump it along the New Jersey shore to replace sand eroded by the littoral currents. The Government has finally acceded to the

State's viewpoint and will shortly commence the dumping of sand about 2500 feet offshore along the beaches of our North Jersey coast.

The importance of protecting our beach front has been recognized by the continuous attempts to develop new methods of jetty construction and seawalls to break the force of winter storms. During the year jetty construction was continued in cooperation with various municipalities along the coast.

One of the most vulnerable spots along the shore is an extremely slender strip of land between Highlands and Sea Bright. This land is highly developed and protection must be afforded home owners in this vicinity. As of this date construction of a massive seawall, to replace the present one, is nearing completion. This wall extends from Highlands to Low Moor.

Our utilization of water resources, both potable and industrial, affects not only the economic stability of the State, but every individual citizen. Therefore, vigilance to protect these resources can never be abated. Today in certain areas we are using practically the entire developed sources of supply and a protracted drought would create a serious menace. Therefore, we should without delay develop and impound additional water supplies.

A serious situation has developed in the Newark area where over-pumpage of wells has resulted in salt water intrusion. Discovery of this condition, led at once to a study which, it is anticipated, will afford remedial measures that will avert a severe disruption in the industrial life of this area.

An important law enacted this year created the Examining Board of Well Drillers which was organized shortly after July 1. This Board, composed of three Department engineers and four well-drillers, serves without salary and issues licenses and permits as required by this law. Although this act was sponsored by the well drillers themselves, the Department has long recognized the need of such legislation in the public interest.

Along the Atlantic Coast and in Delaware Bay our shellfish industry affords employment to many people and supports, in part, numerous small towns and villages. The extension and enlargement of this industry is desirable. Great credit is due Dr. Thurlow Nelson, eminent biologist, and the

consultant for this Department, for his research work in the shellfish industry and his constant efforts to maintain the supply of oysters and clams, improve the quality and reduce the hazards of the natural enemies and disease.

The future of the shellfish industry depends upon certain conservation practices determined by extensive research. A vigorous educational campaign through conferences and the press has been undertaken to emphasize to those engaged in the shellfish industry their obligations if the continued productivity of oyster and clam bottom is to be assured.

Our efforts in forest conservation have been fruitful. The Forest Fire Service, which has advantageously used every modern improvement for the protection and control of forest fires, including the use of fire line plows and experimentation with water detergents, reports a reduced acreage burned for the year.

The demand for the Department's services to private woodland owners, which encourages the cutting of forest lands in accordance with the best conservation practice, has increased from 274 requests for forestry assistance last year to 346 this year. This assistance is presently being offered to woodland owners without any charge. It is my feeling that this type of service is more than the State can reasonably be asked to provide free to woodland owners and that some charge is justified and proper.

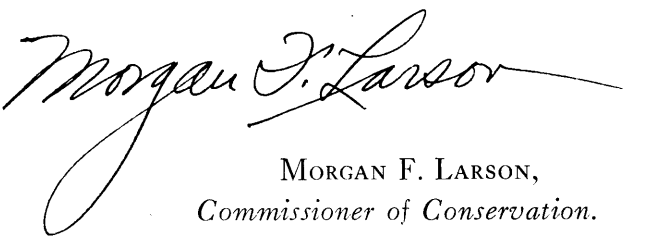
I am aware that our State forest and park system is unable to meet the demands made upon it for recreational use, but I do not feel that we can justify, at this time, a request for funds for any material expansion.

In the field of fish and game a better feeling has been developed between the farmer and sportsman. As a direct result of improved relations, the so-called "Plainsboro Plan" is progressing. Under this plan adjoining farmers make their lands available for public hunting with a limit set on the number of hunters that may use the tract at any one time. Three large tracts in various sections of the State are operating successfully under this plan.

All phases of conservation are assuming increasing importance from a national standpoint. This is inevitable as our resources continue to dwindle. Our natural resources affect the common good and, therefore, are not to be wantonly dissipated.

New Jersey reflects the national situation, and this State is, fortunately, endowed with a great variety of important natural resources. The continued development and wise expenditure of these resources is a responsibility which cannot be neglected.

Respectfully submitted,



MORGAN F. LARSON,
Commissioner of Conservation.

January 15, 1948

THE DEPARTMENT OF CONSERVATION

The Department of Conservation created on July 1, 1945, represents the consolidation of related State agencies responsible for the protection and development of New Jersey's important natural resources.

There are five divisions as follows:

Division of Fish and Game.
Division of Forestry, Geology, Parks and Historic Sites.
Division of Navigation.
Division of Shell Fisheries.
Division of Water Policy and Supply.

The administrative head of the Department is the Commissioner of Conservation. Each Division is supervised by an administrative director and a governing board known as a Council. The Councils are essentially policy-making boards, meet monthly and serve without compensation. The Councils are independent of each other and are practically autonomous except that their actions are subject to the veto power of the Commissioner.

DEPARTMENT OF CONSERVATION

Statement of Appropriations, Expenditures and Receipts—1946-1947

Division of Fish and Game*—*Expenditures*

General Fund

Administration	$ 59,967.14
Coastal Patrol	15,859.73
Enforcement	134,791.33
Predator Control	17,321.32
Fish Distribution	22,561.43
Fish Hatchery	160,019.63
Game Purchased	64,983.60
Game Farms	99,624.37
	$575,128.55

Public Shooting and Fishing Grounds Fund

Purchase of Land	$ 66,087.47
Game Purchased	39,935.25
Game Management	55,523.68
Federal Aid Projects	18,720.17
	$180,266.57

Receipts

Hunters and Anglers Licenses	$586,972.60
Special Fish Netting Licenses	47,282.50
Special Breeders Licenses	1,418.00
Fines and Trepass	48,364.64
Federal Aid Reimbursements	8,042.65
Miscellaneous Receipts	9,863.41
	$701,943.80

*The Fish and Game Division is supported entirely from receipts, and therefore operates on what is known as a dedicated fund. Although moneys are appropriated in the regular manner unexpended funds do not lapse but carry over. The cash balance on July 1, 1947 of both funds was $258,985.62.

Division of Forestry, Geology, Parks and Historic Sites

Expenditures

State Funds	Allotted	Expended	Returned to State Treasury	Forwarded to 1947-48
Administration and Public Relations	$ 57,296.44	$ 57,156.14	$ 140.30	
Geology and Topography	30,884.40	30,266.05	618.35	
Forestry Research & Cooperation	13,323.75	13,208.80	114.95	
State Forest Nurseries and Reforestation	34,713.50	34,528.90	184.60	
Planning and Engineering	10,426.66	10,416.42	10.24	
Historic Sites	28,301.54	28,273.81	27.73	
Preventing and Extinguishing Forest Fires	215,435.15	213,585.92	1,849.23	
State Parks (including $31,166.34 from receipts)	250,845.33	152,397.41	467.29	$ 97,980.63*
State Forests (including $1,215.00 from receipts)	180,456.03	126,720.82	53,735.21	
State Forest Fund (appropriated from receipts)	43,700.00	39,025.04		4,674.96
Morris Canal and Banking Company	20,835.83	20,469.93		365.90
Total State Funds	$886,218.63	$726,049.24	$57,147.90	$103,021.49
Federal Forest Fire Fund (including $50,689.70 forwarded from 1945-46)	188,617.45	84,636.18		103,981.27
Federal Forest Nursery Fund (including $6,394.71 forwarded from 1945-46)	9,616.71	2,772.91		6,843.80
	$1,084,452.79	$813,458.33	$57,147.90	$213,846.56

*Unexpended appropriation for Princeton Battlefield —reappropriated.

Receipts

	Received	Appropriated For Use	Credit to Fund	Paid to State Treasury
Forest Fire Penalties	$ 4,416.53			$ 4,416.53
Sale of Tree Seedlings (reforestation)	5,071.04			5,071.04
Sale of geologic Maps and Reports	3,031.63			3,031.63
Historic Sites admissions	941.45			941.45
State Parks—Recreational use, etc	32,567.68	31,166.34	1,401.34	
State Forests—High Point Park, Recreational use, etc.	9,294.62	1,215.00	8,079.62	
State Forest Fund—Recreational use, etc	47,894.92		47,894.92	
Federal Forest Fire Fund	137,927.75	137,927.75		
Federal Forest Nursery Fund	3,222.00	3,222.00		
Morris Canal and Banking Company	50,624.51		50,624.51	
	$294,992.13	$173,531.09	$108,000.39	$13,460.65

Division of Navigation

Expenditures

	Allotted	Expended	Returned to State Treasury	Reappropriated
Salaries	$ 178,510.00	$ 177,155.36	$1,354.64	
Materials and Supplies	17,589.00	17,376.03		$ 212.97
Services other than Personal	12,272.00	11,811.70		460.30
Current Repairs and Maintenance	22,140.00	19,035.64		3,104.36
Additions and Improvements (Waterways)	162,190.40	81,781.07		80,409.33
Extraordinary Expenditures (Beach Erosion Control)	1,120,757.42	988,805.14		131,952.28
Public Yacht Basins	19,589.74	5,816.27		13,772.77
	$1,533,048.56	$1,301,781.21*	$1,354.64	$229,912.01

*Approximately $1,035,000.00 used for Capital Improvements.

Receipts

	Received	Paid to State School Fund	Maintenance of Yacht Basins	Paid to State Treasury
Riparian Rights				
Grants	$219,899.03	$219,899.03		
Leases	29,073.81 (a)	29,073.81		
Easements & Licenses	7,160.75	7,160.75		
Interest	1,402.05	1,402.05		
Dredging Royalty	10,958.28	10,958.28		
Special Fund for Legal Expenses	3,135.24	3,135.24		
Miscellaneous	367.15	367.15		
	$271,996.31			
Power Vessels				
Licenses	15,497.50			$15,497.50
Fines	162.50			162.50
Miscellaneous	40.00			40.00
	15,700.00			
Public Yacht Basins (Dock Rentals, etc.)				
Forked River	6,268.83		$6,268.83	
Fortesque	2,695.06		2,695.06	
	8,963.89			
	$296,660.20	$271,996.31	$8,963.89	$15,700.00

(a) This includes $1,357.31 held in escrow.

Division of Shell Fisheries

Expenditures

	Allotted	Expended	Returned to State Treasury
Administration	$ 20,356.07	$ 20,318.88	$37.19
Survey of Leased and Natural Shellfish Lands	6,499.01	6,498.10	.91
Research	18,964.46*	18,964.46*	
Protection	71,251.95*	71,231.43*	20.52
Propagation	21,062.98	21,046.80	16.18
	$138,134.47	$138.059.67	$74.80

*Increase due to purchase and installation of a new Diesel Engine for the guard boat "Senator Reeves" at a cost of $14,993.56.

*Receipts**

	Paid to State Treasury
Boat Licenses	$ 7,338.00
Clamming Licenses	10,240.00
Tonging Licenses	2,355.00
Leases (Rental of Oyster Beds)	20,608.41
Fines	1,110.25
	$41,651.66

*Does not include 420,000 bushels of Oyster shells valued at $71,400—contributed by the oyster planters under the provisions of Chapter 39 P. L. of 1945.

Division of Water Policy and Supply

Expenditures

Current Operating Expenses	Allotted	Expended	Returned to State Treasury	Reappropriated
General Water Policy Activities	$ 56,082.00	$ 53,148.45	$ 2,933.55	
*Surface Water Investigations	18,072.00	17,190.32	881.68	
*Ground Water Investigations	11,018.00	10,916.30	101.70	
Delaware and Raritan Canal Maintenance	40,000.00	39,623.03	376.97	
Interconnection Maintenance	1,141.20	188.44		$ 952.76
	$126,313.20	$121,066.54	$ 4,293.90	$ 952.76
Capital Improvements				
Delaware and Raritan Canal Rehabilitation	200,000.00	57,807.19		142,192.81
Interconnection Revolving Fund Balance	143,035.00	19,341.06	100,000.00	23,693.94
	343,035.00	77,148.25	100,000.00(a)	165,886.75
	$469,348.20	$198,214.79	$104,293.90	$166,839.51

*Carried on in cooperation with U. S. Geological Survey, which expended $17,769.14 and $10,872.06, respectively, for this work.

Receipts

	Received	Paid to Water Supply Fund	Paid to State Treasury
Excess Diversion of Water	$ 98,698.86	$ 98,698.86	$7,746.24
Delaware and Raritan Canal Rentals	7,746.24		
Delaware and Raritan Canal Sale of Water	2,174.58		2,174.58
	$108,619.68	$ 98,698.86	$9,920.82

(a) $100,000.00 transferred to General State Fund July 1, 1947.

Recapitulation

Expenditures

Commissioner's Office		$ 23,975.81
Division of Fish and Game		755,395.12
Division of Forestry, Geology, Parks & Historic Sites		
State Funds	$726,049.24	
Federal Funds	87,409.07	813,458.31
Division of Navigation		1,301,781.91
Division of Shellfisheries		138,059.67
Division of Water Policy and Supply		198,214.79
Grand Total of Expenditures		$3,230,885.61

Receipts

Division of Fish and Game	$ 701,943.80
Division of Forestry, Geology, Parks & Historic Sites*	294,992.13
Division of Navigation	296,660.20
Division of Shellfisheries	41,651.66
Division of Water Policy and Supply	108,619.68
Grand Total of Receipts	$1,443,867.47

*Includes grants of the Federal Government.

DIVISION OF FISH AND GAME

The primary objectives of this Division are the protection and propagation of fish, birds and game in order that the waters and fields of this State will be adequately stocked.

The accomplishment of these objectives is achieved in several ways. The annual licensing of nearly 250,000 sportsmen, commercial fishermen and game breeders is one measure of control. This division is charged with the enforcement of all fish and game laws which are designed to insure the adequate continuance of fish and game. Another factor is a suitable game management program, including research work, in order that factual evidence will be at hand for proper game management practices. A broad educational program also helps to accomplish the purposes of fish and game conservation.

As there continues to be less and less private land available for the sportsman, it becomes increasingly necessary to provide public lands, streams and water bodies on which game management practices can be instituted to provide adequate fish and game.

This Division now administers 18 areas totalling 42,028 acres as public hunting and shooting grounds and laboratories for the development of wild life techniques.

Summary of Activities 1946-47

The following is a brief summary of conservation of wildlife and propagation and liberation of fish and game during the year.

Fish and Game Liberation

Pheasants—39,743, of which 19,460 were propagated and distributed from State-owned farms; 11,937 purchased from licensed dealers; 8,346 raised to adult stage by 4-H Clubs and others from day-old chicks hatched at State farms.

Quail—13,452, all raised at the State Quail Farm.

Rabbits—39,639, all purchased from the west.

Fish—932,076, propagated and distributed from the State-owned hatcheries as follows: trout over legal size, 416,480; bluegill sunfish, 235,350; large-mouth bass, 128,816; small-mouth bass, 126,430; tadpoles, 25,000.

In addition, 87,459 adult fish were netted from various reservoirs and other closed waters and re-distributed as follows: yellow

Pheasant Rearing Pens—Forked River Game Farm

perch, 32,146; white perch, 700; large-mouth bass, 2,707; small-mouth bass, 71; calico bass, 2,600; pickerel, 1,239; sunfish, 15,241; bluegills, 150; catfish, 5,570; shiners, 15,600; miscellaneous, 11,435.

The market value of all fish and game liberated was $477,646.25.

The receipts from resident and non-resident hunters' and anglers' licenses were $582,811.60.

Licenses Issued

1945	1946
195,866	244,431

1946 Deer Kill

The total number of legal deer taken during the five-day open season was 3,043. This was the greatest number of deer ever taken during any open season since the turn of the century.

Hunting Accidents

There were 28 hunting accidents reported during the year, three of which proved to be fatal. Six of the accidents were self-inflicted. Four deer hunting accidents were reported and two persons died as a result of the injuries received.

Latest Report of Fish and Game Taken

The 1945 tabulation of fish and game taken reveals that with the increased license holders during that year most of the game

species taken correspondingly increased; however, the fish taken registered a decline. This may be accounted for by the fact that only 30 per cent of the licensees reported their bag. A comparison of kill follows:

	1944	1945
Deer	2,633	2,704
Pheasants	135,765	158,982
Quail	25,445	21,599
Rabbits	488,722	588,083
Gray Squirrels	285,596	200,857
Grouse	4,289	4,446
Woodcock	2,520	3,007
Ducks	79,238	84,482
Geese	888	1,944
Trout	299,992	293,926
Bass	181,523	161,494
Pickerel	98,036	77,796
Skunk	2,925	4,012
Mink	245	317
Muskrat	176,112	157,604

Predatory Vermin Control

The following tabulation shows the predatory animals taken by the sportsmen during 1945, as compared with the previous year:

	1944	1945
Cats	3,788	6,425
Weasels	1,261	2,484
Red Squirrels	1,116	4,985
Foxes	1,754	2,248

There were also taken 47,026 predatory birds and animals by the wardens, wildlife managers, trappers, and holders of special vermin permits.

Legislation, Laws of 1947

Chapter 164—Fixes the season on pheasant, quail, rabbit, squirrel, grouse and partridge, from November 10th to December 10th.

Chapter 239—Fixes deer season from December 12th to December 16th, and, if any of said days fall upon a Sunday, then to December 17th. Also provides for a special season from December 7th to December 11th, inclusive, for the killing of deer with

bow and arrow exclusively, and prohibits any person from using or having in possession or under control, any poison arrow, arrow with explosive tips, or any bow drawn, held or released by mechanical means.

Chapter 319—Permits the training of raccoon dogs between the hours of sunset and sunrise for a period of four weeks prior to the last week preceding the opening of the raccoon season.

Chapter 68—Allows the taking of striped bass at any time of the year in the manner known as angling with rod and line.

Chapter 48—Prohibits fishing on the opening day of trout season before 8:00 A.M.

Chapter 163—Provides that on and after January 1, 1948, the fees for licenses to hunt or fish shall be as follows:

Resident Hunting	$3.15
Resident Fishing	3.15
Non-resident and Alien Fishing	5.50
Non-resident and Alien Hunting	15.50

Chapter 159—Permits the Division of Fish and Game to designate agents to issue licenses.

Chapter 64—Eliminates the necessity for the use of a clerk's official seal on hunting and fishing licenses.

Chapter 297—Prohibits any person fishing through the ice in the Navesink and Shrewsbury River from cutting a hole larger than ten inches in diameter or within fifteen feet of any other hole in the ice.

Chapter 303—Provides for the revocation of a hunting and fishing license for two years, and upon conviction of a second violation, a permanent forfeit of license as an additional penalty to be levied on any person who shall cause injury, or destroy crops, orchards, fences, building or live stock, while hunting or fishing on the property of others.

Chapter 334—Provides that the Board of Chosen Freeholders may pay, out of the county funds, the sum of not more than ten dollars as a bounty on fox, and no bounty on fox shall be paid to any employee of the Division of Fish and Game.

Wildlife Management Activities

A careful study of farmer-cooperative plans that were or are being used in various states was made. From this investigation a plan known as the Plainsboro Plan was evolved and experimental

units were located at Plainsboro, Swartswood Lake and Sidney, New Jersey. Under this plan adjoining farmers make their lands available for hunting with a limit set on the number of gunners allowed on the combined properties at any one time.

As a complement to this Plainsboro plan a program has been developed to insure an adequate supply of food and cover for wildlife on farmlands.

The target range of 7,395 acres near Millville in Cumberland County, declared surplus by the U. S. Army, was purchased by the Division. This area joins the Haleyville Shooting and Fishing Grounds on the southeast and makes a unit of 9,144 acres available to New Jersey sportsmen. The area will be developed by interspacing the existing ground cover with fields planted with various game food plants to furnish a suitable habitat for the bulk of our wildlife species. Restoration will be the keynote of this area.

The improvement and maintenance of an adequate wildlife food supply received extensive consideration during the year. A total of 408 food patches, 77 acres of corn, ten acres of soybeans and ten and a half acres of rye were planted on the Public Shooting and Fishing Grounds throughout the State. Interested sportsmen and sportsmen's organizations fostered food patch planting programs. Planting consisted mainly of New Jersey Food Patch mixtures with additional plantings of Japanese and German millet, Atlas sorgo, dwarf Milo, Lincoln soybeans, tartary buckwheat, Reed canary grass and three varieties of lespedeza. There were 1,876 bushels of corn and 1,500 sheaves of wheat produced by wildlife managers to be used for winter feeding at the game farms and in the field.

To improve habitat for game a total of 6,710 food and cover shrubs from five to seven years old, were delivered to thirty-five cooperators throughout the State. These were raised in the nursery maintained by the Division to help improve one of the limiting factors in wildlife populations and were planted by interested sportsmen and landowners.

Other projects of improvement and maintenance on State lands include the clearing of 83.5 acres of land, cleaning of 2,400 feet of ditch line, brushing 7,260 feet of boundary line, replaced one bridge and installed one culvert; constructed 3,800 feet of roadway, 1,000 feet of bridal paths, one well shelter, and nine deer, one duck and two crow traps.

Federal Aid to Wildlife Project 11-D-6, a water fowl development, was maintained at the Tuckahoe-Corbin City Public Shoot-

ing and Fishing Grounds. Three salt ponds were installed, two spillways were built, 3,815 feet of sod wall were erected and 3,950 feet of dike were constructed on the project. Other activities included fire hazard reduction, road and dike maintenance.

Field trials throughout the State totaled 54 with thirteen held on State-owned land. There were 19 raccoon and 2,787 rabbits released to insure adequate trials. Many of the animals released make their way to open ground and resulted in a greater game population to the benefit of the sportsmen.

Management of our deer herd continued to be an important activity. Complaints of deer damage increased from 115 in 1945-46 to 161 in 1946-47. Permits to kill deer were reduced from 99 last year to 75 for the period of this report. Definite strides were made in reducing crop damage through the use of an improved version of the electric fences which were installed on nine properties and permanent wire mesh fences were erected on three properties. Cooperating landowners furnished all materials and the Division erected the fences.

Predator control on public shooting and fishing grounds yielded 22 foxes, 122 hawks, 21 owls, 26 cats, 58 rats, 24 oppossums, 22 weasels, 13 skunks and 135 crows.

During the year 23 complaints of beaver damage were received and a total of 20 beaver were live-trapped and removed where their activities would not interfere with human interests. There were 187 beaver trapped by special license during a special beaver trapping season. It is a policy of this Division to live-trap and move to open areas any small game that causes a nuisance through its activities or presence. A total of 471 squirrels and 39 rabbits were live-trapped and reliberated.

An extensive banding program was innovated to properly evaluate the results of the pheasant and quail stocking program. It is expected to result in better management methods as the program continues and definite data has accrued on pheasant survival, percentage of liberated birds that fell to the hunter's gun, the extent and degree of drift, the proper age for liberation, the survival of hardened birds compared with those reared in strict confinement and the percentage of the annual kill that accrues from liberated birds.

Fish

Report of Hatchery Operations—Hackettstown

	Raised July 1, 1946 to June 30, 1947	Disposed of	Estimated Number On Hand
Brook trout	486,264	136,264	350,000
Brown trout	658,360	148,360	510,000
Rainbow trout	531,856	131,856	400,000
Large mouth bass	379,816	128,816	251,000
Small mouth bass	176,430	126,430	50,000
Bluegill sunfish	299,350	235,350	64,000
Tadpoles	25,000	25,000	.....
	2,557,076	932,076	1,625,000

Survey and plans were made for building sixteen large ponds and 3,000 feet of storm channel on forty-six acres of land recently acquired which is expected to double the output of pond fish.

The water system at the Willow Grove Street hatchery on the east side of Hackettstown was rearranged to give six combination ponds which are used for trout in winter and bass and bluegill propagation in the summer, thus producing a double crop.

The shrubbery was trimmed. One hundred and fifty acres of grounds were cleaned up and two miles of dirt road temporarily repaired.

Ten large pond bottoms were regraded and relined, and mud was pumped from twenty other large lakes which were regraded. Three thousand feet of drainage ditch was cleaned out.

The foundations of one large spring house and the nursery building were replaced with eighteen hundred cement foundation blocks. The barn was remodeled to be used as a garage and storage building and a new rubberoid roof was put on it.

Over one thousand screens were rebuilt and rewired, and 140 hatchery troughs were repaired and painted.

In the past years a great many trout have been lost with furunculosis and "red spot". Furunculosis is one of the most serious bacterial diseases with which hatcheries have had to contend. In some cases whole hatcheries have been wiped out by this disease. A successful treatment for this disease has been worked out by the Federal Fish and Wildlife Service using sulfamerazine. This treatment was adapted to local hatchery conditions and an outbreak of furunculosis was effectively controlled.

There were no serious losses through external and internal parasites because of effective treatments using a dilute dip of acetic acid and the additions of small amounts of calomel or carbarsone to the food. The usual amount of bacterial gill infection was effectively controlled by use of a dip of copper sulphate.

There was a substantial increase in the size, number and value of pond fish produced during the fiscal year 1946-47. Good results were obtained with commercial fertilizers in producing natural food for the small bass and bluegills. However, fertilizer is most effective when producing a small number of pond fish per acre, but top results are not obtained when a maximum number of large pond fish per acre is desired; therefore the natural food must be supplemented by a meat or fish diet after the bass and bluegills reach a size of two inches.

A trap was designed to catch small bass and bluegill sunfish, and quite some labor was saved in removing fish from the ponds by this method.

A large number of bluegill sunfish were successfully carried through the winter for spring stocking. This was the first time that this was done, and the size of these sunfish was doubled during the hold-over.

Experiments using 2,4-D as a herbicide on obnoxious aquatic plants are being conducted at the hatchery. Good results have been obtained on emergent plants such as cattail, round stem bulrush, willow and arrow weed. While not producing results as quickly as was expected, it does show promise of controlling the underwater plants.

Netting Operations

The fish reclamation and redistribution work resulted in the netting of the following fish from reservoirs and other private sources which were planted in open waters:

Yellow Perch, adult	32,146
White Perch, adult	700
Large Mouth Bass, adult	2,707
Pickerel, adult	1,239
Small Mouth Bass, adult	71
Miscellaneous	11,435
Shiners	15,600
Sunfish, adult	15,241

Bluegill Sunfish, adult	150
Calico Bass, adult	2,600
Catfish, adult	5,570
	87,459

Fish Distributed by Federal Government

The following tabulation shows fish distributed in New Jersey by the Fish and Wildlife Service, United States Department of the Interior, during the calendar year 1946:

Brook Trout	1,000
Rainbow Trout	4,000
Large Mouth Bass	17,711
Small Mouth Bass	485
Crappie	174
Bluegill Sunfish	20,691
	44,061

Law Enforcement

Prosecutions

There was a 32 per cent increase in the number of prosecutions for flagrant violations of the fish and game laws during the fiscal year ending June 30, 1947. Only nine cases were dismissed in a total of 1,405 complaints filed. In addition there were 1,018 written warnings given for minor infractions of the fish and game laws.

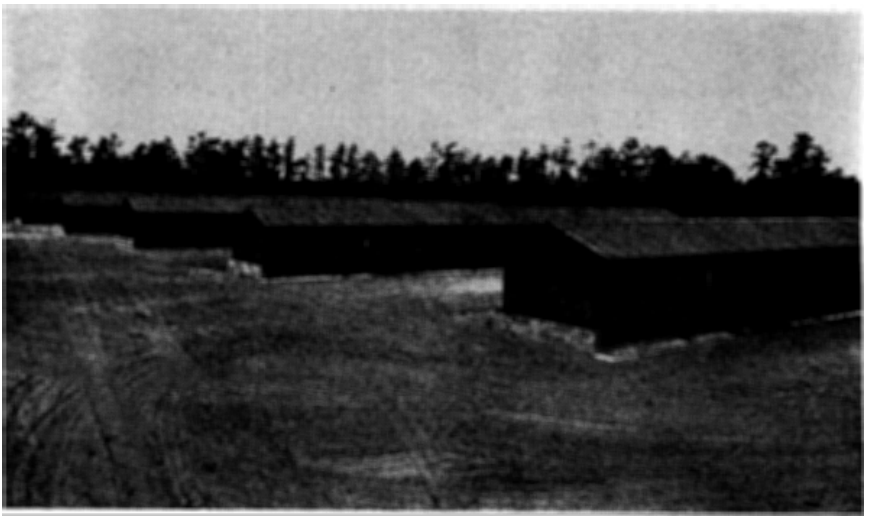
Sentences were suspended in 66 cases, ten were placed on probation, two were given time to pay the penalty imposed and eighteen defendants were committed to jail. One gun was confiscated and 66 licenses were revoked. Appeals to the Common Pleas Court were filed by defendants in 33 instances.

Deputy Wardens

A change was made in the deputy wardens set-up which had been in effect for a great many years. The appointments of all deputies were recalled with the exception of a very few active deputies who could arrange to be on call at all times when their assistance might be needed for law enforcement work. A new policy was adopted allowing a maximum of ten deputy wardens for each county. Those to be retained were selected by the warden of each

county. This resulted in reducing the number of deputies in the State from 2,216 to 168. Of those retained 22 were employees of the Department.

The fact that law enforcement was not hampered by this reduction is shown by the actual arrest figures for the State. During the fiscal year 1945-46 the final year in which the large deputy force was in operation, 58 arrests were made by deputy wardens. The arrests made by the reduced force in the fiscal year 1946-47 totaled 134.



Quail Holding Pens—Quail Farm, Van Heisville (Ocean Co.)

Deputy Conservation Officers

A plan was formulated to retain the active interest of many of the former deputies, who had been of inestimable service in the conservation of our wild life, particularly in such activities as shelter building, winter feeding and predator control. These men were invited to become affiliated with the Department as Deputy Conservation Officers. This plan met with widespread enthusiasm and 1,763 Deputy Conservation Officers have been enrolled and furnished with an identification card.

Game

Progress has been made in quality and quantity of birds produced at the State Game Farms. Repairs and renovations have been made to buildings and facilities. An open pen has been

added to the Forked River unit but facilities for increased production are behind schedule due to inability to secure wire and materials. Five 90 foot rearing pens were completed at the State Quail Farm. This has made it possible to properly harden and condition birds released from the game farms so that they will be better able to cope with the rigors of the wild.

Game Farm Reports

Forked River Farm

The pheasant record at this farm for the calendar year of 1946 was as follows:

Breeding birds on hand January 1, 1946		37
Young birds on hand January 1, 1946		2,167
Received from Rockport Farm		400
Eggs laid	36,621	
Eggs purchased	2,965	
Eggs distributed		
Eggs set	34,215	
Birds hatched		21,411
		24,015
Spring distribution		645
Fall distribution		6,916
Day-old chicks distributed		6,495
Birds died or escaped		3,925
Breeding birds on hand December 31, 1946		1,356
Birds held for spring distribution		4,678
		24,015

Rockport Farm

The pheasant record at this farm for the calendar year of 1946 was as follows:

Breeding birds on hand January 1, 1946		1,112
Young birds on hand January 1, 1946		3,351
Eggs laid	30,514	
Eggs purchased	1,994	
Eggs distributed	1,980	
Eggs set	28,150	
Birds hatched		18,965
		23,428

Spring distribution	2,600
Turned over to Forked River Farm	400
Fall distribution	7,674
Day-old chicks distributed	8,384
Birds died or escaped	1,794
Breeding birds on hand December 31, 1946	1,296
Birds held for spring distribution	1,280
	23,428

Quail Farm

The quail record for the calendar year of 1946 was as follows:

Breeding birds on hand January 1, 1946		1,318
Young birds on hand January 1, 1946		5,295
Eggs laid	29,318	
Eggs distributed		
Eggs set	26,033	
Birds hatched		20,087
		26,700
Spring distribution		5,224
Fall distribution		7,221
Day-old chicks distributed		400
Birds died or escaped		5,787
Breeding birds on hand December 31, 1946		291
Birds held for spring distribution		7,777
		26,700

Educational Activities

Conservation exhibit material was designed and constructed at the workshop on the Flat Brook Tract and displayed at seven major exhibits including the Asbury Park, "Calvacade of Progress", the State Fair at Trenton and several county fairs. The exhibits were on view a total of 41 days and covered a total of 7,000 square feet of exhibit space. It is estimated that more than 200,000 people viewed the display of panels, photographs, live and mounted fish and wildlife. The panels portrayed safety with firearms, the kill of wildlife on highways, the pheasant rearing program, wildlife on the farm, and the essentials of food, cover, water and protection.

State-wide education of youth in conservation principles is regarded as one of the most powerful factors for developing the proper appreciation of the natural resources of New Jersey. More than 60,000 young people have viewed the color motion pictures, and exhibits, and have heard the conservation lectures on this Division's programs given to school assemblies, Boy and Girl Scouts, Summer Camps, 4-H Clubs, Father and Son gatherings, Future Farmers of America, Junior Sportsmen's Clubs and other young people's organizations. There is a continuous demand for information, displays, mounted materials and specimens from these various groups which cannot always be met because of the limited supply.

The Division sponsored the organization of a Conservation Club in the Teaneck High School with plans to have conservation clubs in other high schools of the State. One group of the Teaneck Conservation Club conducted a wild life sanctuary and another group of the same club had outstanding success in a pheasant rearing project in a comparatively metropolitan community. Their achievements received nation-wide publicity and requests for the program have been received from many of the states, Mexico and South America.

The day-old pheasant chick rearing project was conducted in 15 counties. The participants, consisting of Future Farmers of America, 4-H members, farmers, individuals, and sportsmen's clubs, reared 8,346 birds which were banded and released before the upland season. Some of the participants held seed stock for spring releasing. Reports of natural propagation were again noted in some areas this spring.

Members of the Future Farmers of America, 4-H Clubs and sportsmen's clubs have constructed permanent brooder houses with larger runs. Some clubs have installed bottled gas brooders as a precautionary measure in event of a power failure. This indicates a continued interest and enthusiasm for the pheasant rearing program. The Division was represented at several conservation conferences including the first Conservation Workshop at the Trenton State Teachers College, Teachers Faculty Institute, Rutgers University, the Annual State Grange and Farm Bureau meetings. Aid was given to the State Department of Education in preparation of the filming in color of "Resources Limited."

A multitude of minor functions is carried on in the dissemination of information on hunting, fishing, and conservation through the media of newspapers, magazines, radio, exhibits and correspondence.

Over 50,000 leaflets and 4,000 colored posters on safety with firearms and 1,000 booklets on Wildlife Management through Soil Conservation were distributed. Work in cooperation with Agricultural Associations, 4-H Clubs, Future Farmers of America, granges, the Farm Bureau, county agents, and directly with land owners to formulate a better understanding between the Division, the sportsman and the land owner was carried on.

Commercial Fishing

Pound Fisheries Summary

The following is a summary of the pound fisheries' reports for the calendar year ending December, 1946:

Approximate value of all pounds	$1,070,401.77
Proceeds derived from sale of fish	1,519,254.99
Number of pounds of fish caught and disposed of	34,772,450

Licenses issued:

Atlantic Ocean	127	
Sandy Hook and Raritan Bay	46	
		173
Number of pounds operated		154
Number of men employed		331

Menhaden and Food Fish Licenses

There were 49 vessels licensed to take menhaden with purse or shirred nets within the three-mile limit during the calendar year of 1946, and 133 vessels licensed to take food fish in the area between the two- and three-mile limit.

Striped Bass Licenses

During the fiscal year, there were 529 licenses issued to 104 persons for the netting of striped bass. Licenses were granted for the use of 496 gill nets and 33 hand seines.

Special Netting Licenses

Special licenses for the use of various specified nets in tidal waters were granted as follows during 1946-47:

Drifting gill net	66
Hauling seine	36
Flounder fyke	94
Miniature fyke	1,764
Fyke	109
Shad	284
Staked gill	263
Bait seine	20

Delaware River Shad Industry

County	Boats		Nets		Men Engaged		Number Shad Caught	
	1946-'47		1946-'47		1946-'47		1946	1947
Burlington	3	3	4	4	9	8	55	190
Cumberland	32	30	25	23	42	38	14,110	21,350
Gloucester	4	1	4	1	7	2	1,850	200
Hunterdon	4	5	3	4	11	13	200	1,238
Mercer	3	3	3	4	9	8	40	83
Salem	12	5	12	5	23	10	758	436
	58	47	51	41	101	79	17,013	23,497

County	Pounds Shad Caught		Value Shad Caught		Value Boats & Nets	
	1946	1947	1946	1947	1946	1947
Burlington	210	785	$ 60.00	$ 340.00	$ 600.	$ 435
Cumberland	57,594	81,491	14,078.50	16,943.30	7,974.	9,750.
Gloucester	6,900	1,000	1,100.00	200.00	1,000.	5.
Hunterdon	500	4,338	175.00	1,178.00	400.	860.
Mercer	170	382	34.00	121.00	1,025.	1,025.
Salem	3,695	1,744	923.75	438.50	3,475.	2,550.
	69,069	89,740	$16,371.25	$19,220.80	$14,474.	$14,625.

Hudson River Shad Industry

Description	1946	1947
Boats	226	203
Nets Owned	182	154
Men Engaged	264	232
Pounds Caught	1,525,243	1,024,392
Number of Shad Caught	437,689	282,121
Value of Shad Caught	$240,637.63	$161,447.21
Boats & Nets	$198,440.00	$183,485.00

Financial Statement

Report for 1946-47

General Fund

Income

Cash Balance July 1, 1946		$141,900.55
Hunters' & Anglers' licenses, Title 23, Chap. 3	$455,412.40	
Special licenses, Title 53, Chap. 18	49,224.50	
Sales and sundries	3,439.30	
Fines, Title 23, Chap. 10	47,792.64	
Miscellaneous receipts, Title 23, Chap. 7	2,290.30	
		558,159.14
		$700,059.69

Expenditures

Chapter 52, Laws of 1945, expenditures	$51,776.97	
Chapter 111, Laws of 1946, expenditures	532,185.40	
		$583,962.37
Cash balance, July 1, 1947		$116,097.32
Requisitions outstanding against this balance		42,943.15
Account balance, July 1, 1947		$73,154.47

Public Shooting and Fishing Grounds Fund

Report for 1946-47

Income

Balance July 1, 1946		$174,209.76
Receipts from U. S. Federal Aid Account, 1945-46	$3,420.38	
Receipts from U. S. for Federal Aid Account, 1946-47	4,622.27	
Receipts from hunters' and anglers' licenses	131,560.20	
Miscellaneous receipts	4,181.81	
		143,784.66
		$317,994.42

Expenditures		
Expenditures for 1945-46	$4,441,72	
Expenditures for 1946-47	170,664.40	
		$175,106.12
Cash balance, July 1, 1947		$142,888.30
Requisitions outstanding against this balance		9,602.17
Account balance, July 1, 1947		$133,286.13

DIVISION OF FORESTRY, GEOLOGY, PARKS AND HISTORIC SITES

The work of this Division covers a wide range of activities.

A major responsibility is the forest conservation program committed to its supervision. This includes protection against forest fires, reforestation, forest research, advisory service to woodland owners and the operation of a State-wide system of forests and parks.

In the field of geology this Division has important obligations including: cooperation with existing mineral industries, compilation of mineral statistics, stimulation of an active search for new sources of minerals, assistance in the solution of ground water and well drilling problems, revision and distribution of topographic maps and geological reports and the maintenance and extension of the system of survey monuments established by the New Jersey Geodetic Control Survey.

Protection of the State's interest in the remaining portions of the abandoned Morris Canal is the responsibility of this Division.

On July 1, 1945, this Division assumed the obligations of the former Commission on Historic Sites which was abolished.

Division Administration

During the year ex-officio work has been done in connection with the State Soil Conservation Committee, the Advisory Committee of the Allegheny Forest Experiment Station, U. S. Forest Service, the American Forestry Association and the State Foresters Association.

Cooperative activities have included participation in the work of the N. J. Parks & Recreation Association; in a conservation workshop organized and directed by the State Teachers College, Trenton; in the planning and filming of a conservation-education film by the Visual Education Consultants, Inc.; in a number of conferences with the Department of Economic Development on the State Master Plan; in conferences and planning with the State Department of Public Instruction relative to the installation of a Conservation Camp on the Stokes State Forest.

A bill proposing the first steps in connection with the control of indiscriminate woodland cutting was studied, prepared and introduced for study by the Legislature.

Time has been devoted to the proposal for a Federal Seashore under the National Park Service on Island Beach, north of Barnegat Inlet.

Morris Canal and Banking Company

Preliminary arrangements have been made for the abandonment of the leased campsites at Hopatcong State Park. A large amount of time has been spent in the administration of the leases at the Little Basin, Jersey City. Survey work has been continued on the Cranberry Lake survey and follow-up studies have been made of the results of chemical treatment for aquatic weed control at this lake.

Income

Rentals	$48,225.76
Parking and Fireplace Permits	2,261.00
Sale of Charcoal	137.75
	$50,624.51

Geology

Administration

A special appropriation for the topographic work permitted the employment early in the year of engineers and a draftsman to maintain and extend, where necessary, the system of survey monuments which have proved so useful to engineers, surveyors, mapping agencies and others who need to know the precise elevation or position of any particular point. Because all maps of New Jersey are based on this same precise control data, this topographic work is of value to the millions of people who use maps of this State.

Considerable time was given to answering inquiries relating to the geology, topography or mineral resources of New Jersey. Many questions must be answered on the basis of personal experience and judgment, if published material is inadequate.

To acquaint the public with geological activities and the information and services that are available, an effort is made to accept as many engagements as possible for speaking before groups and clubs. Articles on relevant subjects were prepared for publi-

cation in technical and professional journals and details will be found in the Public Relation's section of the work of this Division.

Several technical reports which dealt with the geology of New Jersey, prepared by authors outside the Department of Conservation, were critically read or carefully edited.

The Bureau of Mineral Research at Rutgers University was given the fullest cooperation and assistance was given the newly created Department of Geology at Upsala College.

Cooperation with the U. S. Bureau of Mines in the selection and compilation of mineral statistics was continued, as well as cooperation with the Academy of Natural Sciences in Philadelphia and the Department of Geology at Princeton University, in the study and correlation of samples from deep wells in southern New Jersey.

Conferences with the State Chamber of Commerce, Newark Chamber of Commerce, the Division of Water Policy and Supply, and interested individuals and corporations led to the joint initiation by the State Geologist and the Division of Water Policy and Supply of a detailed study of ground water conditions in the Newark area where a lowering groundwater table and an expanding area of salt water intrusion have led to a very serious condition.

To keep abreast of the changing picture of mineral production in this State and obtain the cooperation of as many operators as possible in furnishing statistics of their mineral production, visits were made to most of the active mines, pits and quarries in New Jersey. The compiled statistics of mineral production, therefore, are essentially accurate and complete.

Studies of samples taken in one of the operating ore mines added important knowledge of the genesis of those ores. Detailed examination of the Ordovician rocks west of Clinton, resulted in a better knowledge of their character, thickness, stratigraphic correlation and potential economic value.

Individuals, corporations and municipalities have been aided in connection with ground-water problems, and this work has involved the detailed study of hundreds of well samples and occasional visits to drilling operations. Information relating to wells in Newark and vicinity was collected and the position of each well carefully plotted on large-scale maps. Water samples from wells in different parts of Newark were collected for analysis.

Core samples from borings made by the Highway Department and the U. S. Army at various localities were carefully examined and notes on the sub-surface geology so obtained were given the

respective agencies for their use and also filed in the Department's permanent records.

Scores of mineral and rock specimens were identified, including some fine specimens in a collection given the State by Mr. G. E. Conkling of Maplewood. The Bureau of Mineral Research, Rutgers University, was aided in the collection of large samples of feldspathic rocks for use in mineral dressing tests.

Guided tours to points of particular geologic interest were conducted for members of the U. S. Geological Survey and other interested groups of geologists.

Topographic Work

A field crew was engaged in checking the position and condition of the several thousand monuments which are the basis of the geodetic control network. A total of 1,816 monuments were checked, and all of those found damaged or moved were repaired or replaced. Hundreds of blueprints giving coordinate (horizontal control) and/or level (vertical control) data were supplied at cost to engineers, State and federal agencies and others; and several hundred new tracings giving similar data for additional monuments were completed.

In cooperation with the U. S. Coast and Geodetic Survey, and as an aid to their mapping of a strip along the New Jersey side of Delaware River, 105 typed sheets of descriptions of municipal boundaries in Cumberland, Burlington, Salem and Gloucester Counties were copied from statutes and ordinances.

Several tracings of the county maps showing the position of all the geodetic control monuments were revised, and information supplied relative to State, county and municipal boundaries. Computations were completed to show the coordinate position of monuments in the Oce-26 traverse (Ocean County), and an index of all the triangulation stations in New Jersey was prepared. Upon request, tapes used by engineers in the State Highway Department, the Aero Service Corporation and others were tested for accuracy.

New editions of Topographic Atlas Sheets 35 and 36 were received from the printer, and reissues of Atlas Sheets 23, 25, 29 and 33 were also printed. Copy for the revision of Atlas Sheets 21, 22 and 23 was prepared and sent the printer, and the new edition of Sheet 21 was received shortly before the end of the fiscal year. A revised price list of maps and geologic folios was also printed.

The following tabulation shows the distribution in recent years of maps published by this agency:

	Fiscal year ended June 30th		
	1947	1946	1945
Maps sold	5,083	5,418	4,954
Free copies to governmental agencies	567	419	284
Total number distributed	5,650	5,837	5,238

Income from the sale of maps and printed reports has been as follows:

	Fiscal year ended June 30th		
	1947	1946	1945
Maps	$2,607.17	$2,693.52	$2,445.98
Printed reports	432.29	244.45	462.66
Total cash receipts	$3,059.46	$2,937.97	$2,908.64

Planning and Engineering

This field includes the preparation of plans and specifications for the construction, development and maintenance of public use facilities in State Forests, State Parks and Historic Sites. Three employees devote full time to this work with some additional assistance.

General

At the request of the Department of Economic Development ten projects for State park development previously submitted to that Department for the Public Works Reserve were re-examined and additional information forwarded.

State Forests

Bass River Forest—Supervision was continued and working plans supplied to complete the cabin units at this area. One hundred and nine tax sale certificates were investigated and 41 tracts have been identified during the year.

Norvin Green Forest—A property map of this new area was prepared.

Stokes Forest—Inspections were made and data assembled for the preparation of plans and work estimate for the completion of the Skellinger Group Camp.

State Parks

Allaire Park—Preliminary surveys of the old raceway or canal at the Deserted Village were completed and a location map and profile prepared. Preliminary work plans and specifications were made for restoration of the raceway.

Cheesequake Park—Studies were made of spring location and a possible water supply at the Museum area. Studies were continued for the further development of the Hook's Creek beach area, a plan prepared and a site selected for a larger, temporary concession building at this location.

Edison Park—A base map of the present area and a plan for general development were prepared.

Farny Park—This park is still undeveloped. Preliminary field investigations, plotting of individual tract maps and an acquisition study of the enlarged proposed park area were completed.

Hacklebarney Park—A location map and work schedule for the construction of new signs at this park were reviewed and recommendations prepared.

Hopatcong Park—Sketch and plan were completed for the proposed development of the park. Preliminary cost estimates were assembled for these improvements. Study was made for alternate road locations of the county road now passing through this park.

Princeton Battlefield—Survey data for the tracts which have been acquired were completed.

Ringwood Park—Preliminary survey was made of the new locations proposed to provide additional picnic facilities.

Stephens Park—Plan and specifications were prepared for a workshop at the park headquarters.

Swartswood Park—Plans and specifications were provided for the installation of part of the new water system. Planning and supervision were continued on the construction work which will provide new picnic facilities and a new bathing beach at Emmons Cove. A boundary line between the park and an adjoining property were surveyed and staked.

Voorhees Park—Recommendations were made for the maintenance of bridges in the Hoppock Grove area and field inspection of roads, bridges and other recreational structures was carried on. Recommendations were also made for the construction of certain culverts.

A general plan for more complete development of the entire

area was made and construction plans for improvement of the picnic area were completed.

Historic Sites

Assistance was given on design, engineering and maintenance problems arising at several Historic Sites. These include the investigation of the title, preparation of a plot plan for the Wallace House, plans for drainage at the Dutch Parsonage and recommendations on the proposed location of the new monument subsequently to be erected by the Mexican Government at Carranza Memorial.

Forest Fire Service

General

The most important forestry problem in the State is the protection of the woodlands from the ravages of forest fires. The New Jersey Forest Fire Service affords protection over the wooded areas in all but the most populous sections of the State and, in addition, protects the marshlands along the New Jersey coast. The Forest Fire laws are applicable to more than 50 per cent of the total land area of the State, or about 3,000,000 acres.

This year, especially, has been one of the lowest in the history of the Forest Fire Service in the number of fires and area burned. The important factors contributing to this record of fire frequency and the area burned this year were: (a) weather conditions of above average rainfall and high humidity; (b) use of tractor-drawn plows on large fires; (c) protective burning during the fall and winter along railroad rights-of-way and other areas of high fire frequency and hazard.

There were, however, several short periods of high fire danger in which dangerously low humidity and high winds prevailed in Southern New Jersey, particularly periods at the end of March and the middle of May.

Forest Fire Statistics

Forest fire occurrence and spread are correlated with weather factors of relative humidity, wind velocity and rainfall. In order to evaluate progress in fire control it is necessary to compare periods of years. The following table illustrates the progress made during eight and nine year periods. The figures for 1946-7 are submitted as a matter of record:

	No. Fires	*Area (Acres)*	*Av. (Acres)*	*Cost to Extinguish*	*Av. Cost*
8 yr. average ('30-'37) ...	1,299	69,719.2	53.7	35,749.3	27.5
9 yr. average ('38-'46) ...	1,621	28,664.9	17.2	28,240.4	16.9
1 year (1947)	1,134	9,057.75	8.0	20,145.2	17.8

Law Enforcement	*Violations Detected*	*Violations Closed*	*Penalties Collected*
Technical Violations (a)	149	120	$ 123.98
Responsibilities (b)	123	163	1,834.90
Railroads	192	148	2,449.68
Forest Fire Hazards	40	31	.....
Total	504	462	$4,408.56

(a) burning without a permit
(b) fire escaping and burning woodland

Equipment

Fire fighting equipment purchased during the year included 50 one quart Pyrene fire extinguishers to be mounted in trucks, 400 knapsack sprayers, 852 shovels, 480 buckets, 12 forest fire swatters, one pair Universal 6x30 binoculars. Two Ranger Pal plows were constructed at the Fire Service shop.

Other equipment purchased included one drill press, one Stewart hydraulic floor crane, one Devilbis aircompressor, and pipes and elbows for backfiring torches. There is sufficient equipment on hand to simultaneously equip some 8,000 fire fighters.

Trucks constructed at the Fire Service shop at the Trenton Airport are completely equipped as fire fighting units and there are now 45 forest fire trucks in service.

This year the following mobile equipment has been purchased: 10 Dodge one-ton, four wheel drive trucks, which are being equipped with fire fighting equipment; one Hale 100 gallons per minute power take-off pump and one Hale 100 gallons per minute portable pump; (these two units have been mounted on new Dodge trucks) one beam pump and tank unit that operates under high pressure; two Trailer Hale units; two Darley Front Mounts; and four Monroe Trailers.

The four wheel drive truck purchased last year has now been equipped with the large high pressure decontamination unit.

The development of new equipment and the adoption of equipment used in other fields for fire service use has been continued this year. The use of plows drawn by tractors for fire line construction is becoming more extensive on "going fires" in New Jersey. This type of plow is capable of cutting a line nearly four feet wide down to mineral soil at the rate of two miles an hour. By building these lines while fires are burning, it is estimated that over 8,000 acres were saved from destruction on fifteen large fires during the past year as well as several thousands of dollars in extinction costs.

Radio

The development and general use of an ultra-high frequency radio system has also had its place in the improvement of fire extinction and control.

The Forest Fire Service radio system has been developed so that in the system there are 62 two-way communication sets; one in the airplane, one in each of the 21 lookout towers, one at State Headquarters, one in each of the three Division Headquarters, and 36 mobile units located in fire trucks or key wardens' cars.

Airplane

The Fire Service airplane has played a prominent part in the record of reduced fire damage. The plane observes all fires burning over 35 acres. Upon arrival at a fire the observer plots the fire area, charting streams, swamps, roads, etc., and other natural lines of resistance and drops a map to the warden in charge. Thereafter, for the duration of fire, the observer keeps in constant contact with the field force giving information of changing fire conditions either through maps or by radio, saving hours in ground reconnaissance.

Lookout Towers

There are 21 lookout towers located at strategic points throughout the woodland areas of the State. These are manned during the daylight hours from March 1st to December 31st of each year.

A major improvement in fire detection methods is the change from the former 64 sector circle to that of the 360° circle. This change was made so that sharper and better readings can be made for a more accurate fire location.

Protection Program

During the past fall a program was continued in the "hot-spot areas" of Atlantic, Camden, Cumberland, Cape May, Ocean and Burlington Counties whereby the Forest Fire Service, in conjunction with railroad companies, protective burned a safety strip 100 feet wide on each side of the road bed, on 115 miles of railroad right-of-way. This eliminated seventy-five per cent of this type of fire, or approximately 200 fires. This burning was the responsibility of the railroad companies and assistance only was given by the Forest Fire Service.

During the winter and early spring, fire breaks totalling 25 miles were constructed in various sections of South Jersey. The six mile stretch in Burlington County between Lake Oswego and Bass River Forest was probably the most important.

Safety strips were constructed around the Atlantic City Race Track because of the fire hazard from large crowds. There were twelve miles of strips constructed of varying widths, from 50 to 75 feet.

Tests were conducted with detergents, mixed with water, in order to make woodlands more fire resistant. The proportion used on these tests was two gallons of solution to 500 gallons of water. In all cases field firewardens report that the solution tends to prevent rekindling. With plain water rekindling occurred and the line required constant patrol. Experimentation with detergents will be continued.

Arrangements have been made with the Helicopter Transport Service at Camden, New Jersey for the experimental use of their helicopter service. The helicopter may prove to be more adaptable than the airplane for fire observation.

Training Program

The annual Section Firewardens' Conference was held in Trenton on January 16, 1947. There were 21 District Firewardens' conferences held at various places throughout the State. General discussions by all wardens were encouraged and plans for the improvement of fire prevention, control and other phases of forest fire activities were presented.

Prevention Activities

Contacts were made by firewardens with schools, social, business, welfare and sportsmen's organizations where fire prevention movies and talks were presented.

There were four "fire hazard" cases prosecuted with convictions obtained in all cases. Thirty-one hazards were eliminated by violators after they had been sent warning letters.

The State Firewarden is represented on a committee appointed by the Regional Forester, U. S. Forest Service, to produce a forest fire motion picture for training and publicity purposes; the cost of this picture is to be borne jointly by the thirteen northeastern States. The filming of this picture is about half completed. Most of the scenes have been taken on the Stokes State Forest.

State Forests

The management policy of the State Forests is directed towards multiple land use which includes: the production of timber and other forest products for commercial use, the maintenance of a forest cover to protect watersheds and control soil erosion, the development and operation of adequate public recreational facilities, the development of food and cover to provide a habitat for wild life.

New Jersey's State Forest and Park System affords relaxation for those who enjoy the woods

Area

The total area of the nine State forests is 57,080 acres; 56,176 acres acquired by purchase at an average cost of $5.35 an acre and 904 acres acquired by gift. This figure does not include an estimated 48,314 acres of tax delinquent lands accepted by the State for forest purposes in accordance with law.

State Forest	*Initial Acquisition*	*County*	*Acres*
Bass River	1905	Burlington & Ocean	9,270
Belleplain	1928	Cape May & Cumberland	6,492
Green Bank	1930	Burlington & Atlantic	1,833
Jackson	1915	Ocean	43
Jenny Jump	1931	Warren	967
Lebanon	1908	Burlington & Ocean	22,185
Norvin Green	1947	Passaic	904
Penn	1910	Burlington	2,958
Stokes	1907	Sussex	12,428
			57,080

Acquisition

An exchange of lands on the Stokes Forest resulted in the alienation of 0.675 acres, and the addition of 1.359 acres, making the net gain of 0.684 acres.

A tract of 904 acres in Passaic County, west of Wanaque Reservoir, has been acquired by gift from Norvin Hewitt Green. This State Forest has been named for the donor. In addition, Mr. Green has leased to the State an adjoining area of 1,356 acres.

An appropriation of $55,000 for the purchase of "interior" exceptions in the Stokes Forest was not expended because asking prices for the properties considered were regarded as unreasonable.

Organization

Personnel for the administration of all State Forests include 35 full-time and three part-time employees.

Income

The income from the sales of forest products, leases and rents, camp and picnic sites, cabin rentals, the sale of two former CCC Camps and from other special uses was $47,894.92 as compared with $34,378.90 received for the previous fiscal year.

Income by Forests	*Amount*
Bass River	$12,331.58
Belleplain	1,228.55
Green Bank	153.00
Jenny Jump	583.30
Lebanon	19,645.42
Penn	5.50
Stokes	13,947.57
Total	$47,894.92

Income by Products	*Amount*
Stumpage	$1,720.50
Cordwood	95.88
Cedar Products	967.93
Sawmill	250.00
Mill By-Products	1.44
Recreation	14,574.30
Leases and Rents	3,400.00
Sand and Gravel	17.95
Miscellaneous	26,866.92
Total	$47,894.92

Recreation

The number of visitors to the State Forests was 150,266 as compared with 93,785 for the preceding year. This is the highest number recorded for any one year. Some forests are now taxed beyond the capacity of the existing facilities.

Tax Lieu

In accordance with law $5,617.52 was paid to several townships for the calendar year 1946, at the rate of ten cents per acre for the State Forest lands located within the township.

Forest Fires

Six forest fires burned State forest land damaging approximately six acres. There were four fires on the Belleplain Forest and one each on the Lebanon and Stokes Forest.

The State Forest organization, in addition to the suppression of the forest fires on State lands also assisted in the suppression of 25 forest fires, and the investigation of 33 false alarms or illegal burnings on lands adjacent to and adjoining the State Forests.

Deer Kill

During December, 1946, it was estimated from information obtained that there were 163 legal deer taken from the State Forests.

Roads

Miscellaneous work such as scraping roads, cleaning ditches, mowing brush, posting road signs, and patching washouts with gravel was performed by the State Forest personnel.

The major portion of the maintenance work on the State Forest roads, grading, resurfacing with gravel and hard surface treatment was done under the "Institutional Roads" program by the State Highway Department which reports total expenditures of $82,736.56 for the year.

Forest Management

There were 1,032 cords of pine and oak removed during improvement and liberation cuttings and thinnings from 385 acres on the Lebanon Forest. The wood was sold. Approximately 12,000 board feet of pine logs were cut to be manufactured into lumber for administrative use at the Lebanon Sawmill. One acre of 40-year-old Southern white cedar was thinned.

There were no major cutting operations on other State Forests, except the removal of 560 cords of damaged, dead, dying, suppressed or inferior trees. This cutting was to provide fuel for recreation and administrative uses.

Hardwood trees were cut from 26 acres of pine plantations to release the pine and nine acres of red pine were pruned and the brush burned.

European pine sawfly parasites were distributed in all the Stokes Forest red pine plantations for insect control. The Scotch and red pine plantations of 41.3 acres on the Jenny Jump Forest were sprayed with D.D.T. by plane with resultant satisfactory control of the European Pine Sawfly damage.

Fire Protection

Forest fire safety strips (fire lines) were maintained by broadcast burning on the South Jersey State forests on approximately 800 acres, principally on the Lebanon State Forest. In some cases this burning served silvicultural needs, although it was done primarily as a fire protective measure.

State Parks

The State Parks are developed primarily to afford facilities for recreational use. There are now 19 State parks in the system. Pertinent facts are shown on the following page.

Location and Area

State Park	Initial Acquisition	County	In Land	In Water	Acres
(a) Allaire	1940	Monmouth	1,170		1,170
Cheesequake	1938	Middlesex	947	15	962
(a) Cranberry Lake	1925	Sussex	70	129	199
(b) Edison	1947	Middlesex	30		30
(a) Farny	1944	Morris	803		803
Hacklebarney	1924	Morris	193		193
High Point	1923	Sussex	10,856	79	10,935
Hopatcong	1925	Sussex	13	2	
		Morris	78	14	107
(a) Mount Laurel	1908	Burlington	20		20
Musconetcong Lake	1925	Sussex	14	231	
		Morris	14	84	343
Parvin	1931	Salem	860	107	967
(a) Princeton Battlefield	1946	Mercer	7		7
Ringwood Manor	1936	Passaic	504	10	514
Saxton Falls	1925		11		11
Stephens	1937	Morris	89		
		Warren	148		237
Swartswood	1914	Sussex	185	519	704
Voorhees	1929	Hunterdon	429		429
Washington Crossing	1912	Mercer	373		373
Washington Rock	1947	Somerset	27		27
		Totals	16,841	1,190	18,031

(a) Undeveloped.
(b) Park not developed for public use. Edison Memorial Tower open.

Organization

There are 74 permanent and 29 seasonal employees in the State Park organization.

Income

The income for the year was $41,862.30, an increase of 54 per cent over the previous year.

Rentals: Cabins	$7,607.00
Boats and Canoes	3,970.85
Dwellings	4,394.27
Concession Leases	9,683.94
Museum Entrance Fees	3,537.80
Recreational Fees	11,871.79
Miscellaneous	796.65
	$41,862.30

Attendance

During the year 775,933 visitors, an increase of 35 per cent over the previous year, enjoyed the facilities offered in the State Parks.

The use of all developed State Park areas has increased beyond the capacity of existing facilities.

Acquisition

At Saxton Falls 9.27 acres were purchased.

Norvin H. Green deeded as a gift 43.72 acres at Hewitt for an addition to Ringwood Manor State Park and has leased to the State an adjoining area of 65.58 acres.

Robert C. Maxwell and Agnes Pyne Hudson deeded as gifts 7.35 acres for the Princeton Battlefield Park.

The annual appropriation bill carries an item of $17,000.00 for the acquisition of the Fort Mott Reservation (103 acres).

Edison and Washington Rock Parks were transferred to State Parks from Historic Sites on January 1, 1947.

Alienation

The United States Army acquired through war time condemnation powers 108.3 acres of Allaire State Park for antennae mast construction.

General

The red pine plantations at Washington Crossing Park, Voorhees Park and Hacklebarney Park were sprayed by airplane with DDT solution to control a serious sawfly infestation. The elms at Ringwood Manor received the same treatment to control the elm leaf beetle. The elms at Washington Crossing Park and Ringwood Manor Park received additional treatment with lead arsenate spray.

Maintenance crews of the State Highway Department constructed paved gutters at Washington Crossing Park and road culverts at Cheesequake Park. Roads and parking area surfaces were given maintenance treatment on five parks.

The Division of Fish and Game stocked the trout streams at Hacklebarney, Stephens and Ringwood Parks. The lakes at Swartswood, Musconetcong, Cranberry and Parvin Parks were stocked with pond fish.

One hundred fifty prefabricated pressure treated picnic tables were purchased. The new type of standard park sign was constructed at Swartswood, Ringwood and Stephens Parks.

At Parvin Park a carpenter shop and storage building were constructed and the roof replaced on the dwelling. The concession

stand at Cheesequake Park was moved to a new location and enlarged to double its capacity.

Sections of the Lakes at Swartswood and Ringwood Parks were treated with Beneclor to control aquatic weed growth.

The construction of the new bathing beach at Swartswood Park has been 80 per cent completed. This includes 300 feet of sand beach, safety float lines and a large float complete with four ladders, life guard stand and two spring boards. Twenty 15-foot row boats with built in bait boxes were purchased and moorings constructed for 40 boats. A floating dock with gang plank approach was built.

At High Point Park "the Inn", a restaurant and refreshment stands, were completely renovated after a period of disuse during the war and were made available to a concessionnaire who opened them the last of May.

Historic Sites

Acquisitions

During the year the following properties and their contents were deeded to the State and full administrative responsibility was assumed by this Division.

Hancock House, Hancock's Bridge, Salem County.

The Building has been owned by the State since 1932 and the full administrative responsibility for this property was assumed on May 1st, 1947.

Old Dutch Parsonage, Washington Place, Somerville.

This property and the contents of the house were deeded to the State by the General Frelinghuysen Chapter D.A.R. on January 27, 1947.

Wallace House, Washington Place, Somerville. (Washington's Headquarters in Somerville)

The Department had been paying the caretaker's salary and contributing toward the upkeep of the house and on January 27, 1947, the Revolutionary Memorial Society of New Jersey deeded the house and contents to the State.

Properties

The following are the properties administered by the Department as Historic Sites:

Boudinot Mansion, Elizabeth
Carranza Memorial, near Tabernacle
Grover Cleveland Birthplace, Caldwell
Hancock House, Hancock's Bridge
Indian King Tavern, Haddonfield
Lawrence House, Burlington
Monmouth Battle Monument, Freehold
Monocacy Battle Monument, Monocacy, Maryland
Old Dutch Parsonage, Somerville
Oxford Furnace, Oxford
Princeton Battle Monument, Princeton
Steuben House, North Hackensack
Somers Mansion, Somers Point
Trenton Battle Monument, Trenton
Veterans of All Wars Memorial, Lakehurst
Wallace House, Somerville
Washington Headquarters, Rocky Hill
Walt Whitman House, Camden

Improvements

Boudinot Mansion—The exterior of the building was painted and the flag pole was painted and repaired.

Carranza Memorial—Two new steel flag poles were erected to replace the wooden poles. The location was selected after consideration of the proposed new Carranza monument which it is expected the Mexican Government will subsequently erect.

Grover Cleveland Birthplace—A new steel flag pole was installed to replace an unsatisfactory wooden pole.

Indian King Tavern—The entire lower floor interior was painted, plumbing improvements were made and the old Indian King Tavern sign was repaired and repainted.

Monmouth Battle Monument—Several gravel paths which were difficult to maintain were eliminated and made part of the lawn. The gravel circle around the monument was replaced with bituminous macadam.

Old Dutch Parsonage—When this Department assumed the responsibility for this property there was considerable repair work to be done. Copper tubing was installed throughout the house replacing the worn out galvanized pipe. Extensive repairs were made to the plumbing and the caretaker's quarters were completely renovated.

Princeton Battle Monument—The Japanese cherry trees which had been neglected during the war were sprayed for scale. The lawn was treated to improve its condition.

Somers Mansion—Several new fluorescent lighting fixtures were installed.

Steuben House—It was discovered that three of the main roof beams were cracked and the roof had sagged approximately one-half foot. An extensive repair job to the roof was completed satisfactorily. A new steel flag pole was erected in a new location.

Trenton Battle Monument—The elevator in this monument is in daily use and should be maintained in good working order. It has been completely overhauled and new cables installed. Because of the safety angle, regular inspections by the elevator company under contract have been arranged.

Washington's Headquarters at Rocky Hill—General improvements to grounds including replacement of dead shrubbery, trimming back overgrown bushes, replacement of yew trees in the formal garden and regrading the grounds have been completed.

Attendance and Income

The attendance was 25,861, an increase of 20 per cent over the previous year. The income from admissions, etc., was $1,005.45.

Forest Research and Cooperation

The forests of New Jersey occupy 46 per cent of the State's land area and they are the source upon which a number of important industries depend for their raw materials. The shipyards, pulp mills, basket factories, copper refineries and marine dock interests all rely upon New Jersey timber products. It is estimated that the value of these products amounts to about $6,000,000 annually. The work in forest management and cooperation is directed toward improving the timber stands and increasing the yield of forest products in the State. It consists of two phases, research and forest management. Investigations of practical problems are undertaken. The results are made available to private woodland owners in the actual management of their timber throughout the State. Private woodland owners avail themselves of the services offered by this Department in forest management on a purely voluntary basis.

Two State Foresters are assigned to the research and private cooperation work. They are assisted by one forester paid by the

U. S. Forest Service, and two supplied by the Soil Conservation Service. Two private timber agents, who operate under the general direction of the Department, are paid by private woodland owners for handling the details of timber sales.

Research Projects

During this fiscal year investigations were carried out on the following projects:

Cost of "release" cuttings following selective logging.
Prescribed burning for combined protection and silviculture in South Jersey.
Construction of volume tables and taper tables.
Growth of managed versus unmanaged woodland.
Correlation of log scale volume with lumber tally volume.
Correlation of site index with timber yields.
Underplanting hardwoods following selective logging.
Establishment of (1) permanent two-acre plot in selectively cut woods for study of growth, mortality and regeneration.

Private Cooperation

More than 90 per cent of New Jersey's forest land is in private ownership. The future productivity of these lands depends on proper methods of cutting, but under ordinary commercial methods this is not done. The Division is attempting to introduce proper management practices by marking the trees to be cut for owners who agree to follow out the program.

The following table shows the work done in this field during the year:

(1)	Number of forestry projects underway ..	167
		Fiscal Year
(2)	Requests for Forestry Assistance	346
	New contacts made	280
	Forest examinations: Number Owners	220
	Acres involved	13,593
	Timber marked: Number Owners	128
	Acres involved	2,083
	Volume board feet	4,015,500
	Woodland Harvested Under Approved Forestry Practice:	
	Number of Owners 61	
	Acres involved 1,252	

Volume, board feet	2,805,500
Fuelwood, cords	132
Posts	6,247

Reforestation

The Division encourages reforestation and offers advice and assistance to private woodland owners for the solution of their idle land problems. Nearly one million acres in New Jersey need partial or complete reforestation.

Three technical foresters are assigned to reforestation work and their services are available to all farmers and land owners in the State; both for recommendations and advice and actual field assistance on large planting operations during the spring and fall.

Forest Nurseries

Forest planting stock is sold at reasonable prices to all land owners in the State who comply with the regulations which have been established. A nursery is operated at Washington Crossing, in Mercer County, and at Green Bank, in Burlington County.

Since 1923 when the State first commenced the distribution of forest planting stock through the period covered by this report,

Mature Oak—Bordentown

Tulip Poplar—Delaware Valley

New Jersey can produce quality timber if forest management is practiced.

31,247,000 young trees have been distributed for reforestation. This year 701,553 were planted throughout the State. This is a substantial increase over the number of trees planted last year. It is still far short of the annual distribution during prewar years due primarily to the difficulty of securing labor for tree planting operations. The following tabulation shows the distribution of forest planting stock this year.

Agency	*No. of Trees Planted*
State Institutions, Cities, Counties	10,000
Water Companies	89,200
Industries and Corporations	3,500
Schools and Colleges	8,500
Organizations and Associations	11,500
Farmers	572,350
4-H Clubs	6,500
Total	701,550

European Pine Sawfly continues to be a problem in red pine and Scotch pine plantations in North Jersey. Because of the damage done by this insect, the State Forest Nurseries have practically discontinued the growing of red pine and Scotch pine reforestation stock. Red pine, one of the most common trees in Northern New Jersey for reforestation, has been supplanted in a large measure by white pine. Some 1,440 pounds of seed were sown in the nurseries in the spring of 1947. Seed sown included loblolly pine, southern white cedar, tulip poplar, black locust, red gum, red oak, and small quantities of various other species. The tree seed market is still uncertain and the supply of most species is difficult to obtain. It is interesting to note the diversity of the origin of the seed used this spring. It was obtained from Central Europe, Sweden, France, Canada, Arkansas, Wisconsin, North Carolina, Maryland and New England. Red gum and southern white cedar seed was collected from native stands in southern New Jersey by nursery personnel.

Tree Farms

Forest properties now certified as Tree Farms in New Jersey total 4,430 acres. The purpose of the Tree Farms program sponsored by the American Forest Products Industries, is to encourage forest management on privately owned woodland throughout the United States.

Shade Trees

The Division continued its service to municipal and county shade tree commissions during the past year by rendering advice and assistance both in the field and by mail on the solution of shade tree problems. This is a part of the regular service which the Division has offered to organized shade tree bodies throughout the State for many years.

Tree Expert Bureau

Facts concerning the Tree Expert Bureau established by law in 1940 are listed below.

Statement

Bank Balance July 1, 1946		$372.85
Receipts		
Renewal Fees	$90.00	
Examination Fees	70.00	
Re-Examination Fee	5.00	
		165.00
		$537.85
Expenditures		
Travel Expense	$36.90	
Printing	124.25	
Filing Cabinet	61.00	
*Reimbursement of Examination Fee	10.00	
		232.15
Balance in Bank June 30, 1947		$305.70

*Application rejected

Applications received	7
Applicants Examined	2
New Certificates Issued	2
Certificates Renewed	18

Public Relations

The functions of the Public Relations activities are two-fold; first, to promote interest in the conservation of those natural resources with which this Division is concerned; second, to acquaint

the public with the services and facilities offered by this Division. Most of the members of the technical staff assist in public relations work and two men assigned to this work devote the major portion of their time to it. Much of the public relations work cannot be reduced to statistical terms. Certain information, however, is listed herewith.

Radio

Departmental personnel took part in three radio programs presented over WTTM, Trenton, WAAT Newark, and the Rutgers Forum of the Air at New Brunswick.

News Releases

During the year period twenty-six releases were written and sent to all newspapers in the State (also New York and Philadelphia papers) and spot news on current forest fires was released on thirty-five occasions.

Feature Stories

Full information and photographs were furnished from which two newspaper feature articles were prepared and published.

Photographs

Additions were made to the large and varied photographic file of the Division. Special emphasis was placed on securing up to date pictures of the recreational use on the Forests and Parks. Requests for photographs from magazines and other publications average one a week and during the year more than three hundred pictures were furnished for illustrative purposes.

Magazine Articles

An illustrated article on forest fires appeared in the "New Jersey Compass".

The State Geologist prepared articles for professional and technical journals as follows: Bulletin of Geological Society of America, Journal of the Association of American State Geologist and New Jersey Plans.

An article describing the organization and work of the entire Department of Conservation was revised for the New Jersey Industrial Directory of 1947. Descriptions of the work of the Division

was prepared for the New Jersey Legislative Manual and the Philadelphia Bulletin Almanac.

Revisions were also made for the AAA Tour Book information on State Forests, Parks and Historic Sites, the official State Highway Map and road maps of several oil companies.

Printing

A number of publications were edited and are currently being printed.

Guided Tours

The Mountain Lakes Garden Club was given an opportunity to view the problems and work of the Division through a tour to the Stokes State Forest. Other tours were conducted for the students of Glen Rock High School, and the members of the Garden Club of New Jersey were conducted on a field trip, to the Pine Barrens.

Exhibits

Conservation exhibits featuring State Forests, State Parks and the Forest Fire Service were placed at the Sussex County Farm and Horse Show at Branchville, Morris County Fair at Troy Hills, the Flemington Fair, and the State Fair at Trenton. Forest Fire exhibits and demonstrations were held at Egg Harbor, Roxbury and Rockaway.

Lectures

Talks and illustrated lectures relating to the work of the Department were given by divisional personnel to 114 schools, service clubs, garden clubs and other groups during the year as follows:

Forestry	47
Forest Fire	58
Geology	9

Dedication of Princeton Battlefield

Complete preparations were made for the dedication of the Princeton Battlefield on October 20, 1946, including the addressing of 6,000 invitations. About 1,600 attended the ceremonies.

Canoe Marathon

This Division co-sponsored with the New Jersey Council of the State Department of Economic Development, the Second Annual Delaware River Canoe Marathon from Easton, Pennsylvania, to Trenton on October 12, 1946, to draw attention to the recreational value of the Delaware Valley.

This event and the Princeton Battlefield dedication consumed practically the entire time of four employees in Public Relations work from September 15th to October 20th.

DIVISION OF NAVIGATION

The Division of Navigation administers the State's right, title and interests in tidal and navigable waters. It makes grants and leases; issues bridge and other crossing rights and licenses and collects royalties on sand and gravel dredged from State's lands under water; has jurisdiction in the reclaiming of, or building upon lands under tidewater and the abatement of purprestures; and compels the removal of boats illegally moored upon riparian lands.

This Division is charged with the duty of investigating the condition of waterfront or harbor facilities and any other matters incident to the movement of commerce upon all navigable water in the State or bounding thereon. Its approval must be obtained for all plans of construction or alteration of any structure or development of waterfront on tidal waters.

The Division conducts the work of developing, maintaining and improving inland waterways and appoints harbor masters to supervise their use and to enforce the observance of all rules and regulations. It marks annually the channel of the Inland Waterway between Manasquan Inlet and Cold Spring Inlet at Cape May, a distance of 123 miles, as well as approximately 160 miles of tributary channels and maintains and operates public yacht and boat basins at Forked River, Ocean County and at Fortesque, Cumberland County, and has started, but has not yet in operation, a public yacht basin at Atlantic City, Atlantic County. It maintains a repair shop at the Forked River Basin where most repairs to its mechanical equipment are made.

Under the law for Beach Protection and Improving Waterways the Division of Navigation is authorized and empowered:

1. To repair, reconstruct or construct bulkheads, breakwaters, groins or jetties, on any and every beachfront along the Atlantic Ocean, or any beachfront along the Delaware Bay and Delaware River, or at any inlet or any inland waters adjacent to any inlet along the coast of New Jersey, to repair damage caused by erosion and storm, or to prevent erosion of the beaches and to stabilize the inlet.
2. To use the facilities and services, and any funds which may be available or which may hereafter be appropriated by the Federal Government, or any division of the State Govern-

ment, or of any county or municipality within the State for the purpose of beach protection.

3. To dredge and remove any and all obstructions in every waterway in the State to a depth and width to be determined by the Council.
4. To dredge, bulkhead and improve the Shrewsbury and Manasquan Rivers, and any of their tributaries within the limits of tidewater.

The Division conducts the work of registering all boats and the licensing of all operators on waters above tidewater, regulates and enforces power vessel laws and the rules and regulations of the Council.

The Division makes examination of the monuments marking the State boundary between New Jersey and New York, and in cooperation with the Superintendent of Public Works of the State of New York, it repairs, restores or replaces any monuments wherever the State boundary is intersected by the boundary of any municipalities or counties of this State, or by a highway.

Administration of State's Riparian Lands

The summary of cash receipts from riparian transactions completed during the fiscal year ending June 30, 1947, is shown in Table I. Evaluation of the riparian business transacted is outlined in Table II.

These moneys are dedicated to the School Fund. The receipts from the sale of grants, easements, etc., as transmitted to the State Treasurer, are added to the School Fund Investment Account. The principal has now accumulated to about $14,500,000 and yields about $450,000 a year.

The income from these invested funds together with current receipts from lease rentals, license fees and other income from the State's riparian lands constitutes the School Fund Income Account. For upwards of twenty years this has yielded an average of some $500,000 of the amount distributed annually to public free schools.

Referring to Table I, the net total cash receipts from riparian transactions completed during the 1946-47 fiscal year, were $270,639.00. The evaluation of the net worth of the riparian business during the year (Table II) was $234,093.08. The difference in the two figures is due largely to deduction made for the unrealized capitalization of two large leases converted into grants.

The various riparian transactions are grouped to show their relation to the different accounts.

The number of riparian leases in effect at the end of the year was 128 as compared with 146 a year ago. The valuation was $321,335.35 as compared with $356,008.65 as of June 30, 1946, and of $581,058.31 in 1940.

TABLE I

SUMMARY OF RIPARIAN CASH RECEIPTS
Fiscal Year Ending June 30, 1947

Moneys Dedicated to School Fund			
Investment Account		$222,724.03	
Income Account	$46,122.29		
Lease Rentals in Escrow	1,357.31	44,764.98	
			$267,489.01
Special Fund for Legal Expenses			3,135.24
General State Fund			14.75
Net Total Cash Receipts: 1946-47 Fiscal Year			$270,639.00

TABLE II

EVALUATION OF RIPARIAN TRANSACTIONS
Fiscal Year Ending June 30, 1947

INVESTMENT ACCOUNT—SCHOOL FUND

Grants, Easements, Etc.			
92	Grants		$179,631.18
2	Grants converted from leases		36,323.75
1	Final installment on grant converted from lease		2,069.60
2	Grants superseding leases		1,473.50
16	Easements		2,600.00
5	One fee licenses—indeterminate term		225.00
Riparian Fees			
7	Confirmatory grants	$400.00	
1	Agreement	1.00	401.00
126	Total—Investment Items		$222,724.03

Principal Account—School Fund

Evaluation of New Leases

4	Convertible leases, 15 yr. term (capital sum value)	$6,955.63	
1	Convertible lease, 5 yr. term (aggregate rentals)	2,627.10	
6	Non-convertible leases (aggregate rental value)	3,135.47	
11	Total—Principal Account		12,718.20

Income Account—School Fund

Lease Rentals Collected

11	New leases: current $930.73; in escrow $1,357.31	2,288.04	
74	Old leases within evaluation period	10,906.61	
85	Total on leases within evaluation period	$13,194.65	
52	Old leases on which rentals exceed capital sum	14,786.21	
2	Arrearage on expired leases	1,092.95	
139	Total Lease Rentals Collected		29,073.81

Revocable Licenses (Fixed Term)

1	Total fee for 5 yrs.	$100.00	
15	New, annual fee	772.25	
74	Renewals, 1 yr.	3,248.50	
1	Arrearage on old license expired	215.00	
5	Dredging royalties on 1 license and 4 agreements	10,958.28	
96	Total Fees and Royalties		15,294.03
4	Use and occupancy of State's lands		352.40
6	Interest on deferred payments		1,402.05
245	Total Income Account		$46,122.29

FUND FOR LEGAL EXPENSES

179	Fees for preparing instruments ...	$2,972.60	
10	Certified and/or photostatic copies of instruments	45.00	
2	Court costs, collection of arrearages	117.64	
191	Total—Fund for Legal Expenses		3,135.24

GENERAL STATE FUND

7	Copies of Atlas sheets and maps (7 transmittals)	14.75
719	Gross Total—All Transactions	$284,714.51

Deduct Items Evaluated Twice

5	Unrealized capitalization of leases changed to grants	$32,758.87	
3	Unrealized capitalization of leases superseded by new lease	4,667.91	
85	Rentals on leases within capitalization period	13,194.65	
			50,621.43
	Net Total Riparian Business Transacted ..		$234,093.08

SUMMARY OF INVENTORY OF RIPARIAN LEASES, JUNE 30, 1947

Evaluation, 128 leases	$321,335.35
Unrealized capitalization	91,444.77
Sum total of annual rentals (leases in force)	26,252.28

1 Lease cancelled—unrealized capitalization (1943 year) 465.26

Permits Issued and Pending for the Year

Permits for erection, dredging and maintenance of structures on navigable waters, issued in accordance with law numbered 176.

The total value of the improvements authorized by these permits is summarized on the following page.

Character of Work	*Amount*	*No. of Permits*
Structures	$844,422	116
Submarine cables	114,918	22
Maintenance dredging	755,400	21
Commercial dredging	10,958	2
Bridges	3,185,540	12
Submarine pipes	20,750	3
Estimated value of work	$4,932,038	176

Purprestures (illegal occupancy)

Investigations of illegal occupations of the State's riparian lands are being continued. The unauthorized occupations disclosed by these investigations consist mainly of small piers or bulkheads erected by the owners of residential properties. These owners, unfamiliar with the law and necessity for acquiring the riparian rights, are notified of the statutory requirements. Some thereupon file applications for the rights and acquire grants. The cases in which the owners fail to respond to the notices are referred to the Attorney General.

During the year 35 additional purprestures were discovered and twenty-one grants or leases were issued to cover these and previous purprestures. There are still a number of cases pending either in the hands of the Attorney General for legal action or in the office of the Division of Navigation because of inadequate surveys or proof of ownership of the upland.

Increase in Riparian Values

As a result of a review of price maps and field inspections, the Council increased the riparian values in some localities in the State. There was, however, no general increase in any particular locality.

United States of America Condemnation Proceedings

All condemnation proceedings by the United States of America in which riparian lands of the State are involved have been turned over to the office of the Attorney General for settlement.

Progress in Recapture of Goetchius Grant

This very important case discussed on page 46 of the previous annual report is in the hands of the Attorney General for settlement. The final outcome is dependent on the decision in a suit pending before the Court of Chancery.

The Federal Threat to State's Title to Riparian Land

The case of United States vs. California in the United States Supreme Court was finally adjudicated in favor of the United States. The history of this case is given in the 1946 report.

Although the case has been settled and the decision is viewed by some as a precedent which might deprive New Jersey of title to its riparian lands, others feel that the decision cannot deprive New Jersey of title to these lands since the State's title stems from the King, whereas California's title came to it by Congressional consent.

Administration of Easements, Licenses and Commercial Dredging

Revocable Licenses

The Navigation Council, from time to time, issues revocable licenses for a period of one year, where it is not possible to convey title by a grant or lease; as, for instance, channelward of the United States Pierhead Line or where the fixing of a permanent exterior line of a grant might prove detrimental to navigation along the waterway.

The Council requires that the licensee file a surety bond sufficient to cover the cost of removal of pipe line or structure if upon the expiration or revocation of the license, the licensee fails to remove structures constructed under the license.

Easements

Easements are usually granted at one fee to public utilities, municipal and county governments and private corporations. The easement grants the right forever for crossings of submarine cables, water mains, oil and gas pipe lines.

Easements are executed in the same manner as grants requiring the signatures of the Governor, Commissioner of Conservation and the Navigation Council.

Commercial Dredging

This work is covered by an agreement or license running for a period of years and where a large volume of dredging is involved, the instrument is executed in the same manner as an easement.

The licensee is required to report quarterly upon the number of cubic yards of material removed with payment for same. A charge of two cents per cubic yard for material removed has been established. There is no charge for maintenance dredging, where

the applicants have acquired the necessary riparian rights, or for dredging in established navigation channels.

As the revenues received from easements, licenses and commercial dredging are allocated to the Public School Fund, the same as revenue received from the riparian grants and leases, the details are recorded in the Riparian Section of this report.

Power Vessel Administration

Power Vessel Registration

Tabulated herewith are the classifications of licenses for power vessels on the inland waters of this State above tidewater and other pertinent data for the year.

Number		*Fee*	*Total*
5724	Operators' Licenses	$1.50	$8,586.00
4201	Private Boat Licenses	1.50	6,301.50
35	Passenger Boat Licenses	15.00	525.00
9	Dealers' Licenses	5.00	45.00
8	Commercial Licenses	5.00	40.00
7	Lost Plates	1.00	7.00
33	Transfers	1.00	33.00
34	No Fee Boat Licenses	....	No Fee
73	No Fee Operators' Licenses	....	No Fee
6	Fines	....	100.00
	Snook vs. Davilin, Jr., still pending in court on appeal	....	62.50
			$15,700.00

Administration

Motor boating has increased tremendously during the past year as new boats and outboard motors have become available. During the year assistance was given to 14 motor boats of the inboard type and 26 outboard motor boats which were in distress.

The Division recovered two outboard motors which had previously been reported stolen and returned them to their owners. During the year 10 additional outboard motor thefts were reported, but none of these has yet been recovered. It is quite possible that all of these motors are now on tidewater where no check can be made by this Division. The theft of 24 rowboats and canoes was reported. Nineteen of these were recovered and returned to their owners. Two sail boats were stolen and one was

recovered. Four violations of the navigation laws, 243 warnings and six summons were issued. There were three drownings during the year in waters supervised by this Division and assistance was given upon notification.

During the year 36 light buoys and 33 can buoys were removed from Hopatcong, Cranberry, Mohawk, upper Greenwood Lakes and Green Pond at the end of the 1946 season, stored for the winter, and reinstalled again in the spring of 1947.

The work of this division has increased tremendously in the past 28 years since its creation under Chapter 233, Laws of 1919. Unfortunately, the original act has never been revised to keep abreast of changing conditions and limited appropriations have not permitted increased personnel. The division is dependent on public spirited citizens who act as non-salaried inspectors in the enforcement of the provisions of the law.

There is need for at least three paid inspectors for five months each year and at least two more patrol boats for Lake Hopatcong. Of the total registration of 4201 boats, over half of these boats are operating on Lake Hopatcong. Besides these 2000 odd boats, there are estimated to be 5000 canoes, rowboats and sail boats, thus necessitating constant patrol to keep the lakes safe for the public.

There is now need for a waterway safety campaign to try and eliminate some of the reckless operation on the water as well as on our highways.

Examination of State Boundary Monuments

During the 1946-47 year fourteen additional monuments were located, referenced and photographed. Some twenty monuments remain to be located and examined during the late fall or early winter when visibility is more favorable.

Inland Waterways

Inland Waterway Channel Marking

In response to the demand of Florida bound boatmen and citizens of New Jersey who desired to use their boats long after the summer season had ended lights and buoys were kept in the waterways until December 12, 1946. This was six weeks longer than had been the custom heretofore.

On March 24, 1947 marking the waterways for the 1947 summer season was commenced. The work of marking the 123 miles of main stem channel and 178 miles of branch channels was completed on June 18, 1947.

In addition to the Inland Waterway from Manasquan to Cape May the following branch channels were marked:

Monmouth County: Shark River (both channels)

Ocean County: Upper Manasquan River, Metedeconk River, Beaver Dam Creek, Shelter Cove, Seaside Heights Entrance Channel, Toms River, Forked River, Oyster Creek, Oyster Creek Channel (in Barnegat Bay), Harvey Cedars Channel, Ship Bottom, Long Point Channel, Liberty Thorofare, Tuckerton Channel, Mullica River to Sweetwater.

Atlantic County: Brigantine Channel, Bonita Tideway, Absecon Channel to Absecon Creek, Lakes Bay Channel to Pleasantville, Great Egg Harbor River to Mays Landing.

Cape May County: Rainbow Channel back of Ocean City; Ocean City Lagoons, Hereford Inlet (both channels), Sunset Lake at Wildwood.

The following is a summary of the markers used:

4,000	Cedar Stakes
2,000	Reflector Buttons
107	Marine Flashers, electric
19	Marine Flashers, gas
100	Spar Buoys
200	Barrel Buoys
2	Electric Buoys
1	Gas Buoy

During the past year two electric beacons and seventeen barrel buoys were destroyed maliciously by unknown persons.

The subject of Federal acquisition of the main stem of the Inland Waterway was discussed in detail in the 1946-47 report. In addition there is considerable agitation for the construction of a canal from the Manasquan River to the Shrewsbury River. The first formal proposal for the undertaking of such a project was made by Dr. Henry B. Kummel in 1910.

The Division of Navigation has made an estimate of the cost of Dr. Kummel's proposal and studied eight additional possible routes. The study of the route up the Manasquan River and thence to the South River and Raritan River was abandoned as too costly. The other seven routes will be submitted to the Army Engineers for their consideration if deemed desirable.

Bay Head—Manasquan Canal

Maintenance and improvement of the Bay Head—Manasquan Canal under the comprehensive plan established in 1939 was continued. An additional 700 feet of bulkhead costing $47,419.16 was constructed along the west side of the Canal south of the Lovelandtown Bridge.

The depth of the water in the canal is satisfactory and strengthens the belief that the canal if bulkheaded on both sides for its full length, will maintain itself without any further dredging.

Inland Waterway Dredging

The summer season of 1946 marked the beginning of a revived and greatly enlarged public interest in boating following the dormant war years. The expansion of this form of recreation continued at a high rate through the spring of 1947. While this increase in boating was anticipated, unfortunately, the maintenance of the Main Inland Waterway, Manasquan Inlet to Cape May Harbor, and the tributary waterways has been inadequate due to lack of funds for this purpose. Complaints from navigation interests have been numerous.

The cost of restoring the Main Inland Waterway to navigable depths may be realized by reference to calculations made by the War Department in August 1946. The net cost, excluding overhead items, for the most economic route with depth of eight feet below mean low water was estimated as $1,720,000.00. The recommended route, eight feet deep, which includes realignment to straighten and shorten the through channel was estimated at a net cost of $2,987,600.00.

During the year five maintenance dredging projects were executed. They covered three and one-half miles of channel and cost $110,268.00. One project for removal of shoals at the Atlantic City Harbor area at Clam Creek was held in abeyance until it was advantageous to use the dredged material as beach fill along the depleted Atlantic City beaches fronting on Absecon Inlet Channel.

The long planned Beach Channel on the east side of Barnegat Bay from Mantoloking to Island Beach with cross-bay connecting channels, was started in May, 1947 with dredging of the Lavallette Seaside Park section. The contract amount is $160,000.00. As of June 30, 1947, the work was 30 per cent completed. It is estimated that 85 per cent of the material dredged from the channel will be used to build a sub-grade for the new County Highway

connecting Lavallette and Seaside Heights, and public bathing beaches on the Barnegat Bay frontage of Lavallette and Seaside Heights. The Division has cooperated fully with the Ocean County Board of Freeholders and the Boroughs of Lavallette and Seaside Heights in order to promote relief of highway congestion and crowded bathing recreation areas in these localities. It is hoped that similar beach improvement can be established in the Borough of Seaside Park. When the project was being planned in 1946, the Seaside Park representatives were not in favor of beach improvement. The question is being reconsidered at this time by the Borough government.

Barnegat Lighthouse Repairs

Repairs to Barnegat Lighthouse during the year cost $3,897.71. These repairs included structural repairs to Beacon Tower, replacement of window glass, new entrance roof, and interior painting and repairs.

Mechanical Maintenance and Repair

The Division continued the practice of doing a large part of its repair work with its own employees. The repair shop is not as completely equipped as planned but as appropriations permit, more equipment will be purchased until all or nearly all repairs to boats and equipment will be performed by own employees.

One job started during the year was the rebuilding of the boats "Sextant" and "Surveyor".

Greenwood Lake

Lack of adequate help prevented undertaking this work as early as anticipated but it is certain that the work contemplated, the removal of the floating islands, will be completed before the 1948 boating season.

Terminal and Public Yacht Basins

The two public yacht basins at Forked River and Fortescue are now being used to capacity. Lack of funds prevented the construction of additional docking facilities. The Council of Navigation authorized the rental of anchorage space at the Atlantic City Basin. It is hoped thereby to relieve the demand for anchorage space in the Atlantic City area.

The legislation under Chapter 32, Laws of 1947, instructed the Division of Navigation to take over and operate the Leonardo Public Yacht Basin on July 1, 1948. The Legislature did not,

however, provide any operating funds although these funds may be provided in the 1948-49 budget.

The Leonardo Basin is now in operation and the present income would be sufficient to continue to operate it as a public service but there would be no surplus to provide for major repairs. The legislative act further provides that the Division of Navigation shall acquire land to expand the existing facilities. That cannot be done until such times as adequate funds are provided.

Coast Protection

The state coast protection or beach erosion program is one of the most important functions of this Division. The Governors and Legislators have been in sympathy with the shore communities of the State in meeting this most serious problem. The allocation of state-aid funds to shore municipalities has been based on the urgency of the erosion problem confronting each community. The most serious cases have been given priority. Judgment of degree of need is difficult because of the rapidity with which erosion can advance and reach a critical stage. An example was the rapid deterioration of the Atlantic City beaches during the 1947 winter which alarmed the whole city and led to the formation of the Emergency Erosion Committee composed of leading civic and business representatives.

The method of setting up beach erosion money for future projects should be changed to give the State entire control of the money, as was previously done on similar projects. Divided authority in some cases has resulted in difficulty with the contractors; the project proceeding on orders of one authority without first obtaining the approval from the other.

While it is the function of the Legislature to establish the basic policy of State aid for coast protection, it is recommended that a study be made of the possibility of rendering assistance to municipalities badly in need of coast protection but who are unable to raise the 50 per cent cost of the project. One municipality should not be given preference and the basis of participation must be kept the same, but a committee of the Legislature could look into the possibility of setting up a finance plan whereby the State could be repaid over a period of years for the amount of money advanced for a project. The seriousness of the beach erosion problem is such, that some plan must be worked out for not only their protection but in many instances the protection of the neighboring com-

Beach—Vicinity of Deal Casino—Before Installation of Coast Protection Structure

munity which must also suffer although able to finance its own project because the comprehensive plan is not being carried out in full.

The shore-front recreation industry is reported as grossing over $600,000,000.00 annually and is among the first three largest business activities in the State. It is dependent on the stability and availability of the beaches and adjacent upland for public recreation. Narrow, unusable beaches and damaged, precarious dwellings, boardwalks, and recreational areas are detrimental to continued prosperity of this business. An examination of any eroded beachfront locality will prove that there is a direct relationship between progressive beach erosion and gradual beach abandonment by the public.

The authority and funds for current grants of aid to municipalities undertaking coast protection projects are contained in Chapter 93, P.L. 1944, and annual supplemental Acts thereto. All projects are reviewed by the Governor, the Commissioner of Conservation, and the Division of Navigation, and if approved, are eligible for allotment of State Aid funds to one-half of the construction cost.

During the year ending June 30, 1947, eleven projects were in force in ten municipalities ranging from Seabright to the north to

Same View—After Installation of Coast Protection Structure

Cape May City at the south. These eleven projects totaled $3,944,800.00. The value of the work executed during the year was $1,417,976.65 of which $852,297.97 was paid by the State.

Four projects totaling $1,095,000.00 are being prepared for bidding. Six projects totaling $577,000.00 are being reviewed for consideration. During the year many municipalities withheld applications for State aid knowing that State funds were not available.

The principal construction material used was quarried stone. The quantities of the work carried on may be measured by the fact approximately 314,000 tons of stone was used or roughly 20 railroad carloads per working day.

This wide acceptance and construction of all-stone jetties also is indicative of a trend in coast protection jetty design. Throughout State participation in planning and financing coast protection structures, a basic consideration has been to develop the best structure at the least cost. New Jersey as the pioneer State in coast protection and preservation has had to explore and develop methods, designs, and construction materials.

Earliest work employed simple jetties of creosoted timber and steel sheet piling with creosoted timber wales and master piles. Normal deterioration, heavy sea-wave attack, and in the case of steel, abrasion by sand made uncertain the length of useful structure life. The next step, envelopment of the timber and steel

jetties with large quarry stone was tried but again only with fair results. Finally, the decision was made to attempt jetty construction using only quarry stone.

The design consisted of a center mound of small stone laid in a compact mass as a seal to prevent movement of sand through the jetty. This center core of small stone is enveloped by large pieces of stone weighing between two tons and seven tons each, and in special projects up to twelve tons.

This design was used five years ago for the first time. Its use during the current year by all seashore communities under the State aid program is an indication of the wide-spread acceptance by municipal officials and engineers.

The closing year also is noteworthy for wider acceptance of the Division's opinion that artificial beach filling and dune building are essentials of coast protection. This belief has been propounded for many years with the knowledge that the essence of coast protection is the accumulation of beaches and dunes and from experience with the hazards of waiting for nature to function. Progress has been made to the extent that it is hoped several municipalities will adopt beach filling projects during the coming year.

The comprehensive program as initiated by the engineering department and approved by the Governor has been found to produce the results expected. It should be pointed out, however, that the completion of this entire comprehensive plan will cost an average of $1,0000,000 a mile.

Plans have been laid for the establishment of a "Coast Protection Laboratory" to study ocean phenomena along the New Jersey Coast. It is hoped the State of New Jersey in conjunction with the Federal Government as a result of these studies may develop more economic means of protecting and rebuilding our ocean front beaches.

DIVISION OF SHELL FISHERIES

The State of New Jersey owns outright every foot of shellfish producing bottom lying under its tidal water extending from Raritan Bay, along the Atlantic seashore and to the head of Delaware Bay. The natural oyster and clam beds of the area set apart by law for the cultivation of oysters and clams are conservatively estimated in their present state of productivity to be worth $50,000,000—some experts estimate the value at $75,000,000. Any citizen of the State, after obtaining a license may take oysters and clams from the natural oyster and clam bottoms.

The shellfisheries industry has more than local significance, as licenses are sold and leases made to citizens from all sections of the State. Importance of the industry is emphasized by the fact that a recent survey showed there are 63 towns and villages in Southern New Jersey principally supported by the shellfisheries industry.

A few years ago New Jersey stood first among the oyster and clam producing states. Today it stands fifth. This is primarily because other oyster and clam producing states, realizing the importance of the industry, are spending substantial sums to rehabilitate their natural oyster and clam beds which, at one time, were nearly depleted. New Jersey is now spending less for enlarging and developing the present beds and for building new ones.

The present cost to the State to produce a bushel of oysters and clams is less than one cent a bushel. If the State were to spend two or three cents a bushel, the improvements resulting from this added expenditure would be extremely favorable to the industry.

In the rehabilitation of natural oyster beds the Mullica River is a case in point. Prior to 1937 the Mullica River produced only 2,000 bushels of seed oysters per year. The present production is 35,000 per year. With more adequate funds it would produce more than 100,000 bushels a year.

In the Delaware Bay section the oyster planters have become so alarmed over the diminishing supply of seed that with the Department they co-sponsored an act which requires the planters to return to the State 60 per cent of the shells taken from the oysters that originate in the natural beds in that area. These shells must

Oyster Shells from Shucking Houses—Bivalve
(sixty per cent of shells returned to natural oyster beds)

be replanted on the State's natural oyster beds in this area. The cost of planting is paid by the planter. During the year 420,466 bushels of shells were returned to the State under the provisions of this act. On the open market these shells, including planting, would have cost $71,479.22.

In order that the program for the improvement of oysters and clam beds may be continued, an increase in the appropriation for this purpose has been recommended. These projects should receive approval, not only to increase the supply of oysters, and clams as a valuable food, but to provide employment opportunities for veterans and former war workers who have returned to the shore communities.

The significant increase in the sale of licenses indicates that many in the above classifications are finding employment through this natural resource.

New Jersey has shellfish laws that are setting the pattern for other states and sanitary shellfish control that is approved by the U. S. Public Health Service. In fact, New Jersey has everything

necessary to produce in large quantities the best oysters and clams in the world.

It is encouraging to learn that Rutgers University has made a grant to the Oyster Research Laboratory to conduct a study of quahaug clams. Dr. Thurlow Nelson, an eminent biologist, and consultant for this Division, will conduct the study which will cover all phases of clam culture including the means to be employed in developing new clamming bottom.

Seafood, because it makes no demands upon the land or upon critical stores of food stuffs, is the one source of food available in the nation today to replace shipments of meat to devastated Europe. As a leading producer of seafood in the nation, New Jersey should make every effort to use its available seafood resources to the utmost during the present international crisis.

Report of the Hydrographic Engineer

Department of the Maurice River Cove (Field Work)

1. *Survey Targets*—During the year the following survey targets were painted and repaired, False Egg, Doby, Station No. 12, Goshen and Dennis Creek Rear Range Light. The last two named targets had been damaged by storms and considerable repair work was necessary. A new survey target was erected at Kimbal Beach. This target was needed to survey the grounds that are being leased in this area.

2. *Surveys*—One hundred corners were checked to determine the accuracy of their location. Sixty-five new "grounds" or plots were surveyed, with a total of two hundred and seventy corners. Three hundred and fifty-five corners were relocated and staked.

Tongers beds were staked at the Mouth of the Maurice River and Dividing Creek. A reconnaissance survey was made to station Kim at Kimbal Beach, Cape May County.

Department of the Atlantic Coast (Field Work)

1. *Survey Stations*—Twenty survey stations were relocated and used in the work of this department.

2. *Surveys*—One hundred and thirty-five plots were surveyed, with a total of 651 corners. Five hundred and seven of these corners were located in Tuckerton Bay. Twenty-six corners were relocated.

All corners that had been surveyed were computed on the New Jersey system of Plane Coordinates; this involved computations for

Dredging Oysters for the Market—Morris River Cove

921 corners. The acreage was computed for two hundred plots. All new surveys were indexed on the card file system that is set up for each plot.

The maps of the Department of the Maurice River Cove were revised and prints made for official use and for sale to oystermen.

Three new maps were made for the Department of the Atlantic Coast, covering the new areas where surveys were made. Four maps were revised where new plots had been leased.

Assistance was given the chiefs of the Department of the Atlantic Coast on their Ground Record Book in order that all plots can be numbered when application is made.

The survey boat, Gimble, was condemned as not being safe for use as a staking and survey boat in October, 1946. During the first half of 1947 there was no survey boat. A guard boat, the J. H. Lake, and other boats that were owned by the oystermen were used for survey work. These proved very unsatisfactory because the boats used were either too large or small or were not properly equipped.

STATISTICAL DATA FOR DEPARTMENT OF THE ATLANTIC COAST AND DEPARTMENT OF THE MAURICE RIVER COVE

Leases granted for shellfish lands	641
Acres of shellfish lands leased	33,570
Linear feet leased, averaging 100 ft. in width	54,246
Licenses issued	5,908
Large boats licensed	156
Small boats licensed	42
Violators convicted	32
Bushels of clam shells planted on State's Natural Oyster beds in the Mullica River by means of State Funds	25,000
Bushels of seed oysters transplanted to the State's natural oyster beds at the mouth of Mullica River by means of State Funds	8,700
Bushels of shells contributed by the Delaware Bay Oyster Planters and planted on the State's natural oyster beds in the Delaware Bay at the expense of the oyster planters	420,466
(Value of these shells, including planting—$71,479.22)	
Patrol boats employed	22

DIVISION OF WATER POLICY AND SUPPLY

General

The Division of Water Policy and Supply, as the trustee of the State's most vital resource—water—is responsible for the formulation of policies for the conservation and prudent development of this resource for the benefit of all the people of the State. Authority is conferred to allocate sources of supply, fix conditions under which water may be diverted, pass on water supply contracts between municipalities, require interconnection of supplies; conduct scientific studies and investigations, including the systematic gaging of stream flow and rainfall and underground water levels; maintain records of consumption and yields, compute and levy charges for water diverted in excess of the free allowances permitted by statute.

In addition to the supervision of water supplies, the Division has jurisdiction over flood control, the construction and maintenance of dams and the erection of structures along streams, generally above tidewater, such as bridges, walls, fills, etc., affecting the passage of flood waters.

The Division also has responsibility for the rehabilitation of the Delaware and Raritan Canal and its conversion into a source of industrial water supply and for park and recreational use, including the management, maintenance, operation and control of canal properties.

During the year, the Water Policy and Supply Council, in addition to its regular meetings, had 35 committee meetings, and conducted 33 public hearings in connection with the various phases of the Division's activities.

Water Supply

Diversion Grants. Applications for new or additional water supplies from 13 municipalities and seven private water companies were approved, under which a total diversion of 6,750,000 gallons daily, all from wells, was authorized after hearings. One application for diversion of water from surface sources was denied without prejudice to future consideration. An application to sink a well for the purpose of supplying a housing development was with-

A Source of Industrial Water
Delaware and Raritan Canal—Trenton Section—Sheet Steel Piling Installation

drawn, after hearing disclosed the necessary supply could be furnished by a nearby municipality.

All approvals granting the right to divert water were made subject to conditions for conserving the underground water resources. In addition to the standard conditions for protecting the source of contamination and overdraft, special conditions were also included in certain grants. For example, on one watershed, where several systems were diverting water from wells, evidence and studies indicated that further pumping would adversely affect the dry season flow of a stream used as a source of supply by a municipality downstream. In this instance, approval to take additional water from wells was made contingent upon the applicant's providing storage and releasing water therefrom to maintain the required stream flow. In other instances where per capita water consumption was unreasonably high, indicative of careless and wasteful use, applicants were required to institute metering programs to reduce consumption. In many cases, the quantities of water applied for were in excess of requirements for present and reasonably

anticipated needs and were scaled down in the interest of fair and equitable allocation.

During the year extensions in time were granted on three limited diversion grants previously made to private water companies and one diversion right was cancelled. In another instance the development of a much needed addition to a municipal water system resulted from hearings on an order to show cause why an unused diversion right should not be cancelled. Water supply works as constructed by five systems under prior grants were approved for permanent operation. Seven contracts for the sale of water between municipalities were approved. The furnishing of a supply by a municipality to a private company—after termination of the contract by the municipality—was ordered continued for one year pending arrangements by the company to obtain a new source of supply; increased rates were allowed the municipality in the interim.

Water Consumption. The upward trend of water consumption continued during the calendar year 1946, exceeding the prior peak year of 1945. The records are summarized as follows.

Consumption—Million Gallons Daily	*1945*	*1946*
North Jersey Metropolitan District	348.7	357.4
South Jersey Metropolitan District	67.1	69.6
Sea Shore Area	35.4	37.0
Rest of the State	42.3	41.6
Total for the State	493.5	505.6

Rainfall and run-off during 1946 and the first six months of 1947 were close to normal and almost ideally distributed throughout the period for water supply purposes. As a result, the consumption demand could be met and all of the major water supply reservoirs were full, or practically so, on June 30, 1947. This condition, however, cannot be viewed with complacency except for the immediate future. Records of rainfall and run-off over past years clearly indicate that the present rate of consumption in the northern metropolitan area cannot be met by the present developed sources of supply during a prolonged dry period.

Water Situation. The small margin between the available supply of water and the demand for it is appreciated by the officials of many systems, and some headway is being made toward augmenting their supplies. However, the only projects under way at

the present time which can be considered as contributing much to increase this margin are (1) the storage reservoir being constructed by the Commonwealth Water Company at Canoe Brook in Chatham Township, (2) the increasing of the height of the Split Rock Pond on Beaver Brook, Morris County, by Jersey City, and (3) the rehabilitation of the Delaware and Raritan Canal as an industrial water supply. These can only be considered "stop gap" methods and in no way solving the future needs for water for the northern metropolitan district. Something more must be done, and in a large way, if the State of New Jersey is to continue to grow industrially and in population.

Interconnections. During the year, improvements were completed at the Great Notch Pumping Station on the interconnection between the pipe lines of the Wanaque and Jersey City systems, in Little Falls. The interconnection was constructed by the former State Water Policy Commission under war emergency powers in 1942-43, but due to war-time restrictions on materials and labor, the motive power for this station was limited to second-hand automobile engines. The improvement program involved their replacement with heavy duty stationary gasoline engines, the installation of surge relief valves, paving of the driveway, and other minor improvements. The work was done under contract, and paid for out of the Interconnection Revolving Fund.

By means of this interconnection, it will be possible to pump 25,000,000 gallons of water daily from the Jersey City pipe line into the Wanaque pipe line. An equal amount of water can be transferred in the opposite direction by gravity. It therefore provides an emergency source of supply for either system in the event of interruption in service or shortage of water. The interconnection also makes it possible to conserve large quantities of water by pumping into the Wanaque system when there is a surplus going to waste over the spillway of the Jersey City reservoir at Boonton and when the Wanaque reservoir is below full level. Such a transfer was made in 1944.

Cooperation with United States Geological Survey

The stream-gaging and ground water investigations were continued under cooperative agreements with the United States Geological Survey, with the cost being shared equally by the State and Federal government. The fundamental information upon water resources collected over many years of this cooperation is an im-

portant basis in the solution of all water supply and flood control problems.

Stream Gaging. In the stream-gaging investigations 76 stream-gaging stations are operated in New Jersey. These stations are equipped with automatic recording gages which produce continuous records of the flow. The records become more valuable as they get longer and are most useful when they are not interrupted. Records from some of the stations are used for computation of the Excess Diversion charges. Reports showing the daily and monthly discharge at all of the gaging stations are published annually by the Geological Survey without cost to the State. In order to make the records more useful in the study of flood control and other engineering problems, flood data at many of the stations are being compiled and curves drawn showing the probability of occurrence of floods of various magnitude.

Ground Water Investigations. The purpose of the ground water investigations is to determine the safe yield of all the important water-bearing formations, or aquifers, in the State, so that they may be developed in an orderly fashion without jeopardizing the future water supply from these sources by over-pumping. It thus supplements the work that has been done for many years by the State Geologist in advising interested parties where and at what depth water may be found.

Some of the aquifers have very large reserve capacities, but others have already been developed up to or beyond their capacity. Most but not all the areas where the aquifers have been developed up to or beyond their capacity, are along the coast where there is a constant danger that over-pumping may cause the intrusion of salt water which would ruin the supply for all ordinary uses except cooling. In recognition of the serious problem that would arise if a substantial part of our ground-water supply should be destroyed by salt-water intrusion or by over-pumping, the Legislature at its 1947 session passed a bill which has since become Chapter 375, Laws of 1947, and which gives the Division control over all substantial diversions of ground water for any purpose in areas where, in the judgment of the Division, such control is necessary for the conservation of the ground-water resources of the State. It is believed that the application of this law will result in the wiser use of this vital natural resource.

The use of ground water for irrigation is assuming increasing importance in areas of the State where high-value crops are being

grown. It has been demonstrated that the increased value of the crops more than offsets the costs of irrigation works by making water available at critical times during the growth of the crops. The use of ground water for irrigation is not yet large enough to constitute a serious threat to the permanency of the supplies, but it is becoming a factor that must be considered in evaluating the total supply available.

The advance of salt water toward the industrial well field at Parlin and into the 100-foot sand at the Atlantic City Water works appears to have been checked by reduced pumpage in both localities. On the other hand, the rate of pumping from the so-called Atlantic City 800-foot sand has continued to increase; the water levels in wells tapping this sand declined to a new record low level, thereby increasing the danger of salt-water intrusion into it. Lesser intrusions of salt water in other parts of the State were observed, but the data obtained were insufficient to warrant a statement as to its progress.

The practice of artificially recharging important ground-water aquifers with excess surface water is increasing in the State, and studies are being made to determine the best means of accomplishing it. In effect, this practice amounts to storing surface waters beneath the ground in times of flood or high water, so that it may be available from wells at other times of the year.

Dams and Stream Encroachments

The supervision exercised over dams and other structures in streams is in the interest of protecting lives and property in the valley below and of flood control. The purpose is to prevent improper building of structures impounding water or likely to interfere with the safe passage of floods. Permits for such construction are required and issued only after plans and specifications meet the engineering requirements of the Division. In the case of dams particularly, inspections are made of the site prior to the granting of the permit, and frequently during the course of construction, as well as the maintenance thereafter.

During the year, 14 permits for the construction of dams and 103 permits for the construction of stream encroachments were issued. The Engineering staff made 102 inspections of dams and 46 inspections of encroachments. Eight hearings were held in connection with approval of applications, violations and complaints.

Flood Control

The Flood Control Unit, authorized under this year's appropriation, was inaugurated with a one-man personnel on July first and assigned the task of developing a comprehensive design for alleviation of flood damage on the Elizabeth River in Essex and Union Counties. Progress on this design has been disappointingly slow due to the inability to recruit a full staff of competent personnel. The Unit, comprised of two engineers for part of the year, has completed most of the base work involved in this problem. Design floods for the major tributaries of the Elizabeth River have been determined and routed down the main channel to the proposed detention basin areas. Completion of this design, including final report, may be expected this coming year.

In order to prepare flood data, the cooperative agreement with the United States Geological Survey was extended to include one engineer assigned to the analysis of flood records collected from all available sources. Satisfactory progress has been made in completing flood frequency tabulations from records at 17 stream gaging stations.

At the request of interested municipalities, comprehensive designs have either been prepared or reviewed for channel improvements to alleviate flooding on West Brook in Linden, East Branch of the Rahway River in South Orange, and the Rahway River in Cranford. Several conferences were held with engineers engaged by the City of Clifton to prepare a comprehensive design for channel improvements of Weasel, Wabash, and McDonald Brooks.

On the larger problem of flood control on the main Passaic River, the Engineering Department has continued to cooperate with the New York District Office, United States Corps of Engineers, in their study of this problem. At the request of the District Engineer, the Flood Control Committee of the Council has held five meetings, including one at county level with interested local officials, to study the question of benefits and damages to municipalities and counties in which the proposed detention basin may be located.

Delaware and Raritan Canal

Substantial progress was made in rehabilitating and converting the Delaware and Raritan Canal into a source of industrial water supply. The rehabilitation program, begun in 1945, consists of rebuilding dilapidated locks, control structures and aqueducts, dredg-

ing and walling the canal to assure the continuous delivery of water over the 60-mile length of the canal from the Delaware River to New Brunswick. The program was approximately 50 per cent completed at the end of the year.

On the strength of the completed and current repairs, a 25-year contract was executed for the sale of 2,000,000 gallons of water daily to the Bakelite Corporation for use at its plant opposite South Bound Brook. Contract negotiations for a slightly smaller quantity of water were under way with Johnson & Johnson, of New Brunswick. Numerous inquiries were received from prospective customers for water along the route of the canal in Lambertville, Trenton, Penns Neck, Millstone and in the Bound Brook and New Brunswick areas.

Several applications to purchase canal property were denied, in line with the general policy of retaining all land contiguous to the waterway pending final determination of requirements. Consideration was given to the sale of an isolated tract in Trenton, but action was discontinued upon receipt of information indicating possible future use by the State Highway Department. The policy of leasing certain parcels, subject to cancellation upon notice, was continued. In order to expedite the handling of canal business, the Canal Committee of the Council was authorized to act directly upon matters not involving major policy decisions, reporting thereon monthly.

With the ending of the inactive status of the canal, which had existed since the cessation of navigation in 1934, emphasis has been placed on the elimination of pollution—to assure a higher quality of industrial water as well as to permit full enjoyment of the recreational facilities of the canal for canoeing, picnicking, fishing and swimming. Considerable progress has been made in eliminating and preventing both pollution and the dumping of trash and other material into the canal. An application for permission to discharge effluent into the canal feeder from a county workhouse sewage treatment plant was denied. An obstructing waste-bar was removed by an adjoining industry in South Bound Brook and initial action was taken to have wash-water silt removed by an adjacent quarry. "No Dumping" signs were posted generally along the canal.

Canal Rehabilitation

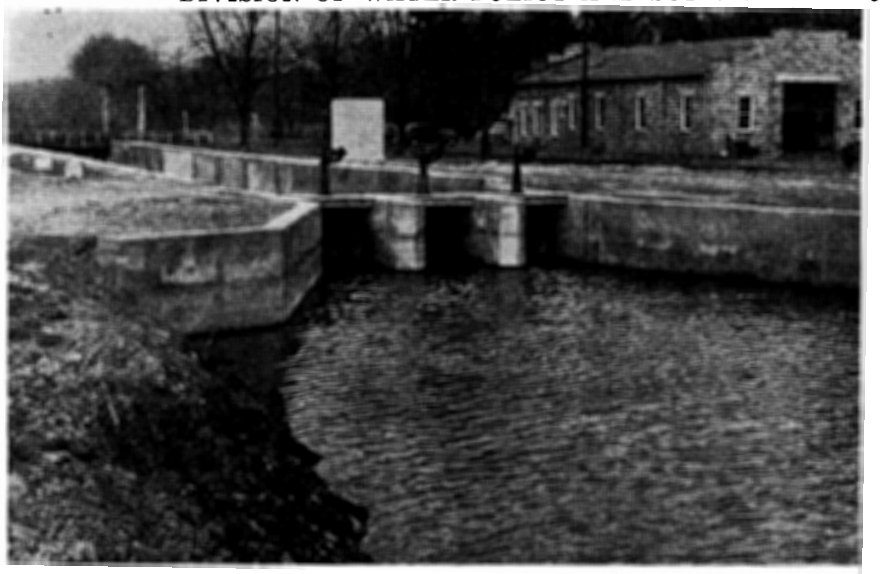
Kingston Control Gates. Construction of control gates at the site of the old Kingston lock, about two miles below the Carnegie

D. & R. Canal—Old Kingston Lock

Lake aqueduct in Princeton, was undertaken in July, 1946, under contract let on June 20th of that year. The gates control the longest water level in the canal, extending through Trenton and up to Lambertville, a total distance of 28 miles. It was necessary to repair the old masonry walls for the entire length of the lock. This was done by "gunniting" over a thousand square yards of the surface of the old walls. A concrete weir and gage house were also erected to measure the flow of water passing downstream. The work was completed in November, 1946, at a total cost of about $55,000.

Dredging. Contract was awarded on September 9, 1946, for dredging at five locations on the canal feeder between mile posts 5.25 and 16.15 in Hunterdon and Mercer Counties, and involved the removal of bars formed by streams discharging into the feeder. The work under the contract was completed during the year at a cost of $27,436.20.

Lambertville Aqueducts. This project, involving the construction of reinforced concrete aqueducts to replace the old wooden flumes carrying the canal feeder over Alexauken and Swan Creeks in Lambertville, was given priority due to the poor condition of the existing structures. In addition to the aqueducts, the project included dredging of the badly silted stretch of the feeder between the



D. & R. Canal—Kingston—Lock and Control Gates after Reconstruction

two creeks, a distance of approximately one mile, and also some excavation and paving in the creek beds to facilitate local flood runoff and to protect canal structures. The project was advertised for the receipt of bids on May 5, 1947—timed so that the work could be performed during the normal low stream flow periods of summer and fall. Unfortunately, when the prospective contractors inspected the site, unusually high stream flow prevailed and, apparently, the anticipated construction difficulties, as then visualized, were reflected in their bid prices. These prices were considerably in excess of the engineer's estimate and all bids were rejected. The project was ordered re-advertised for the receipt of bids on July 7, 1947, when the contract was awarded at a price approximately 25 per cent below the previous low bidder's figure.

Prallsville and Other Projects. Plans and specifications were completed for the reconstruction of the deteriorated control structure and spillway at Prallsville. However, it became necessary to abandon arrangements for placing this work under contract coincident with the Lambertville project, due to the lack of an appropriation for the rehabilitation program in the fiscal year beginning July 1, 1947.

Preliminary surveys and designs were made for other replacements and improvements which must be carried out if the canal is

to be placed in reasonable shape for continuous, uninterrupted use. Among these are the gate structures at Lambertville, Griggstown, Weston, Bound Brook, Fieldsville and New Brunswick. Construction, however, must be held in abeyance until funds are appropriated.

Canal Maintenance and Operation

Operation of the canal continued to be governed by requirements of the improvement program. Levels were adjusted to permit preliminary inspection and subsequent construction operations at the Kingston lock, Prallsville lock (construction deferred), Lambertville aqueducts and removal of bars along the feeder. In connection with the latter project it became necessary to limit drawdown periods in order to maintain sufficient supply for the gas plant in Trenton. Special action was necessary during several periods of high flow.

In addition to flow control, canal forces repaired a bank break near Princeton, built a new footbridge and repaired the outlet lock at New Brunswick, prepared a new office for the State Topographic Engineer in the canal office building, repaired roofs of several canal houses and started renovations on other buildings at the canal headquarters. The towpath at South Bound Brook was cleared to provide access for installation of the Bakelite Corporation water intake in connection with its purchase of canal water. Gate stands on the new Carnegie Lake aqueduct were replaced with a type not susceptible to tampering.

The canal organization was considerably strengthened by the appointment of an assistant supervisor, appointment of a labor foreman to handle flow control on the Eastern section of the canal and the addition of a part-time gate tender for the critical Carnegie Lake Aqueduct-Kingston area. At the end of the year action was taken to assign a labor foreman responsible for flow control on the Central Section, thus completing organization of control activity into three 20-mile subdivisions covering the full length of the canal.

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