

100  
ORE  
DSL  
OE  
1973

# OREGON ESTUARIES



STATE OF OREGON  
DIVISION OF STATE LANDS

© 1973 Oregon State University



Clam diggers invade the Tillamook Bay tidelands near Garibaldi. Several species of bay clams are taken by both commercial and by sport diggers from most estuaries. A license is not required for sport diggers, however, limits are imposed. Clams too small to make a meal are used for crab or fish bait. (Fish Commission of Oregon)

The front cover pictures a crab fisherman in Netarts Bay. Crab rings are baited with scrap fish and lowered to the bottom. If tidal conditions and the weather are favorable, crabs will fill a ring in 30 minutes. However, only a few will be legal size. Good crabbing sites are found in all of Oregon's estuaries.

STATE OF OREGON  
STATE LAND BOARD

TOM McCALL  
*Governor*

CLAY MYERS  
*Secretary of State*

JAMES A. REDDEN  
*Treasurer*

# OREGON ESTUARIES



## DIVISION OF STATE LANDS

WILLIAM S. COX  
*Director*

JUNE 1973

PREPARED UNDER THE DIRECTION OF:

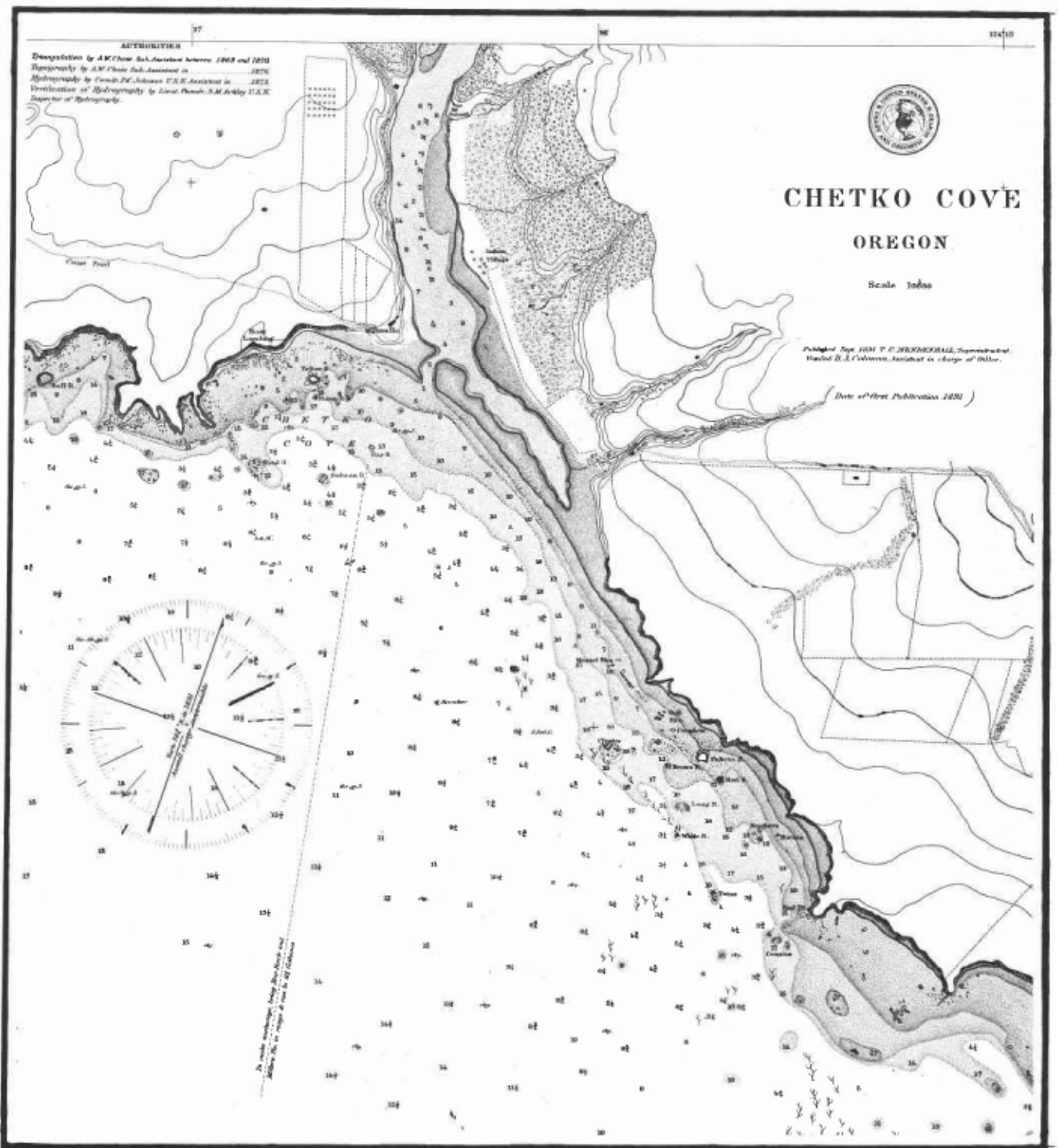
Stanley F. Hamilton, P.E. . . . . Staff Engineer

LAYOUT AND DESIGN

Mark E. Harbert . . . . . Engineering Technician III

CARTOGRAPHY AND FIELD WORK

Mark E. Harbert, V. Kent Searles,  
Ronald W. Frost, Dale S. Wulffenstein,  
Perry E. Lumley, Stephen A. Moser,  
Jerry Dull, and Gordon V. Coons . . . . . Engineering Technicians



This 1876 survey chart shows an Indian village located along the Chetco River. Like the Chetko Indians, many coastal tribes relied upon the estuaries as sources of food. While their primary staple was salmon, the Indians also gathered bay clams when the tides permitted. Piles of clam and oyster shells discarded by the early inhabitants are still found along the shores of many estuaries.

The Division has used charts like this and other historic material to determine natural and man-caused changes in the estuaries.



## OREGON STATE LAND BOARD

### ABOUT ESTUARIES

Estuaries — or bays if you prefer that term — are places where fresh water off the land meets and mingles with salt water from the sea. The result of this mixing is a zone of brackish water which acts as a buffer between the two dissimilar solutions. There in the transition zone dominated by the tides are the most productive lands on earth.

Estuary lands abound with countless varieties of plants and animals, each perfectly fitted into its unique niche in the estuarine environment.

Many of the creatures found in estuaries are transients enroute inland or to the deep ocean. These organisms spend only a short — but important — part of their life cycle in the brackish bay waters. Other species, however, are permanent residents of the bay and spend their entire lives in the estuary.

In addition to being a productive habitat for fish and wildlife, estuaries provide a pleasant productive environment for people, too.

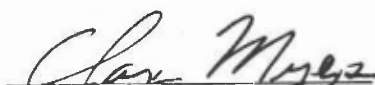
Thousands of Oregonians live on the shores of coastal bays. Many live by selling products from the bay or nearby sea or by handling cargo involved in international commerce. Equally as many persons visit estuaries to fish and boat in the relative safety of protected bay waters or just to enjoy the beauty and grandeur of the seacoast.


These things are important to all of us — whether we live on the coast or just visit occasionally. So, it is easy to see why we in Oregon are fiercely protective of our estuaries and, indeed, the entire Oregon coastline. The intricate and delicately balanced estuarine environment is all too easily disturbed — or damaged — and poor planning or careless development can destroy an estuary beyond all hope of revitalization in our time.

We, the members of the State Land Board, are pleased to have a part in managing the lands in Oregon's estuaries. We intend to continue our aggressive search for the best ways to use estuarine lands for the benefit of all the people of Oregon, now and in the future.

Sincerely,

  
TOM McCALL  
Governor

  
CLAY MYERS  
Secretary of State

  
JAMES A. REDDEN  
State Treasurer



March 1973

Nestucca Bay — Division of State Lands

Three factors combine to produce the bio-rich estuarine areas. First, tidal forces continually pump nutrient rich ocean water into the bay. Twice each day the ebb and flood tides provide food, nutrients, and oxygen to the estuarine ecosystem. Simultaneously, the flowing water removes waste products.

Secondly, solar radiation penetrates the shallow water and provides energy to sustain the aquatic vegetation. Tideland is the final and most important factor producing a fertile estuarine environment. The expanse of tideland found in most Oregon estuaries serves as an anchorage for transient creatures and as a home for those that burrow.

The immense number of marine organisms that grow on the tide flats are the first link in the estuarine food chain. The food chain leads through snails, worms, shrimp, insects, clams, fish, shore birds, and eventually to man himself. The destruction of tideland by removal or filling has an effect on the estuary's overall productivity. Degradation of the water quality also effects the ecosystem adversely.



## DIVISION OF STATE LANDS

### OFFICE OF THE DIRECTOR

502 WINTER STREET NE. • SALEM, OREGON • 97310 • Phone 378-3805

#### OREGON STATE LAND BOARD

**TOM McCALL**  
Governor

**CLAY MYERS**  
Secretary of State

**JAMES A. REDDEN**  
State Treasurer

**WILLIAM S. COX**  
Director

The Division of State Lands has just finished mapping all of the major Oregon estuaries. The results of our work are presented, in considerably reduced form, in this report entitled "Oregon Estuaries". In addition to the maps presented in this report, we have included selected aerial photographs of each area and a certain amount of information concerning estuaries which we felt might be helpful in better understanding estuaries and their role in the aquatic environment.

We, as an agency, have been actively involved in planning, protecting and conserving the natural resources of Oregon estuaries for many years. During the past four to six years, we have become extremely concerned with the future of these areas. Our recently completed mapping project (to provide a planning base) is just one of the ways in which we are attacking the problems that we see in maintaining productive estuarine areas.

The future of Oregon's estuaries depends on the care and effort which go into the planning and development process now. Many of Oregon's estuaries are still in a near-pristine state and in no instance has an estuary deteriorated to the point where we do not have the ability to plan its future development.

Oregon is indeed fortunate to have many excellent estuary planning programs in progress at the present time. We heartily approve these programs and encourage other groups to form whenever possible.

We are proud of the role that the Division of State Lands has played in helping to plan and develop the lands in Oregon estuaries. We intend to continue our efforts to provide background material and data, base maps, and other information essential to the estuary planning process. We encourage you to become familiar with Oregon's estuaries and to take the time to participate in planning this small part of Oregon's future.

Sincerely,

William S. Cox

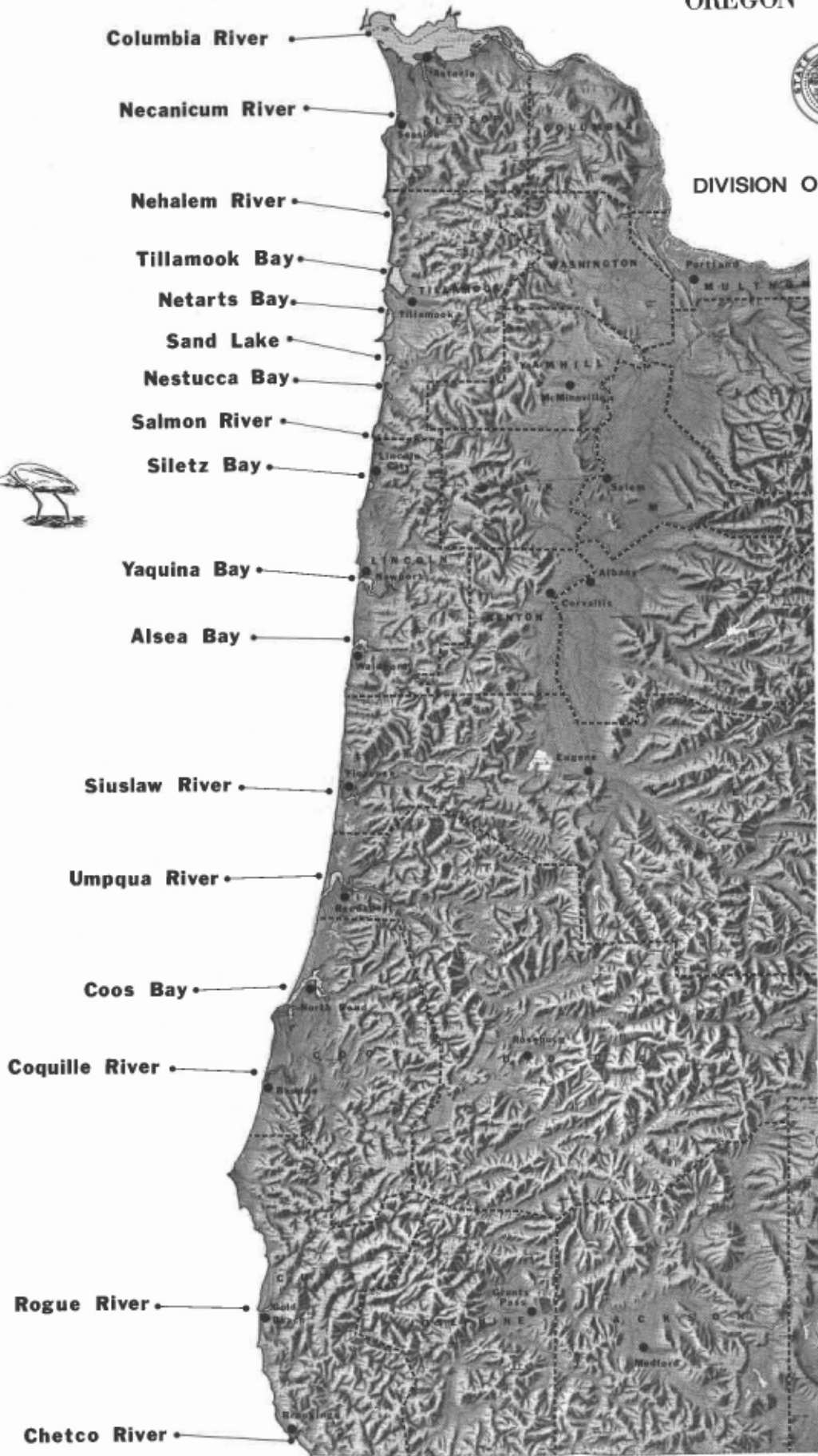
Director

WSC/sde

# OREGON ESTUARIES



DIVISION OF STATE LANDS



RELIEF BASE MAP FROM U.S.G.S.



# AREA OF OREGON ESTUARIES

## STATE OF OREGON DIVISION OF STATE LANDS

ESTUARY	TOTAL AREA ACRES	RELATIVE SIZE	TIDELAND AREA ACRES	SUBMERGED LAND ACRES
Columbia*	93,782	1	24,507	69,275
Necanicum	278	15	149	129
Nehalem	2,309	7	1,078	1,231
Tillamook	8,289	3	4,163	4,126
Netarts	2,325	6	1,513	812
Sand Lake	528	14	397	131
Nestucca	1,000	11	578	422
Salmon River	204	16	126	78
Siletz	1,187	10	775	412
Yaquina	3,910	5	1,353	2,557
Alsea	2,146	9	979	1,168
Siuslaw	2,245	8	756	1,489
Umpqua	6,830	4	1,531	5,298
Coos Bay	12,380	2	6,200	6,180
Coquille	771	12	301	470
Rogue	627	13	149	478
Chetco	102	17	12	90
<b>Total</b>	<b>138,913</b>		<b>44,567</b>	<b>94,346</b>

Areas were determined by planimeter from Division of State Lands' tideland maps at the scale of 1" = 1000'. The estuary area measured extended from a line across the entrance to the upper extent of tideland. The upper limit chosen usually coincided with the point of continuous diking along the river edge and was not necessarily the head of tide. At the point of continuous diking, the tideland narrows to a width of 20 to 30 feet.

The tideland area given is that land between mean high water and mean low water. The submerged land is that area below mean low water. All mapping and area determination was completed between February 1972 and March 1973.

\*Area of the Columbia River estuary was computed from USC&GS charts 6151 and 6152. The limits extend from the entrance jetties to the lower tip of Puget Island. The C&GS line of mean lower low water was used for the computation. Tideland and submerged land in both Oregon and Washington are included in the figures.

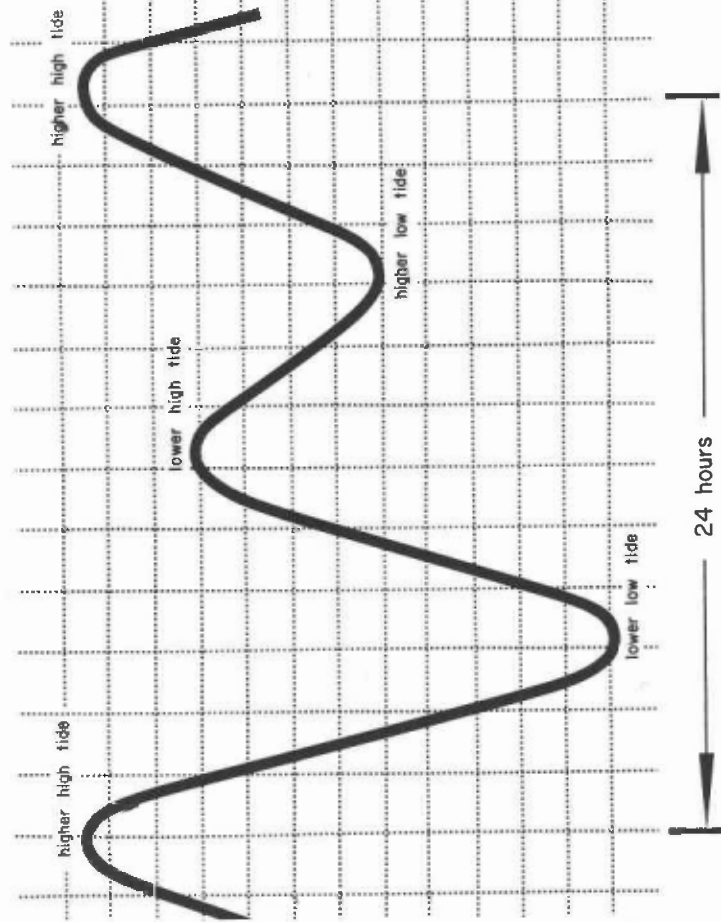
Minor Oregon estuaries not tabulated are: Elk Creek, Neskowin Creek, Yachats River, Ten Mile Creek, Sixes River, Elk River, Hunter Creek, Pistol River, and Winchuck River.

# TIDAL ELEVATIONS ON THE OREGON COAST

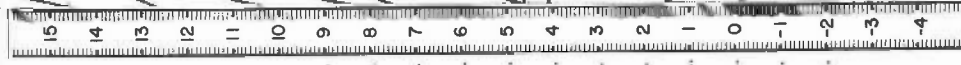
STATE OF OREGON  
DIVISION OF STATE LANDS

502 Winter Street N.E.  
Salem, Oregon 97310

## Typical Days Tide



Tide Staff  
inft.  
MLLW



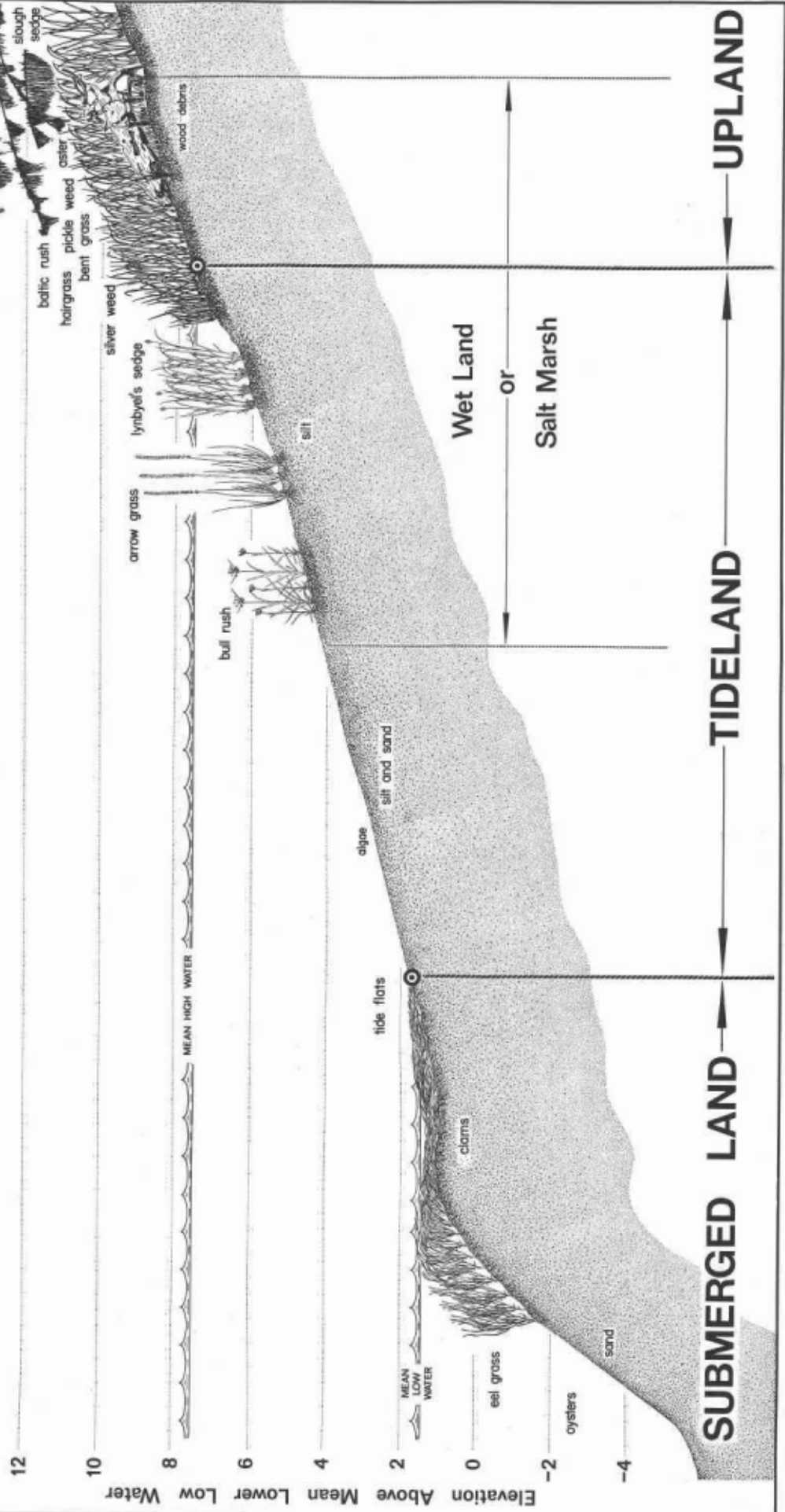
- 14.5 **Extreme High Tide** — The highest projected tide that can occur. It is the sum of the highest predicted tide and the highest recorded storm surge. Such an event would be expected to have a very long recurrence interval. In some locations, the effect of a rain induced freshet must also be taken under consideration. The extreme high tide level is used by engineers for the design of harbor structures.
- 12.63 **Highest Measured Tide** — The highest tide actually observed on the tide staff.
- 10.3 **Highest Predicted Tide** — Highest tide predicted by the Tide Tables.
- 8.38 **Mean Higher High Water** — The average height of the higher high tides observed over a specific time interval. The intervals are related to the moon's many cycles which range from 28 days to 18.6 years. The time length chosen depends upon the refinement required. The datum plane of MHHW is used on National Ocean Survey charts to reference rocks awash and navigational clearances.
- 7.62 **Mean High Water** — The average of all observed high tides. The average is of both the higher high and of the lower high tide recorded each day over a specific time period. The datum of MHW is the boundary between upland and tideland. It is used on navigational charts to reference topographical features.
- 4.58 **Mean Tide Level** — Also called half-tide level. A level midway between mean high water and mean low water. The difference between mean tide level and local mean sea level reflects the asymmetry between local high and low tides.
- 4.51 **Local Mean Sea Level** — The average height of the water surface for all stages of the tide at a particular observation point. The level is usually determined from hourly height readings.
- 4.11 **Mean Sea Level** — A datum based upon observations taken over a number of years at various tide stations along the west coast of the United States and Canada. It is officially known as the **Sea Level Datum of 1929, 1947 adj.** and is the most common datum used by engineers. MSL is the reference for elevations on U.S. Geological Survey Cuadrangles. The difference between MSL and Local MSL reflects numerous factors ranging from the location of the tide staff within an estuary to global weather patterns.
- 1.54 **Mean Low Water** — The average of all observed low tides. The average is of both the lower low and of the higher low tides recorded each day over a specific time period. The datum of MLLW is the boundary between tideland and submerged land.
- 0.00 **Mean Lower Low Water** — The average height of the lower low tides observed over a specific time interval. The datum plane is used on Pacific coast nautical charts to reference soundings.
- 2.9 **Lowest Predicted Tide** — The lowest tide predicted by the Tide Tables.
- 3.14 **Lowest Measured Tide** — The lowest tide actually observed on the tide staff.
- 3.5 **Extreme Low Tide** — The lowest estimated tide that can occur. Used by navigational and harbor interests.

**Note:** Specific elevations are based on six years of tide observations at the Oregon State University Marine Science Center Dock on Yaquina Bay. Values have been reduced by the National Ocean Survey (formerly the Coast and Geodetic Survey). The elevations differ from estuary to estuary and from different points within an estuary. The exception is MLLW which is zero by definition.

# GENERAL ESTUARY PROFILE

STATE OF OREGON  
DIVISION OF STATE LANDS

502 Winter Street N.E.  
Salem, Oregon 97339





Uncontrolled Aerial Mosaic Prepared by The Division of State Lands.  
Aerial Photographs by WESTERN AERIAL CONTRACTORS and  
the ARMY CORPS of ENGINEERS 1970 and 1971.

State of Oregon  
Division of State Lands  
**COLUMBIA RIVER**  
Entrance to Pillar Rock  
April 1973

An aerial mosaic of the Columbia River reveals its great size. Having the distinction of being the second largest river in the United States, at points it is five miles wide. Astoria, Warrenton, and Hammond fringe the south shore; the Washington towns of Ilwaco and Chinook are built along the north shore.



The proposed Lower Columbia River National Wildlife Refuge encompasses an area equal to all the Oregon estuaries combined. If the federal refuge is established, it will insure preservation of this valuable land. The wetland is essential to migratory birds using the Pacific Flyway and is the last stronghold of the Columbia Whitetail Deer (inside back cover). The refuge would also provide a variety of recreational and economic uses.

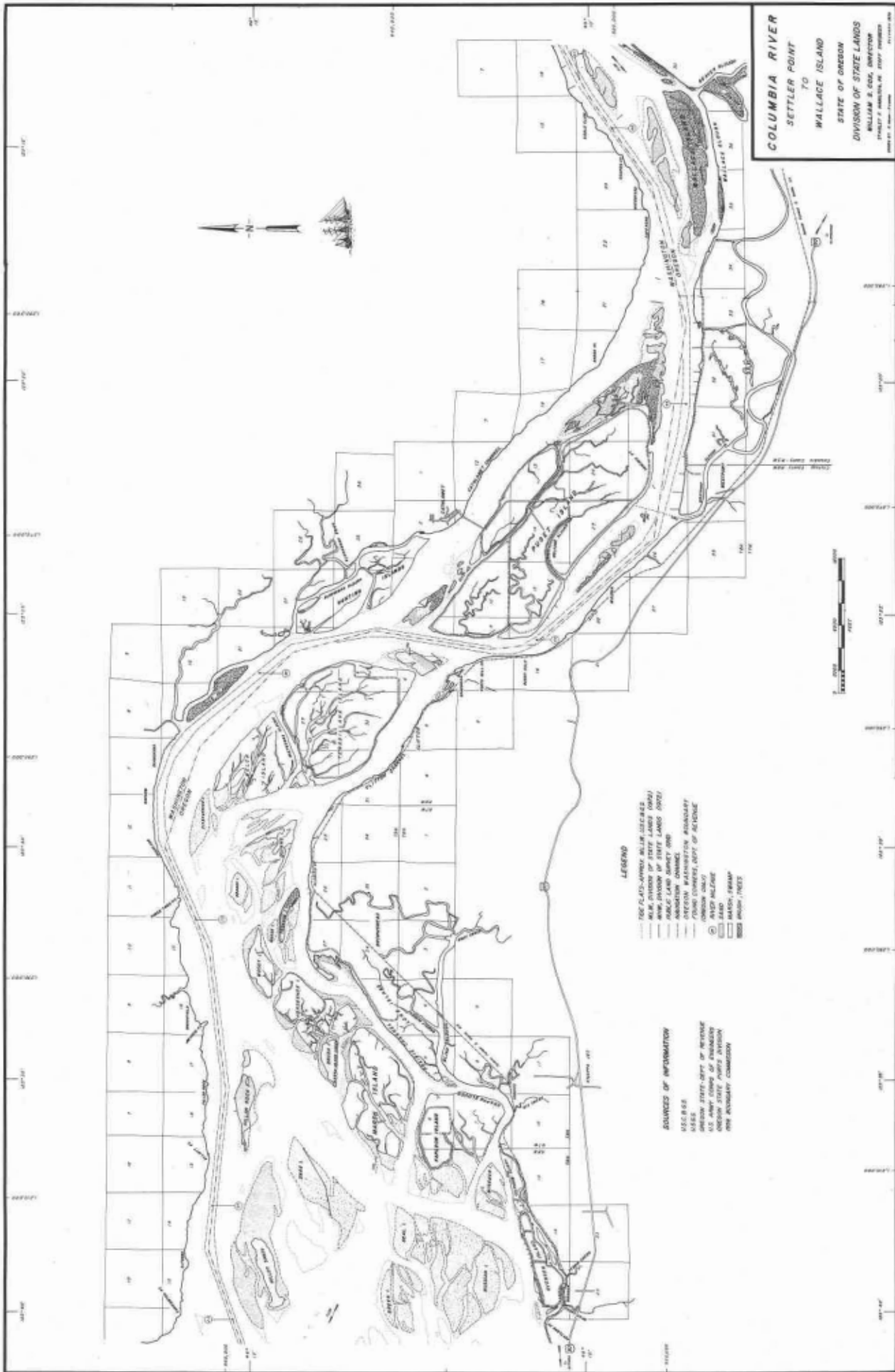
The Lower Columbia Islands area is the largest natural marsh remaining in western Oregon. The estuarine environment serves many interests - hunting, fishing, general recreation and outdoor studies. For extended periods before going to sea, salmon and other fish depend on the area for foods produced in the estuary complex. It is here they become conditioned for the change between salt water and the fresh water environments. Total commercial development would destroy wildlife, recreational and esthetic values. Placing the islands in a refuge status will help to preserve these resources.



February 1964

Bureau of Sport Fisheries and Wildlife — Ray Glenn

Marsh islands laced with channels in the Columbia Estuary. An idea of this photograph's scale can be gained by noting the size of gulls on the sand bar. The proposed Lower Columbia River National Wildlife Refuge encompasses 42,000 acres of islands like these.



**COLUMBIA RIVER**  
 SETTLER POINT  
 TO  
 WALLACE ISLAND  
 STATE OF OREGON  
 DIVISION OF STATE LANDS  
 WILLIAM E. COG, DIRECTOR  
 1954

- LEGEND**
- FLOOD-PRONE BELIEF ZONES
  - REG. DIVISION OF STATE LANDS (1942)
  - REG. DIVISION OF STATE LANDS (1952)
  - PUBLIC LAND MARKET 1952
  - OREGON WASHINGTON BOUNDARY
  - FRONTIER, MOUNTAIN, AND OTHER
  - OREGON ONLY
  - LAND BELONGING TO
  - WASH. STATE
  - WASH. STATE
  - WASH. STATE

- SOURCES OF INFORMATION**
- U.S.G.S.
  - OREGON STATE DEPT. OF REVENUE
  - OREGON STATE DEPT. OF LANDS
  - OREGON STATE ARCHIVES
  - OREGON STATE COMMISSION





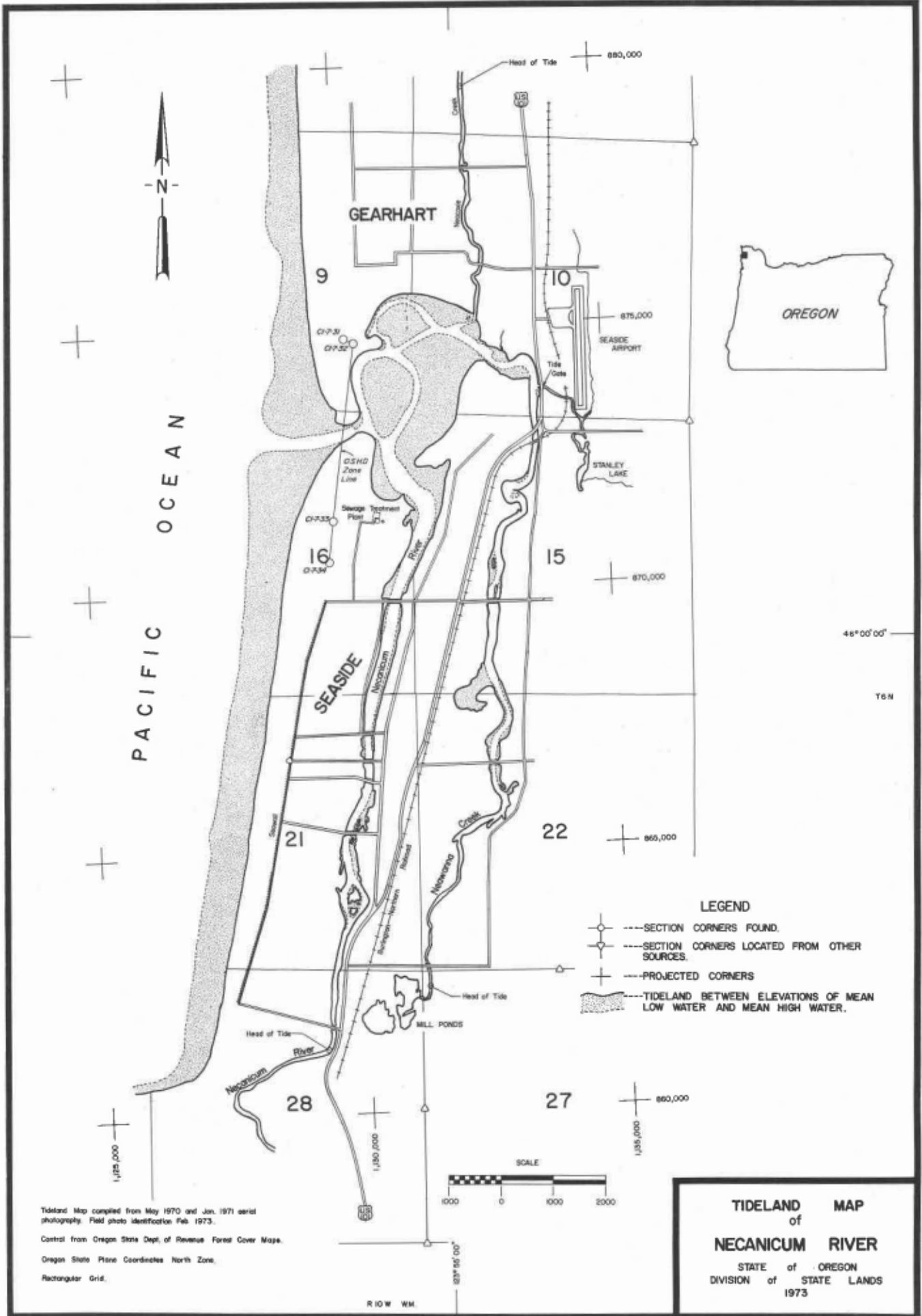
June 1967

Western Ways, Inc.

Meanders of the Necanicum River and Neawanna Creek are seen as they traverse the tideland and enter the Pacific Ocean. These channels shift slightly during each tide and completely realign yearly. Seaside is located in the center right – Gearhart in the lower left.

Due to the combination of high density sand and coastal configuration, the 20 mile long beach from Seaside to the Columbia River entrance is ideal for razor clams. Thousands of Oregon clam diggers “thump” the beach during minus tides.





Tideland Map compiled from May 1970 and Jan. 1971 aerial photography. Field photo identification Feb. 1973.  
 Control from Oregon State Dept. of Revenue Forest Cover Maps.  
 Oregon State Plane Coordinates North Zone.  
 Rectangular Grid.

**TIDELAND MAP**  
 of  
**NECANICUM RIVER**  
 STATE of OREGON  
 DIVISION of STATE LANDS  
 1973

R I O W W M

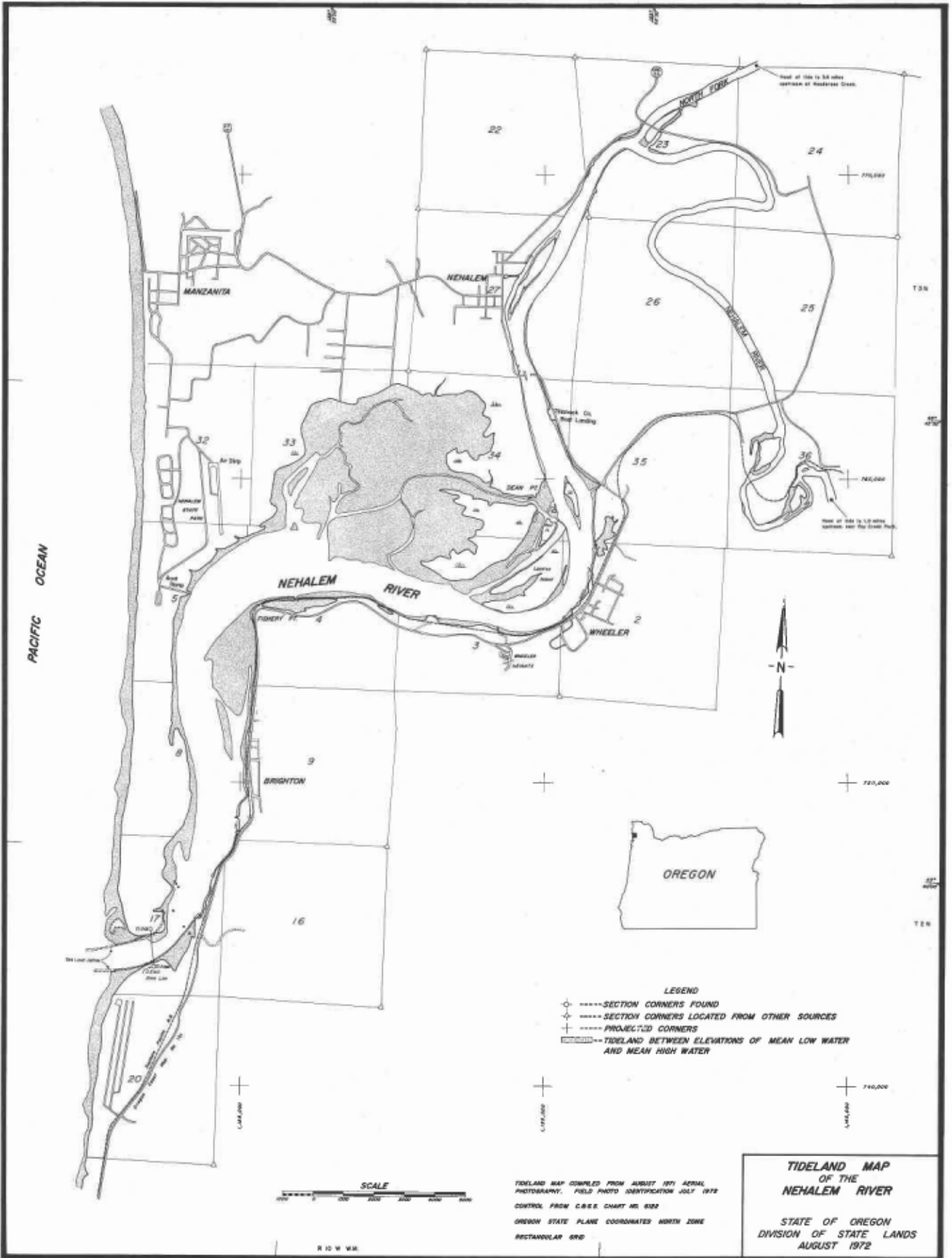


May 1972

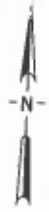
Oregon State Highway Division

Driftwood bleached white by the sun is visible on these three marsh islands in Nehalem Bay. Variations of the vegetative cover is also apparent. Such islands are vital to many shore birds. The town of Wheeler is located in the lower left.

Peter Eilers, a Geography graduate student at Oregon State University, has investigated the Nehalem marsh expanse. He has determined the relationship between plant species and the tidal elevation at which they grow. The results will be realized as a valuable estuary management tool. The Division of State Lands funded a portion of Mr. Eiler's project.



PACIFIC OCEAN



- LEGEND
- SECTION CORNERS FOUND
  - ⊕-----SECTION CORNERS LOCATED FROM OTHER SOURCES
  - ⊕-----PROJECTED CORNERS
  - ▨-----TIDELAND BETWEEN ELEVATIONS OF MEAN LOW WATER AND MEAN HIGH WATER



**TIDELAND MAP  
OF THE  
NEHALEM RIVER**

STATE OF OREGON  
DIVISION OF STATE LANDS  
AUGUST 1972

TIDELAND MAP COMPILED FROM AUGUST 1971 AERIAL PHOTOGRAPHY, FIELD PHOTO IDENTIFICATION JULY 1972  
CONTROL FROM C.B.S. CHART NO. 629  
OREGON STATE PLANE COORDINATED NORTH ZONE RECTANGULAR GRID

R 10 W 4 E

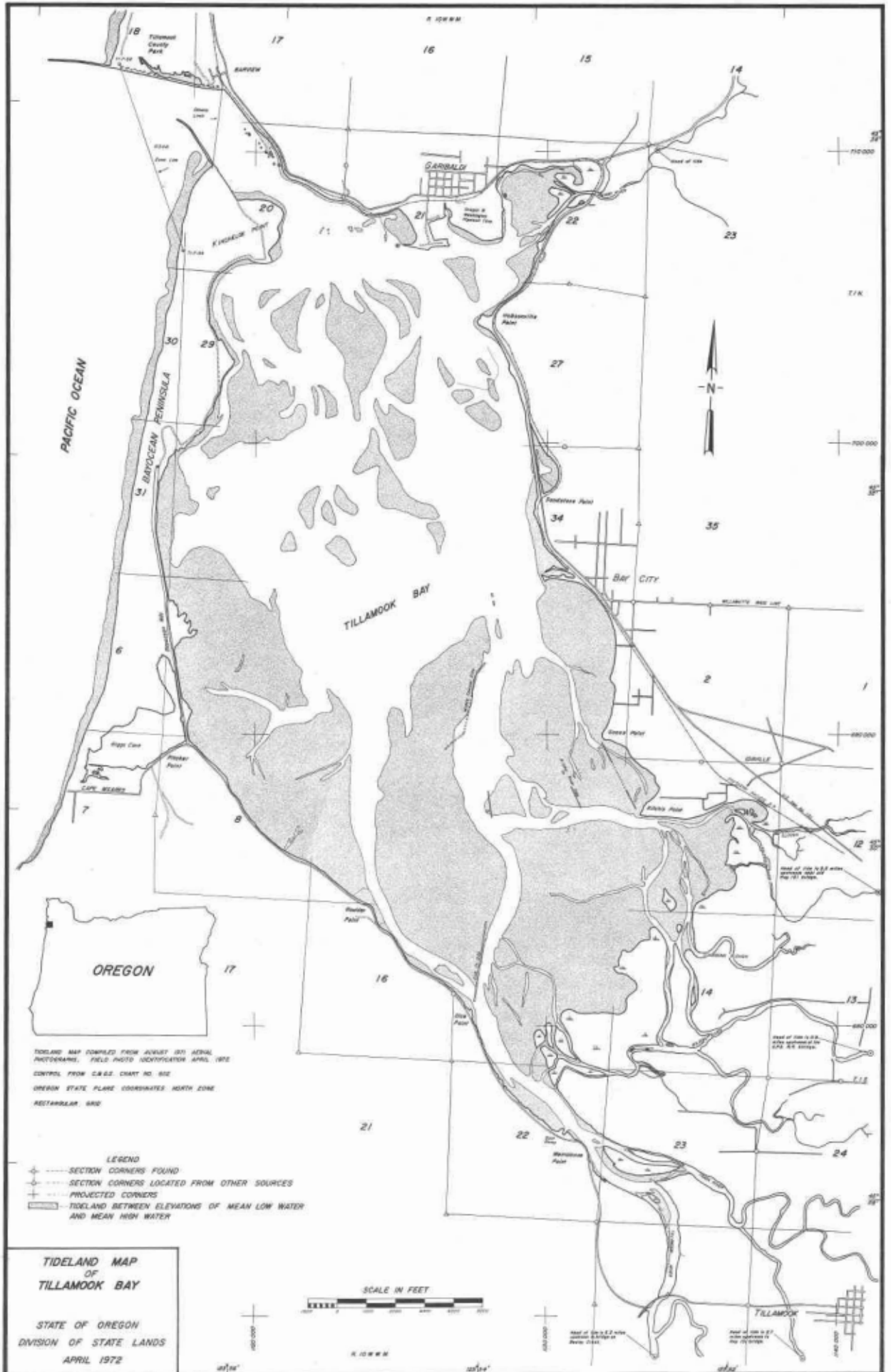


February 1962

Western Ways, Inc.

Scars from the 1953 breach of Bayocean Peninsula are visible in this 1962 photograph. A south jetty was started in 1969 and is now about half completed. Located in the upper left, the city of Tillamook is concealed by fog. The town of Bay City and Garibaldi can be seen on the left edge. Barview is in the center foreground.

Tillamook Bay has always abounded with oysters and bay clams. Mounds of clam shells discarded by the Killamouch Indians were visible on Kilchis Point as late as the 1950's. Even though oyster populations are far below historic levels, 85% of Oregon's harvest is taken from Tillamook Bay. In 1970, the wholesale market harvested 4,432 gallons of oysters worth \$270,000. The Pacific and Japanese oysters have been found to grow well in the bay and oyster growers have taken advantage of the fact. Approximately 3,000 acres of tideland in the western half of the bay are being used for oyster cultivation. The Cockle clam is readily gathered and sold as bait for both the local crab fishery and the recreational ocean fishery. The bay's five tributaries are excellent salmon and steelhead streams.



TIDELAND MAP COMPILED FROM JULY 1971 AERIAL PHOTOGRAPHS, FIELD PHOTO IDENTIFICATION APRIL 1972 CONTROL FROM C&G.S. CHART NO. 832 OREGON STATE PLANE COORDINATES NORTH ZONE RECTANGULAR GRID

- LEGEND
- +--- SECTION CORNERS FOUND
  - o--- SECTION CORNERS LOCATED FROM OTHER SOURCES
  - +--- PROJECTED CORNERS
  - +--- TIDELAND BETWEEN ELEVATIONS OF MEAN LOW WATER AND MEAN HIGH WATER

TIDELAND MAP OF TILLAMOOK BAY

STATE OF OREGON  
DIVISION OF STATE LANDS  
APRIL 1972



Map of Ore. S. 27' with 1/4" intervals of 6.25' corners

Map of Ore. S. 27' with 1/4" intervals of 6.25' corners

Map of Ore. S. 27' with 1/4" intervals of 6.25' corners



June 1970

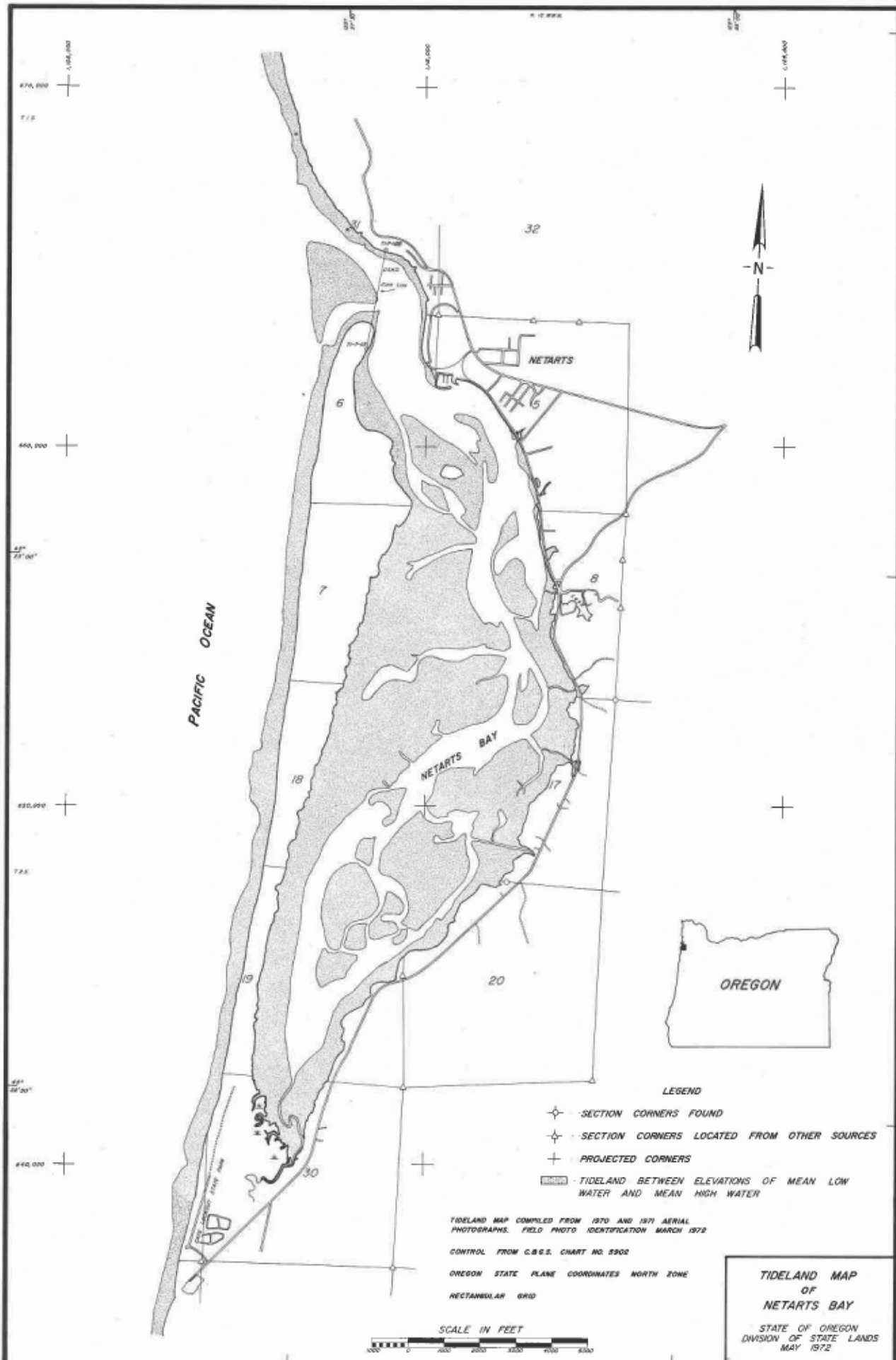
Corps of Engineers

The 1857 General Land Office survey map of Netarts Bay called it "Oyster Bay". Evidently, the large oyster population must have impressed the early settlers of the area enough to influence the selection of the bay name. Although the name did not prevail, oysters remained abundant until the 1930's when a destructive parasite was unintentionally introduced through seeding with a foreign oyster. Today, both native and cultivated oysters remain at insignificant levels because the parasite continues to infect the bay.



The remoteness of Netarts Bay makes it a haven for timid migratory birds like the Black Brant. A number of rare birds of prey inhabit the area for the same reason. The noise associated with increased development or a major highway could cause the timid birds to seek a new habitat.

**Netarts Bay**



**LEGEND**

- ⊛ SECTION CORNERS FOUND
- ⊙ SECTION CORNERS LOCATED FROM OTHER SOURCES
- ⊕ PROJECTED CORNERS
- ▨ TIDELAND BETWEEN ELEVATIONS OF MEAN LOW WATER AND MEAN HIGH WATER

TIDELAND MAP COMPILED FROM 1970 AND 1971 AERIAL PHOTOGRAPHS. FIELD PHOTO IDENTIFICATION MARCH 1972

CONTROL FROM C.B.S.S. CHART NO. 5902

OREGON STATE PLANE COORDINATES NORTH ZONE  
RECTANGULAR GRID

SCALE IN FEET



OREGON

**TIDELAND MAP  
OF  
NETARTS BAY**

STATE OF OREGON  
DIVISION OF STATE LANDS  
MAY 1972



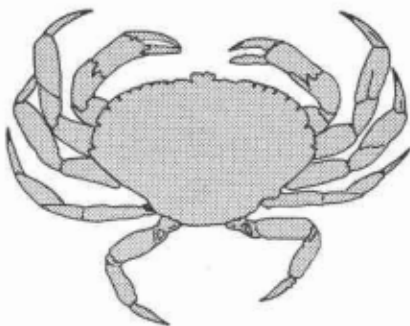
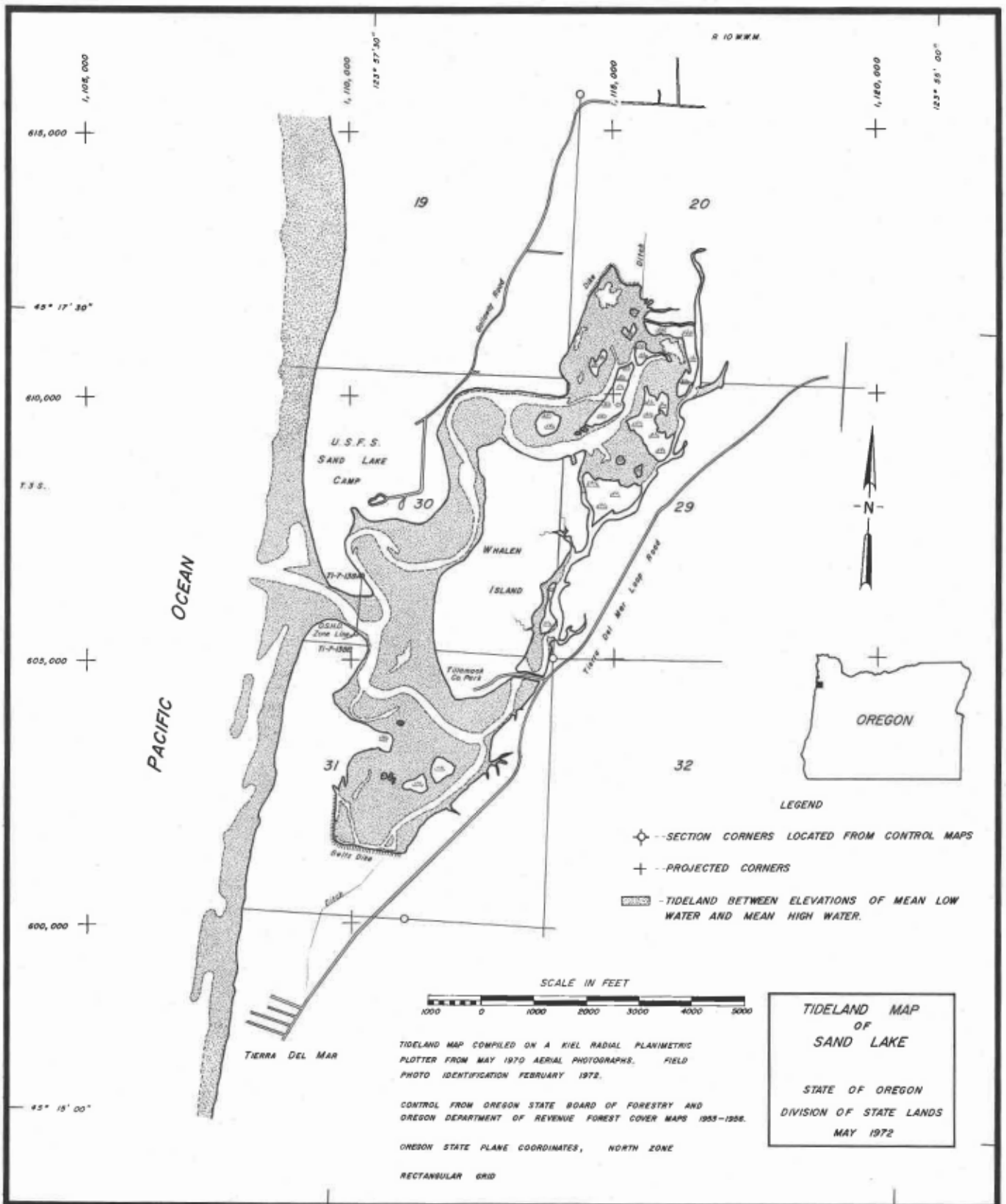
June 1972

Oregon State Highway Division

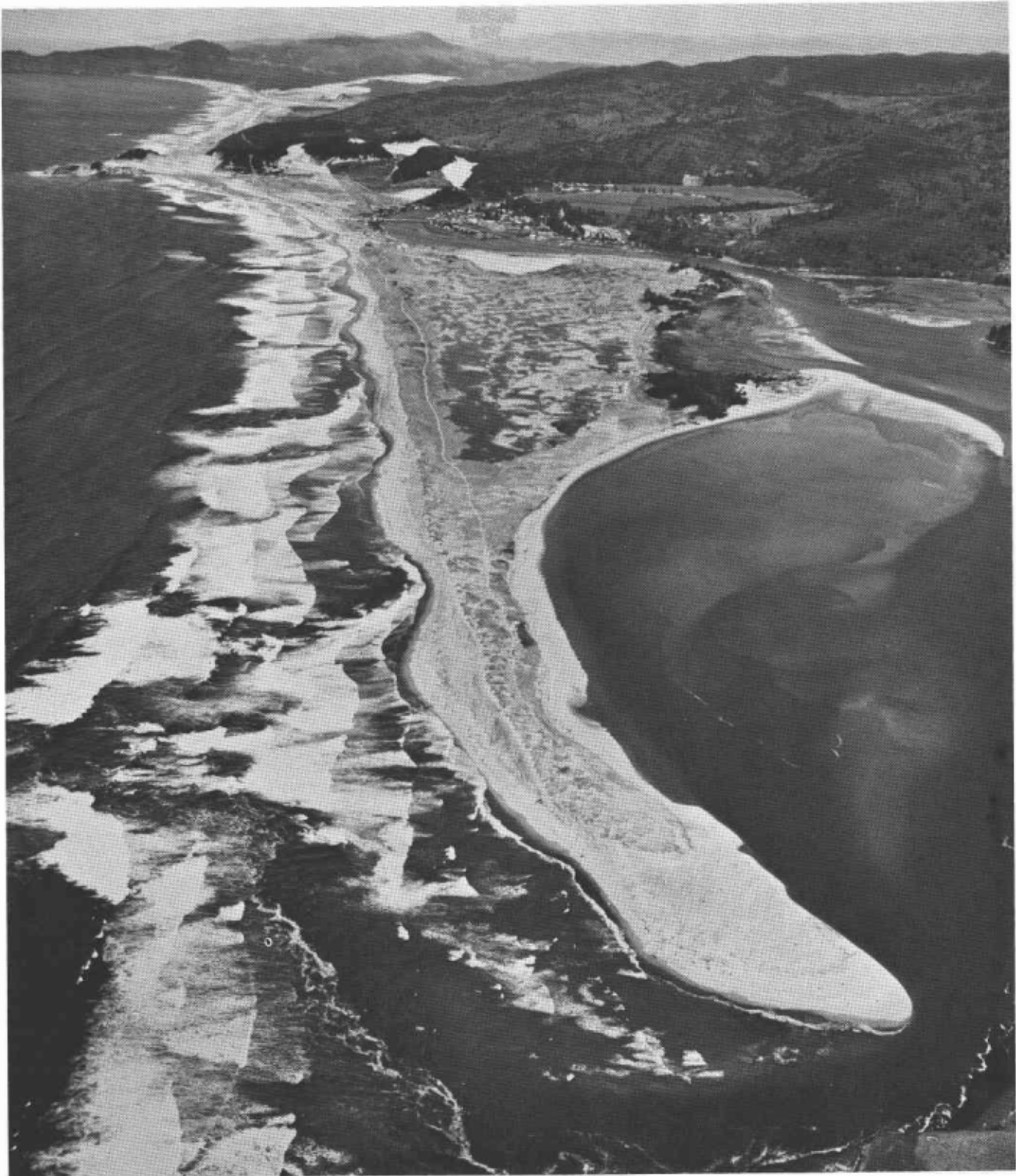
Many sinuous channels cutting their way to the Pacific are seen in this aerial photograph of Sand Lake. Surrounded by dairy farms, this estuary is one of the few remaining in the natural state. Flounder fishing and duck hunting are popular here.

Sand Lake drains 14 square miles of timber and valley land. The small area yields an insignificant fresh water discharge compared to the cyclic ebb and flood of tidal waters passing through the mouth. Consequently, tidal flow is largely responsible for Sand Lake's shape and depth.





Dungeness Crab taken from the shallow coastal waters and estuaries supports a valuable Oregon industry.



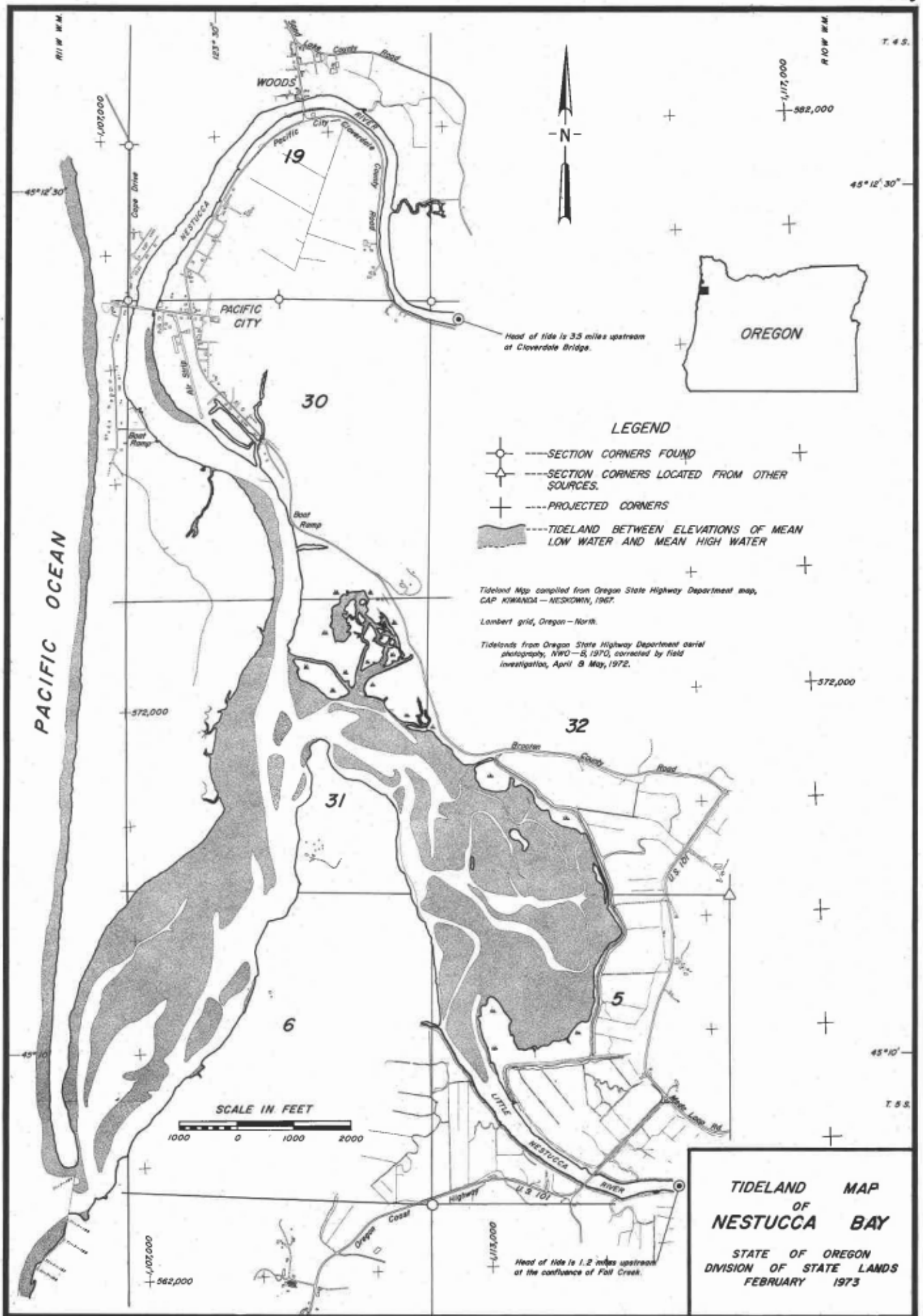
May 1972

Oregon State Highway Division

A long sand spit separates Nestucca Bay from the Pacific Ocean. Harsh elements experienced on the coast produce interesting phenomena like the crescent shaped cusps seen along the beach shoreline. An exact explanation of cusp formation has not been developed. The towns of Pacific City and Woods are built along the Nestucca River located in the upper center. The much photographed Capes Lookout and Kiwanda are seen in the upper left.

The few remaining undeveloped sand spits in Oregon are an esthetic resource to be protected. They offer the outdoorsmen an uninterrupted hike through a completely natural area free of mechanical noise and "no trespassing" signs.

Nestucca Bay



Head of tide is 3.5 miles upstream at Cloverdale Bridge.

LEGEND

- SECTION CORNERS FOUND
- SECTION CORNERS LOCATED FROM OTHER SOURCES.
- PROJECTED CORNERS
- TIDELAND BETWEEN ELEVATIONS OF MEAN LOW WATER AND MEAN HIGH WATER

Tideland Map compiled from Oregon State Highway Department map, CAP KIMANDA - AESKOWH, 1967.

Lambert grid, Oregon-North.

Tidelands from Oregon State Highway Department aerial photography, NWO-5, 1970, corrected by field investigation, April 8 May, 1972.

SCALE IN FEET  
1000 0 1000 2000

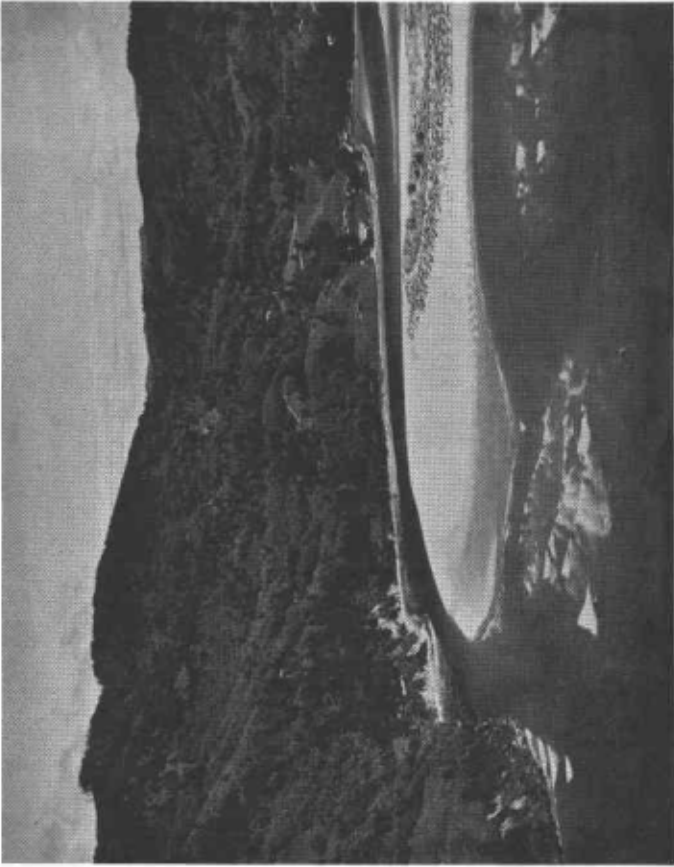
**TIDELAND MAP OF NESTUCCA BAY**  
STATE OF OREGON  
DIVISION OF STATE LANDS  
FEBRUARY 1973

Head of tide is 1.2 miles upstream at the confluence of Fall Creek.



May 1972

Oregon State Highway Division

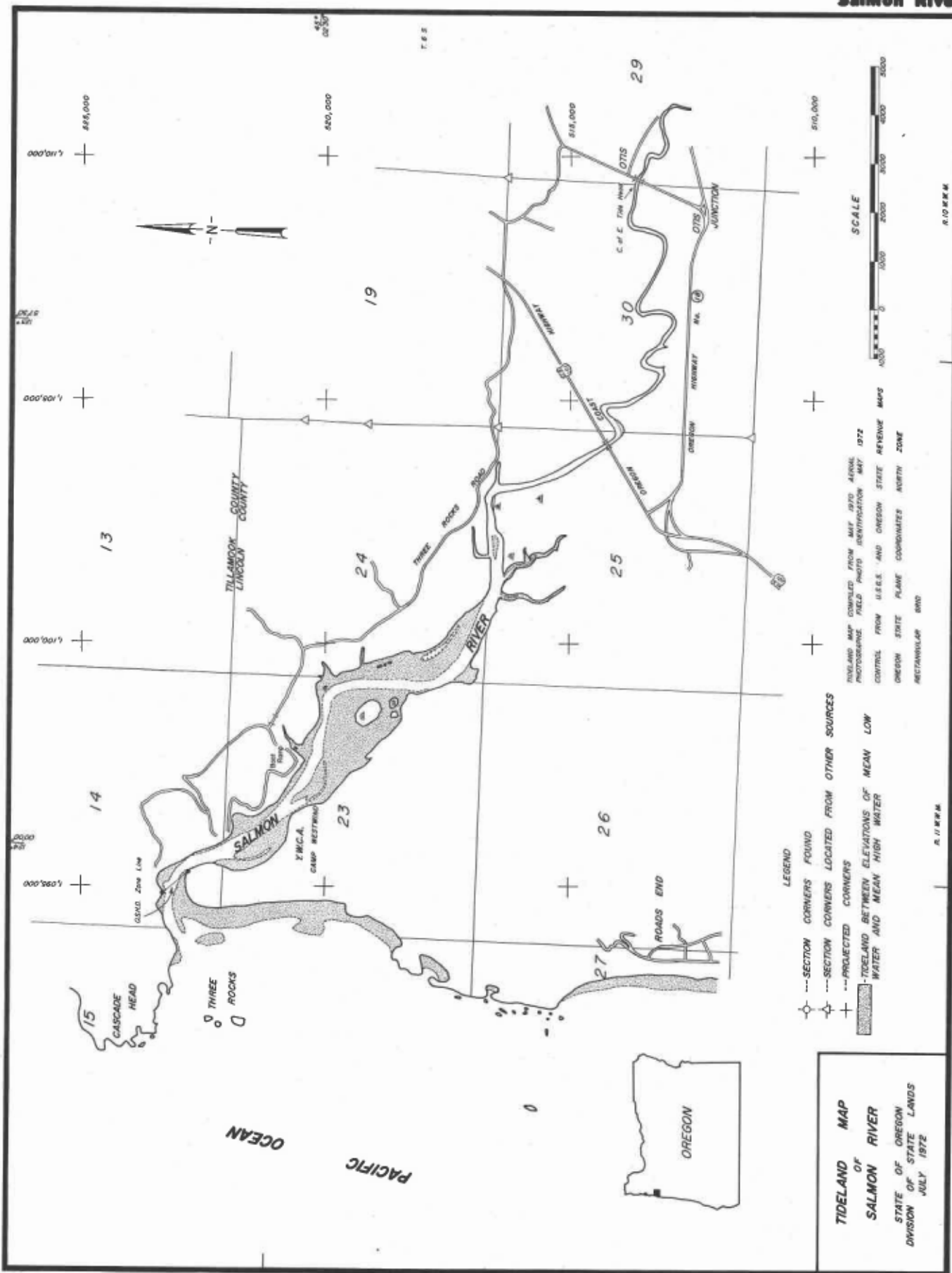


Oregon State Highway Division

June 1972

Salmon River enters the Pacific Ocean just south of Cascade Head. The estuary and 4,500 acres of surrounding timber land have been proposed as an addition to the Siuslaw National Forest. The area is noted for unique scenery and solitude. Pictured is the entrance of the five mile long estuary.

The transition from beach sand to tidal mud flat and then to salt marsh can be seen in this aerial. This transition takes place in all estuaries at various rates. It is more evident in Salmon River because of its small size.



**TIDELAND MAP OF SALMON RIVER**  
STATE OF OREGON  
DIVISION OF STATE LANDS  
JULY 1972

**LEGEND**

- SECTION CORNERS FOUND
- SECTION CORNERS LOCATED FROM OTHER SOURCES
- PROJECTED CORNERS
- TIDELAND BETWEEN ELEVATIONS OF MEAN LOW WATER AND MEAN HIGH WATER

TIDELAND MAP COMPILED FROM MAY 1970 AERIAL PHOTOGRAPHIC FIELD PHOTO IDENTIFICATION MAY 1972  
CONTROL FROM U.S.G.S. AND OREGON STATE REFERENCE MAPS  
OREGON STATE PLANE COORDINATES ADITY ZONE  
RECTANGULAR GRID

**SCALE**

0 1000 2000 3000 4000 5000

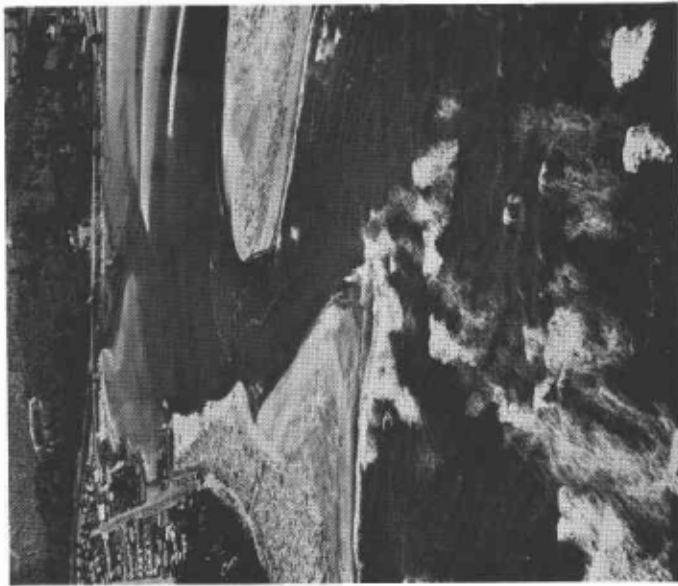
R. J. W. P. M.

R. J. W. P. M.



May 1972

Oregon State Highway Division

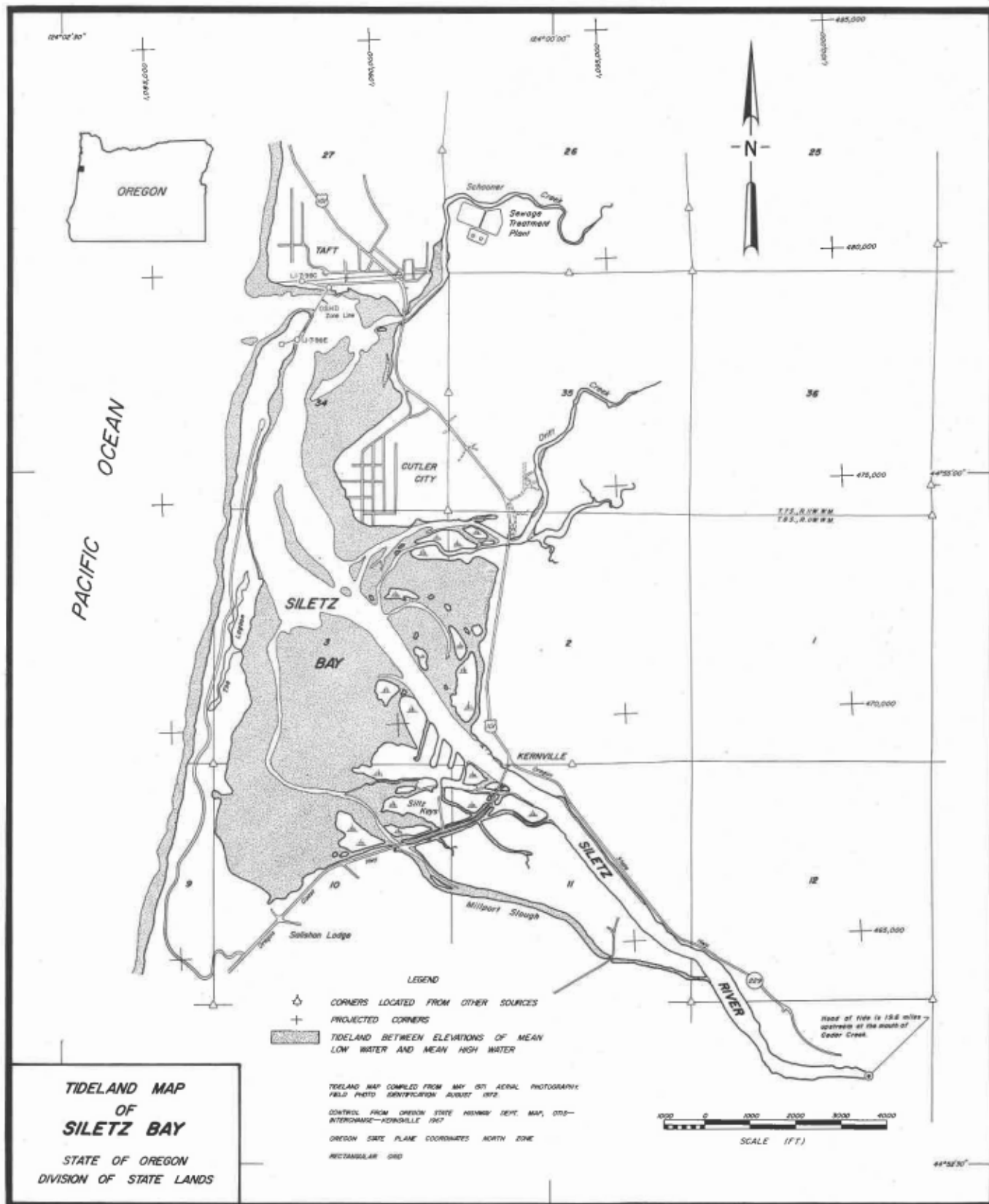


June 1972

Oregon State Highway Division

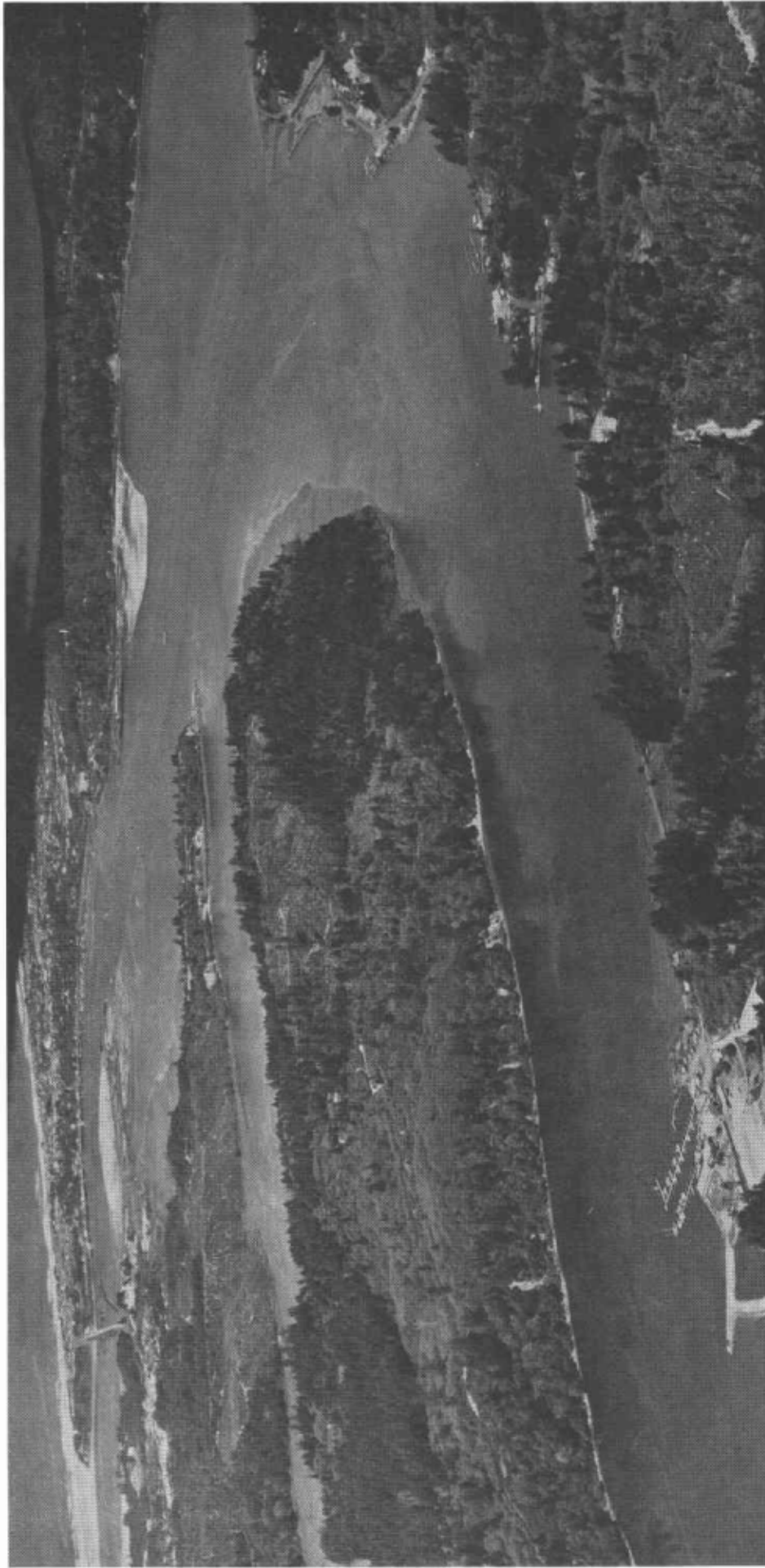
This photograph displays the entrance of Siletz Bay. A vast accumulation of driftwood can be seen on both the north and south sand spits. The south spit adjacent to Salishan experienced increased erosion during the past two winters. The town of Taft lies on the left of the photograph. Schooner Creek enters the bay at the top. Siletz Bay is well known for crabbing and beachcombing.

Hundreds of drift logs lay on the Siletz Bay tide flats. A majority of the drift accumulated after logging of the Siletz drainage in 1920 and 1930. While much of Oregon's tideland was sold early in statehood, Siletz Bay remains almost totally state-owned.



The Harbor Seal feeds on fish, squid, and shellfish. It is distinguished from the Sea Lion by its smaller size, chunky shape, lack of external ears, small front flippers, and spotted coat.





May 1972

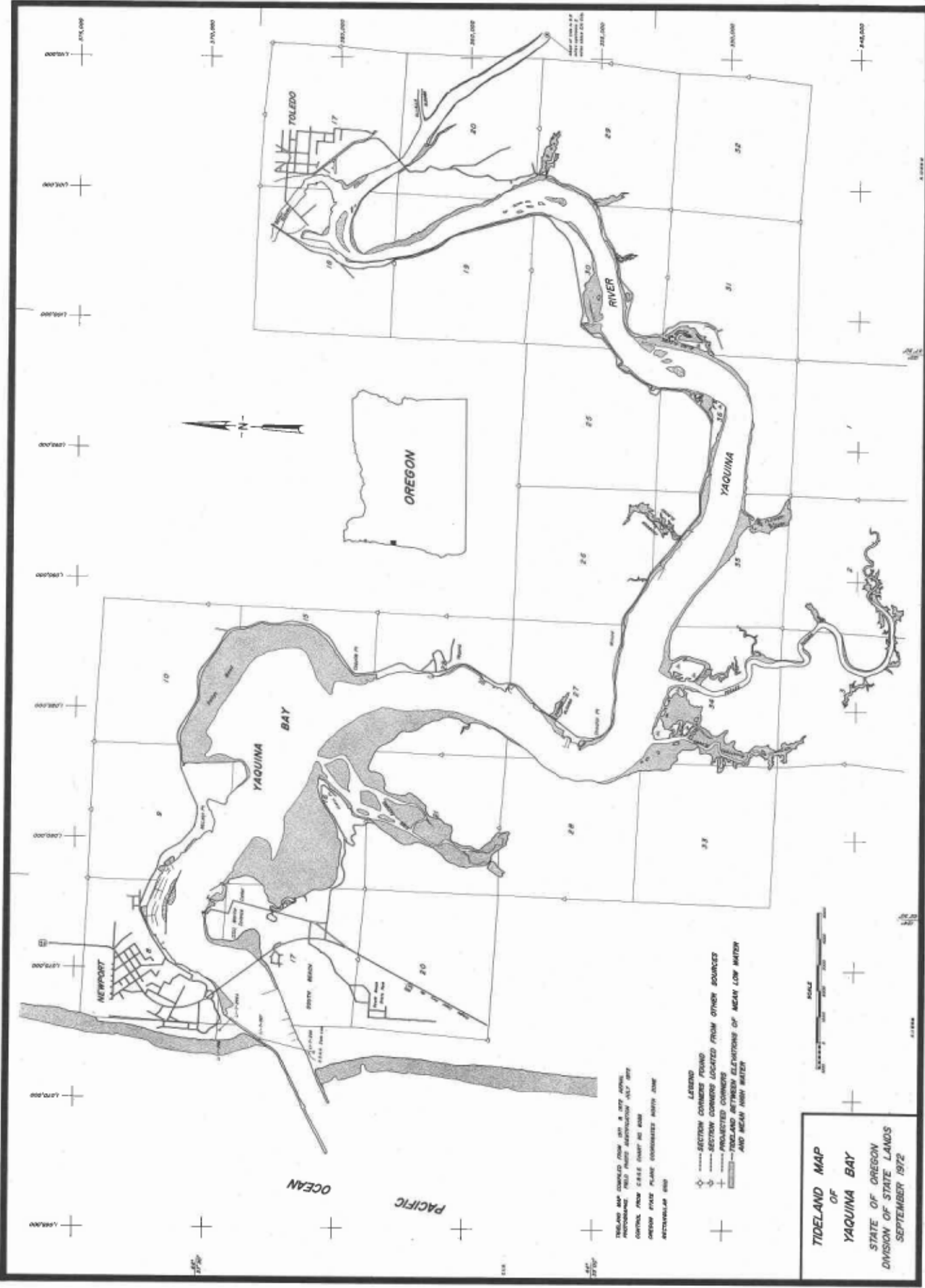
Oregon State Highway Division

Yaquina Bay is home of a sizeable fishing fleet, a marine science center, and is an important deep draft port. The Oregon State University Oceanography Department and the Fish Commission of Oregon maintain facilities at Southbeach. While a majority of the effort is directed toward oceanographic research with world wide benefits, much time is applied toward the advancement of Oregon's aqua-culture, commercial fishing, and shellfish production.

Although an estuary is very productive as a whole, certain areas within the estuary may be 1,000 times more productive than others. Sallys Bend, located in the upper right, is one of these highly productive tideland areas. At low tide on a calm day, all forms of marine creatures and water fowl can be seen on the tide flat. The city of Newport is visible in the upper left.







TIDELAND MAP COMPILED FROM 1871 & 1877 ADRIAN  
 PHOTOGRAPHIC FIELD NOTES REVISIONS JULY 1972  
 CONTROL POINT CASE CHART NO. 1040  
 OREGON STATE PLANE HORIZONTAL MATHS ZONE  
 NAD83/BLM 1883

- LEGEND
- ◆ SECTION CORNERS FOUND
  - ◇ SECTION CORNERS LACKED FROM OTHER SOURCES
  - PROJECTED CORNERS
  - TIDELAND BETWEEN ELEVATIONS OF MEAN LOW WATER AND MEAN HIGH WATER



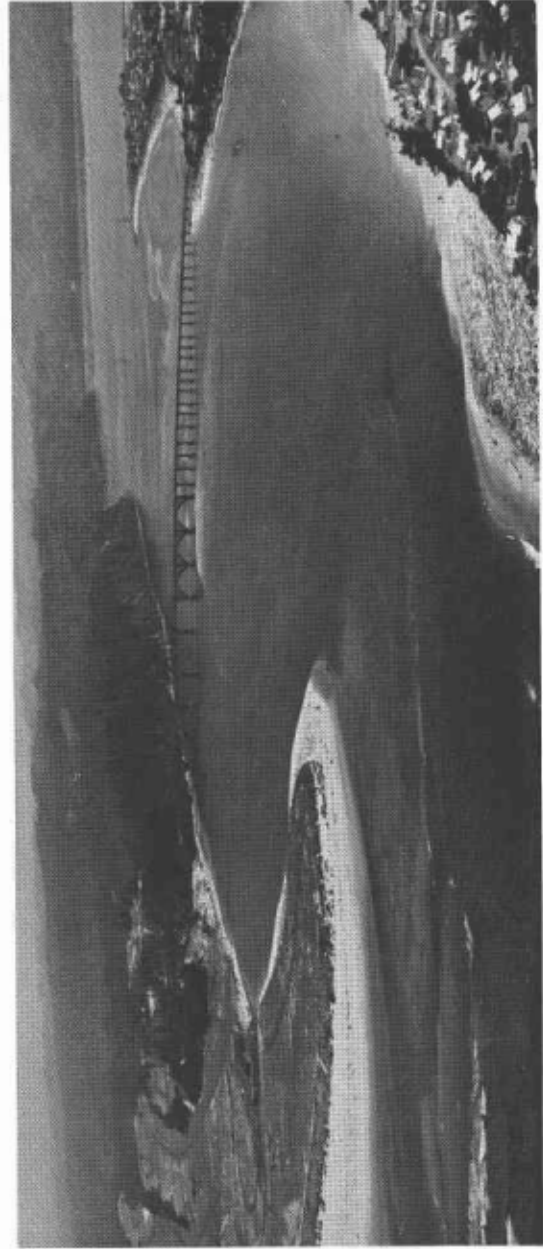
TIDELAND MAP  
 OF  
 YAQUINA BAY  
 STATE OF OREGON  
 DIVISION OF STATE LANDS  
 SEPTEMBER 1972

The Alsea River has formed a delta of low marsh islands as it flows into Alsea Bay. A small grass island with a sand tail seen in the center left of this photograph has the appearance of a boat headed up the Alsea River. Aerial photography reveals the character of submerged bay features such as the sand ridges in the lower right. The outskirts of Waldport are visible.



May 1972

Oregon State Highway Division



June 1970

Corps of Engineers

In 1874, the Oregon Legislature granted the Alsea Bay and Yaquina Bay tidelands to the Willamette Valley and Coast Railway Company. In return for the tideland and other conveyances, a rail line between Corvallis and Newport was completed. The railroad changed hands a number of times prior to 1900 and finally went into bankruptcy. The tideland is now held by the counties, local ports, and private owners.



The Siuslaw River yields grudgingly to wind blown sand as it weaves a path to the sea. Wind streaks trailing the south jetty break are apparent in this 1961 photograph. The same strong winds have created and shaped the famous Oregon dunes all along the central coast. The towns of Florence and Glenada, connected by the U.S. 101 bridge, can be seen in the upper center of this aerial view.

During July, August, and September, the best sea-run Cutthroat trout fishing in the northwest is found in the lower Siuslaw Estuary. High water temperatures that occur in the upper estuary near Mapleton create a barrier to the incoming fish. Unwilling to pass through the warm water. Cutthroat concentrate in the lower estuary near Florence. Fall rains in October cool the waters and the Cutthroat continue up the Siuslaw River to the spawning streams.

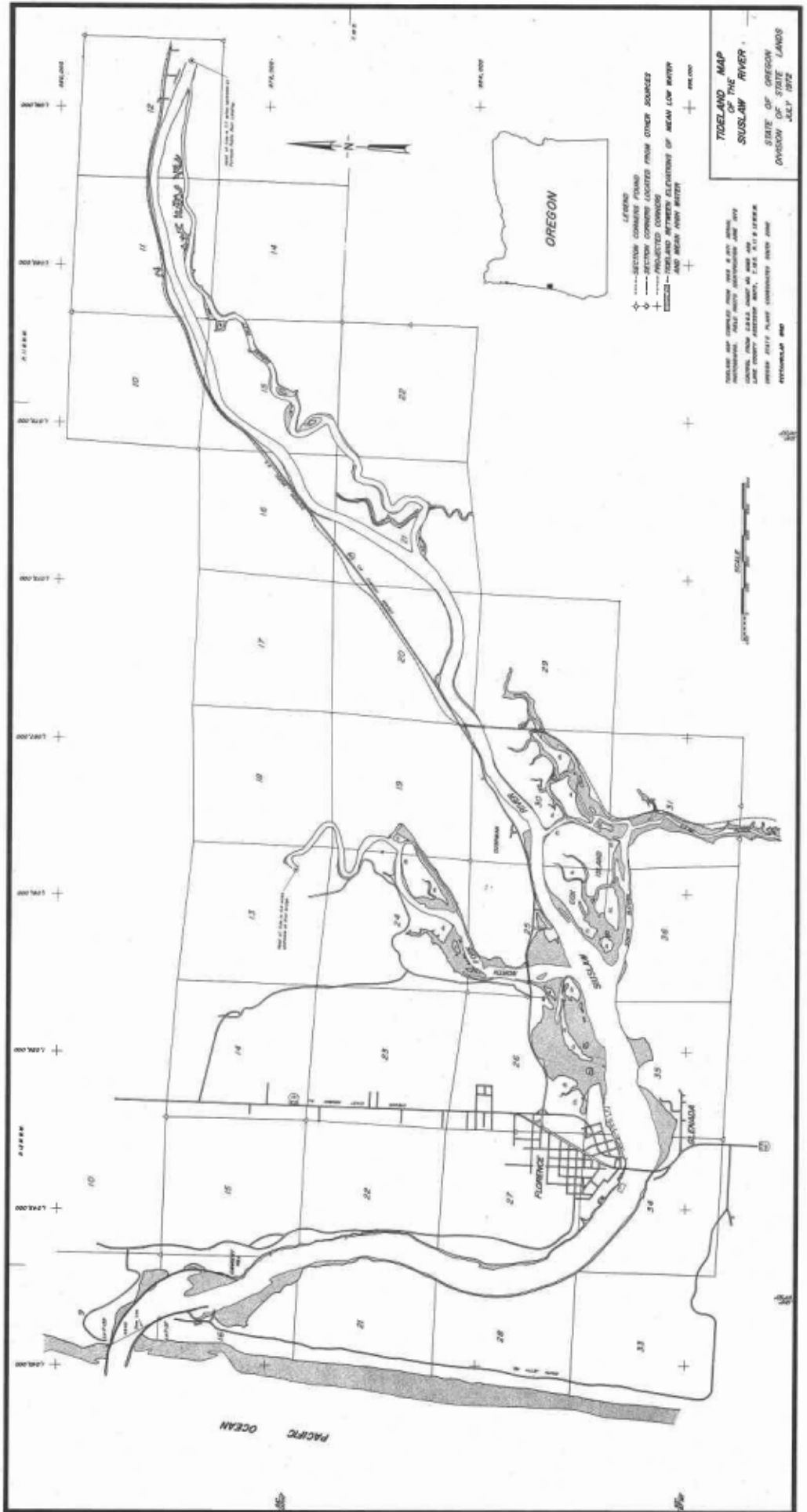


August 1961

Delano Photographics, Inc.

While dredges have been deepening Oregon harbors since the turn of the century, the ecological impact of dredging has never been fully investigated. A National Science Foundation grant has allowed researchers at Oregon State University to begin studying the effects of dredging in the Coos Bay, Umpqua, and Siuslaw estuaries. The program seeks to develop methods for measuring the ecological changes due to present dredging operations and to determine the long term effects of past dredging. Project directors from the School of Engineering are Dr. L. S. Slotia, Dr. D. A. Bella, Dr. C. K. Sollitt, and Mr. Ken Williamson. Directors from the Oceanography Department are Dr. J. McCauley and Mr. Danit Hancock.

# Suslaw River



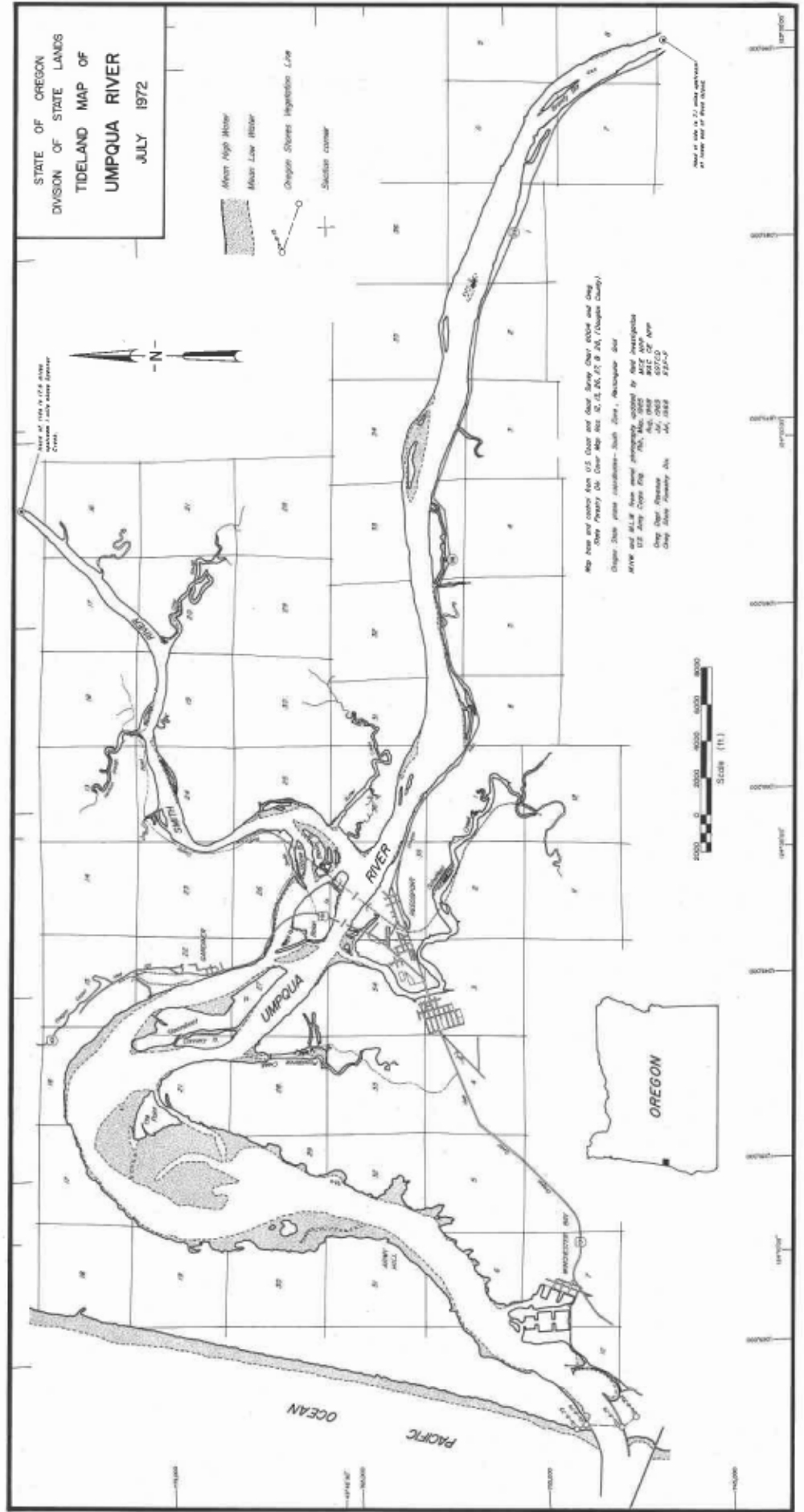


March 1957

Delano Photographics, Inc.

The entrance of the Umpqua River is seen in this 1957 aerial photograph. The small towns of Winchester Bay and Gardiner are visible. The Umpqua is the only estuary that offers sport and commercial fishermen year-round activity. Fall Chinook and Cobo are taken by a summer rush of sportsmen. Steelhead, Spring Chinook, Shad, Striped Bass, Cutthroat, and Sturgeon are caught at other times of the year.

The Umpqua Estuary is one of several Oregon bays investigated by Dr. Larry Slotta, Director of Ocean Engineering at Oregon State University. The estuarine hydraulics project seeks to describe the physical and chemical processes present in each estuary. Knowledge of water movement and water quality are fundamental to planning, management, research and surveillance activities.





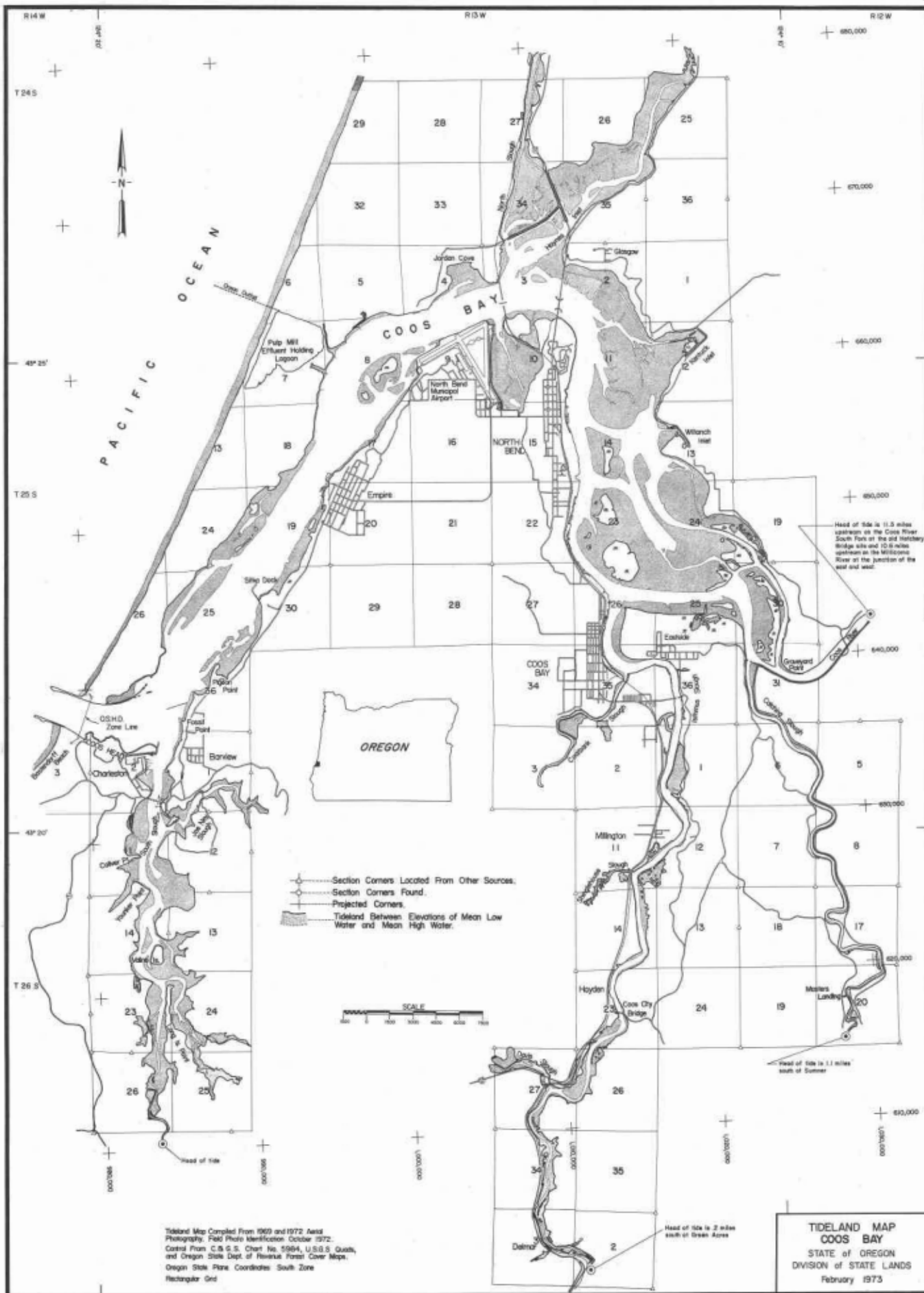
December 1962

Western Ways, Inc.

Many uses of an estuary are evident in Coos Bay. Log storage occupies a sizable percentage of the bay surface. Deep draft vessels loading wood products are seen tied to docks in the foreground. Log and wood chip export is essential to the area's economic base.

The University of Oregon has established the Oregon Institute of Marine Biology at Charleston. Headed by Dr. Paul Rudy, the Institute is engaged in research that will benefit coastal planners. The research includes an inventory of estuarine organisms and determination of their interrelationships. Other studies deal with coastal erosion, water quality, and the physiology of aquatic animals.





Tidal Map Compiled From 1969 and 1972 Aerial Photography, Field Photo Identification, October 1972. Control From C.S.G.S. Chart No. 5984, U.S.G.S. Quads, and Oregon State Dept. of Revenue Forest Cover Maps, Oregon State Plane Coordinates South Zone Rectangular Grid

**TIDELAND MAP**  
**COOS BAY**  
 STATE OF OREGON  
 DIVISION OF STATE LANDS  
 February 1973

LIBRARY / EPA  
 National Environmental Research Center  
 200 S. W. 35th Street  
 Corvallis, Oregon 97330

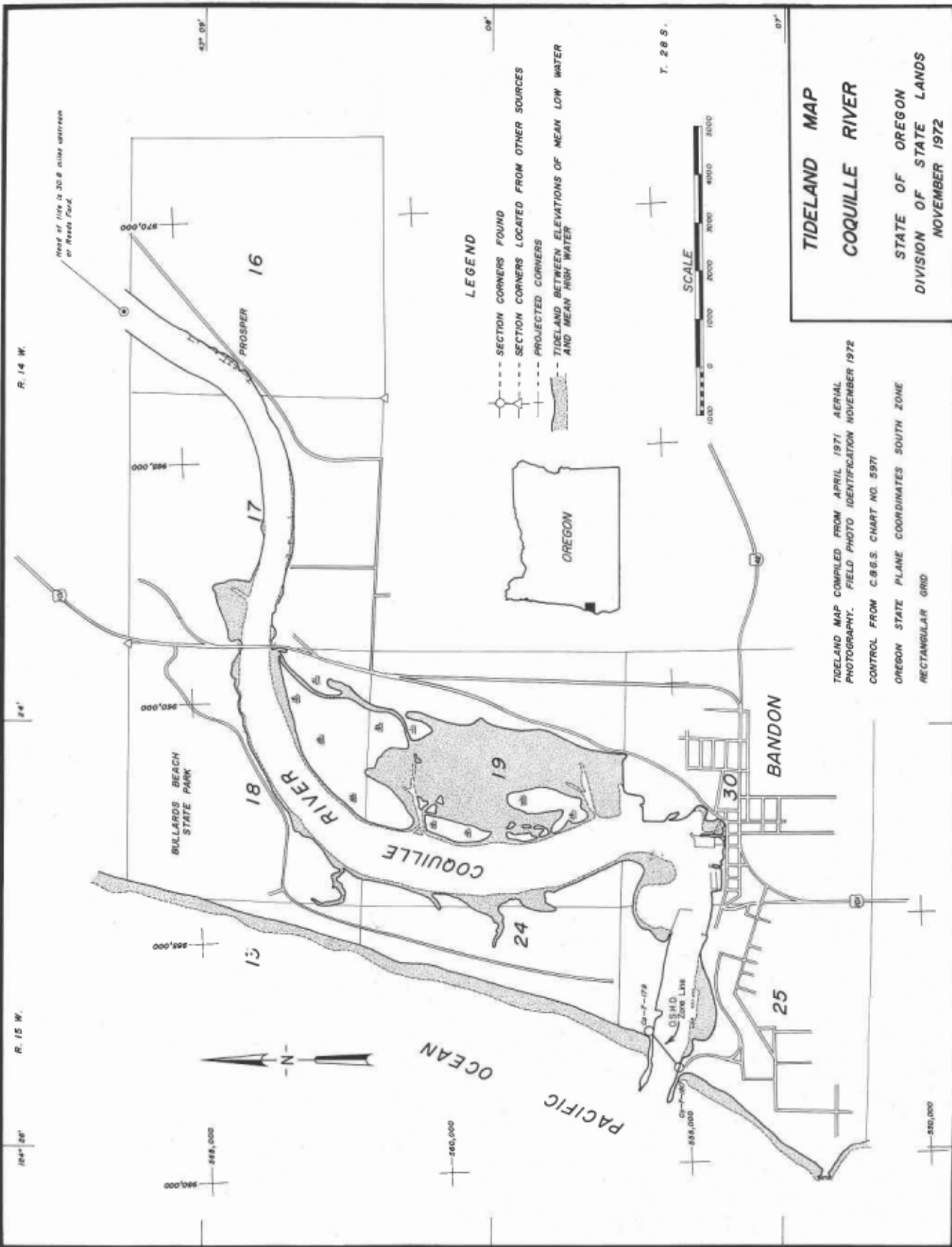


July 1969

Corps of Engineers

The city of Bandon is seen at the mouth of the Coquille River. Ocean going barges loaded with lumber regularly use this waterway.

The undeveloped wetland between Bandon and the Highway 101 bridge is important to migratory birds. Shore birds are abundant and include the Great Blue Heron, Gulls, Belted Kingfisher, and the Double Crested Cormorant. The estuary area is inhabited by river otter, mink, beaver, and black-tailed deer. A section to the north of the Coquille estuary serves as a winter range for Roosevelt Elk.



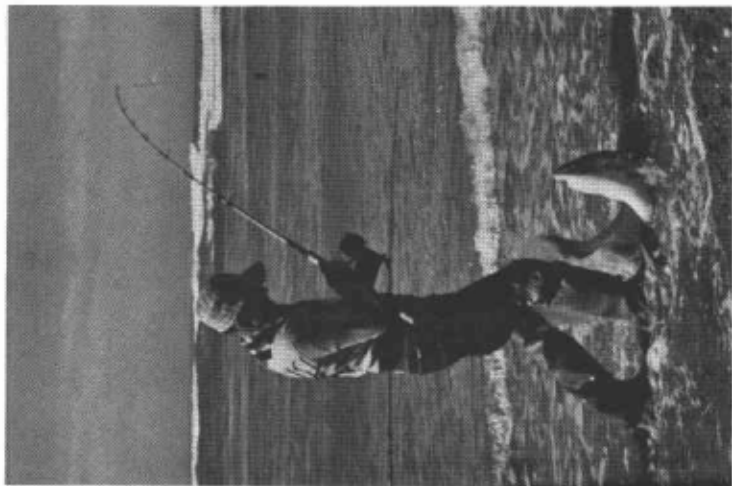
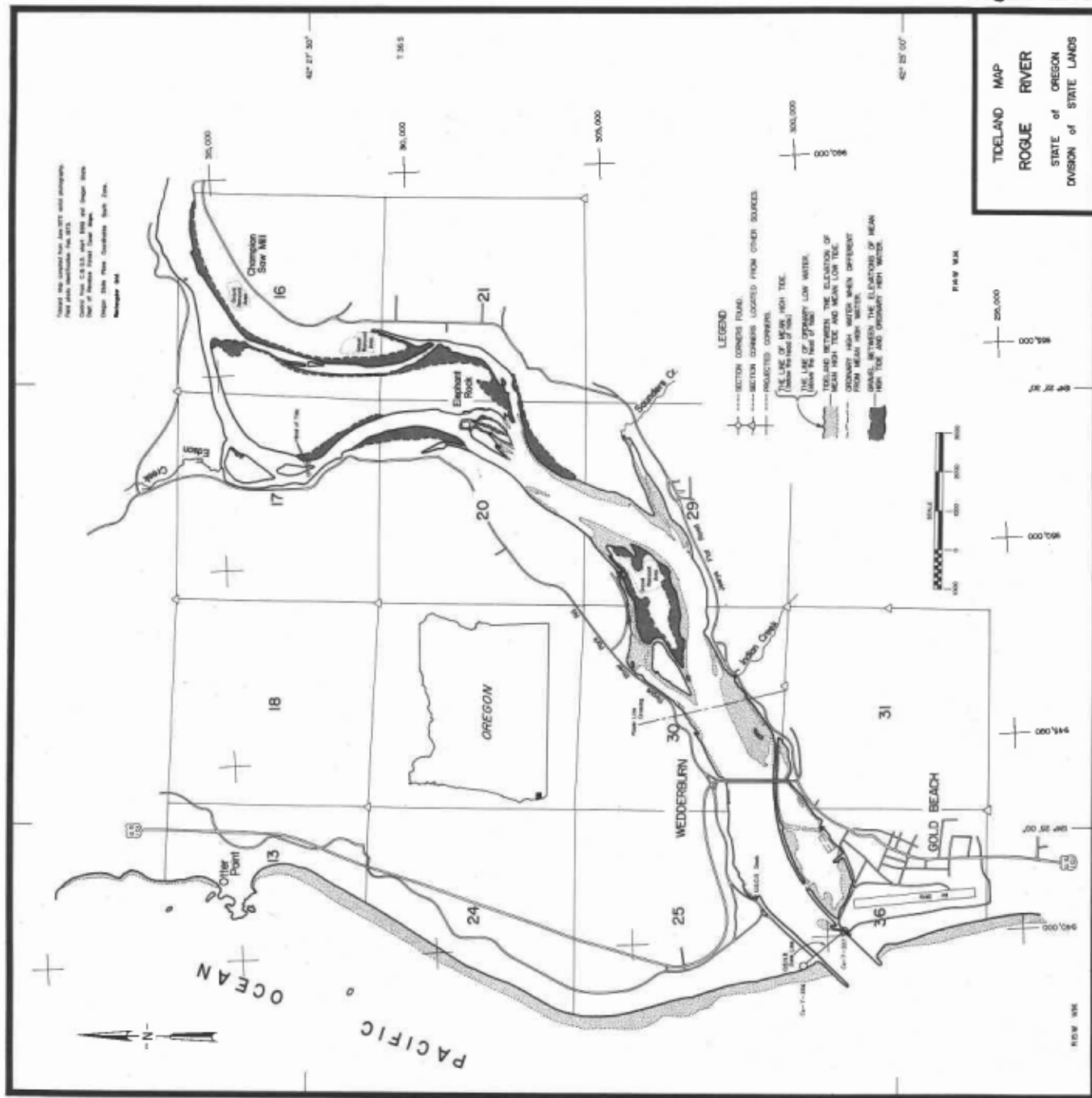


June 1970

Corps of Engineers

The Rogue River entrance is pictured here as it was in 1970. Visitors from across the United States come to enjoy the famous salmon and steelhead fishing. The town of Wedderburn is located on the left and the outskirts of Gold Beach can be seen on the right.

The southern Oregon coastal rivers have relatively steep slopes as they enter the Pacific Ocean. Consequently tidal waters do not have an appreciable inland penetration and the estuaries are foreshortened. The Rogue Estuary is three miles long and the Chetco is only one mile long. The steep river gradients supply gravel sediments to the river banks and ocean beach rather than the sand found at all the other Oregon estuaries.



A 36 pound Chinook salmon is landed at the Rogue River entrance. Each fall, salmon pass through the estuaries on their way to the spawning streams. The estuary acts as a transition zone between salt and fresh water for incoming fish. It also serves as a nursery for juvenile salmon before they enter the ocean.

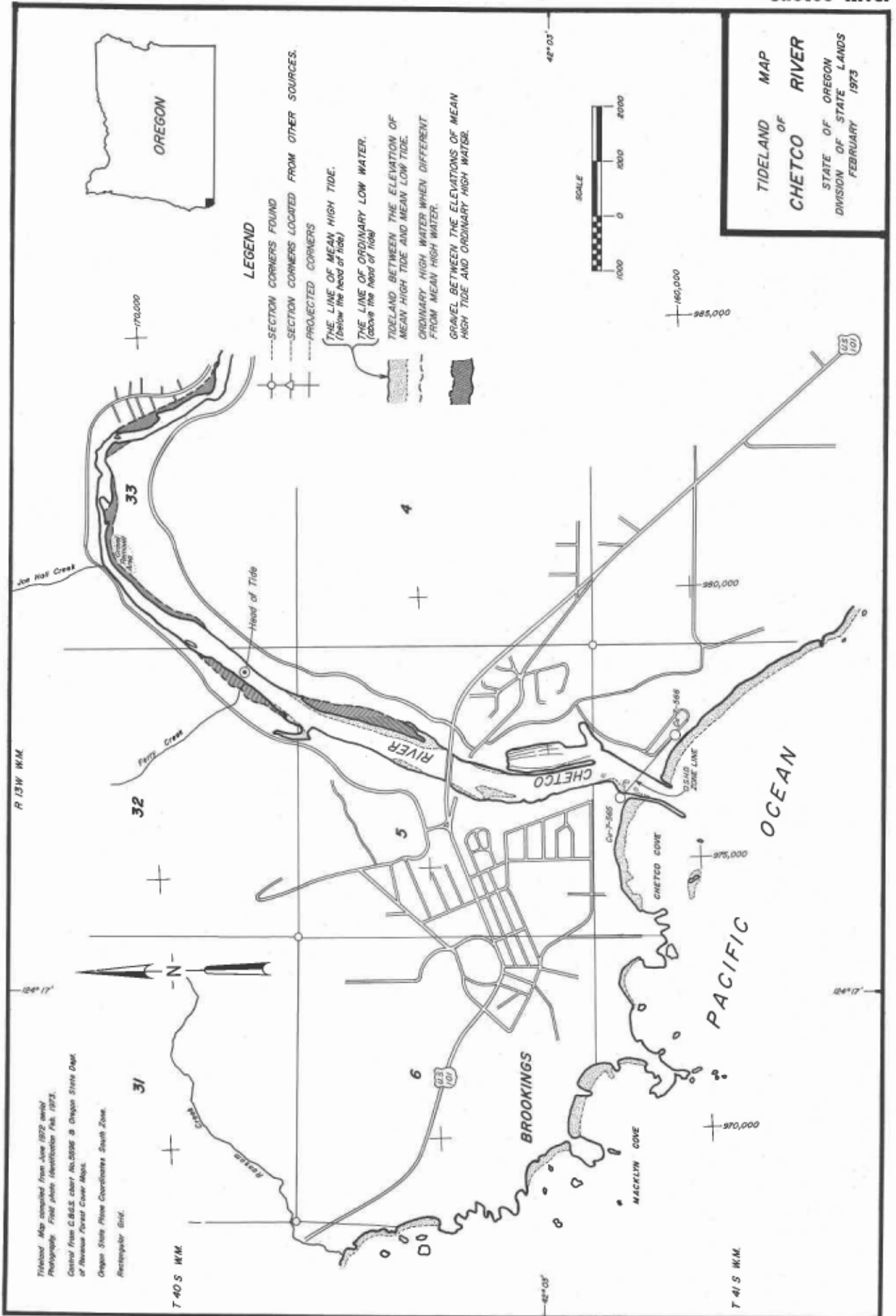


May 1972

Oregon State Highway Division

The towns of Brookings and Harbor are home port to a large commercial fishing fleet which operates out of the Chetco River entrance. Because the harbor faces south, vessels receive shelter from prevailing northerly wind and swells that develop during the summer months. While other entrance bars along the coast may be too rough to cross, the Chetco entrance usually remains passable. Brookings' proximity to the fishing banks of Saint George Reef is another reason for the existence of the large commercial fleet.

TIDELAND MAP  
OF  
CHETCO RIVER  
STATE OF OREGON  
DIVISION OF STATE LANDS  
FEBRUARY 1973

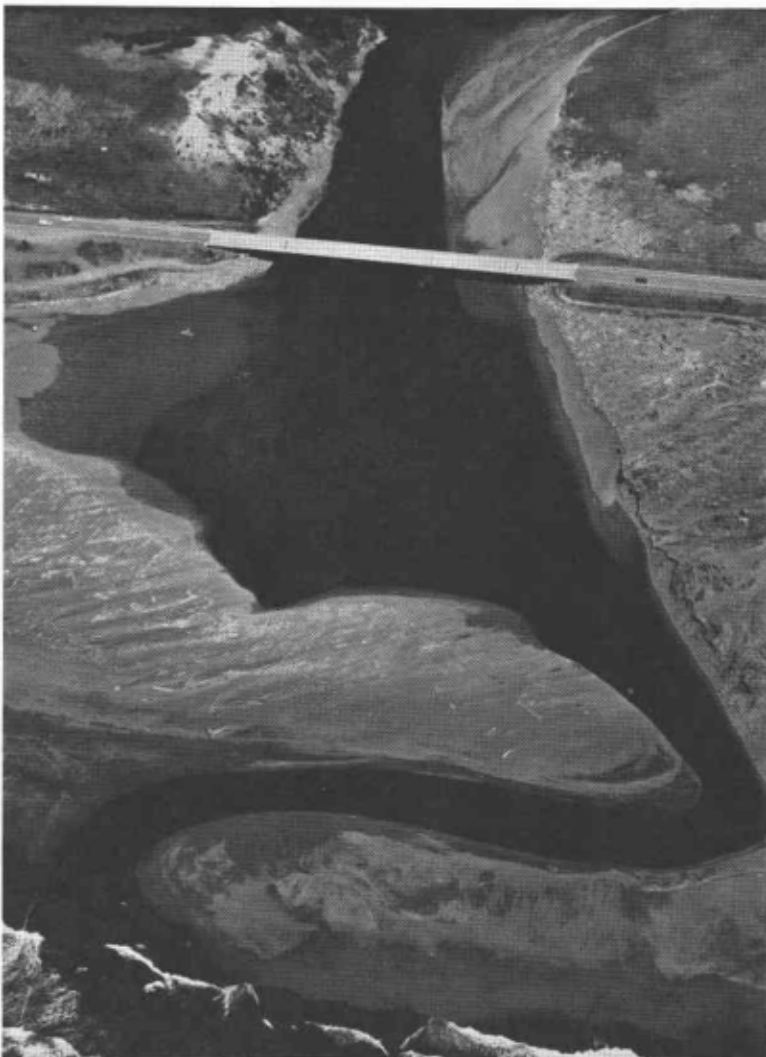


Tideland Map compiled from June 1972 aerial  
Photography. Field photo identification Feb. 1973.  
Control from C.B.G.S. chart No. 2096 & Oregon State Dept.  
of Revenue Forest Cover Maps.  
Oregon State Plane Coordinates South Zone.  
Rectangular Grid.



May 1972

Oregon State Highway Division



May 1972

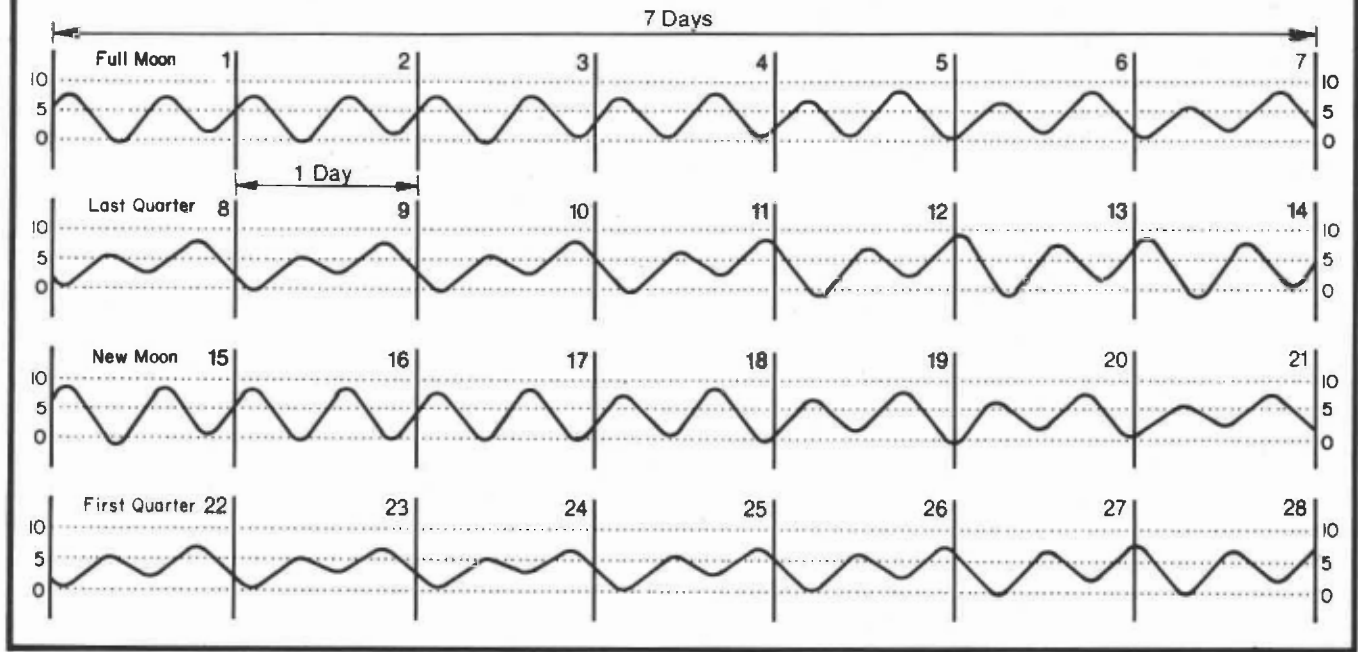
Oregon State Highway Division

The Winchuck River enters the Pacific one mile north of the California line. A sand spit, which is choking the mouth, has been created by breaking ocean waves. The spit represents an equilibrium established between sand transport currents in the surf zone and tidal currents through the entrance. The size and shape of spits change throughout the year as the shaping forces continually change.

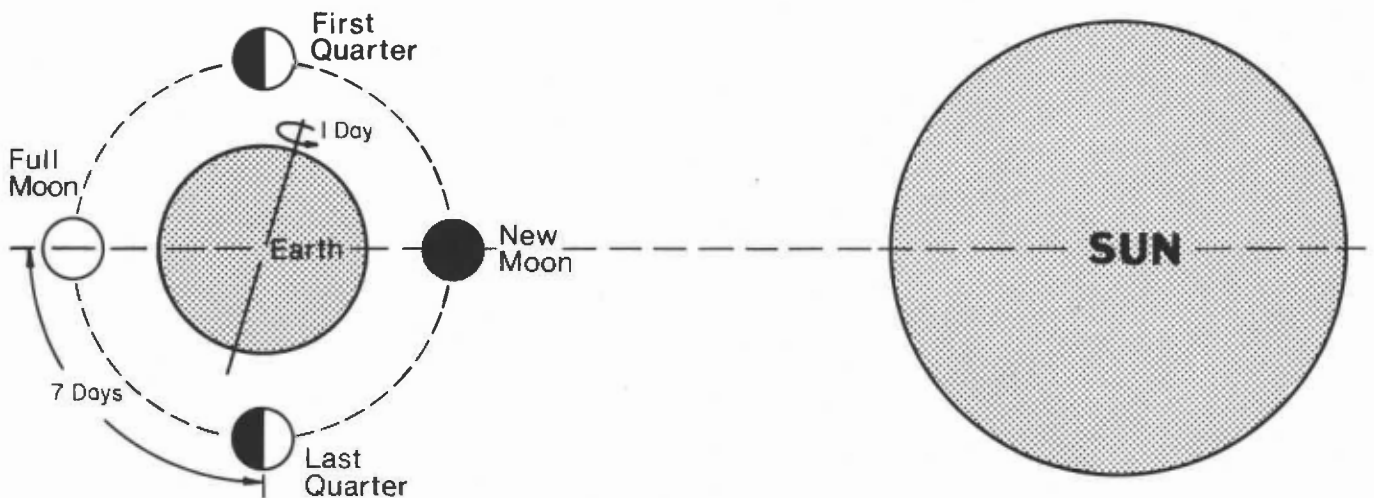
The Pistol River displayed opposing sand spits at the time this aerial photograph was taken. Both could be obliterated by an intense winter storm and replaced with an entirely new configuration. The coarse dark sand characteristic of the southern Oregon beaches is apparent.

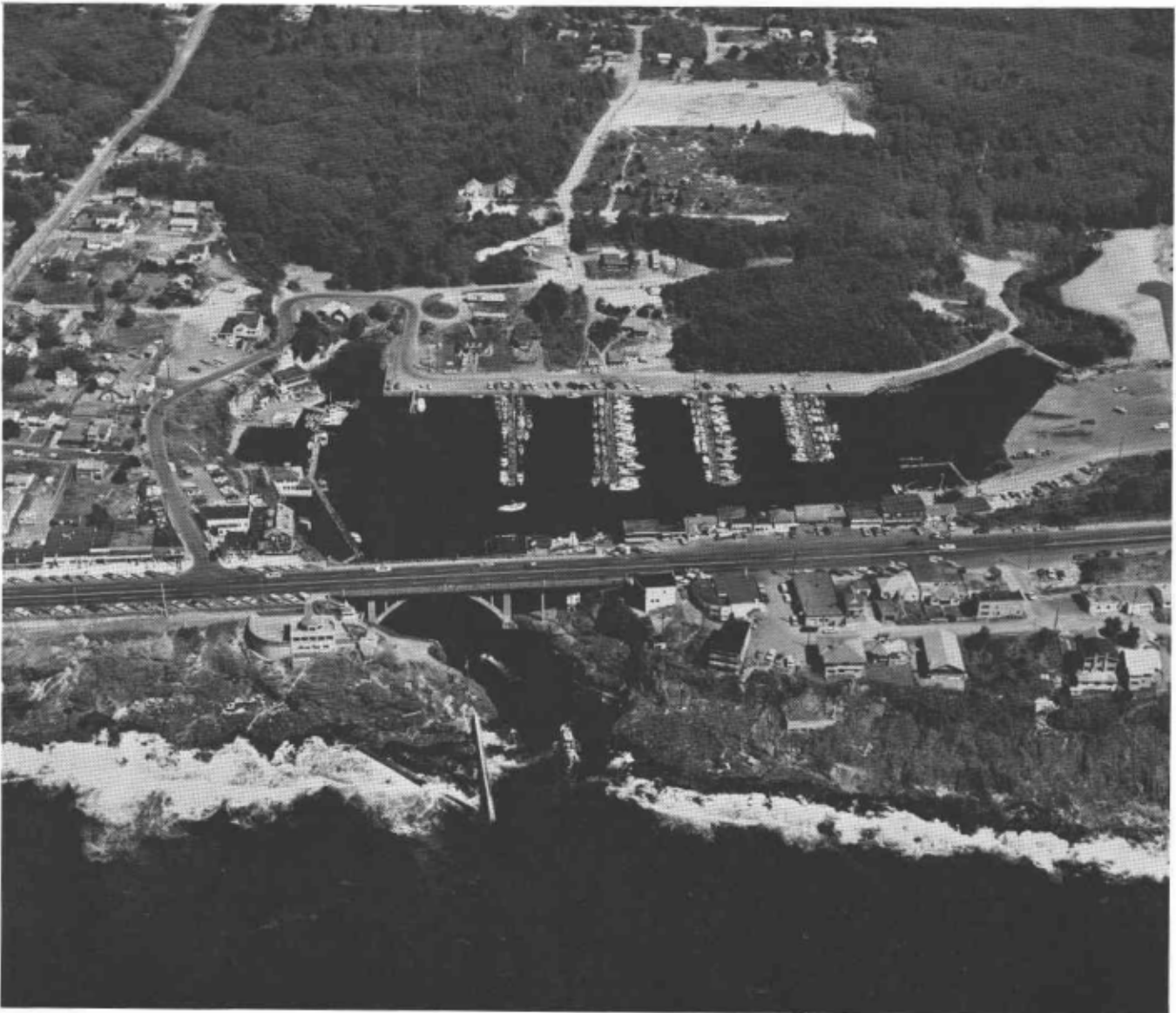


## Tides of The 28 Day Moon Cycle



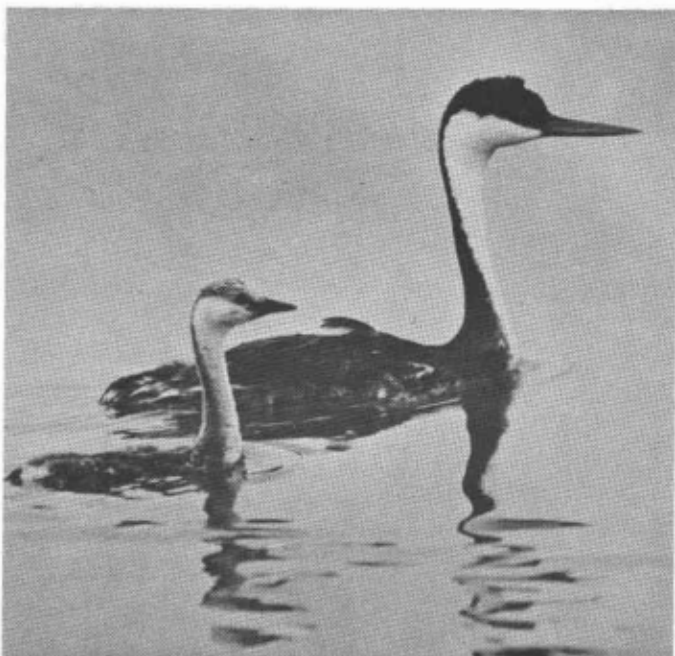
The relationship between tidal signature and moon phase is evident in the 28 days of predicted tides above. Tides are caused by gravitational forces of the moon and sun acting upon a rotating earth. The tide height reached each day depends upon the moon-sun alignment. When the moon and sun are in line, their gravitational forces compliment one another and an increased tide range results. A decreased tide range occurs during the first and last moon quarters when the moon and sun are not in line.





August 1967

Oregon State Highway Division



Bureau of Sport Fisheries and Wildlife

Depoe Bay is an important harbor on the central coast. The term "estuary" defines the unique marine environment created by the mixing of fresh and salt water. Because Depoe Bay does not have an appreciable fresh water influx, the water remains totally saline and the inlet is not considered an estuary.

The Western Grebe is commonly seen diving for fish in Oregon estuaries. The bird is able to adjust its buoyancy to float high in the water or to swim along half submerged.

The Sitka Spruce, also known as Tideland Spruce, grows well in the moist coastal zone. The tree roots are able to endure frequent inundation by overflowing water that Hemlock and Fir can not tolerate.



Division of State Lands

The Columbian Whitetail Deer was once found throughout the Willamette and Umpqua Valleys. Now a fairly stable small herd exists near Roseburg and a diminishing herd along the lower Columbia River. The valley floors where these animals once lived have been taken over by agricultural crops and other noncompatible land uses.



Bureau of Sport Fisheries and Wildlife, D. B. Marshall

LIBRARY / EPA  
National Environmental Research Center  
200 S. W. 33rd Street  
Corvallis, Oregon 97330

**THE BACK COVER TOP TO BOTTOM:**

The Western Sandpiper feeds on small marine creatures that grow on the tide flats (Oregon State Game Commission).

A Blue Heron is frequently seen in shallow water searching for small fish (Oregon State Game Commission).

The Western Gull is the most common bird seen on the coast. (BSF&W – D. B. Marshall).

