



Project Summary

Distribution and Abundance of Waterfowl and Submerged Aquatic Vegetation in Chesapeake Bay

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Waterfowl populations in Maryland and Virginia portions of Chesapeake Bay were examined during long-term (1890-1970) and current (1972-1980) periods to identify trends in their distribution and abundance. Comparisons were also made between State and Atlantic Flyway populations and waterfowl species distributions among survey areas. Distribution and abundance of submerged aquatic vegetation (SAV) among waterfowl survey areas in Maryland were summarized for seven plant species during nine years (1971-1979). These data (SAV species combined) were used to test the hypothesis that annual variation in area populations of waterfowl was related to variation in the abundance of SAV, following an adjustment for annual variation in the general abundance of waterfowl. The distribution and abundance of SAV species declined in Maryland waters during the 1970s. There were few statistically significant relationships between distribution and abundance of waterfowl and SAV. But there was an implied biological relationship, since the most important waterfowl wintering areas were also among the most abundantly vegetated areas. This report was submitted in partial fulfillment of Interagency Agreement No. EPA-78-D-X0391 by the U.S. Fish and Wildlife Service, Migratory Bird

and Habitat Research Laboratory under the sponsorship of the Chesapeake Bay Program, U.S. Environmental Protection Agency.

This Project Summary was developed by EPA's Chesapeake Bay Program, Annapolis, MD, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

The Chesapeake Bay is the most important wintering area in the Atlantic Flyway for more than 1.5 million waterfowl, including Canada geese (*Branta canadensis*), whistling swans (*Cygnus columbianus columbianus*), canvasbacks (*Aythya valisineria*), ruddy ducks (*Oxyura jamaicensis*), common goldeneyes (*Bucephala clangula americana*), redheads (*Aythya americana*), black ducks (*Anas rubripes*), and mallards (*Anas platyrhynchos*). The estuary also serves as a resting area for birds that migrate farther south. Of the 45 species native to North America, 30 migrate through or winter in Chesapeake Bay.

Large beds of submerged aquatic vegetation (SAV), especially widgeon-grass (*Ruppia maritima*), wild celery (*Vallisneria americana*), and sago pondweed (*Potamogeton pectinatus*), have

traditionally been important to the Bay's population of waterfowl. The decline of the grasses, a major source of food for the birds, prompted this examination of historic and current relationships between waterfowl and SAV.

Procedure/Methodology

The U.S. Fish and Wildlife Service (USFWS) conducts annual population surveys of Chesapeake Bay waterfowl. Although information may be affected by weather conditions, birds not found, and birds found but not counted, these surveys constitute the only long-term source of information on waterfowl distribution and abundance. These surveys were analyzed so that population comparisons between pre-1970 (long-term) and 1972-1980 (current) periods could be made. United States populations were used as baseline measures to indicate species trends. Species had to compose at least five percent of the Atlantic Flyway population to be considered in this study.

Waterfowl feeding habits were tabulated according to species, time period (pre-1960, 1960s, and 1970s), and organ source (gizzard, gullet, or unknown). (See Table 1.) This information, collected by Stewart¹ during the 1950s, Rawls² during the 1960s, and supplemented with current data, provided the information necessary to examine relationships between waterfowl and SAV as a food source.

Distribution and abundance records of SAV taken from results of summer surveys conducted by the USFWS and Maryland Wildlife Administration during 1971-1979 were studied to determine the trends of SAV populations. Linear regression and analysis of variance techniques were used to examine relationships between waterfowl and SAV.

Results/Conclusions

Reductions in SAV populations affected the distribution and abundance of waterfowl species that were historically dependent on SAV and could not adapt to the changes. Some species left the area while others changed their feeding habits.

The SAV population as a whole declined dramatically in the 1970s. Vegetated sample stations in Maryland waters declined from approximately 29 percent during 1971 to 8 to 15 percent since 1973. Important waterfowl food plants which were abundant during the late 1960s became less prevalent in the Bay by 1973. Examples include widgeon-

Table 1. Summary of the Incidence of Plant Material in the Diet of Waterfowl that Winter in Chesapeake Bay

Species	Percent plant material, and sample size () ^a		
	Pre-1960	1960s ^b	1970s
<i>Whistling swan</i>	74.7 (50) ^{b-c}	- (-)	- (-)
<i>Canada goose</i>	- (-)	100.0 (221)	- (-)
<i>Ruddy duck</i>	65.2 (25)	- (-)	- (-)
<i>Bufflehead</i>	24.6 (20) ^{b-c}	32.6 (27)	20.8 (30)
<i>Common goldeneye</i>	53.1 (14)	36.9 (45)	25.1 (21)
<i>Canvasback</i>	71.3 (47)	52.3 (246)	8.6 (273)
<i>Greater scaup</i>	40.4 (36)	37.2 (9)	32.8 (40)
<i>Lesser scaup</i>	51.4 (29)	56.7 (82)	57.9 (76)
<i>Ring-necked duck</i>	65.4 (17)	94.0 (10)	- (-)
<i>Redhead</i>	99.0 (86) ^{b-c}	76.6 (77)	96.6 (7)
<i>American Widgeon</i>	97.1 (35)	97.7 (121)	- (-)
<i>Blue-winged teal</i>	90.7 (21)	- (-)	- (-)
<i>Green-winged teal</i>	84.9 (10)	100.0 (13)	91.3 (29)
<i>Black duck</i>	74.1 (55)	93.5 (131)	82.6 (57)
<i>Gadwall</i>	99.0 (21)	- (-)	- (-)
<i>Mallard</i>	98.9 (25)	94.5 (134)	92.7 (84)
<i>Pintail</i>	97.5 (36) ^{b-c}	96.4 (47)	95.2 (27)

^aUnless otherwise noted, aggregate percentages are from gizzard samples.

^bTaken from Rawls, C. K. (in prep.). *Food habits of waterfowl in the upper Chesapeake Bay, Maryland.* University of Maryland Center for Environmental and Estuarine Studies. 140 pp.

^cAggregate percentages are from samples for which organs were not recorded.

grass, sago pondweed, horned pondweed and wild celery.

Table 2 illustrates trends in Bay grass populations, among waterfowl survey areas, for nine years. Over 600 sampling stations of shoal water habitats were established to monitor these trends. By 1979 each of the 20 areas had depleted supplies of SAV. The Lower Choptank River, for example, had 25.5 percent of its stations vegetated in 1971. By 1979, however, this total fell to 12.8 percent. Eastern Bay, another important wintering area for waterfowl, fell from 21.4 percent in 1971 to 11.1 percent in 1979.

Widgeongrass, the most important food item of widgeon and black ducks, was the most abundant and widely distributed species in each of nine annual surveys. Low populations of widgeon, pintails, and redheads, which were predominantly vegetarian in nature, were correlated with the overall decline of SAV.

Diving ducks, including canvasbacks and redheads, were most affected by the SAV decline. Diving ducks have small wings and legs set back on their bodies making walking difficult. They need water to run across prior to flight and are thus unable to feed in dense marshes or agricultural fields. Redhead populations, which subsist on SAV, declined in numbers. Apparently they could not change their diets and exist in

an area with reduced SAV populations. Canvasbacks, on the other hand, incorporated Baltic clams (*Macoma* spp) and other invertebrates into their diets, and therefore remain as important members of the wintering waterfowl population of the Bay.

Puddle ducks, which feed by dabbling at the water's surface, were historically more dependent on vegetation. Puddle duck populations, as a group, are presently at one third their former level. Pintail and widgeon populations are now nearly absent from Maryland wintering areas. Other puddle ducks, such as black ducks and mallards, have also decreased.

Whistling swans survived the decline of SAV by foraging on the land. This species now depends more on the availability of unharvested cereal grains from agricultural fields than on SAV. The population of Canada geese continued a long-term increase in numbers during the 1970s. Like swans, Canada geese rely on cereal grains from fields around the Bay.

Recommendations

The declining numbers of waterfowl that winter in the Chesapeake Bay are cause for concern. Biological links exist between abundance of grasses and certain waterfowl populations in the Bay.

Table 2. Frequency Occurrence of Measurable SAV (Species Combined) in Maryland Waterfowl Survey Areas During the Years 1971-79

Survey area ^b	Percent with Vegetation, and Sample Size ^a								
	1971	1972	1973	1974	1975	1976	1977	1978	1979
Lower Choptank River	25.5 (51)	20.8 (48)	14.9 (47)	14.3 (49)	0.0 (47)	21.7 (46)	8.2 (49)	6.1 (49)	12.8 (47)
Manokin, Annemessex R.	33.3 (57)	12.7 (55)	10.7 (56)	17.6 (34)	5.8 (52)	14.0 (57)	12.5 (56)	0.0 (55)	0.0 (66)
Chester River	41.7 (36)	13.9 (36)	14.7 (34)	11.8 (34)	11.1 (36)	8.6 (35)	16.7 (36)	30.6 (36)	22.2 (36)
Eastern Bay	21.4 (28)	20.8 (24)	14.3 (28)	10.7 (28)	14.8 (27)	18.5 (27)	14.8 (27)	11.1 (27)	11.1 (27)
Smith Island (Maryland)	47.1 (17)	27.3 (11)	25.0 (12)	23.5 (17)	11.8 (17)	17.6 (17)	0.0 (17)	5.9 (17)	5.9 (17)
Bloodsworth, South									
Marsh Island	27.5 (40)	13.6 (44)	8.7 (46)	7.0 (43)	0.0 (43)	0.0 (45)	0.0 (46)	0.0 (46)	0.0 (45)
Patapsco R., Aberdeen P.G.	1.9 (52)	0.0 (50)	2.0 (50)	3.8 (52)	4.5 (22)	1.9 (52)	7.7 (52)	3.8 (52)	5.8 (52)
Honga River	30.0 (30)	23.3 (30)	3.3 (30)	3.3 (30)	3.4 (29)	3.4 (29)	0.0 (30)	3.3 (30)	0.0 (30)
Bayshore, Hooper Island	39.1 (23)	17.4 (23)	4.3 (23)	8.7 (23)	4.3 (23)	4.3 (23)	4.3 (23)	0.0 (23)	0.0 (23)
Magothy - Severn Rivers	33.3 (27)	7.4 (27)	14.8 (27)	14.8 (27)	(0)	0.0 (25)	7.4 (27)	11.1 (27)	14.8 (27)
Susquehanna Flats	36.4 (22)	0.0 (30)	0.0 (30)	6.7 (30)	6.7 (30)	0.0 (29)	0.0 (30)	0.0 (29)	6.9 (29)
Miles River	12.5 (8)	37.5 (8)	12.5 (8)	12.5 (8)	25.0 (8)	28.6 (7)	25.0 (8)	12.5 (8)	0.0 (8)
Wye River	9.1 (11)	36.4 (11)	18.2 (11)	36.4 (11)	9.1 (11)	18.2 (11)	9.1 (11)	9.1 (11)	9.1 (11)
Little Choptank River	10.0 (30)	3.3 (30)	0.0 (30)	0.0 (30)	0.0 (30)	0.0 (30)	3.3 (30)	3.3 (30)	0.0 (30)
Upper Choptank River	11.1 (9)	20.0 (10)	0.0 (10)	0.0 (9)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)
Fishing Bay	7.9 (25)	0.0 (25)	0.0 (25)	0.0 (25)	0.0 (24)	0.0 (25)	0.0 (25)	0.0 (25)	0.0 (24)
Sassafras River	20.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)	0.0 (10)
Northeast, Elk,									
Bohemia R.	5.0 (20)	0.0 (23)	0.0 (23)	0.0 (23)	0.0 (22)	0.0 (22)	0.0 (23)	0.0 (22)	0.0 (23)
Bayshore, Kent County	8.3 (12)	0.0 (6)	0.0 (12)	0.0 (12)	0.0 (12)	0.0 (12)	0.0 (12)	0.0 (12)	0.0 (12)
Patuxent River	0.0 (50)	0.0 (45)	0.0 (50)	2.0 (50)	0.0 (47)	0.0 (49)	0.0 (49)	0.0 (50)	0.0 (48)
Total	19.2 (624)	9.6 (613)	6.2 (629)	7.2 (610)	3.8 (552)	5.7 (628)	5.0 (638)	4.2 (636)	4.4 (631)

^aData from the files of PWRC, Laurel, Maryland.

^bFrequency occurrence of SAV averaged over years, when multiplied by the extent of shoal habitat (<2.44 m at mlw) in an area, determined the sequence of survey areas used above.

Decreases in distribution and abundance of SAV directly affect certain species of waterfowl. Recovery of SAV resources will encourage the return of SAV-dependent waterfowl that annually migrate through the area. Scientists should continue to study factors leading to the declension of SAV and how such changes affect other aspects of the Bay ecosystem.

References

1. Stewart, R.E. 1962. Waterfowl Populations in the Upper Chesapeake Bay. U.S. Fish and Wildlife Service. Special Science Report. Wildlife No. 65. 208 pp.
2. Rawls, C.K. In prep. Food Habits of Waterfowl in Upper Chesapeake Bay Basin. University of Maryland Center for Environmental and Estuarine Studies. 140 pp.

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The complete report, entitled "Distribution and Abundance of Waterfowl and Submerged Aquatic Vegetation in Chesapeake Bay," (Order No. PB 82-266 156; Cost: \$16.50, subject to change) will be available only from:

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