Chesapeake Update

Ecological Forecast

~ Aquatic grass in 2005 ~

Issue 3
May 05

Ecological forecast produced by the Monitoring and Analysis Subcommittee (MASC).
MASC coordinates and supports the monitoring activities of the Chesapeake Bay Program .

This newsletter summarizes the main findings of an ecological forecast aimed at predicting changes in aquatic grass area within Chesapeake Bay for the current growing season. This forecast is part of a new initiative of the Chesapeake Bay Program to forecast a range of ecological conditions for the coming summer. In addition to the aquatic grass forecast, a forecast of dissolved oxygen in the Bay's mainstem and harmful algal blooms in the Potomac River was produced this year (see *Chesapeake Update* -- Issue 2). Additional components of the Bay's ecosystem, such as fish abundance, will be forecast in coming years.

Aquatic grass area expected to increase this season

The Chesapeake Bay Program forecasts an overall increase in aquatic grass area within Chesapeake Bay during the 2005 growing season. While the overall forecast is for increased area, the forecast varies across each of the main aquatic grass community types or regions within the Bay (Figure 1).

Aquatic grasses in Chesapeake Bay can be categorized into three main community types based on the salinity tolerance of the species present – high, medium, and low salinity tolerance. The low salinity community is forecast to have the largest increase in area this growing season. This increase is largely attributable to continued expansion of aquatic grass beds on the Susquehanna Flats, which represent the largest single area of the low salinity community type. The high salinity communities are also expected to increase in area this growing season, as they start recovering from losses caused by Hurricane Isabel in 2003. Increased distribution of the high salinity community type is, however, not expected to be as extensive as that predicted for the low salinity community type, largely due to the slower reproductive potential of the species present in this community type. The medium salinity community type is expected to remain unchanged in area this growing season. It is important to note that these forecasts are for broad community types and regions of the Bay and as such, specific locations may experience changes in area that do not follow the forecast.

The forecast is based on expert interpretation and analysis of past aquatic grass distribution, spring water conditions (temperature, salinity and clarity), and previously established relationships between water clarity and aquatic grass survival. The forecast does not account for unexpected summer conditions, such as that caused by hurricanes or extreme drought. Like any forecast, the aquatic grass forecast is not a guarantee of what will occur, but rather it offers scientifically sound estimations of what is likely to occur.

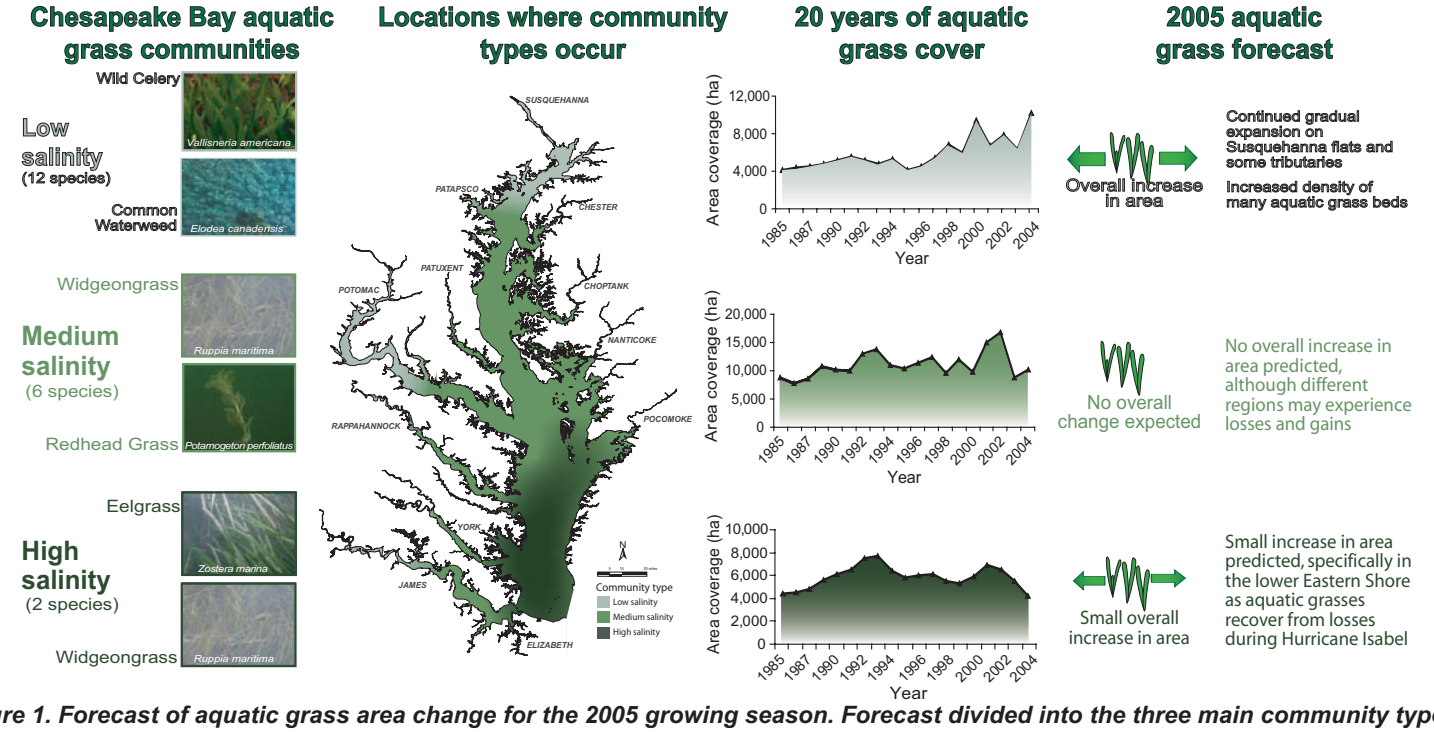

Figure 1. Forecast of aquatic grass area change for the 2005 growing season. Forecast divided into the three main community types in Chesapeake Bay and compared to past 20 years of aquatic grass survey data.

Keeping Track

To help track changes in aquatic grass area over the growing season, the Chesapeake Bay Program will be reporting important field observations made by scientists and restoration experts who are working in the Bay. This information will be posted on the Ecological Forecasting web page - *www.chesapeakebay.net/bayforecast.htm*

River discharge and loads affect community type

Distribution and survival of aquatic grasses in Chesapeake Bay is largely controlled by freshwater discharge and associated loads of nutrients and sediments (Figure 2). Periods of high river discharge tends to favor expansion of the low salinity community type as the area of the Bay with suitable salinity increases. As many low salinity species have growth forms that enable them to grow close to the water surface, where light levels are higher, they are also able to persist during poor water quality conditions associated with the high discharge rates. In contrast, the medium and low salinity community groups tend to decrease during high discharge and load periods as salinity levels are too low and water clarity reduces the availability of light for growth and survival.

During low discharge and load periods the distribution of low salinity community groups decreases as the area of the Bay with favorable salinity levels diminishes. In contrast, these conditions favor growth and expansion of the medium and high salinity community groups as a greater area of the Bay has favorable salinity and water quality.

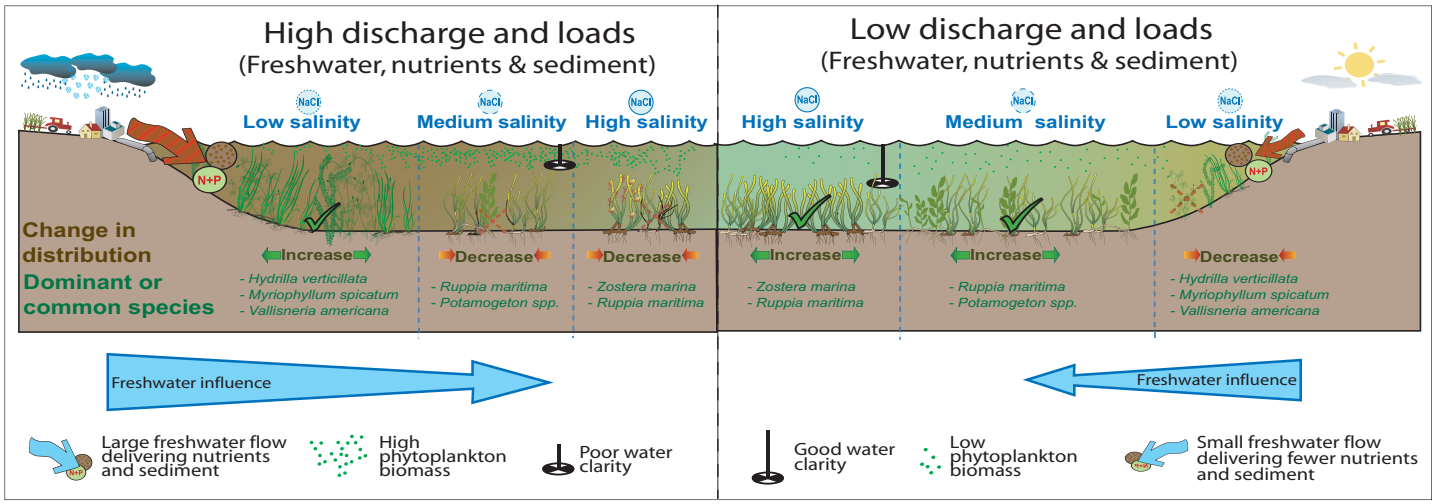

Figure 2. Conceptual diagram illustrating the main factors controlling distribution of aquatic grass community types in Chesapeake Bay.

Forecasting changes in aquatic grass area

This year's forecast is based on expert interpretation and analysis of the primary factors influencing aquatic grass distribution and survival (Figure 3). The forecast was also aided by recent field observations made by members of the forecast team. The main data used in the forecast were past aquatic grass distribution and spring water column conditions (temperature, salinity and clarity). These were interpreted with the aid of previously established relationships between water clarity and aquatic grass survival (Kemp et. al., 2004; Carter, et al., 1994). As the current forecast methods are relatively interpretive, and factors affecting the distribution of aquatic grass meadows are complex and often poorly understood, this year's forecast is; (a) very general in nature, only stating whether there is likely to be an increase, decrease or no change in area and; (b) only provided for the major community types -- high, medium, and low salinity communities. It is the aim of this project to improve the forecasting methods in the following years so that increased certainty and geographic detail can be provided. It is important to note that the forecast only accounts for the influence of spring conditions and past distribution, it does not account for the effects of unusual water quality events during the summer such as Cyanobacteria blooms, hurricanes or above average precipitation.

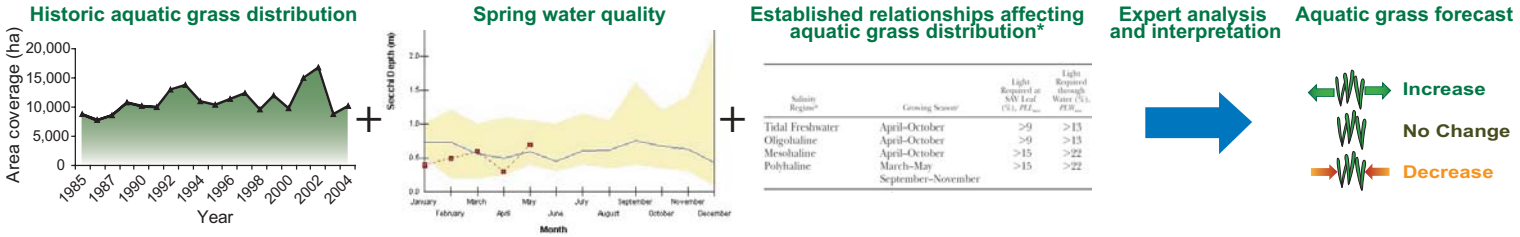

Figure 3. Flow diagram illustrating the data and process used to generate this year's aquatic grass forecast (* table from Kemp et al., 2004)

The aquatic grass forecast was directed by the Chesapeake Bay Program's **Tidal Monitoring and Analysis Workgroup** (TMAW). Forecast analysis and interpretation provided by Robert Orth, Bill Dennison, Peter Bergstrom, Michael Naylor, Michael Williams and Ben Longstaff.

Chesapeake Bay Program
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Carter, V., N.B Rybicki, J.M. Landwehr, and M. Turtora (1994) Role of Weather and Water Quality in Population Dynamics of Submersed Macrophytes in the Tidal Potomac River. *Estuaries.*17(2):417-426

Further information:

Ecological forecast information at the Chesapeake Bay Program Website: *www.chesapeakebay.net/bayforecast.htm*

Aquatic grass information can be found at Virginia Institute of Marine Science website*: www.vims.edu/bio/sav/*

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