**From Activity A**

* Regardless of year and season, surface DO is always higher than bottom DO
* Every year highest DO measurements for both surface and bottom occurred during the winter
* Every year on the bottom an anoxic event and stays at hypoxic or anoxic concentration typically at least June thru August
* Every year in surface waters, lowest values occur at about the same time as anoxic events though levels fluctuate more most years
* Hypoxia occurs at least one per year, usually in summer, and always at the bottom
* The low DO events on the bottom from at least June to August at least each year are low enough to cause “all macrofauna to die”
* the DO fluctuations in the bottom water cannot be explained by T & S alone.

**From Activity B**

* Density in bottom waters is always higher than density at the surface.
* Surface density tends to be higher in the fall and winter, and lower in the spring, although this pattern is not always evident every year
* With high density differences, the water column is most density stratified and toughest to mix. With low density differences, the water column is least stratified and easiest to mix. Our data shows that late spring and summer times are most stratified (largest differences) and fall and winter times are least stratified (smallest density differences).
* There are numerous instances where the greatest stratification occurs when lowest DO concentrations occur in both the surface and bottom waters. And high to highest DO concentrations occur when density stratification was the weakest.
* Need Evidence of: primary production for high DO concentrations, and decomposition and/or respiration for low DO measurements; changes in nutrients from anthropogenic sources
* Need data on nutrients; indicators for photosynthesis activity, indicators for decomposition



**When is the water column mixed?**

In the fall and winter, the water column is mixed (low density difference) due to similar temperature and salinity throughout the water column.

**What are the sources of oxygen?**

**Which allows oxygen to go into bottom waters – well mixed or stratified?**

This allows mixing of oxygen from surface waters (from atmosphere and, later, phytoplankton photosynthesis) into the deep waters.

**What impact does increasing surface NO3 have throughout winter and spring?**

The increase in surface NO3 throughout the winter and especially into spring (due to river runoff, which is the main source of NO3 to the Chesapeake Bay) can cause spring blooms of phytoplankton (seen in some years in chlorophyll data).

**What impact does NO3 and sunlight have on phytoplankton?**

 growth from the nutrients and increased sunlight in late spring adds oxygen and can be mixed to deeper waters when the water column is poorly stratified (the bottom waters are below the photic zone thus photosynthesis in bottom waters is not possible).

What impact do phytoplankton have n NO3?

These phytoplankton use up the NO3 (surface NO3 drops quickly in the spring of most years), then die and sink into deeper waters as dead organic matter

Which other data set shows this impact?

as seen in the bottom Pheo and POC data, which showed peaks also in the spring before anoxia sets in).

When does peak bottom Pheo and POC occur?

This happens right around the time that the water column begins to stratify due to an increase of freshwater runoff in the spring, which leads to a lower salinity in surface waters and increases the density difference between surface and bottom.

What happens to the concentration of POC in bottom waters?

The higher concentrations of organic matter in the bottom waters are decomposed, reducing both the amount of organic matter present (as it is turned into dissolved organic and inorganic molecules through the processes of decomposition and respiration) and the DO concentrations (respiration uses O2).

What happens to bottom water DO once water becomes stratified?

Because the water column is now more stratified, no new DO is mixed down into the bottom waters to replenish what’s lost through respiration and decomposition. At the surface, phytoplankton growth continues in some years; however, the DO produced at the surface is prevented from reaching the bottom waters because of stratification (however, dead organic matter can still sink and reach the bottom waters, resulting in some influx of bottom Pheo and POC during the summer of some years).

When does stratification begin to break down?

The stratification begins to break down in late summer/early fall, as surface salinity begins to increase and winds become stronger, leading to a rapid increase of DO as surface waters mix with deeper waters.