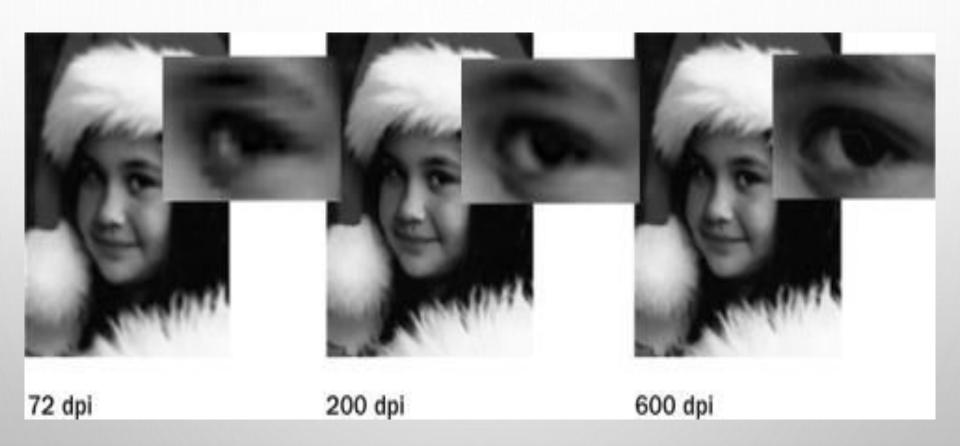
DEALING WITH DATA

ALL ABOUT THE DATA...

WHICH PHONE DATA PLAN DO YOU PREFER— 1 GIGABYTE OR 8 GIGABYTES?

HOW DO YOU KNOW WHEN YOU HAVE ENOUGH DATA?"



DATA DEFINED

- WHAT ARE DATA?
- WHY IS THE AMOUNT OF DATA IMPORTANT?
- THINK OF ONE OR MORE EVERYDAY CIRCUMSTANCES IN WHICH INCREASING AMOUNTS OF DATA HELP YOU UNDERSTAND SOMETHING BETTER. DESCRIBE THESE CIRCUMSTANCES.

DATA IS EVERYWHERE

CAN YOU PROVIDE AN EXAMPLE OF TWO THINGS THAT MIGHT BE RELATED TO ONE ANOTHER IN EVERYDAY LIFE AND THE INFLUENCE THEY HAVE ON EACH OTHER?

HOW MANY TEXT MESSAGES DO YOU SEND EACH DAY?

HOW FAST DOES YOUR PHONE BATTERY LIFE DECREASE AS A RESULT OF THE NUMBER OF MESSAGES?

USES OF BIG DATA

• GENERATE A LIST OF WAYS IN WHICH BIG DATA MIGHT BE HELPFUL FOR SCIENTISTS OR ENGINEERS.

 HOW MIGHT SCIENTISTS OR ENGINEERS COLLECT THIS KIND OF DATA?

CYBER ATTACKS

By 2025, cyber crime is expected to cost the global economy \$10.5T a year. That's almost \$20M every minute.

Here's a look at the countries with the highest amount of significant cyber attacks since 2006.

(i) "Significant" cyber attacks mean hacks into a country's government agencies, defense and high-tech companies, or crimes with losses of more than \$1M.



In May 2020, the NSA discovered that Russian hackers were stealing sensitive data from American organizations, through a bug in a popular email server.

In December 2020, one of the biggest media organizations in Germany, the Funke Media Group, fell victim to a ransomware attack. Roughly 6,000 computers were infected, which halted work at the company's editorial offices, as well as some of its major printing houses.

In June 2020, malware was used to commit cyber attacks against 9 Indian human rights activists. Their keystrokes were logged, audio was recorded, and their personal credentials were stolen.

Australia 16

Source: Specops Software





FROM EXPERIMENTATION

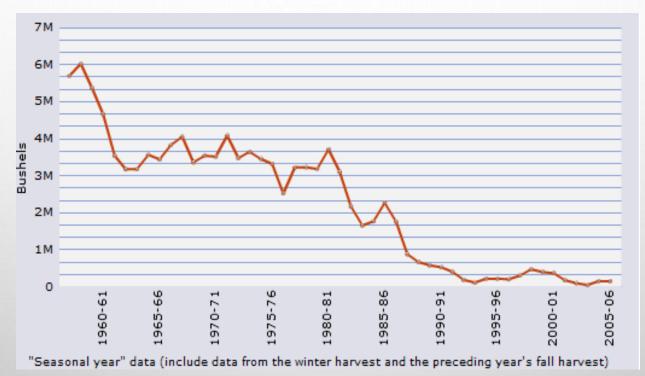
PRESSURE / TEMPERATURE CHART

| The last | | 817 | | RT164 | | SP14E | | 184 | N22 | | 54 15A | | BITTER | | Rel | ar. | 17 ma | ** | | NA. | No. | 114 | # NOT | | |
|----------|-------|---------|----------------|----------|----------|-------|--------|---------|---------|-------|---------|---------|--------|----------|--------|-------|-------|--------------|---------|--------|-------|--|---------|---------|--|
| 1 | ** | _ | Maria Maria | 200 | _ | h | - | i. | Mrs. | | srin. | - | - | | W. | - | 10'1 | - | Ma | - | _ | | M/m | 'n | |
| 114 | | 949 | _ | _ | | 100 | | and the | | - | | me) | - | 100 | - | FF5. | - | pro. | | 246 | | ALC: U | | | |
| | - | - | - | ** | | | | | 184 | | 441 | 81 | | | - | | - 100 | = | - | = | | | 411 | = | |
| | - | = | - | - | | | | | | - | 10.7 | 200 | | | | | - | - | - | 200 | - | | 178 | _ | |
| | | | - | - | | | | | | -11 | | - | 100 | | 100.00 | - | -bri | | - | - | - | - 14 | -61 | = | |
| | | 1000 | - | _ | | | | | -44 | _ | 10.0 | | | | 417 | 70.0 | | 911 | - | -0.0 | - | 200 | - | 24 | |
| | -10 | | - | 8.0 | | | -0 | - | - 24 | 16.6 | 43 | 100 | - | 70 | -61 | - | - | - | - | _ | - | | -01 | - | |
| | -0 | 100 | - | 81 | | | 44 | | | 12. | 28.1 | 44 | ÷ | - 10 | 81 | -71 | - | - | 7 | 20 | - | 14 | - | 94 | |
| | - 41 | - | _ | | | | - | | - | 14 | -562 | 11 | ÷ | 100 | 414 | - | -11 | - | 14 | 11 | - | 11 | - | 10 | |
| | 20.0 | . 44 | -0.0 | 1111 | 810 | THE | 44 | 100 | hall | 44 | 25'0 | 101 | - | 100 | 44 | | wi. | 0.0 | 40 | 81 | ie | 11 | | 14 | |
| | - 11 | - | -00 | - | 01.0 | - | | 15 | - | 8.0 | PHI. | 18.8 | - | 110 | 194 | 18 | 47 | - | - 00 | | 90 | 80 | - | 71.2 | |
| | -1 | - | | - | | _ | - 11 | | in. | | 82 | jas | - | 44 | - | 84 | 87 | 100.0 | - | 104 | 84 | 8.0 | 100 | 24.6 | |
| | - | 100 | - | - | 44 | - | - | - | - | Tie | to. | 181 | - | 100 | - | 116 | 111 | 70.0 | 71 | 19.0 | _ | - | | 100 | |
| | 117 | ** | - | - | 44 | - | 11 | 100 | - | 160 | | 11.0 | 140 | 41 | - | 100 | 107 | - | 100 | 104 | - | - | - | *** | |
| - | - 67 | 34 | 10 | 18 | 6.0 | 19 | | 18 | -100 | 167 | 94 | 10.0 | 79 | 10.4 | - | 71.0 | 140 | DOM: | -64 | - | 100 | - | r/bs. | 647 | |
| | :00 | 331 | - 10- | 29 | P-1 | | 19 | 10 | 18 | 161 | EV. | 80 | 40 | DIA. | 90 | 100 | 188 | Dist. | TW | 100 | 10m | 10.0 | 190 | 178 | |
| | -0.0 | 2.2 | 31 | NA. | 2.1 | 88 | 200 | 4.2 | 4.1 | 80.7 | 361 | 6.1 | 104 | 700.0 | 110 | - | 140 | 270 | 146 | m+ | 1194 | 20.2 | 214 | 21.0 | |
| | - | 90 | 10: | 44 | 111 | ** | - | 12 | 10 | 200 | 102 | | 148 | - | 128 | - | 116 | NT. | in | 201 | 100 | 25.7 | 200 | 240 | |
| 1 | 19. | 548 | - | 81 | 10.7 | 8.0 | - | 11 | 60 | 98.7 | * bis | 2.0 | 140 | | 144 | | - | - | jest | 30.0 | 118 | 24.0 | ite | 30 | |
| - | - 44 | 198 | 44 | 0.0 | 40.1 | No. | 16 | 0.0 | 84 | 201 | 100 | 100 | 180 | 100 | 146 | 18.5 | 81 | 100 | 180 | East 1 | -000 | 40.1 | - | NE | |
| 100 | 100 | 140 | - | 10.0 | 84.0 | 16.0 | - | 110 | 60 | 24.0 | 400 | 100 | 141 | 200.0 | 100 | 411 | 241 | - | 100 | - | ier | 140 | in a | 883 | |
| | 119 | 100 | - | 16.0 | 400.1 | 1815 | - | 114 | -811 | 18/1 | 473 | 80 | 201 | Int : | 616 | 20.0 | 80. | 10.6 | 108 | - | - | 410 | 900 | me | |
| | 100 | 198 | 715 | 16.5 | 191 | 10.0 | 111 | ART. | 81 | | 411 | 20.0 | 441 | 100 | 4100 | m.t. | 360 | 100 | 100 | 100 | - | (40) | - | 100 | |
| 100 | 100 | 418 | 110 | 10.0 | 1004 | 10.0 | 347 | 154 | -84 | 16.0 | 104 | 8.0 | 254 | - | 400 | 30.0 | 80 | - | - | 20.7 | ma | 811 | 410 | - | |
| 1043 | 14 | 446 | 194 | 31.8 | 162 | 200 | 146 | 214 | 94 | 884 | 401 | 80 | 210 | AND D | 200 | and a | | les. | viete | | and a | 18.5 | 100 | ma | |
| 100 | - | 477 | 222 | 14.0 | interf. | 14.0 | 700 | 110 | 41 | 44.0 | *** | 100 | (trade | 101.6 | 200 | 40.7 | 40 | 894 | 400 | | 110 | - | - | 20.0 | |
| 2.0 | 24 | 84 | 191 | 20.7 | 1904 | STR | 194 | AT. | - Ann | 804 | 447 | 401 | 170 | M2 | 284 | 10.0 | 62 | in t | 401 | 22 | when | 10.1 | 100 | 200 | |
| 1000 | 138 | - | 213 | N.A. | Jiwh. | 361 | 310 | 307 | - | 962 | 190 | | - | 100 | Jan | 18.0 | 80. | 317 | hai | 24 | 467 | The same | la a | MIR | |
| | 240 | MI | 290 | 24.2 | 3274 | 14.0 | 627 | | ris. | 811 | ALC: | 1100 | aris: | lant. | 420 | MIN | 91 | - | 1070 | - | Line. | The L | And. | al s | |
| 200 | 14. | 200 | - | 16.1 | 100.0 | | - | | 81 | 197 | 400 | 1047 | ele. | No. | 411 | 18.7 | 91 | E I | - | 611 | las | 41.0 | 100 | 2010 | |
| | 10 | 4911 | and. | 10 D | (int) | 413 | 279 | - | - | 79.0 | 419 | 100 | 411 | 10.0 | 400 | 71.0 | 44 | 201 | Sec. | (m) | 100 | 47.6 | - | 201 | |
| 100 | 16 | 411 | 217 | F0.0 | mer. | *1.0 | 361 | 184 | 611 | | 860 | 2616 | 100 | Dis. | 104 | 218 | 60 | W (8) | 200 | 200 | 100 | 200 | 746 | -0.0 | |
| 200 | 146 | 54.4 | 341 | 10.0 | land # | 100 | 149 | 879 | - 191 | 801 | Natr | 191.0 | 140 | 794 | 679- | No. | 700 | 1880 | 798 | 100.0 | 100 | 100.0 | 760 | | |
| (244) | 120 | 144 | 421 | 38.8 | irea | 88-6 | 367 | 214 | 44 | Mile | trimb. | THE . | 101 | 88.7 | 600 | 100 | 146 | 1114 | Title . | 1114 | 700 | - | inc | 91.5 | |
| 100 | 100 | 344 | And | BIL | 100.0 | 184 | 1007 | 981 | 21 | - | 7.00 | 7500 | 8100 | The same | 444 | 78.0 | 14 | 1781 | THE | 1994 | 1981 | 1154 | Ref. | 813 | |
| N/M | n(m | 400 | 4.00 | M-17 | 4000 | 46.0 | 414 | 014 | .104 | 1401 | 1,46 | THE R. | 440 | into . | 116 | 99.3 | 140 | 100.0 | 918 | 1981 | int. | 1017 | Abri | 98.5 | |
| E ME | ine | 414 | 410 | | 4194 | Mar. | eta: | 914 | ** | sein. | 110 | 208.7 | 111 | - | 166 | 81.5 | 14 | 1001 | 275 | 1411 | - | total . | FIG | 86.6 | |
| CHE | code | 121 | 200 | De. | 108.0 | 765 | 467 | 20.0 | | 1967 | Here. | = | 184 | 11110 | 414 | 14.6 | 19 | 181.0 | 1607 | 100.4 | 167 | 1283 | test- | 811 | |
| 100 | - 244 | 111 | her | 1 | State. | Sec. | 1004 | 7800 | 91 | INT | - | 2118 | 100 | 100.00 | 111 | 100 | THE | 1000 | 1101 | HERT | 118 | 14774 | 981 | 200 | |
| 100 | 186 | 161 | 963 | ** | time? | 363 | 365 | 111 | 101 | 1418 | 1000 | 100 | - | HE | 881 | 200.0 | 1,000 | 1067 | +467 | 1983 | 119 | 1004 | 210 | 20.0 | |
| D#5 | 440 | MILI | 100 | 000 | ing t | - | 66 | 85.6 | 1000 | 1405 | rear | 2016 | 140 | 101 | 201 | #67 | 103 | 1612 | 1006 | 1946 | 116 | 1000 | áreo - | 811 | |
| 0.00 | 481 | 444 | - | 2.1 | 1004 | 184 | -648 | mia. | - | Time! | 1779 | 2674 | 186 | 146.5 | 1014 | TO R | 1019 | 1767 | 188 | 1807 | 1/19 | 1752 | 1964 | wit a | |
| SHE! | 980 | mi. | 313 | State . | mer | NEX | eart | 100 | PER | teta | 1079 | atria. | nthi | 105 | 7718 | 96.3 | 1,094 | 100.0 | istr | 2004 | 119 | 1004 | wio. | 266.0 | |
| | TVB | - | 791 | 7098 | Trebuit. | TOTAL | 710 | 29.1 | 15/16 | 1966 | 7079 | John b. | 1100 | (981) | 1186 | 20.0 | 1866 | 7964 | 1000 | 2719 | 110 | 1948 | 540 | 4113 | |
| SH: | 100 | 204 | 811 | 1000 | 100.1 | | 791 | 211 | 1,000 | 100.0 | 1990 | | 1,80 | F10.0 | 1,000 | | 14,05 | - | 1340 | 9834 | 13.8 | 1000 | , Proci | 80.4 | |
| DAG | 419 | 1004 | 461 | Table II | 881 | NO. | 98 | 100.0 | 1000 | (41) | ine | AND | 10% | | 1884 | 96.3 | 1666 | 311.4 | 4694 | 256.6 | 110 | 1118 | 1000 | 916 | |
| 20-02 | 968 | 2004 | 914 | 100.1 | 400.0 | 301.0 | mi. | 201.4 | retail. | BHT. | part | 544.6 | 1960 | 3885 | 1811 | | 1016 | ions. | 1711 | 1001 | 118 | 1000 | 811 | (MIX.1) | |
| THE. | 901 | = | 100 | TWO I | - | 100.0 | *** | 199,6 | - | PMT. | 2908 | MALE. | 140 | 201K | 1801 | P6.3 | 1900 | 1000 | 1810 | 9811 | 1100 | 291.0 | perio | #51 | |
| 100 | 187 | 201 | 1120 | 500.0 | PRA. | | *** | 301.0 | 100 | 2001 | olyn. | MILIT | 1004 | ine | 1975 | Ser. | 41907 | 307.91 | 1894 | STAT | 119 | 264.2 | tone | - | |
| DHO. | 1000 | Tellis. | 1160 | 1874 | 190 | 100 | 1081 | 82.4 | 1988 | 3430 | 1676 | 200.0 | 184 | 2112 | 1604 | 912 | 4600 | 301.3 | Tribel | mad. | 116 | pety | 446 | 86.2 | |
| Labor | 1962 | (date) | 110 | 1000 | 6760 | 1984 | 100/00 | 80.0 | 1700 | 2041 | and the | MICK. | 161 | 2616 | chia. | - | 1900 | 3004 | anse | 260.1 | 118 | Det of | 346 | 843 | |
| 100 | 1118 | MEE | 1916 | 194 | 11244 | 1888 | tria | 29.5 | 1991 | pate | madi | 4811 | 184 | wite | 1880 | 441 | 4000 | 2001 | 2104 | 3060 | 808 | 1984 | an | 811.4 | |
| CHIC | 1179 | 1704 | 110 | 100 | **** | 103 | 1940 | 22.0 | 1000 | Jan I | 3100 | 4418 | 180 | 2795 | 1969 | - | 2004 | PORT | ART | 2011 | .618 | 2001 | 281 | 341.7 | |
| - | 1404 | TRA. | 100 | 1984 | Seed. | (100) | 100 | Box 1 | 2525 | SHIP! | 3600 | 200 | 160 | STREET. | 21011 | ALL | 2180 | tela: | ürü. | 1884 | 404 | 3940 | .011 | 817 | |
| 100 | 1000 | 100 | 14/2 | para. | 91124 | 100 | 10/8 | - | imia | - | 1100 | *** | 1464 | 2001 | prist. | 25.0 | 8000 | - | 2504 | 200 | dim | - | 411 | F1.1 | |
| 1 mm | 1360 | 1901 | 108 | 4119 | 881.1 | | twist | PHI | 9444 | See 1 | Item | 994 | 140 | 406 | 4674 | 80.1 | 3400 | 8453 | int | 3414 | 348 | 100.5 | #10 | 364 | |
| - | 1434 | - | 100 | PRI I | 9414 | 200 | 1928 | 201.0 | 2000 | sets. | 8700 | 30(1) | ide | 2004 | 041 | *** | 2000 | men | 4167 | 1013 | - | 677.6 | #10 | 013 | |
| | | - | | | | | | - | | - | | _ | | | 11 | 2000 | | | | | | The State of the S | | | |

fact figures once leffs are make tritipesiats. That figures under get are inches of mercury.

NOTE: Wear aromen't of static precisions may vary eligibily from tabulated figures for any refrigurent bland.

Trends in Oyster Populations in Chesapeake Bay



Graph: US Fish and Wildlife Service; Data source: EPA Chesapeake Bay Program

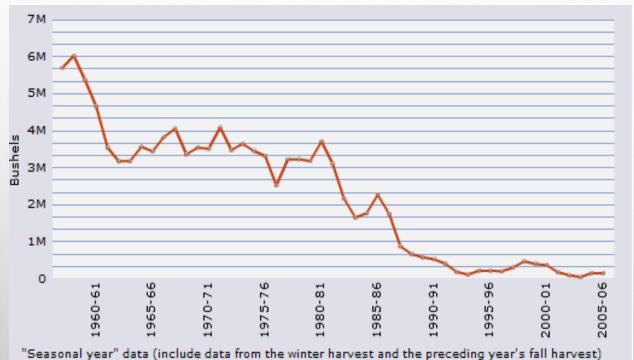
UNDERSTANDING DATA

- LOOK AT VISUALIZING TRENDS AND DIFFERENCES
 - WHAT DO YOU THINK? IS THERE A TREND OR DIFFERENCE?
 - HOW DO YOU KNOW?

INQUIRY VIA SCIENTIFIC QUESTIONS

- WHAT IS THE RELATIONSHIP BETWEEN VARIABLES?
- FOR A GIVEN DEPENDENT VARIABLE, IS THERE A DIFFERENCE BETWEEN TWO GROUPS?

Trends in Oyster Populations in Chesapeake Bay, **BREAKING DOWN THE FACTORS**

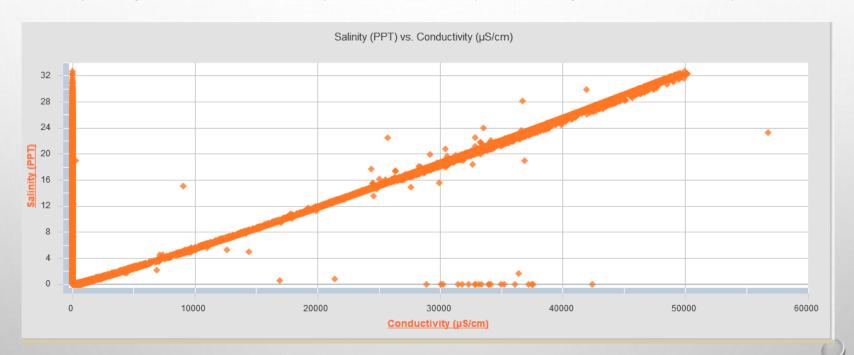


Graph: US Fish and Wildlife Service; Data source: EPA Chesapeake Bay Program



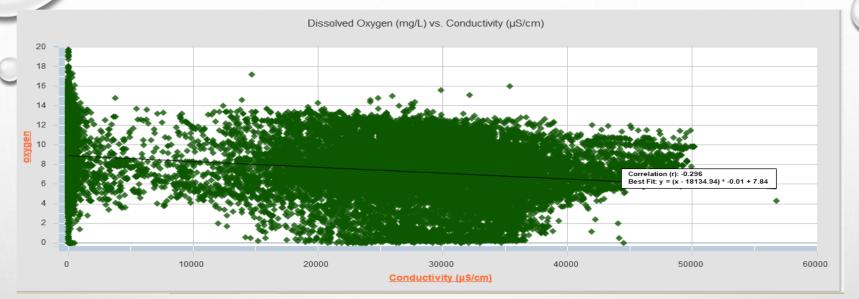
Graph 1: Salinity versus Conductivity

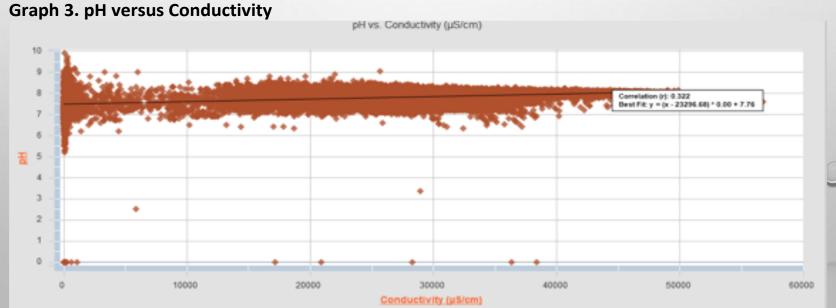
Conductivity measures how easily electricity flows through water. Typical values for conductivity are rain water: 2 to 100 μ S/cm, ground water: 50 to 50,000 μ S/cm, ocean: 50,000 μ S/cm, drainage from landfill: 10,000 μ S/cm.

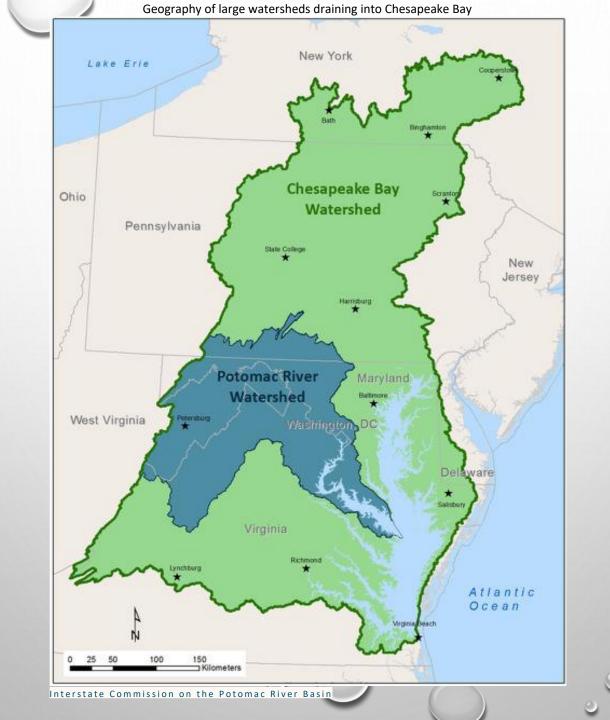


CHESAPEAKE BAY WATER QUALITY DATA

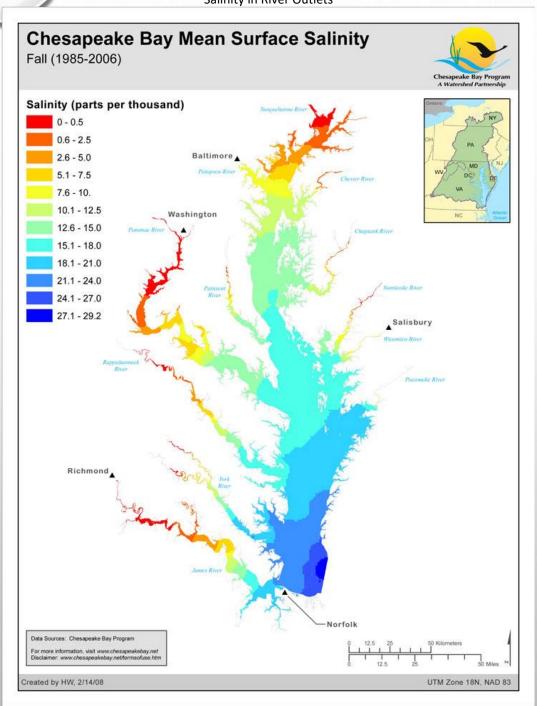
Graph 2. Dissolved Oxygen and Conductivity

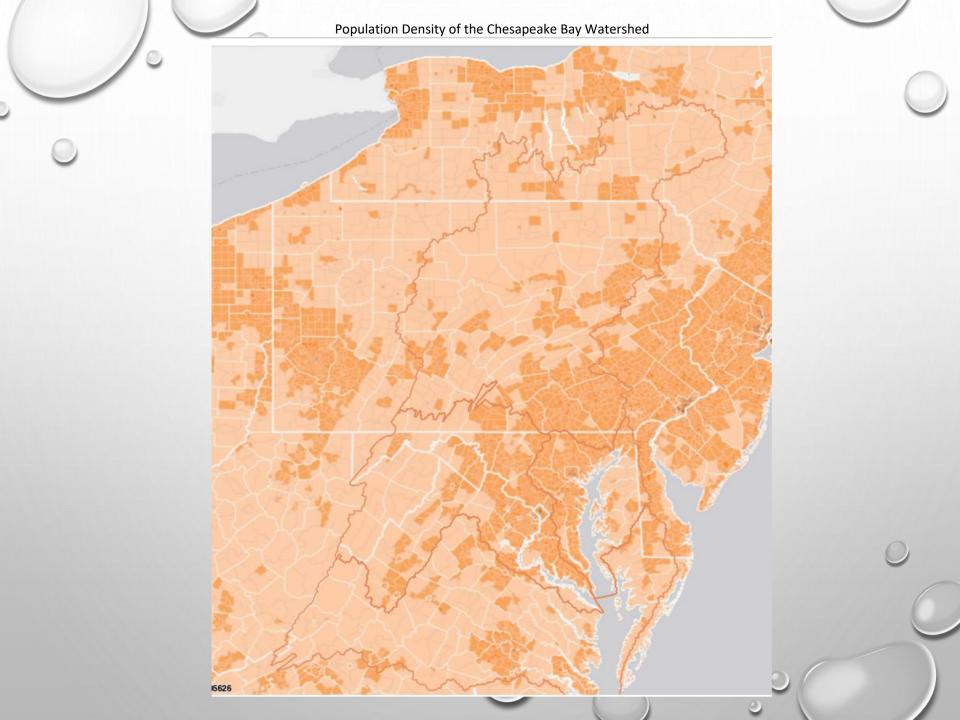




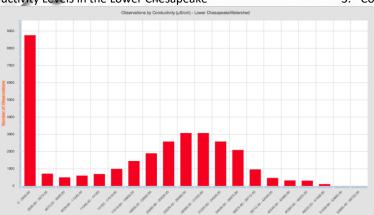


Salinity in River Outlets

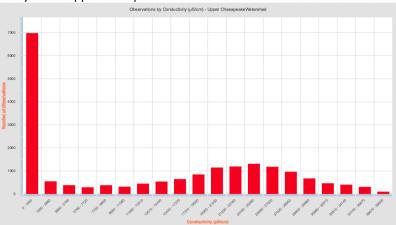




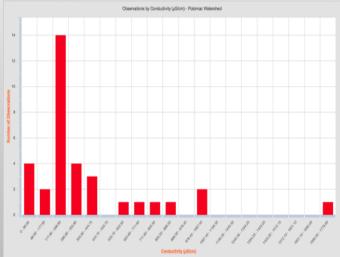
1. Conductivity Levels in the Lower Chesapeake



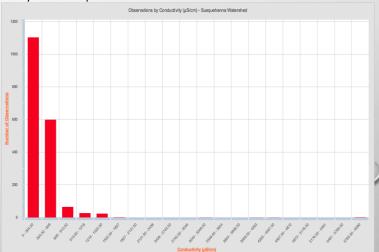
3. Conductivity in the Upper Chesapeake Watershed



2. Conductivity in the Potomac Watershed



4. Conductivity in the Susquehanna Watershed



FORMING A SCIENTIFIC QUESTION

- WHAT KINDS OF SCIENTIFIC QUESTIONS COULD WE ASK THAT WOULD HELP US UNDERSTAND TRENDS BETWEEN TWO VARIABLES?
- WHAT KIND OF SCIENTIFIC QUESTIONS COULD WE ASK THAT WOULD HELP US UNDERSTAND DIFFERENCES IN POPULATIONS?

DEVELOPING AN ARGUMENT

- DEVELOP EXPLANATIONS RELATED TO THE DECLINE OF THE OYSTER POPULATIONS. YOU MAY ARGUE FOR EITHER A: URBANIZATION HAS CAUSED OYSTER DECLINE, OR B: URBANIZATION HAS NOT CAUSED OYSTER DECLINE.
- USE THE DATA SOURCES AND MAPS TO FULLY DEVELOP THEIR EXPLANATIONS OF WHAT THEY THINK IS HAPPENING.
- IN PARTICULAR, PAY CLOSE ATTENTION TO THE RELATIONSHIPS BETWEEN SALINITY AND URBAN AREAS WITHIN THE BAY.
- DESIGN AND CONSTRUCT A VISUAL AID, A MAP OR GRAPH WITH A SUMMARY OR CAPTION. THE SUMMARY CAN BE IN EITHER PARAGRAPH OR BULLET POINT FORMAT.

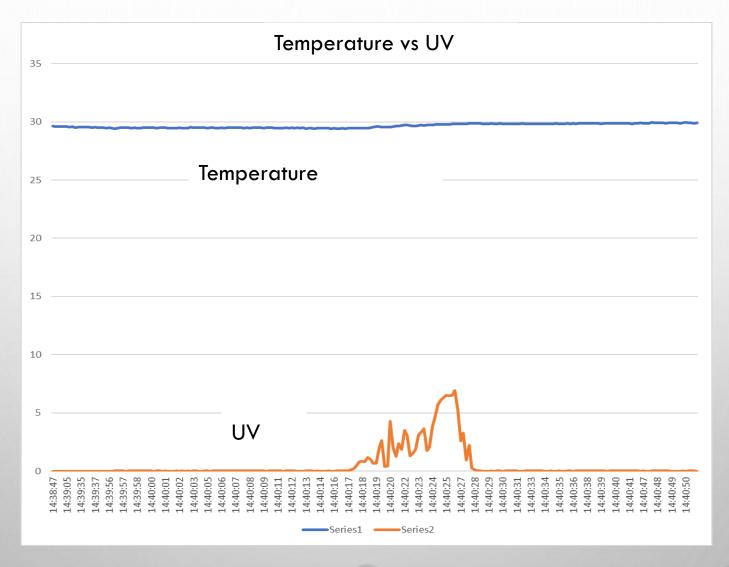
HOW TO MANAGE THE DATA

| | Date | Time | Air Temp | Humidity | Gas | Gas | Lux: | UV | | |
|---|------------|----------|----------|----------|-------|--------|-------|--------|--|--|
| | Date | Tille | °C: | %rH: | Ohms: | PPM: | Lux. | Index: | | |
| | 11/13/2021 | 14:38:47 | 29.63 | 22.14 | 34.92 | 48.33 | 633.6 | 0 | | |
| | 11/13/2021 | 14:38:51 | 29.61 | 22.1 | 21.02 | 192.08 | 630.4 | 0 | | |
| | 11/13/2021 | 14:38:54 | 29.6 | 21.88 | 20.89 | 189.27 | 632.8 | 0 | | |
| | 11/13/2021 | 14:38:58 | 29.61 | 21.6 | 21.27 | 178.16 | 628 | 0 | | |
| | 11/13/2021 | 14:39:01 | 29.58 | 21.6 | 21.16 | 195.32 | 624 | 0 | | |
| | 11/13/2021 | 14:39:05 | 29.58 | 21.51 | 21.08 | 178.35 | 630.4 | 0 | | |
| ľ | 11/13/2021 | 14:39:08 | 29.54 | 21.97 | 21.61 | 169.65 | 630.4 | 0 | | |
| V | 11/13/2021 | 14:39:12 | 29.58 | 21.91 | 21.55 | 174.19 | 626.4 | 0 | | |
| 1 | 11/13/2021 | 14:39:35 | 29.52 | 21.67 | 21.65 | 159.83 | 628.8 | 0 | | |
| | 11/13/2021 | 14:39:35 | 29.53 | 21.69 | 21.76 | 170.4 | 628.8 | 0 | | |
| | 11/13/2021 | 14:39:35 | 29.53 | 21.67 | 21.51 | 168.6 | 628.8 | 0 | | |
| | 11/13/2021 | 14:39:36 | 29.54 | 21.67 | 21.64 | 165.87 | 629.6 | 0 | | |
| | 11/13/2021 | 14:39:36 | 29.54 | 21.68 | 21.72 | 166.76 | 629.6 | 0 | | |
| | 11/13/2021 | 14:39:36 | 29.53 | 21.67 | 21.89 | 168.15 | 629.6 | 0 | | |
| | 11/13/2021 | 14:39:36 | 29.5 | 21.66 | 21.65 | 166.01 | 629.6 | 0 | | |
| | 11/13/2021 | 14:39:37 | 29.54 | 21.66 | 21.91 | 166.78 | 629.6 | 0 | | |
| | 11/13/2021 | 14:39:37 | 29.51 | 21.67 | 21.93 | 169.12 | 629.6 | 0 | | |
| | 11/13/2021 | 14:39:37 | 29.52 | 21.67 | 21.91 | 161.55 | 629.6 | 0 | | |
| Г | 11/13/2021 | 14:40:50 | 29.91 | 23.09 | 21.09 | 188.42 | 279.2 | 0.04 | | |
| | 11/13/2021 | 14:40:50 | 29.96 | 23.13 | 21.04 | 184.7 | 129.6 | 0 | | |
| | 11/13/2021 | 14:40:50 | 29.93 | 23.15 | 21.05 | 179.4 | 216.8 | 0.04 | | |
| | 11/13/2021 | 14:40:51 | 29.91 | 23.22 | 21.18 | 184.28 | 380 | 0.04 | | |
| | 11/13/2021 | 14:40:51 | 29.89 | 23.28 | 21.28 | 186.28 | 403.2 | 0.04 | | |
| | 11/13/2021 | 14:40:51 | 29.9 | 23.36 | 21.2 | 187.68 | 653.6 | 0 | | |

29.96 29.77 34.92 229.97 52428 6.93 max 29.41 21.51 19.43 48.33 129.6 min 23.46 0.55 171.33 7209.91 21.79 average

LET'S VISIT EXCEL!

HOW TO QUESTION THE DATA



HOW TO QUESTION THE DATA

