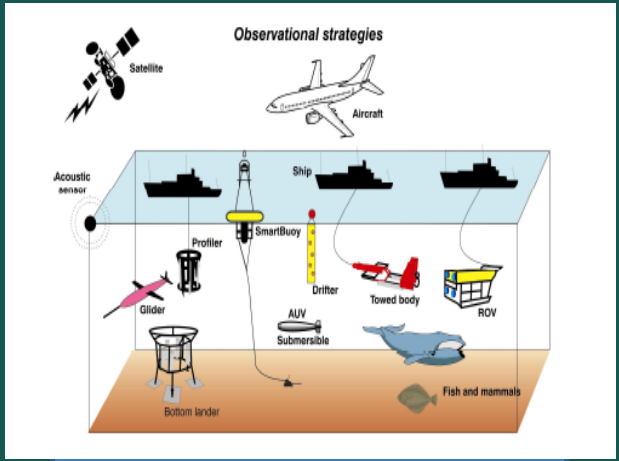
Chesapeake Bay Program
Science. Restoration. Partnership.

Water Quality Standards Attainment and Monitoring Outcome

Peter Tango
USGS@CBPO
Chair - Criteria Assessment Protocol WG
STAR Coordinator

Through the Chesapeake Bay Watershed Agreement*, the Chesapeake Bay Program has committed to…*



Goal: *Reduce pollutants to achieve the water quality necessary to support the aquatic living resources of the Bay and its tributaries and protect human health.*

Outcome:

Continually improve the capacity to monitor and assess the effects of management actions being understand to implement the TMDL and improve water quality. Use the monitoring results to report annually to the public on progress made in attaining established water quality standards and trends in reducing nutrients and sediment in the watershed.

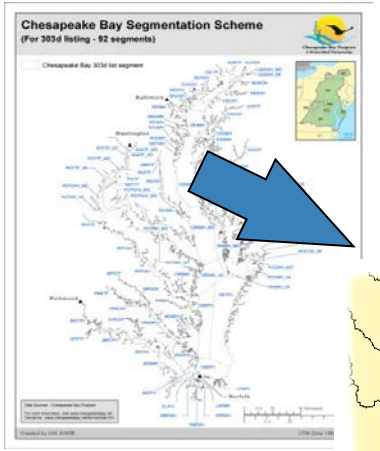
What We Want

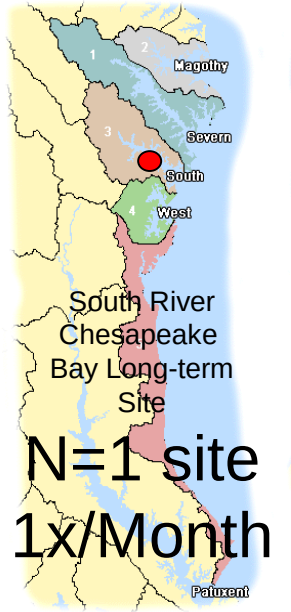
1. Monitoring Capacity building with your support.

A vision for next steps in a successful path forward:

- **Summer 2018**. Management Board accepts Citizen Science and Nontraditional Partner MOU.
- **Summer 2018.** Management Board promotes MOU to PSC.
- **Next PSC meeting 2018**. PSC signs MOU.
- **2019 forward**. Management Board ensures partnership use of citizen science and nontraditional partner data as applicable to assessing progress towards meeting outcomes.

MOU Principles: Program Growth, New Insights & Partnerships.

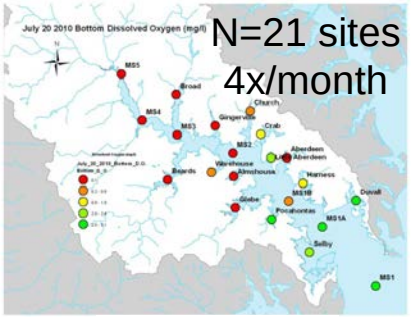




South River Chesapeake Bay Long-term Site

N=1 site
1x/Month

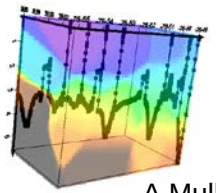
South River Federation



N=21 sites
4x/month

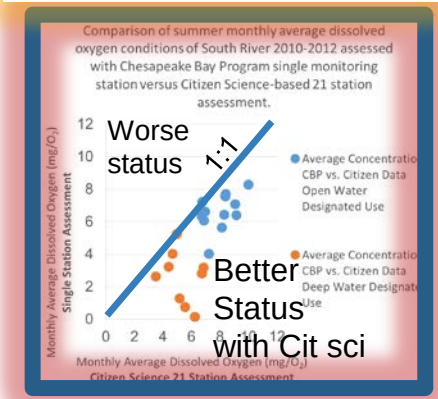
Increasing resolution

Reducing uncertainty



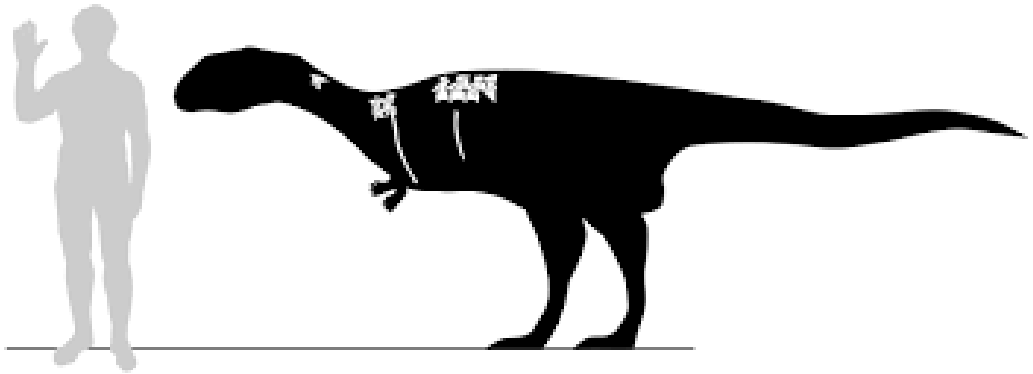
A Muller. USN

Results comparison shows <u>better</u> conditions with 21 sites than 1 site

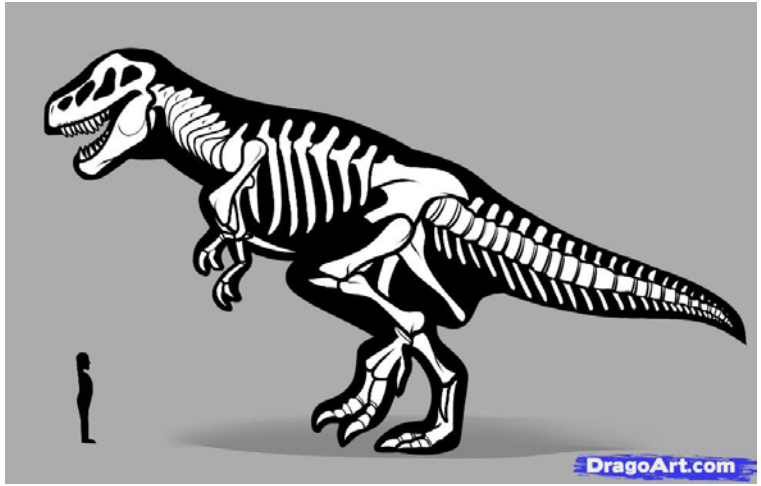


USGS science for a changing world

Which dinosaur picture has less uncertainty and more accuracy?



Marginal information



Adequate to full information

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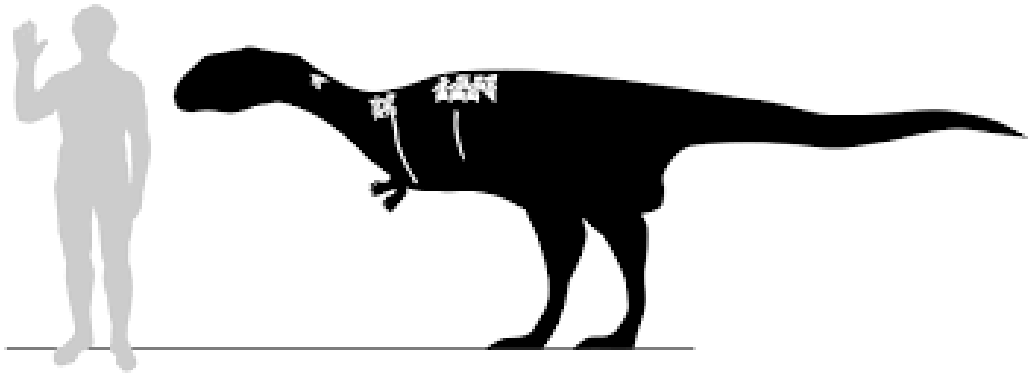
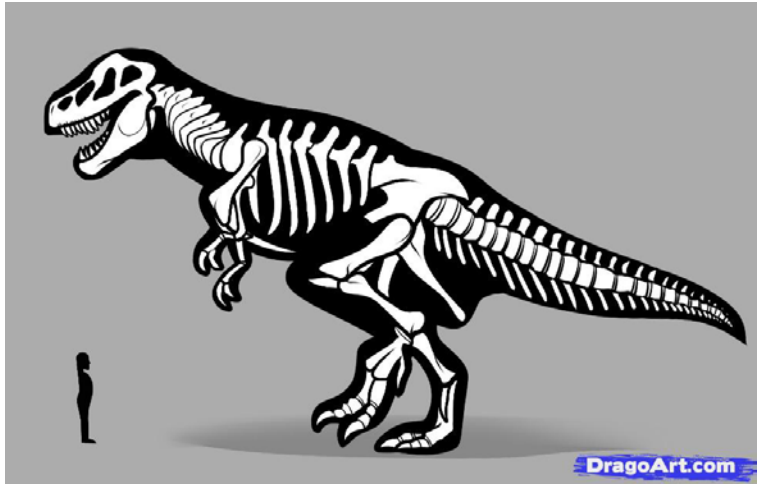


Marginal information

We have been working this way…



Adequate to full information

We are moving closer to this picture.

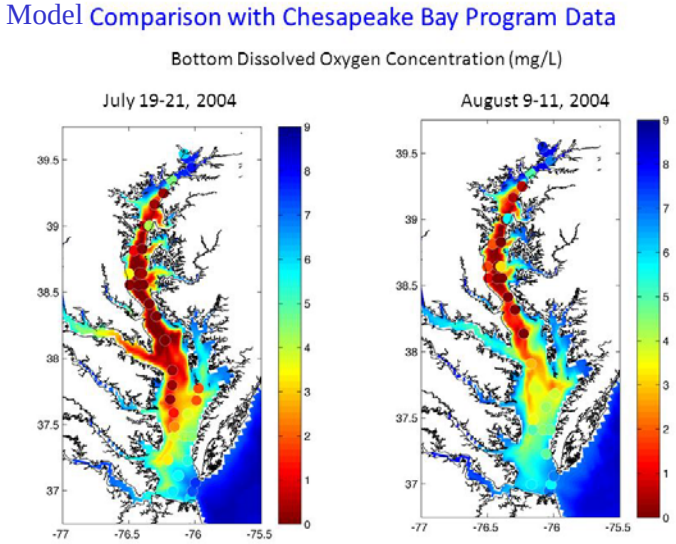
Why We Need This

1. Monitoring Capacity building with your support.

Improved capacity leads to:

- **improved accuracy** of WQS attainment assessments,
- **reduced uncertainty** about status and progress
- **earlier detection of change** in response to management actions
- **better management targeting** of limited resources.

What We Want



2. Use the monitoring results to report annually to the public on progress made in attaining established Bay water quality standards, and trends in reducing nutrients and sediment in the watershed.

Charge STAR with further analyses that support greater understanding of patterns in water quality attainment in the bay, and between monitoring and model results for N,P, and S reductions in the watershed.

Why We Need This

2. Use the monitoring results to report annually to the public on progress.

Enhanced data use and analyses leads to:

- **improved accuracy** of WQS attainment assessments
- **reduced uncertainty** about progress
- **earlier detection of change** in response to management actions
- **better management targeting** of limited resources
- **combat inflation** with cross GIT utcome support

1

Setting the Stage:

What are our assumptions?

Logic Behind Our Outcome

Following the Decision Framework:

Factors

- Delivering necessary financial capacity to implement practices and programs
- Improving the identification of sources and their contributions to N, P, Sed, pollutant loads

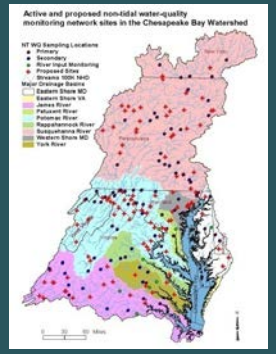
Current Efforts and Gaps

- Continue/expand monitoring and analysis efforts to coincide outputs with two-year milestones and annual progress runs needs.

Management Approaches

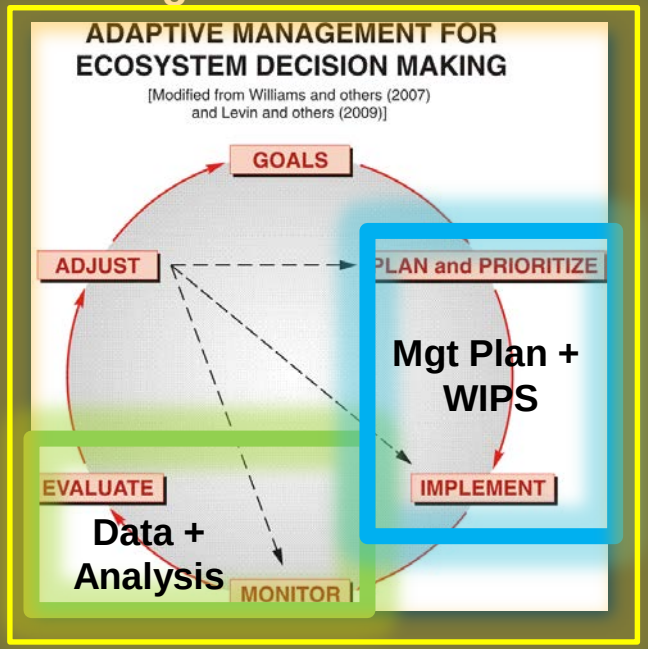
- Adapt the existing monitoring program
- Cit Sci/new partner support in assessments
- Continue to incorporate new land use data.
- Refine factors affecting source and loads changes.
- Better predict future pop growth and climate change impacts

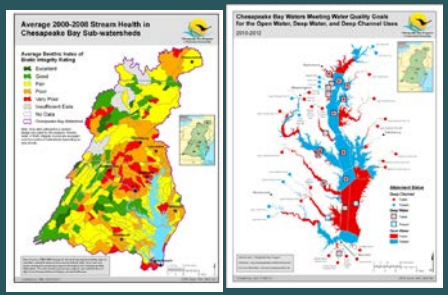
Chesapeake Bay Program Partnership Monitoring Program: Networks and Analysis



Sustaining Core Networks and Conducting Peer-reviews, Planning, Coordination and Implementation

- **Analysis and synthesis are used to tell the stories that address stakeholder interests**
- **Applying adaptive monitoring is supporting Adaptive Management**





Managing Uncertainty,

Evolving Policy

Chesapeake Bay Program
A Watershed Partnership

Leveraging & Growing Partnerships

Assessing and Communicating Ecosystem Status and Change Effectively

USGS
science for a changing world

2

Progress:

Are we doing what we said we would do?

What is our progress?

Our capacity to Monitor

Watershed loads and trends: Adequate

Bay Water Quality Standards Attainment: Marginal

Capacity to Monitor (USEPA 2003 scale):

1. Recommended
2. Adequate
3. Marginal

What is our progress?

Our capacity to Monitor

Watershed loads and trends: Adequate

Bay Water Quality Standards Attainment: Marginal

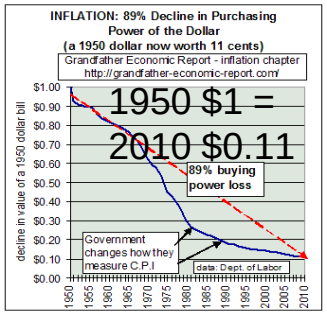
- *Both programs have experienced erosion and decline*.
- *We are generating new growth and gap-filling approaches that are addressing some shortfalls.*

Capacity to Monitor (USEPA 2003 scale):

1. Recommended
2. Adequate
3. Marginal

What is our progress?

Creative Program Management for Sustaining and Growing Capacity To Fill Gaps

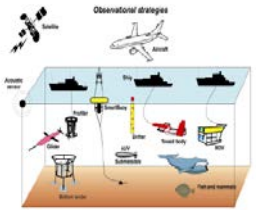


(-) Inflation impacts with level funding

(-) Aging out of the infrastructure

(-) Lost monitoring partnerships

(+) Use of Citizen-based and nontraditional partner data.



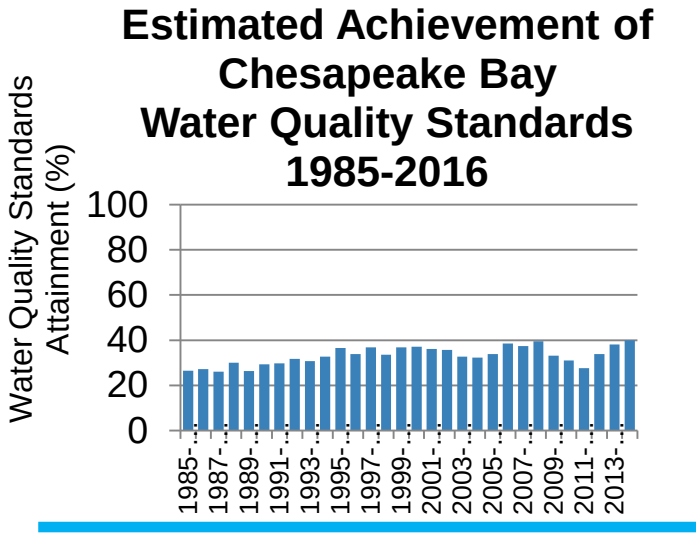
(+) Updated assessment protocols (USEPA 2017)

(+) Partnership adapting of existing monitoring resources

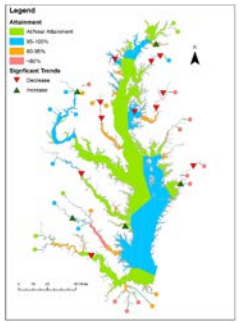
Are we on track? The Bay

- 2014-16 assessment was **the best index score on record**.
- Long-term and short-term trends are improving.

Monitoring – Bay network



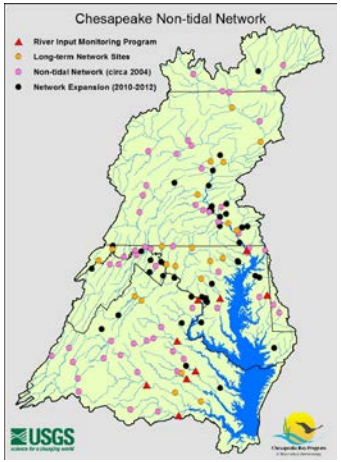
% to attainment
1985-2013
Open Water



Assessing progress

Are we on track? The Watershed RIM

- N trends mostly improving. P and S trends more frequently show no change or degrading.



Monitoring – Watershed Network

Table 1. Summary of long-term (1985-2016) and short-term (2007-2016) trends in nitrogen, phosphorus, and suspended-sediment loads for the River Input Monitoring stations.
[Improving or degrading trends classified as likelihood estimates greater than or equal to 67 percent]

Monitoring station	Total nitrogen load		Total phosphorus load		Suspended-sediment load	
	Long term	Short term	Long term	Short term	Long term	Short term
SUSQUEHANNA RIVER AT CONOWINGO, MD	Improving	Degrading	Degrading	Degrading	Degrading	No trend
POTOMAC RIVER AT WASHINGTON, DC	Improving	Improving	Improving	Degrading	Improving	No Trend
JAMES RIVER AT CARTERSVILLE, VA	Improving	Improving	Improving	No Trend	Degrading	Improving
RAPPAHANNOCK RIVER NR FREDERICKSBURG, VA	Improving	Improving	Degrading	No Trend	Degrading	No Trend
APPOMATTOX RIVER AT MATOACA, VA	No Trend	Degrading	Degrading	Degrading	No Trend	Degrading
PAMUNKEY RIVER NEAR HANOVER, VA	No trend	Degrading	Degrading	No trend	Degrading	Degrading
MATTAPONI RIVER NEAR BEULAHVILLE, VA	Improving	Degrading	No Trend	Degrading	No Trend	No Trend
PATUXENT RIVER NEAR BOWIE, MD	Improving	Improving	Improving	Improving	Improving	Degrading
CHOPTANK RIVER NEAR GREENSBORO, MD	Degrading	Degrading	Degrading	Degrading	Improving	Degrading

Assessing progress in changing loads (WRTDS)

3

Challenges:

Are our actions having the expected effect?

Challenges

Maintain Monitoring Capacity

- In spite of our biggest investments in monitoring in the history of the CBP, program erosion is occurring.
  - *Inflation, retiring aging infrastructure, partner loss and lack of monitoring-specific State match availability are eroding our program* to the threshold of limiting monitoring program maintenance under a level funding status in the next 3 years.

Water Quality Standards Attainment

- Low spatial density of stations and low temporal resolution often require big ecosystem changes in order to detect changes in status.

Challenges

Monitoring and Analysis

- Analysis need: Understanding the relationship between monitoring load trends with model projections for N,P and Sediment

	Model	Monitoring
N	improving	mixed
P	improving	degrading
S	improving	degrade/NT

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Challenges: Trends and Synthesis

- (+) There are significant analysis developments extensive new syntheses and a roll out of publications in progress on trends and linkages.
- (+) Support for analysis on our teams (Emily, Qian)
- (-) There have been some reductions in statistical support due to inflationary pressures
- (+/-) Diverse synthesis support funding

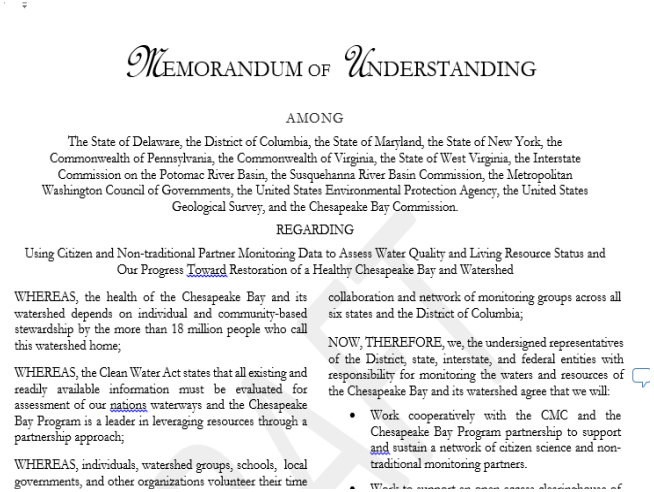
4

Adaptations:

How should we adapt?

Based on what we've learned, we plan to…

- Improve capacity with your help by accepting and promoting the Citizen science and nontraditional partner MOU through PSC signing and data use by all partners.



MEMORANDUM OF UNDERSTANDING

AMONG

The State of Delaware, the District of Columbia, the State of Maryland, the State of New York, the Commonwealth of Pennsylvania, the Commonwealth of Virginia, the State of West Virginia, the Interstate Commission on the Potomac River Basin, the Susquehanna River Basin Commission, the Metropolitan Washington Council of Governments, the United States Environmental Protection Agency, the United States Geological Survey, and the Chesapeake Bay Commission.

REGARDING

Using Citizen and Non-traditional Partner Monitoring Data to Assess Water Quality and Living Resource Status and Our Progress Toward Restoration of a Healthy Chesapeake Bay and Watershed

WHEREAS, the health of the Chesapeake Bay and its watershed depends on individual and community-based stewardship by the more than 18 million people who call this watershed home;

WHEREAS, the Clean Water Act states that all existing and readily available information must be evaluated for assessment of our nations waterways and the Chesapeake Bay Program is a leader in leveraging resources through a partnership approach;

WHEREAS, individuals, watershed groups, schools, local governments, and other organizations volunteer their time

collaboration and network of monitoring groups across all six states and the District of Columbia;

NOW, THEREFORE, we, the undersigned representatives of the District, state, interstate, and federal entities with responsibility for monitoring the waters and resources of the Chesapeake Bay and its watershed agree that we will:

- Work cooperatively with the CMC and the Chesapeake Bay Program partnership to support and sustain a network of citizen science and non-traditional monitoring partners.

Draft MOU 2018

Based on what we've learned, we plan to…

- Address analyses that synthesize science and improve our understanding of water quality standards attainment, watershed trends and model-monitoring results relationships.

Analysis, Synthesis and Reporting: Addressing diverse stakeholder needs

Cross-Outcome Considerations

- Integration of Citizen Science complements work of the Stewardship GIT and Diversity Outcome by engaging groups and creating new leadership across the watershed plus the Habitat GIT and Stream Health Outcome assessment.
- Maintaining the networks supports 'factors' data supporting proposed priority climate impacts and resilience indicators.
- Improved accuracy and reduced uncertainty in water quality standards attainment assessments directly relate to Fish Habitat Outcome information needs.
- Trends in the watershed water quality support the Healthy Watersheds Outcome information needs.

What We Want

1. Accept and promote the Citizen science and nontraditional partner MOU that support enhanced data assessments.

2. Charge STAR with further analyses for understanding comparisons of observed and expected trends in water quality in the bay and watershed.

Discussion

MEMORANDUM OF UNDERSTANDING

AMONG

The State of Delaware, the District of Columbia, the State of Maryland, the State of New York, the Commonwealth of Pennsylvania, the Commonwealth of Virginia, the State of West Virginia, the Interstate Commission on the Potomac River Basin, the Susquehanna River Basin Commission, the Metropolitan Washington Council of Governments, the United States Environmental Protection Agency, the United States Geological Survey, and the Chesapeake Bay Commission.

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WHEREAS, individuals, watershed groups, schools, local governments, and other organizations volunteer their time and talents by participating in environmental monitoring programs; and this *citizen science* represents a unique opportunity for advancing our knowledge while supporting collaboration and network of monitoring groups across all six states and the District of Columbia;

NOW, THEREFORE, we, the undersigned representatives of the District, state, interstate, and federal entities with responsibility for monitoring the waters and resources of the Chesapeake Bay and its watershed agree that we will:

- Work cooperatively with the CMC and the Chesapeake Bay Program partnership to support and sustain a network of citizen science and non-traditional monitoring partners.
- Work to support an open-access clearinghouse of quality-assured environmental data generated by citizen scientists and nontraditional partners

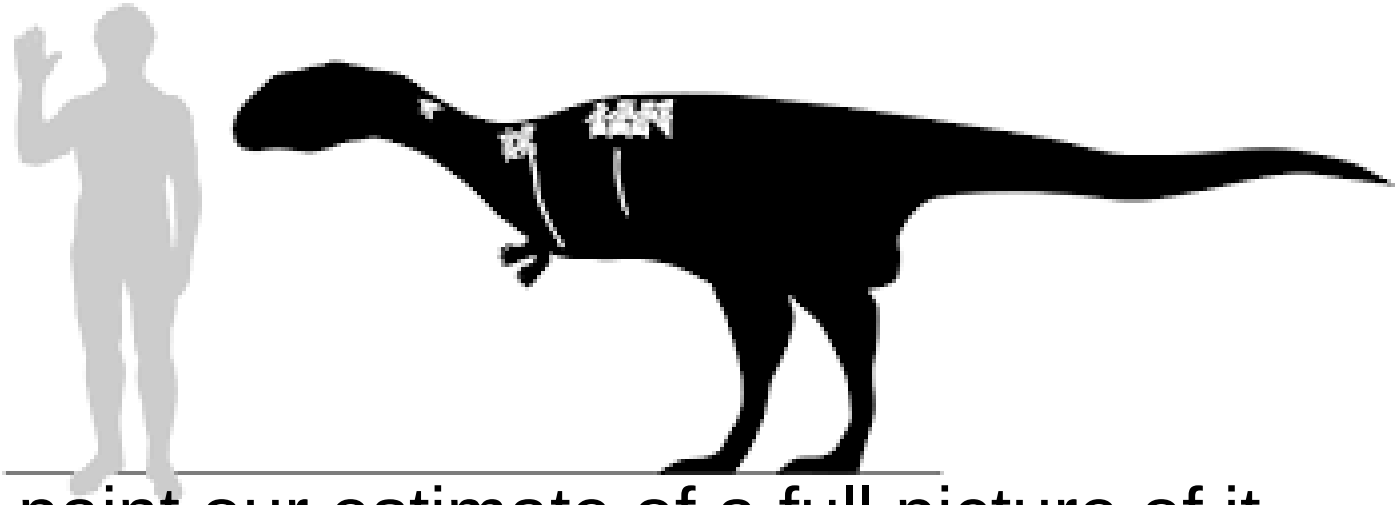
Activity: Dinosaur fossil hunting…what did we find?

Activity: Dinosaur fossil hunting…what did we find?

A few bones of some dinosaur. What does it look like?

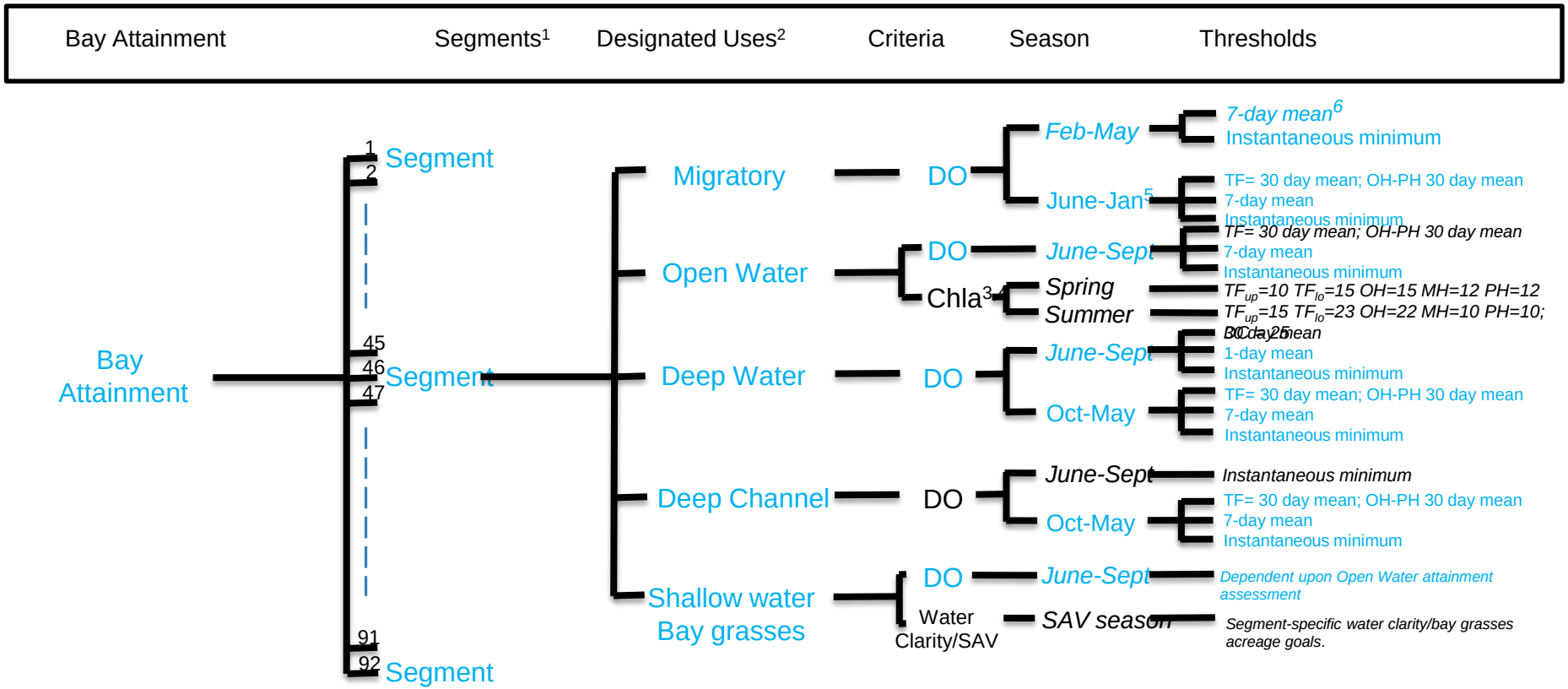
What does it look like?

It’s about a 10 ft dinosaur, standing about 6 feet tall, small front limbs, strong hind limbs, it has about a 4 foot tail and a head as large as my chest is across.



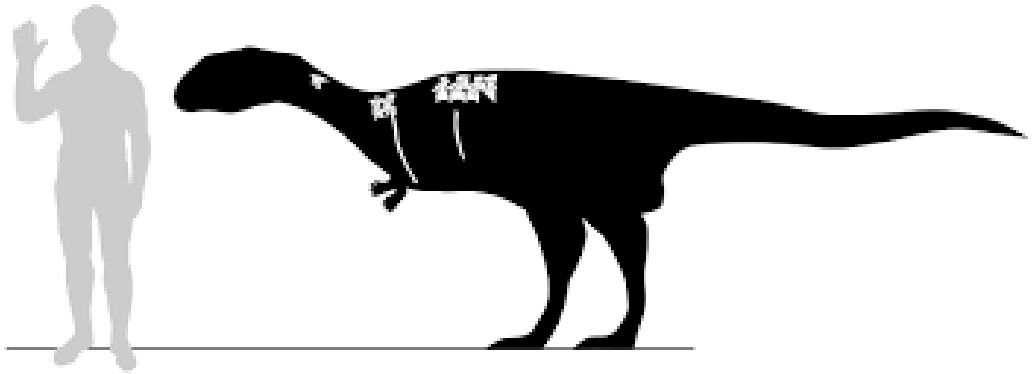
We can paint our estimate of a full picture of it from just a few bones

INDICATOR of Water Quality Standards Attainment Assessment

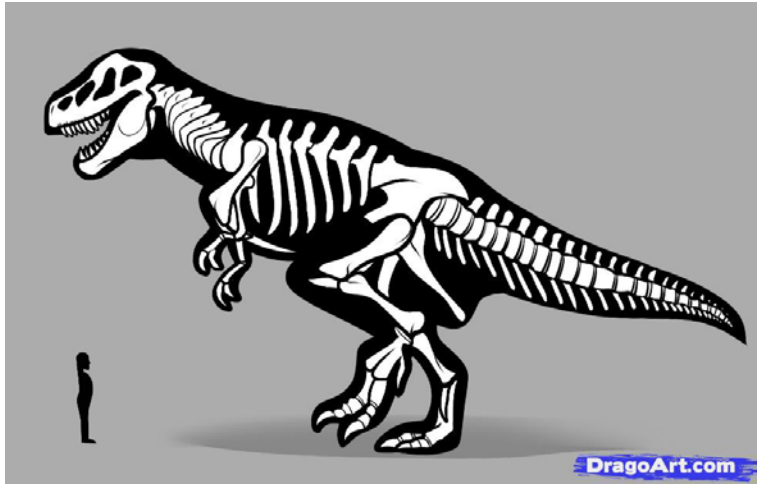


BLACK is measured, known. BLUE is NOT MEASURED BY THE MONITORING PROGRAM. The Indicator ***Estimates Attainment*** *at this time.*

Which dinosaur picture has less uncertainty and more accuracy?



Marginal information



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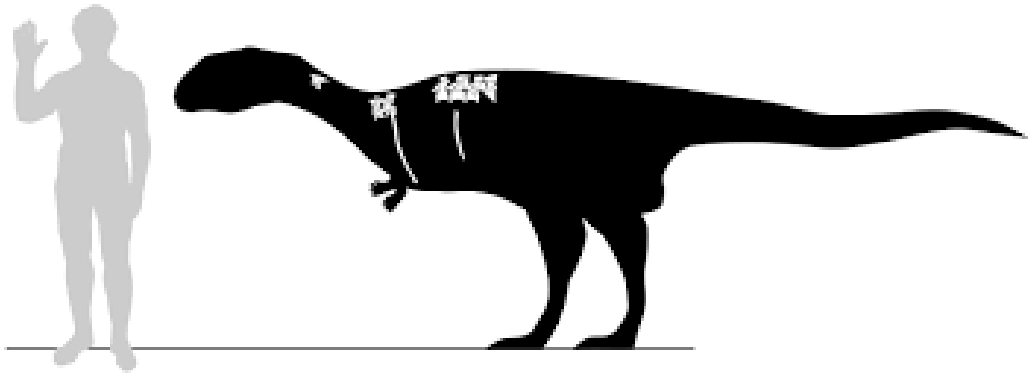

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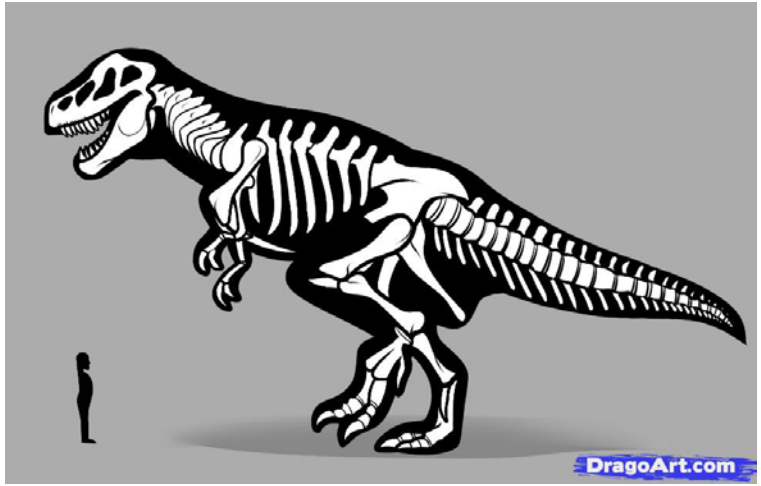
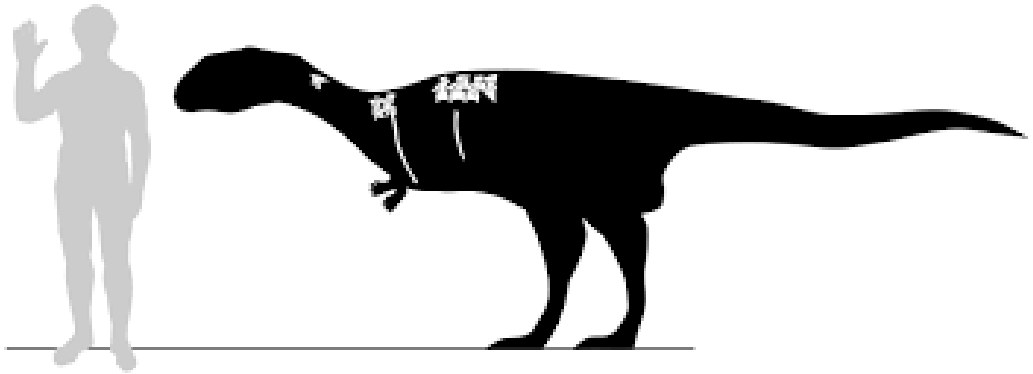


Adequate to full information

This is our Water Quality Standards Attainment Assessment right now

Which dinosaur picture is has less uncertainty and more accuracy?



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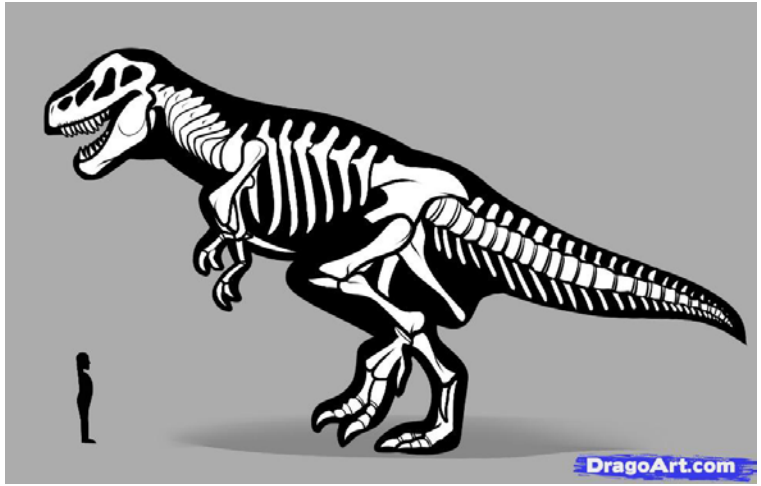


Adequate to full information

With new data plus USEPA 2017 we are getting closer to this.

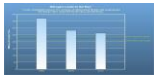
Agreement Goals and Outcomes

Sustainable Fisheries

- Blue Crab Abundance
- Blue Crab Management
- Oyster
- Forage Fish
- Fish Habitat

Vital Habitats Goal

- Wetlands
- Black Duck
- Stream Health
- Brook Trout
- Fish Passage
- Submerged Aquatic Vegetation (SAV)
- Forest Buffer
- Tree Canopy



Water Quality Goal

- 2017 Watershed Implementation Plans (WIP)
- 2025 WIP
- Water Quality Standards Attainment and Monitoring

Toxic Contaminants Goal

- Toxic Contaminants Research
  Toxic Contaminants Policy and Prevention

Healthy Watersheds Goal

- Healthy Waters

Stewardship Goal

- Citizen Stewardship
- Local Leadership
- Diversity

Land Conservation Goal

- Protected Lands
- Land Use Methods and Metrics Development
  Land Use Options Evaluation

Public Access Goal

- Public Access Site Development

Environmental Literacy Goal

- Student
- Sustainable Schools
- Environmental Literacy Planning

Climate Resiliency Goal

- Monitoring and Assessment
- Adaptation Outcome

Our Water Quality Monitoring Funding Support has grown and is the greatest it has ever been in the history of the program.

- 2008: ~3.08M EPA funding the monitoring programs.

- 2010: ~$4.3 Million EPA funds. Not including state match, partner funds.

- 2018:~$5.0M + SAV + State match efforts (not all monitoring match) + Citizen Science.

Capactity - Analysis

- EPA funding and partnerships have grown the monitoring program throughout its history to its greatest level of support ever.
- Managing budgets to address annual inflation are critical to sustaining the existing core monitoring for water quality standards.
- Incorporating newly published protocols will improve the accuracy of our index.
- Adding Citizen Science support to the monitoring program portfolio will expand our monitoring resolution in the bay.
- Adjusting the priorities of shallow water monitoring funding to targeted monitoring will improve segment assessments
- CAP WG opportunity to introduce satellite image assessment of baywide water clarity could further improve attainment assessments
- SAV monitoring program funding is being shored up.
- There are opportunities for State match/additional partners to fill gaps.

FULL Water Quality Standards Attainment Assessment for Chesapeake Bay Dissolved Oxygen, Water Clarity and Chlorophyll a