Updates for CAST-2019

Gary Shenk - CBPO

Model integrity decisions in the past

- Phase 5.3 – no changes to data during calibration period
  - Calibration, averaging, and critical periods were fairly close
  - 1985-2005, 1991-2000, 1993-1995
  - Management question – Are states on trajectory from 2009-2025
- Phase 5.3.2 – no changes to data during calibration period
  - Retained rules from p5.3
  - Management question still trajectory from 2009-2025
  - Pressure building to make changes to model as better data become available.

WQGIT – Flexibility and new data

- 12/2015 DECISION: The WQGIT agreed, starting with the jurisdictions' development of their 2017 milestones, that the partnership will hold the assumptions set at the beginning of the milestone period constant over the two-year period. Land uses will be projected at the beginning of the milestone period, and those projections will not be changed, though the land uses will change annually based upon those projections. At the end of the milestone period, the partners will factor in the new information, BMP efficiencies, and data previously approved by the partnership into the present and past history of progress runs, back through 2009. With the introduction of new BMPs, the jurisdictions can go back and update their past reporting for those new BMPs over the course of past history of progress runs conducted after the end of the Phase 6 Watershed Model calibration period.

Modeling workgroup – integrity of the models

- TMDL modeling question:
  - How would ***changes*** in watershed management and loads between 1995 and a given scenario effect water quality?

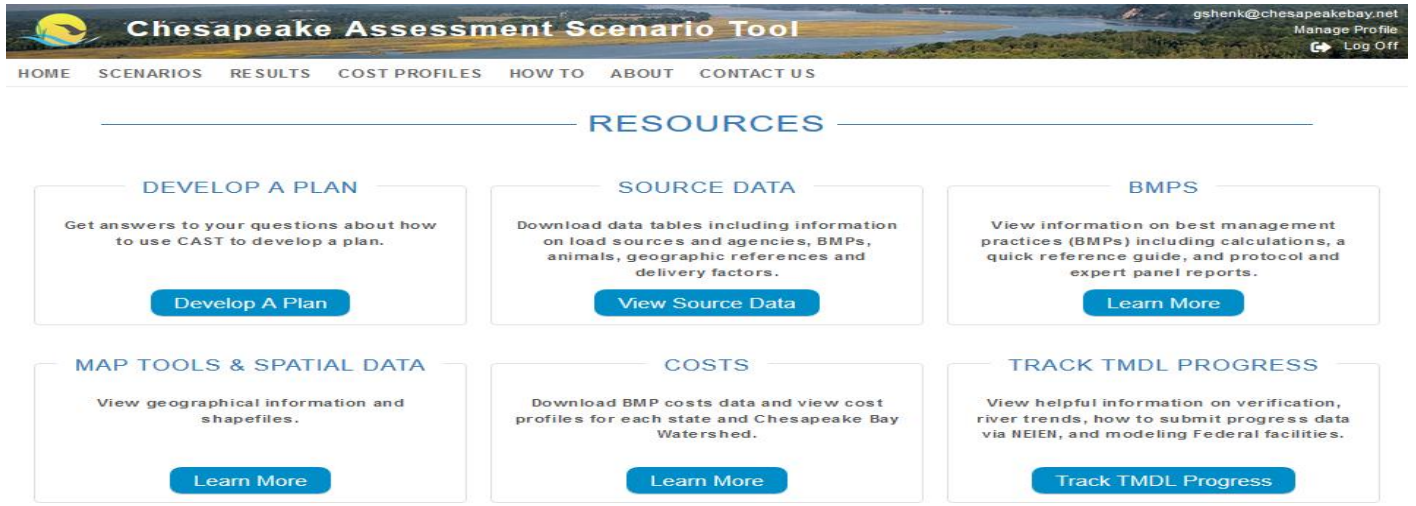
- Management question:
  - Are we on track to reach our 2025 goals?

Maintaining integrity and providing flexibility

- ***No changes may be made to the model that, if applied fairly to all years, would change the loads prior to 1995.***

Updates to CAST-2019 – **Data (WQGIT)**

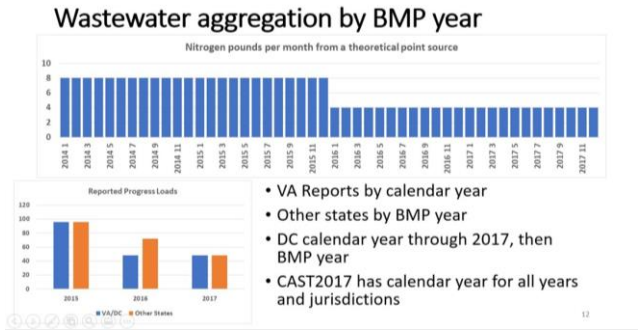
- Adjust fixation rate for “other haylage: grass silage and greenchop”
- Wastewater data aggregated by BMP year in some jurisdictions
- *Add 2017 Ag Census and 2012 NAWQA turfgrass fertilizer data*
- *Land use, MS4, and Septic – Presented by Peter Claggett in August*



The approved nitrogen fixation rate for ”other haylage; grass silage and greenchop” is inadvertently high

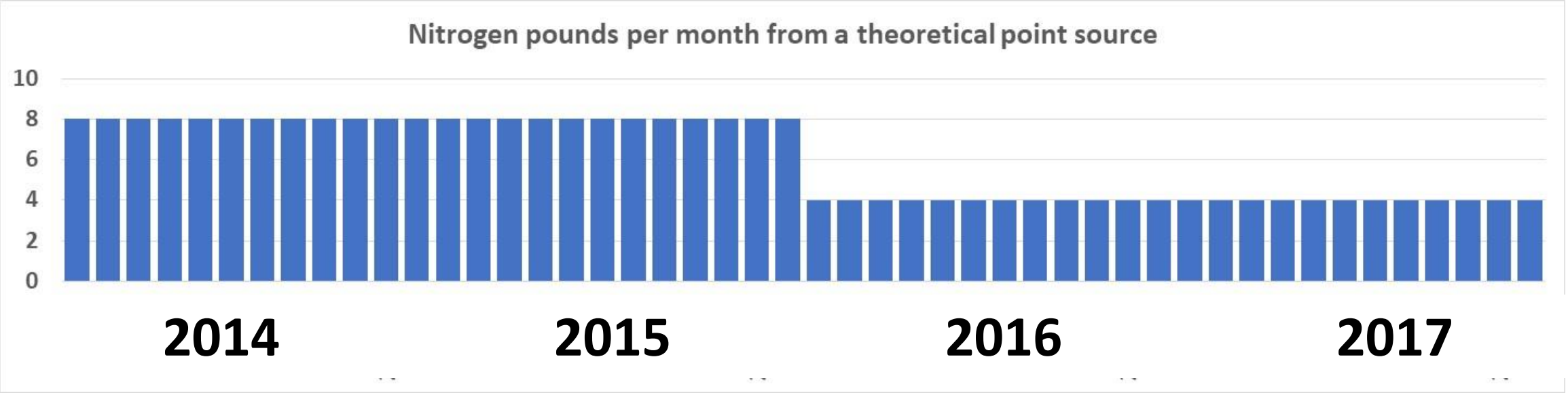
- **Issue**: An incorrect, and high, value for the crop “other haylage; grass silage and greenchop” was inadvertently put in the list of values to be approved by the AMS and AgWG. The values were approved without anyone noticing the error.
- **Action**: On Sept 19th, the AgWG will consider for approval a new value to be used in CAST for all scenarios.
- **Effect**: This crop type was first seen late in the 2002 Ag Census. The high value of fixation is creating high nitrogen loads relative to earlier periods without this crop. The new fixation rate will reduce total delivered N loads by approximately 0.7 million pounds in the 2018 progress run
- **Rationale**: This crop type had zero acres in 1995 so there would be no change to the loads during the TMDL critical period. The update is a more accurate representation.

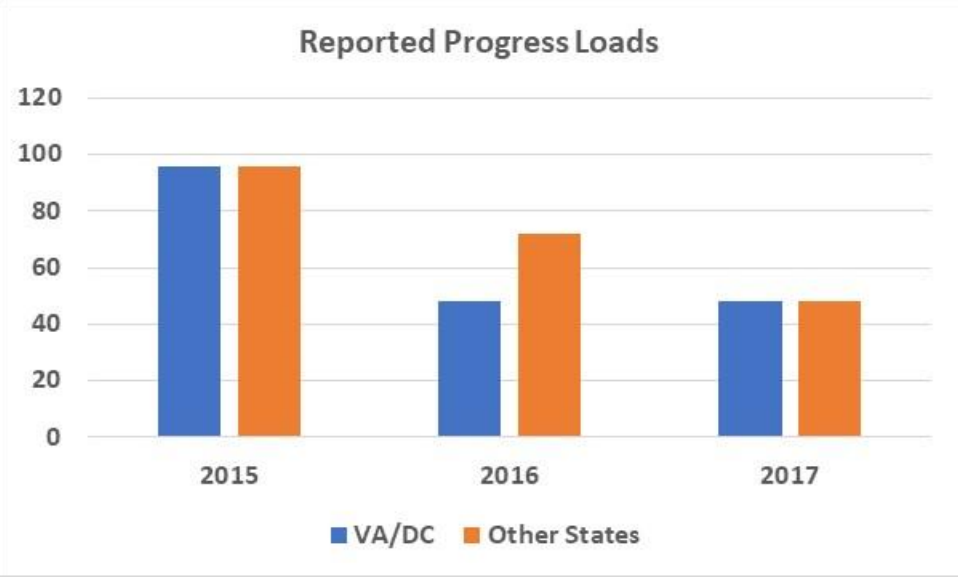
Wastewater aggregation by BMP year



- **Issue:** Wastewater data is supposed to be aggregated by calendar year for VA in all years and DC through 2017. For all other jurisdictions and in DC after 2018, wastewater is supposed to be aggregated by BMP year (July through June). Wastewater is currently aggregated by calendar year for all jurisdictions for progress scenarios.
- **Action:** Recalculate wastewater for progress years.
- **Effect:** Increase in loads for progress years in which upgrades occurred in the second half of the year. No effect on WIPs.
- **Rationale:** The change does not affect the calibration run, which is the base for the TMDL critical period.

Wastewater aggregation by BMP year

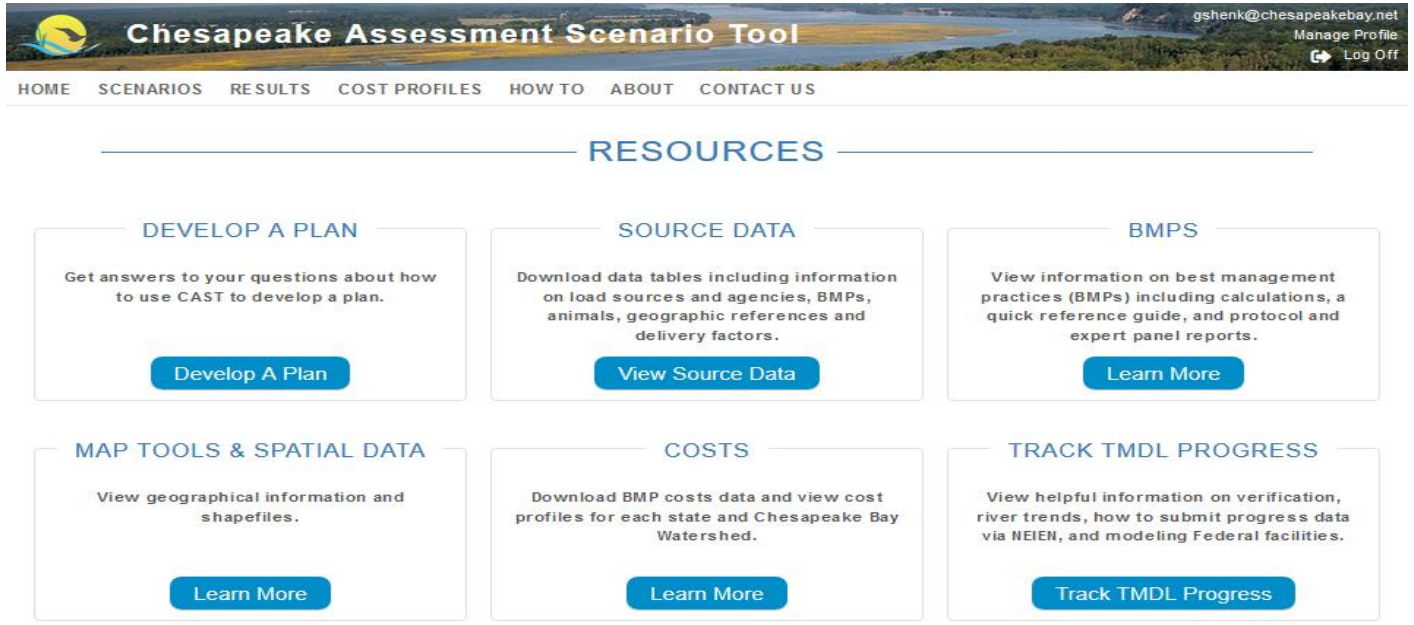




- VA Reports by calendar year
- Other states by BMP year (July-June)
- DC calendar year through 2017, then BMP year
- CAST-2017 has calendar year for all years and jurisdictions

Updates to CAST-2019 – **BMPs (WQGIT)**

- Add biofilter BMP
- Add storm drain BMP
- Add Volkswagen settlement BMP
- Stream Load apportionment to federal and non-federal sources



Add Biofilters BMP

- **Issue:** Biofilters are an approved BMP but they are not credited properly in the model and have never been. None have been submitted through NEIEN.
- **Action:** Add biofilters as a BMP
- **Effect:** Future scenarios will include biofilters. Will reduce loads in some WIP scenarios
- **Rationale:** Adding an approved BMP

- ***As with all BMPs, implementation prior to the critical period will not be counted***

Storm Drain Cleaning BMP

- **Issue:** Storm Drain Cleaning is a recent BMP and was never in NEIEN. None have been submitted through NEIEN.
- **Action:** Add to NEIEN
- **Effect:** Future scenarios will include storm drain cleaning. Will reduce loads in some progress and WIP scenarios
- **Rationale:** Adding an approved BMP

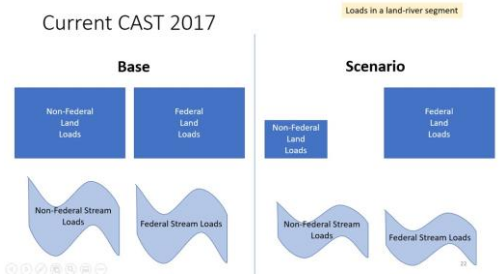
- First submitted MD January 2017
- PA June 2018
- VA June 2017

- ***As with all BMPs, implementation prior to the critical period will not be counted***

Incorporation of Volkswagen settlement atmospheric deposition reductions

- **Issue:** The Volkswagen settlement has supplied funding for states to go beyond the EPA-mandated emission reductions. We need a mechanism for the states to get credit for their actions. The WQGIT has previously approved a method to convert emission reductions to load reductions.
- **Action:** The WTWG and WQGIT will work out methods to report emission reductions such as
  - Attribute reductions to a particular load source
  - Include in a common atmospheric deposition data set used for all scenarios.
- **Effect:** Loads from states will decrease in future scenarios.
- **Rationale:** All effects take place in the future and cannot be part of the TMDL critical period. Reductions are beyond the reductions required by the EPA.

Stream response to upstream load should be proportional to load change by LRseg and agency rather than just LRseg



- **Issue:** Stream bed and bank loads change through scenarios proportional to upstream loads. This is currently calculated by percent change in the land-river segment load. Using this method, the stream bed and bank load attributed to a federal agency changes when a scenario is run with changes in the non-federal portion. This causes confusion similarly to the changing delivery factors in the pre-TMDL Phase 5 model.
- **Action:** Stream bed and bank loads will be calculated by LRseg and agency.
- **Effect:** scenarios for a given agency will be more consistent. No changes in delivered overall loads from LRseg, load sources, or agencies. Small changes in total LRseg stream loads for scenarios based on spatial differences in delivery factors.
- **Rationale:** Dividing up stream bed and bank loads in a way more consistent with management needs. No change in calibration loads for the TMDL critical period

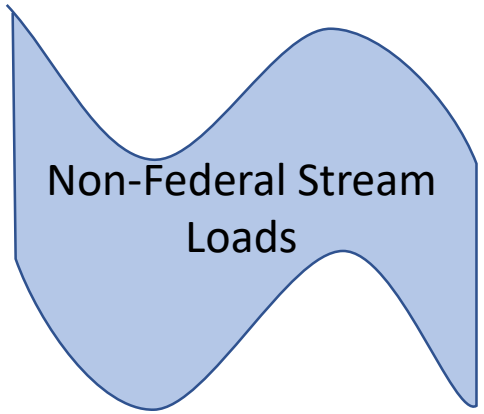
Current CAST 2017

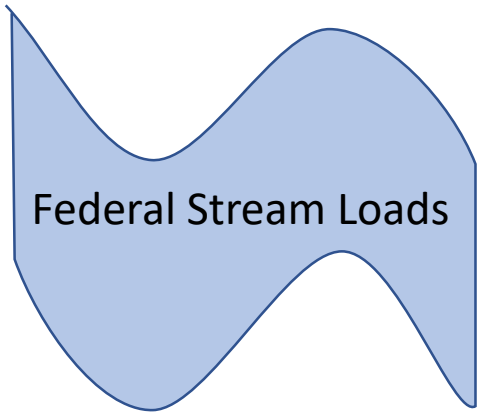
Loads in a land-river segment

Base

Non-Federal Land Loads

Federal Land Loads

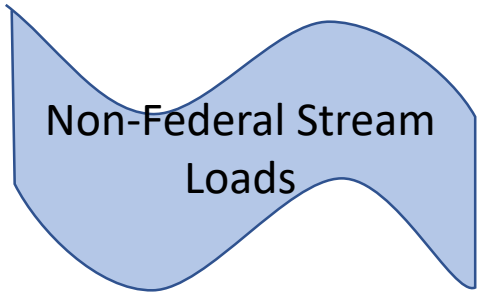


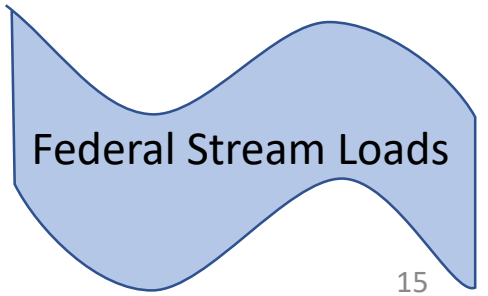


Scenario

Non-Federal Land Loads

Federal Land Loads

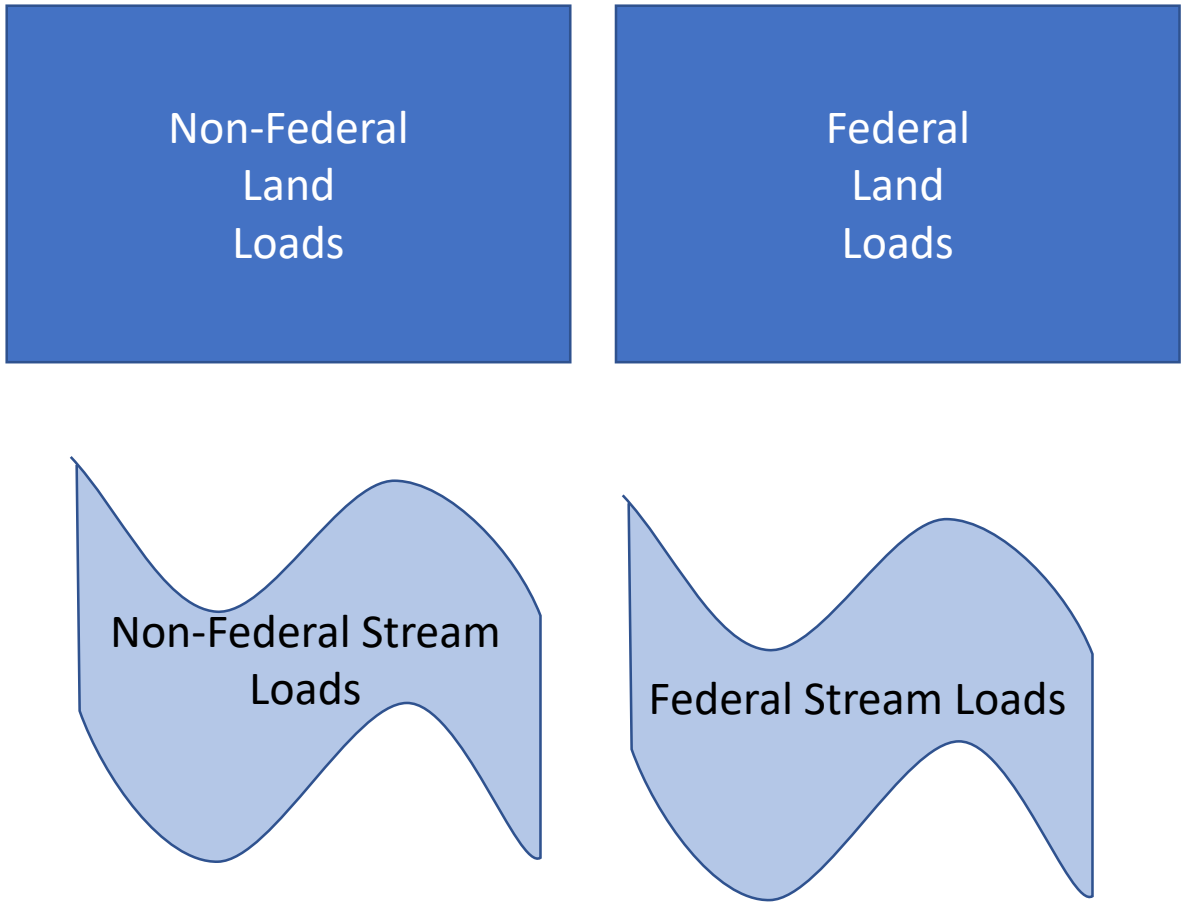




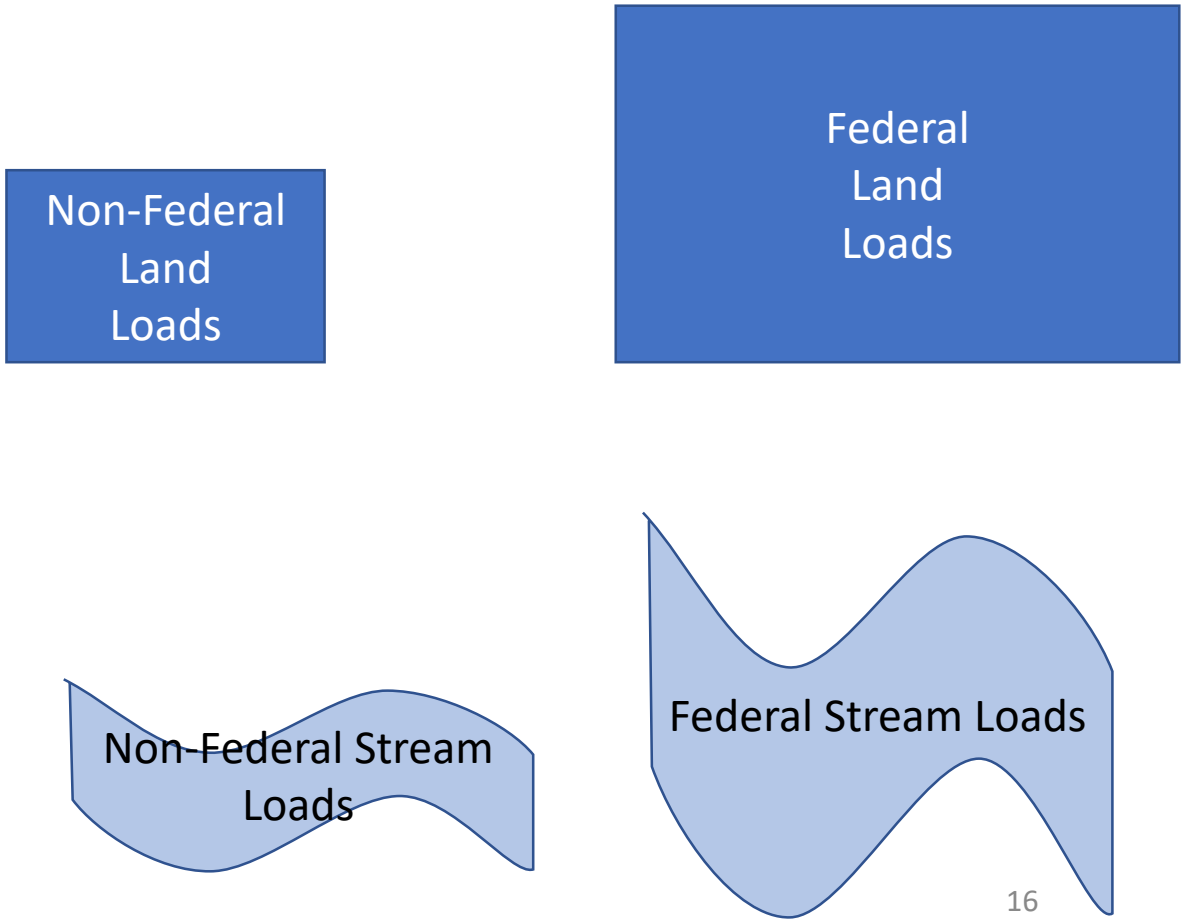
CAST 2019

Loads in a land-river segment

Base

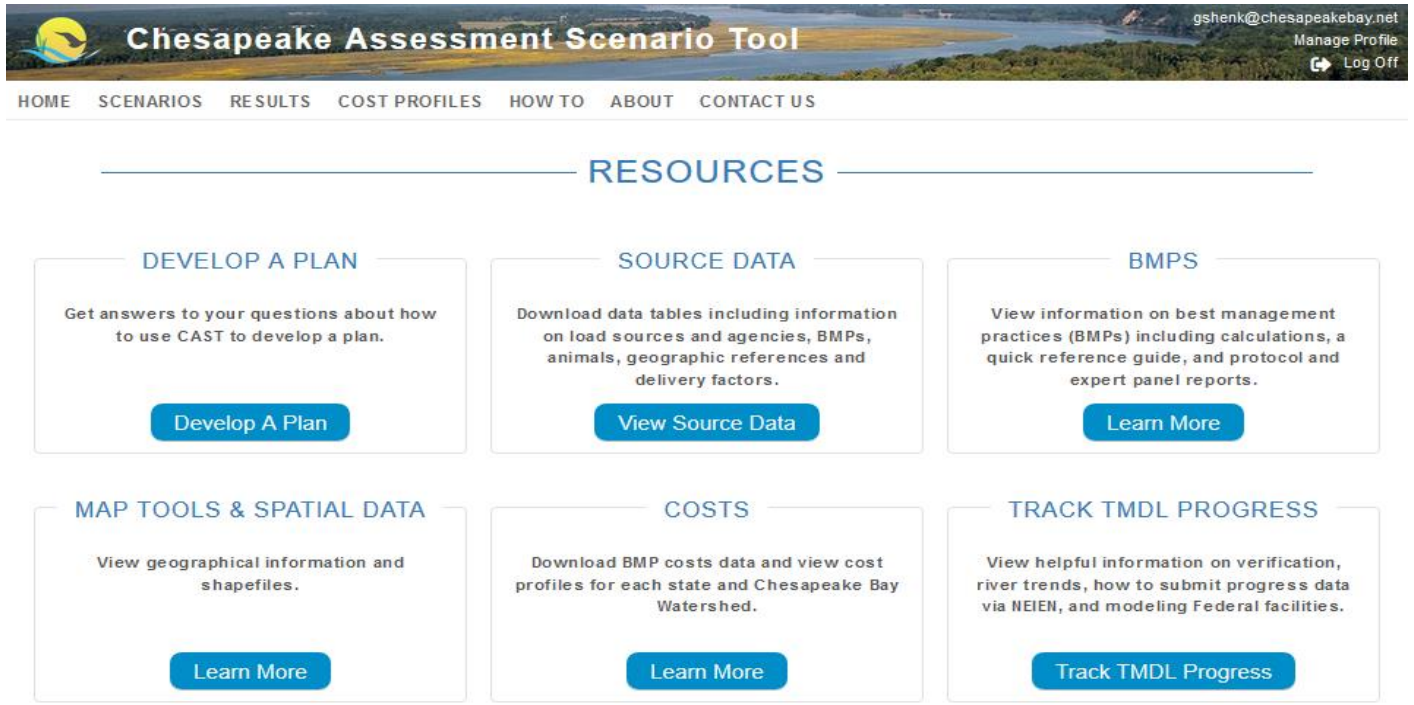


Scenario



Updates to CAST2019 – **Code - MWG**

- Correct code for over-winter crops
- Correct code for impervious-induced stream load *(cannot change)*



Correct code for over-winter crops.

- **Issue**: Inputs are not accounted for properly for over-winter crops. Applications of fixation after December are not applied. For example, if a crop is supposed to have equal applications of fixation in November, December, January, and February, only the first two would be applied.
- **Proposed Action**: Correct the code and only count the change in fixation between 1995 and a scenario.
- **Effect**: Correcting the code and modifying the calibration average inputs will have no effect during the TMDL critical period. Areas and years with an increase in over-wintering crops relative to 1995 will see an appropriate increase in loads. The code change will have an overall increase of ~~1.3~~ **0.6** million pounds spread among all states in the 2018 progress run.
- **Rationale**: This corrects a coding error and does not change the critical period

Direction of the AgWG and AMS

Regions	CropName	Land Use	Fixation (lb/ac)	Plant	Harvest
VA_2,3	red clover seed	Leguminous Hay	134.08	9/1	8/1
VA_1	red clover seed	Leguminous Hay	134.08	10/1	8/1
DE, MD	vetch seed	Leguminous Hay	123.54	9/1	5/1
VA	vetch seed	Leguminous Hay	123.54	10/1	5/1
ALL	alfalfa hay	Double Cropped Land	75.59	10/1	4/30
ALL	other haylage; grass silage and greenchop	Double Cropped Land	175.73	10/1	4/30

Plus more fixing crops that do not cross January 1

Direction of the AgWG and AMS

Regions	CropName	Land Use	Fixation (lb/ac)	Plant	Harvest
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DE, MD	vetch seed	Leguminous Hay	123.54	9/1	5/1
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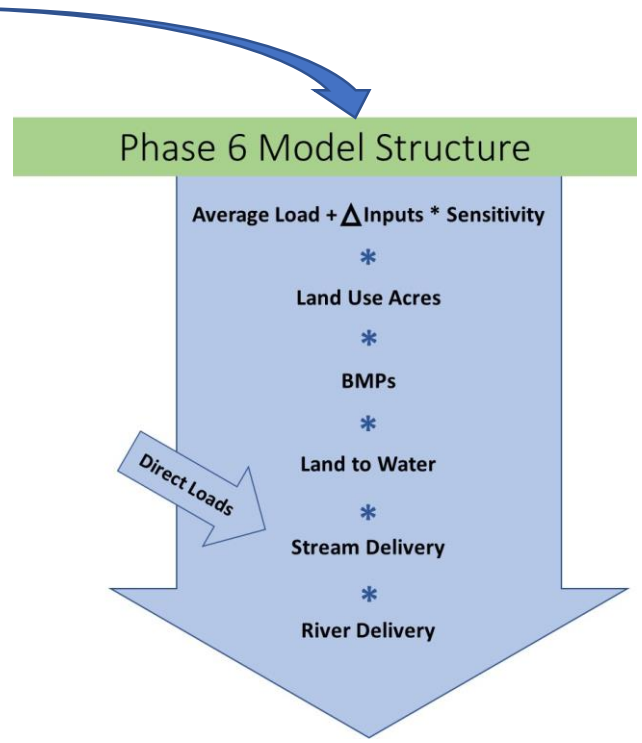

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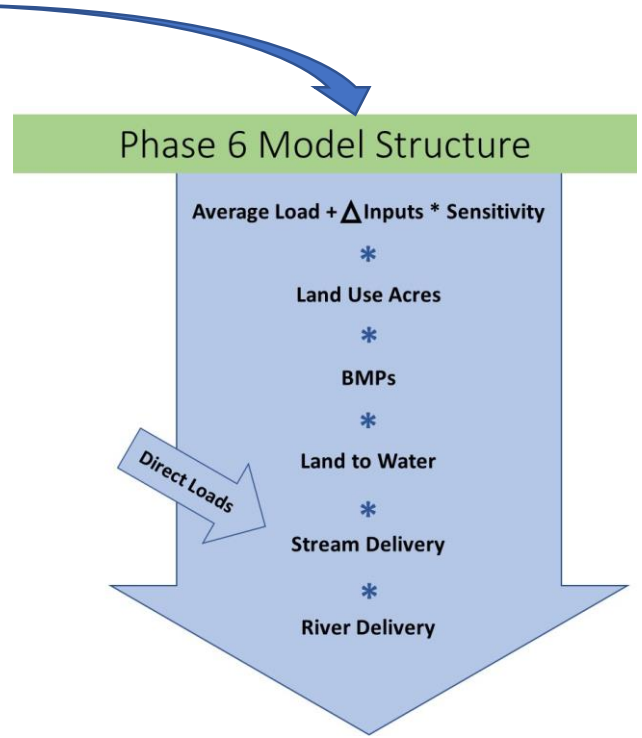

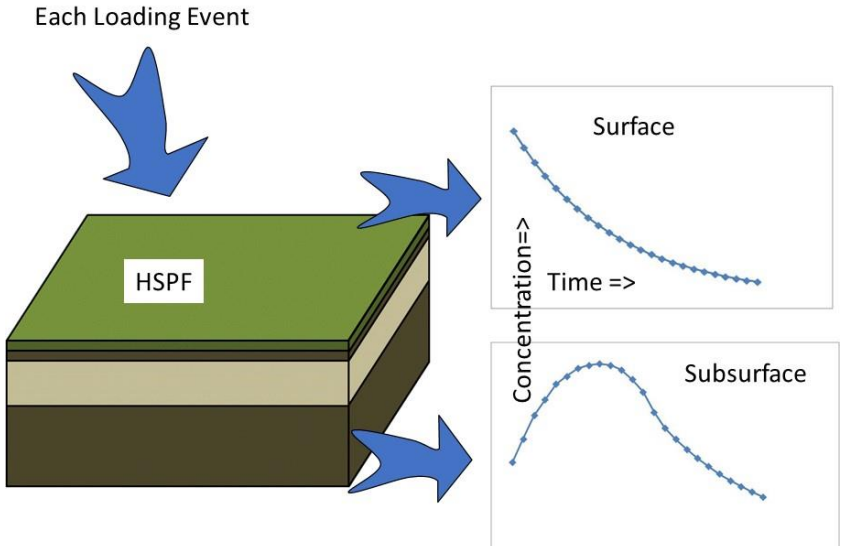

CAST calculation

Regions	CropName	Land Use	Fixation (lb/ac)	Plant	Harvest
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- 1: Split fixation into equal months
- 2: Aggregate across crop types in a land use
- 3: Send monthly to dynamic model
- 4: Aggregate monthly to annual values
- 5: Use annual values to calculate load

CAST code error

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- 1: Split fixation into equal months
- 2: Aggregate across crop types in a land use
- 3: Send monthly to dynamic model
- 4: Aggregate monthly to annual values
- 5: Use annual values to calculate load

If plant date was after harvest date, post-January 1 fixation was not counted

Direction of the AgWG and AMS

Regions	CropName	Land Use	Fixation (lb/ac)	Plant	Harvest	Fixation Used (lb/ac)	Missing
VA_2,3	red clover seed	Leguminous Hay	134.08	9/1	8/1	48.76	64%
VA_1	red clover seed	Leguminous Hay	134.08	10/1	8/1	40.22	70%
DE, MD	vetch seed	Leguminous Hay	123.54	9/1	5/1	61.77	50%
VA	vetch seed	Leguminous Hay	123.54	10/1	5/1	52.95	57%
ALL	alfalfa hay	Double Cropped Land	75.59	10/1	4/30	32.40	57%
ALL	other haylage; grass silage and greenchop	Double Cropped Land	175.73	10/1	4/30	75.31	57%

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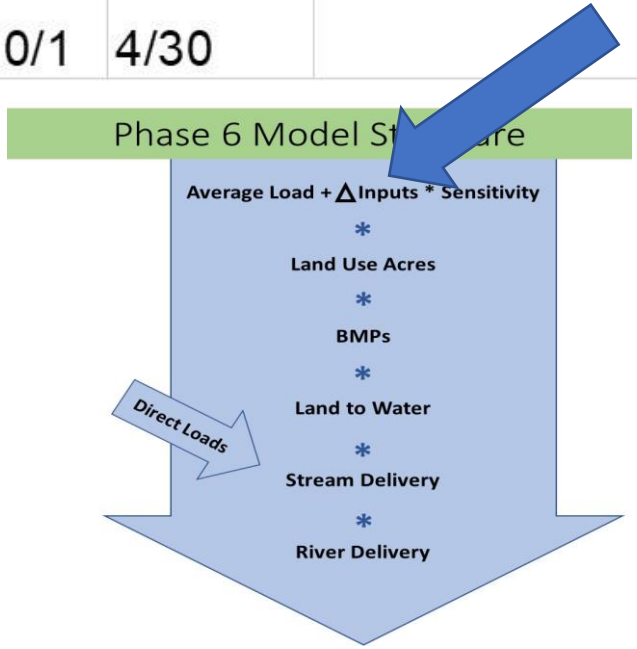

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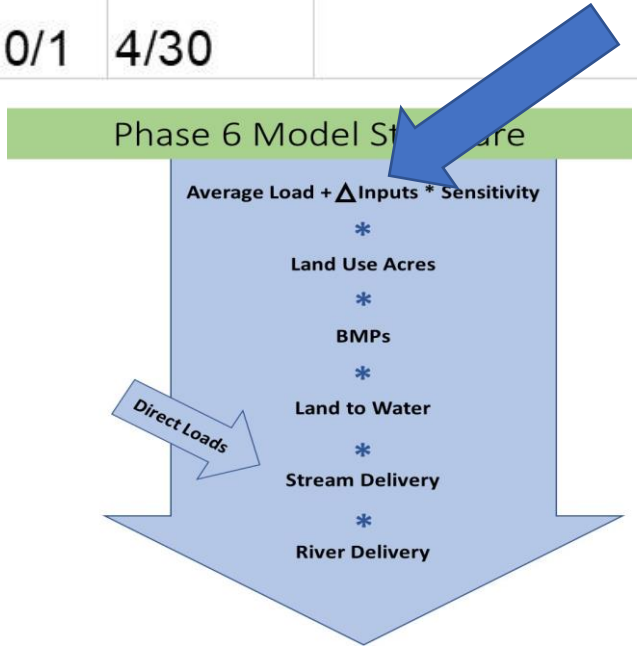
30? **12.9?**



Correct code for over-winter crops

- Correct the code and only count the change in fixation between 1995 and a scenario.
- Will result in an increase of 0.6 Mlbs overall
- WQGIT discussion about low fixation rates in the winter
  - Can adjust proportions by month, but CAST works on annual values so it won't make a difference to annual loads
  - Can collect data from states or model proportions of fixation by month for future versions of the dynamic model.

Recommend not Fix – Stream sediment relation to impervious load to match documentation.

- **Issue:** Stream sediment contribution is calculated from a base level plus 4/3 of the impervious load per the documentation. It was inadvertently set to 100%.
- **Proposed Action:** Change the specification of variables in CAST such that stream loads are properly calculated
- **Effect:** Would add sediment load to all LRsegs with impervious area, resulting in an overall increase at the edge-of-stream of 1.4%. There would be no change to nutrient loads.
- **Rationale:** Updating the code would change the critical period and also change the load in the scenarios that were recently used to create the sediment targets therefore this ***change cannot be made*** at this time.

Stream Sediment Loads based on imperviousness

- End-of-pipe – impervious sediment is 3X pervious sediment
- Watershed – impervious sediment is 7X pervious sediment
  - 4/3 of impervious sediment load comes from stream bed and bank
- Phase 6 implementation
  - Impervious EOS = 3X pervious EOS
  - Stream Bed and Bank = SBB background load + 4/3 impervious EOS sediment

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Approval of Updates to CAST-2019 – **MWG**

- Correct code for over-wintering legume crops
- No not correct code for impervious stream effect