Welcome!!

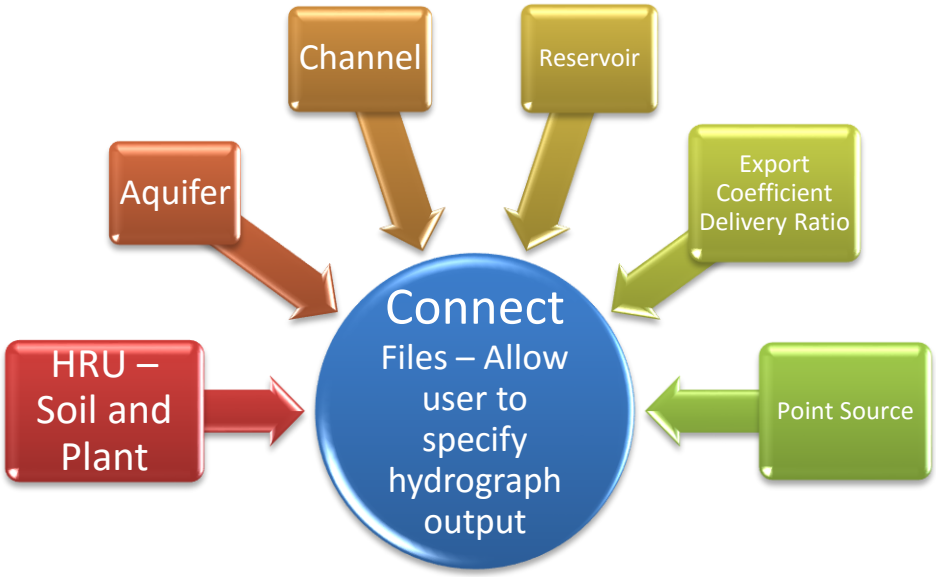
SWAT+
Benefits of Object Structured Code and Data

Benefits of SWAT+

1. Spatial Objects (no fig file) – connect files allow integration of natural system (DEM-based) with water management systems (drainage, irrigation and urban)
2. Support and Maintenance of Data – data become objects that we can support
3. Collaborative Model Development – easier to support and maintain code and incorporate process modules. Better understanding of basic processes.
4. Conditional Files – coded if-then-else conditions for management
5. Incorporation of Budgets in Calibration Procedure and Outputs

Connect Files

Spatial Objects	Hydrographs (%)
hru subbasin	total, surface, lateral, tile, seepage
channel canal reservoir	total, seepage, overbank
pump recall	total



Benefits

1. Easily connect natural and managed flow systems
2. Subbasins and hru's as defined by GIS and incorporate; 1) drainage and road ditches, tile flow directly to ditches; 2) irrigation canals, reservoirs and pumps; 3) urban storm sewers, detention structures
3. Started working on an interface to link the systems – drag and drop icons on natural flow system

Data → Objects

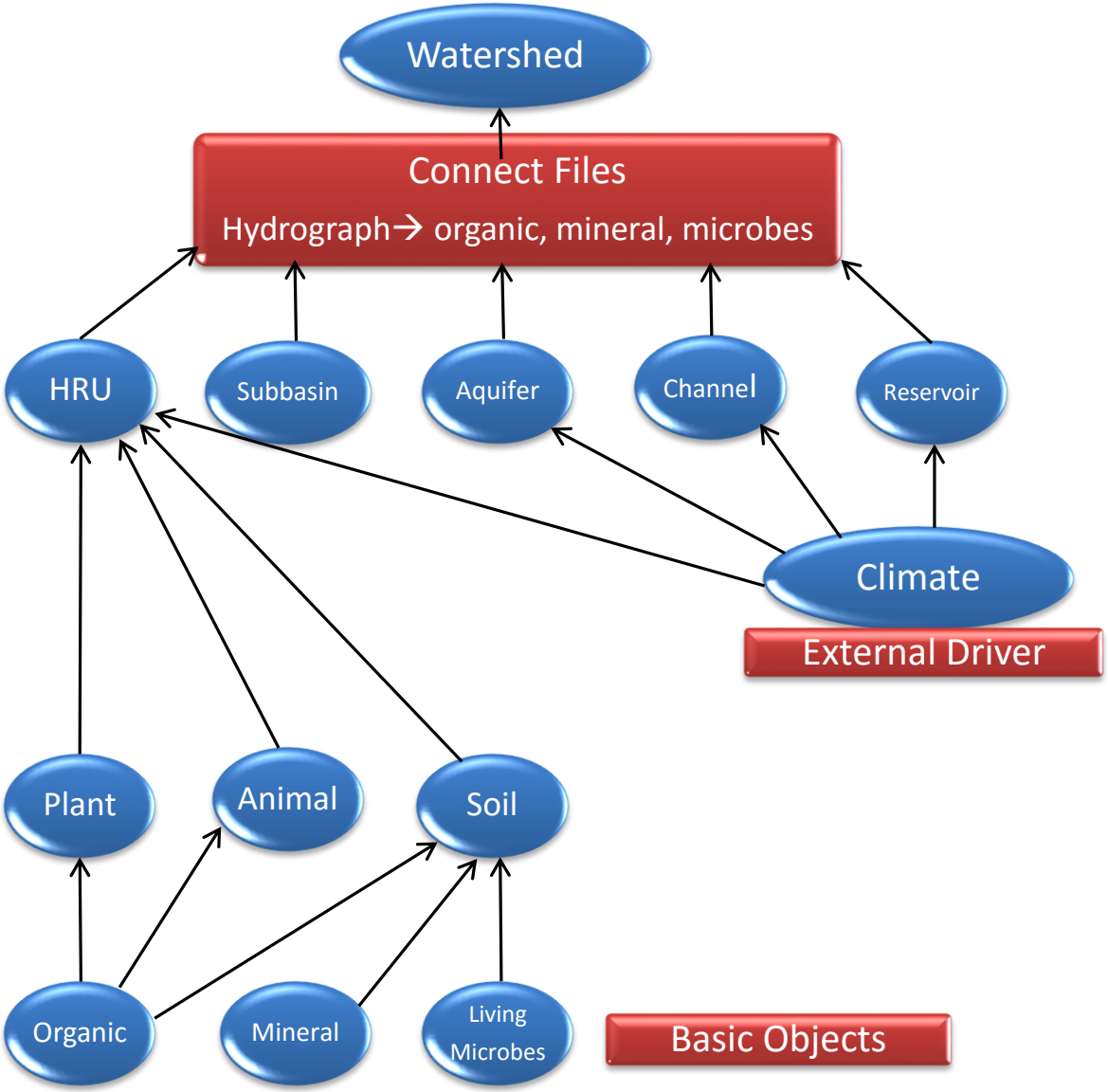
HARV.OPS

forest_cut	tree	1.0	0.99	0.000
stover_high	residue	0.9	1	1000.000
stover_med	residue	0.6	1	2000.000
stover_low	residue	0.3	1	3000.000
hay_cut_high	biomass	0.8	1	3000.000
hay_cut_low	biomass	0.8	1	1000.000
potatoes	tuber	1.1	0.95	0.000

Benefits

1. Improved support and maintenance – new data is easier to include and maintain. Once they are built, an interface doesn't have to recreate each time.
2. Easier to update new versions – spreadsheet format makes easy to add/delete columns
3. Characters and relational database structure make updating easier – not pointing to a number. Files intuitive without interface.
4. Easier to simulate multiple pesticides and pathogens throughout watershed

Basic Objects



Collaborative Development

Benefits

1. Code is better structured making it easier to support and maintain
2. Easier to incorporate new process modules – wind erosion, WEPP hillslope erosion, in-steam water quality, MODFLOW.
3. Better understanding of basic processes – Examples: Linkage of carbon and nutrient pools. Translocation of nutrients to roots in miscanthus.

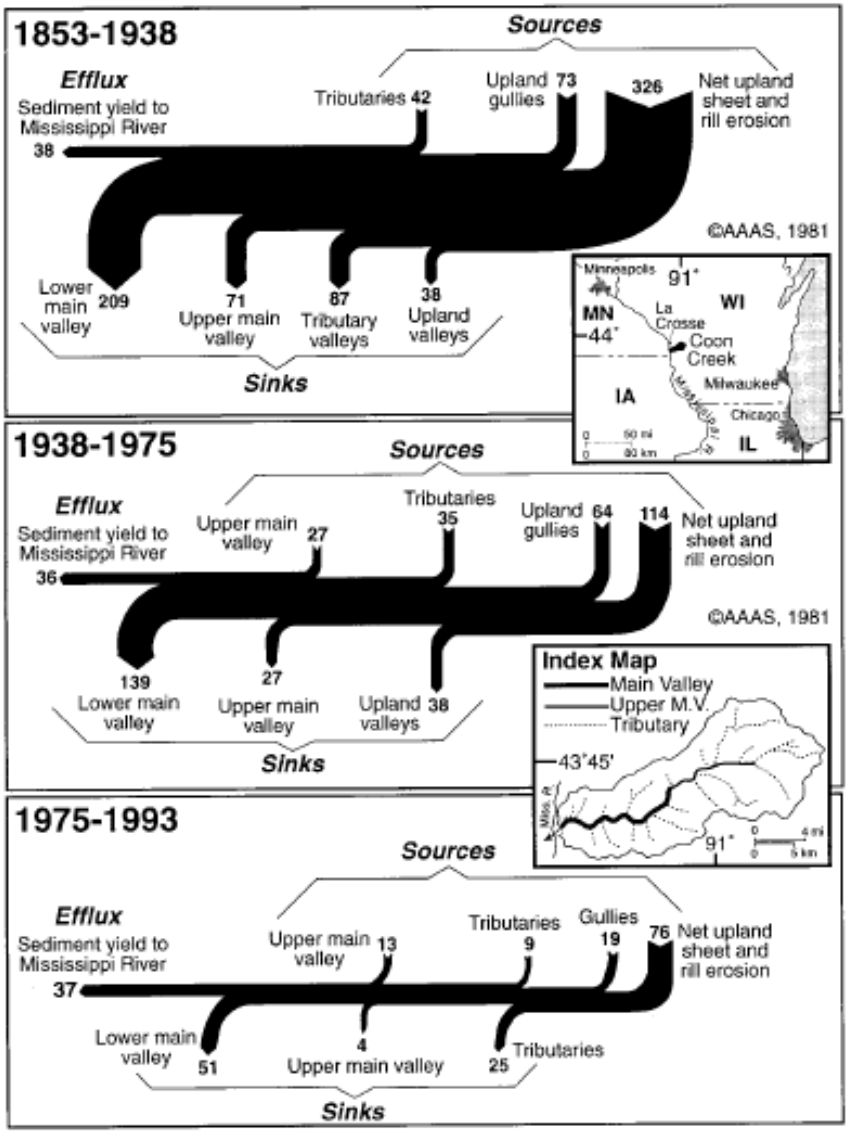
Conditional Files

- Coded If-Then-Else-Endif inputs for management. Currently have autoirrigation and reservoir release included – all management can potentially be included in conditional files.

NUMB	NAME	RULE_TYPE	RULESETS	DEFAULT_TYP	DEFAULT_CONST							
1	res_operation	res	5	rate	0.0							
	below_principle		1	rate	0.1							
						vol	res	1	0.0	1.0	pvol	pvol
	flood		2	rate	10.0							
						vol	res	1	1.0	1.0	pvol	pvol
						tim	res	1	5.0	9.0	mon	mon
	non-flood		2	rate	0.1							
						vol	res	1	1.0	1.3	pvol	pvol
						tim	res	1	10.0	8.0	mon	mon
	non-flood		2	rate	5.0							
						vol	res	1	1.3	1.0	pvol	pvol
						tim	res	1	10.0	8.0	mon	mon
	over_emergency		1	days	10.0							
						vol	res	1	1.0	10.0	evol	evol

Incorporation of Budgets

- Budgets (water, sediment, nutrients, pesticides) are more transparent and easier to output and display
- Landscape processes – fig file was clunky and difficult to manage. Connect files in SWAT+ allow simple set up of landscape processes
- Python scripts have been developed to display budgets in Sankey diagrams. Include in interfaces.



Thank You

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