Watershed Resources Registry (WRR) Workbook

A Primer for Building Consensus and Creating Your Own Watershed Decision Making GIS Tool

Name: _____

State: _____

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Introduction

Using this Workbook

This workbook is intended to be used as a guide so that any given state-federal-local partnership group may begin to develop and implement a WRR for their respective region. This workbook contains the critical elements necessary to transfer the WRR framework and associated processes to another jurisdiction in a manner that is transparent, replicable, and watershed-based. This workbook includes worksheet templates, thought provoking questions, and helpful lessons learned from the implementation of the WRR in Maryland. Each chapter relates to a different aspect of the WRR and the recommended steps to implement.

What is the WRR?

The WRR is an innovative, collaborative approach to improving regulatory streamlining, and achieving sustainable watershed restoration and protection. It is a comprehensive, replicable, framework and GIS-based targeting tool that:

- Integrates and streamlines regulatory programs
- Guides resource planners
- Saves time and money, and increases program efficiencies
- Screens for preferred actions and maximizes watershed benefits
- Is transparent, predictable and reliable
- Facilitates multiagency input and coordination

At its core, the Maryland WRR includes eight GIS-based analyses aimed at identifying and ranking potential restoration and preservation opportunities for wetlands, riparian, uplands, and stormwater. The Maryland WRR can be compared to a wedding registry. Just as a wedding registry lists a couple's "must have" items and maybe even some "nice to have" items, the Maryland WRR model outputs identify or list preservation or restoration sites that have the "must haves" and the" nice to have"s, based on consensus from Federal, State, and Local Government transportation, planning, regulatory, and resource agencies that comprise the Technical Advisory Committee (TAC). The other aspect that makes the WRR a true registry is the ability to upload site descriptions inside the web-based GIS tool. This allows users of the WRR application to gain a unique perspective on a potential site prior to performing field investigations. An additional goal of Maryland's WRR is to begin eliminating sites that have already been committed for preservation and restoration. This would occur as part of the periodic updates the TAC has committed to performing to the models. Locations would be taken out of the registry of opportunities and put into a registry of permitted preservation and/or restoration sites. What makes the WRR unique is the process followed to develop the tool and ultimately the ability to register constructed mitigation/stewardship sites that included extensive collaboration among Federal, State, and Local Government from transportation, planning, regulatory, and resource agencies.

There is agency collaboration and integration among federal, state and local programs such as:

- Clean Water Act Sections: 303(d), 319, 401, 402, 404
  - Watershed planning, permit review, mitigation assessments
  - Total Maximum Daily Load (TMDL)and Watershed Implementation Plan (WIP) applications
  - Stormwater Management
- National Environmental Policy Act (NEPA) Review
- Land Conservation Priorities to Protect Ecologically Valuable areas
- Rare, Threatened and Endangered Species
- 21st Century Act (MAP-21) and Safe, Accountable, Flexible, Efficient Transportation Act: A Legacy for Users (SAFETEA-LU)
- State Transportation and Land Use planning
- Resource Conservation/Environmental Resource planning
- Other State and Local regulations

The WRR fosters Inter-agency partnering by integrating watershed data from multiple agencies and programs into a single geospatial database. It increases decision-making efficiencies for one while considering the priorities of the many. The WRR also achieves secondary benefits to the watershed as a whole in that the decision of one regulator or planner aids the priority of another which can addresses both agency and watershed needs simultaneously.

The WRR increases regulatory and non-regulatory program integration via the watershed approach. It compliments local planning and watershed efforts and is leveraged as a tool for coordinating and streamlining the application of regulatory tools to address watershed-driven resource needs for sustainable growth and results.

Finally, it streamlines and improves regulatory efficiencies and resource planning via minimization of redundancies in decision-making processes by ensuring compliance with the *Compensatory Mitigation for Losses of Aquatic Resources; Final Rule* (Effective June 9, 2008). The WRR incorporates publicly available information into the decision-making framework for regulators, planners, nongovernmental organizations, permit applicants, industry, and others.

Success Defined

In the context of the WRR, success can be defined in many ways, and often evolves during the planning process. Through a broad range of multi-agency participation, that which was once deemed impossible suddenly has potential to become reality. That is, as the Maryland WRR project evolved so did the manner in which ideas were proposed by the TAC and ultimately implemented as a means of gaining greater efficiencies. A phased and/or tiered approach is recommended for successful implementation. Consider the following high-level milestones as your TAC begins defining the concept of successfully implementing a WRR in your region.

- Improved agency collaboration
- Establishment of regional or statewide based watershed specific goals (e.g. those related to restoration and or preservation as in Maryland)

- Creation of mutually agreed upon Suitability Analyses to support restoration and preservation activities
- Construction of a web portal for outreach and distribution of the GIS data
- Development of a GIS-based Web Application for Finding, Reviewing, and Exporting restoration and preservation opportunities
- Implementation of a mechanism to integrate field-verified data back into the system
- Integrating water quality data to monitor and track success and/or failure due to changes in the landscape based on permits issued, restoration, and protection activities performed over time

For purposes of this workbook, success will be defined as completing the first two bullets referenced above.

Steps for Developing a WRR

Establish Technical Advisory Committee

Gaining buy-in at the top levels of each stakeholder's organization is vital to the success and overall sustainability of the WRR for a given State. This occurred in Maryland early on through a multi-agency coordination meeting. The proposed high-level meeting outcome should be establishing the purpose and need for a watershed based approach to land use planning within your respective jurisdiction. You need to consider the status quo – what is it that is currently working well in terms of inter-agency collaboration, permitting and regulatory review, resource protection, transportation planning, etc. and how would the development of a WRR assist the group? At the end of the meeting you should agree upon the purpose and need and at an agency level, commit to your participation in the development of your WRR. It is worth emphasizing that buy-in must be achieved from appropriate regulatory and resource agencies prior to building your WRR. Many applications are built that could be construed as similar to the Maryland-based WRR, however most will tend to fail at sustaining the test of time due to the fact that a given regulatory/resource agency wasn't initially vetted into the process and actively contributing since the inception of the project. Keep this in mind, and assure the appropriate level of buy-in has occurred prior to moving forward with the planning phase of the project.

Choosing the Committee

Your Technical Advisory Committee (TAC) should include at minimum a core group of individuals from regulatory, planning, transportation, and resource agencies. These individuals should be practitioners of the trade as it would relate to environmental planning, restoration, mitigation, preservation, and/or permitting in your State. It will also serve your State tremendously to include at least one GIS practitioner that understands the availability of data in your region. If you are unaware of who would be the best resource in your State, please go to the National States Geographic Information Council

(NSGIC), website at http://www.nsgic.org/state-representatives to determine your state's designated GIS representative.

The initial goal of this committee is to begin discussing each respective agency's needs and overall goals with a focus on documenting common interests that overlap and align with agency specific directives. Ultimately, these discussions will begin to lay the foundation for a direct line of open communication between regulators, resource managers, planners, and applicants. The outcome of your initial committee meetings should be those high-level goals that act as a driver to determine what types of analyses would be best suited for your State.

Members of your TAC should be based on stakeholders that have a role in some aspect of the identified common state-based needs that the group documents. In Maryland, the State-based needs included the following examples:

- A goal of integrating different sections of the clean water act
- Changes in permitting and regulatory requirements - The compensatory wetland mitigation rule, and National Pollutant Discharge Elimination System NPDES Municipal Stormwater permit requirements
- A need for better integration of conservation and restoration planning and transportation planning

The next steps from the initial planning meetings should be establishing regular meeting dates. In Maryland, agencies met on a monthly basis. This was time spent conducting a data inventory, determining priorities, methods, and approach in terms of potential suitability analyses to pursue, determining the ultimate goal for sharing the output of the group's analysis, and setting a timeframe for achieving project goals and objectives.

Develop TAC Priorities

Open communication will be the key to finding those elements of your agency's needs that align with other agency's needs in your jurisdiction. In Maryland, there was a need to agree on a method for determining potential locations for restoring wetlands. Each agency that was involved was able to glean benefits from that coordination by collaborating on what types of criteria (i.e. data) would be needed in order to identify those potential locations in the State. The process included considering what types of data inputs would be appropriate for such an analysis. The group also had to determine if the data inputs they were interested in were even available statewide. Because the TAC was composed of representatives from transportation, permitting, planning, and resource agencies, the group was able to iteratively decide the pros and cons of each dataset and reach consensus while remaining true to the virtues and directives of their respective agency.

As you go through the process of documenting TAC priorities, the group will need to begin identifying potential data available along with data gaps that could exist. You may find that the group's first priority is to create data from scratch and/or perform supplemental processing on existing data prior to integrating it into your analysis. Step one will be to create that forum from which ideas and innovation can flourish.

Develop Suitability Analyses

What is a Suitability Analysis?

Similar to searching for a new house, a suitability analysis seeks to define those qualities or factors that one would look for in purchasing a home. Some qualities are absolutes or "must haves"

- It's within a specific school district

- It's not more than $300k

Some qualities are relative: that is, all other things being equal, it would be better if…

- It was a two-story building

- It was within 1,000 feet of park

- It was within 10-minute drive to a commuter train,

- It was 5-minutes from a grocery store, etc.

It is with this same concept in mind we can apply a suitability analyses to find the best locations to preserve and restore the environment. Within the Maryland WRR, the TAC met to discuss their identified restoration and preservation priorities. The discussion included agency specific initiatives related to conservation and/or land-use planning, availability of GIS data, relevance of data with regard to assisting in suitability of site for a specific restoration/preservation activity, and the absolute versus relative factors in determining suitability. It is critical that decision points made during these discussions are tracked and documented. This will help the TAC revisit and revise the suitability analyses as they move further along in the development of their WRR.

Develop Criteria

Choosing the appropriate analyses and associated criteria is an iterative process that requires coordination amongst all members of the TAC. This process drives the decisions that are made at a fundamental level regarding what your analyses should accomplish. Establishing the factors and overall rationale should be evaluated from a technical as well as regulatory point of view; approaches will vary across the nation. Maryland chose an approach that leverages both national and state datasets. The specific criteria chosen for your state should be based upon group consensus with a realization that periodic updates will need to occur to your analyses in order to assure the data outputs remain the best representation of potential restoration and/or preservation opportunities within your region. As stated in a previous section of the workbook, the periodic updates that are made to the models removing those locations that are now preserved and/or restored is one of the elements that makes the WRR a true registry.

In an effort to streamline creation of the WRR on a National Scale, eight baseline models have been created as part of the national rollout strategy. In most cases, these models leverage National Datasets

and therefore, lack the spatial resolution necessary to adequately factor in relevant criteria based on data that would only be available on a State-by-State basis. Included as part of this workbook are baseline criteria sheets that can be used to aid in developing your State's criteria. Maryland's eight WRR models were used as a starting point. There is no requirement that your State follow the methods or approach regarding any of the models or criteria represented herein. Consider filling in the blanks based on group consensus of your TAC. Refer to the worksheets tab.

Part of this process needs to include thresholds and/or proximity of various features from one another. For example, in Maryland a decision was made within the wetland preservation and restoration models to include a point for areas that were within 200 feet of a stream or a half point for areas within 600 feet of a stream designated with a use classification of II, III, or IV. The intent in this instance was to capture those areas that have the greatest potential of a hydrologic connection to existing Waters of the US. These types of decisions were made iteratively by the Maryland TAC for each GIS data layer that was leveraged to develop each model. This is also where a substantial amount of time and effort is needed to assure ideas and concepts on criteria are thoroughly vetted with the members of your TAC.

Data Validation and Field Testing

Your TAC will need to create a testing plan that includes a systematic approach to verify that the model outputs align with the specific criteria established by your TAC. For example, if you are reviewing the wetland preservation model and you notice that the outputs include large portions of upland areas, you will want to review the geoprocessing that occurred to ensure that the correct data remained in the output. Geoprocessing is a GIS operation used to manipulate spatial data. The Maryland WRR models included over 300 separate geoprocesses to create the 8 model outputs. In the example of the wetland preservation model, you would likely need to ensure that the locations from the US FWS National Wetland Inventory data layer retained the areas that are listed as wetlands. A simple operator error from the analyst performing the analysis can drastically change your model outputs. Remember that the WRR is a collaborative effort and your agency is part of that collaboration. It's much easier to track down errors ahead of time, modify the parameters, and rerun the models within the TAC prior to publishing final results as opposed to publishing invalidated models that will no doubt be scrutinized by the industry. This is also the time to develop Federal Geographic Data Committee (FGDC) compliant metadata for each model output. Realize the end goal will be to update the model outputs on a cyclical basis; please contact a representative from the Maryland TAC if your State would like a sample QA/QC plan. It is also recommended that you catalog and archive published iterations of your analyses when updates are made.

Although the Maryland TAC emphasizes to its WRR users that the tool does not replace the need for fieldwork, field testing is a worthwhile process. Assuring the criteria documented by the TAC aligns with real-world opportunities builds confidence in the tool and trust among the user community. In Maryland, several different approaches were utilized to perform field testing on the model outputs including a comprehensive desktop analysis comparing WRR opportunity results against aerial imagery

in addition to performing field reconnaissance in various locations throughout the State. The field validation effort should match the level of confidence needed by members of the TAC that the models will accurately depict potential locations for restoration and preservation.

You may find that criteria originally chosen for your models gave you limited results based on the data type and overall intended use. The Maryland TAC discovered unexpected results related to Parcel level land use. Parcel level land use, as opposed to Land Cover, was believed to be a data layer of greater accuracy. The result of this decision was outputs that followed the shapes of parcels that in certain cases over-represented and also under-represented potential opportunity locations. Maryland's latest cyclical update removed Parcel level land use and replaced it with Land Cover which yielded much more refined and meaningful outputs.

Publish the Results

Once there is a degree of confidence that your state's WRR model outputs are accurately depicting opportunities based on the TAC's chosen criteria, the next step will be to make the data outputs available for stakeholders and the public to use. In Maryland, a decision was made to develop a GIS-based application that housed the results of the analyses performed. The application allows users to interact with the data in order to find, assess (at a desktop level), and export potential opportunities for restoration and preservation to aid in field investigations. A recent enhancement to the application includes a mechanism to upload site descriptions along with photographs and documents for a given point location created within the mapping interface, once logged into the application.

There is no requirement to develop a web-based application in order to host the results of your state's analyses. Each and every state needs to determine the manner in which the data should and/or could be distributed. Perhaps there is an existing application in your state that the data could be housed within. In Maryland, the state has developed a web-based data portal called iMap; Maryland's Mapping and GIS Data Portal (available at: http://imap.maryland.gov). Part of the Maryland iMap initiative was the development of a state-based GIS web application template which was used in the development of Maryland's WRR Web Application. iMap also includes a data warehouse that allows users to search and download Geospatial data for the state. Members of the Maryland TAC were able to leverage this resource which made it easier to foster a solution for publishing the analytic results of their analyses. It is highly recommended your TAC takes the time to reach out to your state GIS coordinating agency and/or representative regarding state-specific resources that could be leveraged in order to publish your analyses for distribution to stakeholders and the public.

Outreach

Members of the Maryland WRR TAC established an education and outreach campaign which included the creation of a WRR outreach website (available at: http://watershedresourcesregistry.org), agency specific trainings, briefings, publications, workshops, and presentations and local and regional conferences. In Maryland, the TAC found it wasn't enough to simply publish the outputs in the WRR GIS application. Time was taken to go back to staff from each participating agency and explain how to use the WRR. Applicants and reviewers were both educated on how to interpret the outputs and what it meant to find a five star area versus a three star area within a given watershed.

Below are examples of the specific activities the Maryland WRR TAC performed in context to Outreach:

- Agency Specific Trainings & Workshops
    - Day-long training sessions were held in computer labs with the Army Corp of Engineers, the Maryland Department of the Environment, the Department of Natural Resources, and Maryland State Highway Administration. Presentations describing the methods, intended use, and leveraging the application were performed followed by hands on exercises where users interacted with WRR model outputs, the application, and desktop ArcGIS.
- Briefings
    - AASHTO
    - FHWA
    - EPA Headquarters
    - USACE
- Publications
    - Publication through federal register on the Army Corp of Engineers using the WRR
    - National Wetlands Newsletter – Published by the Environmental Law Institute
    - EPA Published Best Management Practice from the Office of Water
- Presentations
    - State/Regional GIS User Community Meetings
    - Metropolitan Planning Organization Conference
    - Standing Committee on Planning/Environment Conferences
    - Regional Wetland Conferences
    - AASHTO Stormwater Practitioner Conferences

Develop a Long-Term Management Strategy

Creating a long-term management strategy will assure the ongoing success of your WRR from an operation and maintenance perspective. Consideration should be made for continued cyclical data updates, and periodic (as mutually agreed by your TAC) model refinements. If you're hosting a web

application or outreach site, your TAC will need to determine expectations regarding maintenance and upgrades to your application over time. Your group may also want to consider developing a signing document that outlines some of these key decisions and acknowledges the commitment of stakeholder agency's time and effort.

Getting Help

There is no question you will run into challenges as your TAC begins framing the vision of the WRR in your State. The first resource at your disposal is the worksheets attached that are part of this workbook. Secondly, Maryland's WRR outreach homepage provides a wealth of information on data, methods, and overall approach used in the State. Finally, members of the Maryland WRR TAC are willing and able to assist with any questions you may have. Refer to contacts tab of the workbook for a list of contacts that are part of the Maryland TAC.

Notes

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Challenges Worksheet

In this exercise, write down some of the challenges your State is dealing with in context to permitting and mitigation. Include high-level goals that could be made to address those challenges.

1. Challenge: _____
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    Goal: _____
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2. Challenge: _____
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    _____

    Goal: _____
    _____

3. Challenge: _____
    _____
    _____
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    _____
    _____

    Goal: _____
    _____

4. Challenge: _____
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    Goal: _____
    _____

5. Challenge: _____
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    Goal: _____
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6. Challenge: _____
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    Goal: _____
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7. Challenge: _____
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    Goal: _____
    _____

8. Challenge: _____
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    Goal: _____
    _____

Goal Establishment Worksheet

In this exercise, use the high-level goals you documented on the Challenges worksheet to define strategies that could be used to accomplish your goals.

1. Goal: _____
_____

   Strategy: _____
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2. Goal: _____
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   Strategy: _____
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3. Goal: _____
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   Strategy: _____
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4. Goal: _____
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   Strategy: _____
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5. Goal: _____

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   Strategy: _____

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6. Goal: _____

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   Strategy: _____

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7. Goal: _____

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   Strategy: _____

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8. Goal: _____

   _____

   Strategy: _____

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Agency Specific Contact Information

It is more than appropriate to have multiple individuals representing one agency participating in the WRR. For purposes of implementing a WRR in your State, consider having at least one contact per agency below as a member of your TAC.

Agency Name	Acronym	Contact	Email	Phone
Environmental Protection Agency	EPA			
US Army Corp of Engineers	USACE			
US Fish and Wildlife Service	USFWS			
Federal Highway Administration	FHWA			
State Permitting Agency				
State Resource Agency				
State Planning Agency				
State Transportation Agency				

Technical Guidance on Building a Suitability Analysis

The GIS analyses performed within each WRR model in Maryland is a raster-based overlay analyses that integrates both relative factors and absolute factors into an output that is then reclassified into groups of -1, which are areas that are not suitable for a given opportunity and 1-5; with 5 having the more relative factors and all absolute factors met and 1 having less relative factors but all absolute factors are still met. The process can be distilled down into the following generalized steps:

1. Convert and Reclassify Point, Line, Polygon data to Raster data with a "1" for areas that meet your criteria and a "0" for areas that do not. An example would be NWI wetlands – For the wetland restoration model you would want to convert the polygon layer into a raster layer, and also change open water to "0" and all other wetland types to "1"
2. Perform Conversion and Reclassification methods to all data layers based on the criteria sheets established by your TAC.
3. Use the Erase Tool to eliminate areas that should not be included in your analyses, i.e. absolute factors. An example could be that you wouldn't perform preservation in areas that are already preserved; therefore you would erase protected areas from all preservation layers so those areas would not return as a potential preservation opportunity in a given preservation model output.
4. Use the Sum Tool to add up all data layers, the result is an output that demonstrates based on count, where the most relative factors are geographically coincident for your State while also accounting for absolute factors e.g. cannot already be protected for a given preservation model as established in your model parameters.
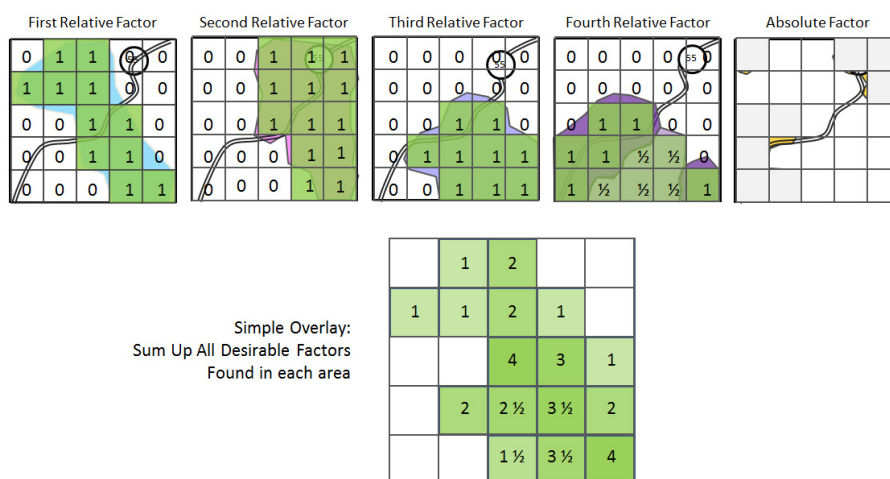
Conducting Research

While there is no requirement to use a specific piece of GIS software in order to accomplish the development of your WRR, Maryland used ESRI's Modelbuilder ™ software that comes with Desktop ArcGIS. If you are using ESRI based products, along with Desktop ArcGIS, you will also need ESRI's Spatial Analyst Extension in order to perform your analyses. For purposes of this workbook, it is assumed users will be running a recent version of ESRI's Desktop ArcGIS.

Data Inventory Worksheet

Once a comprehensive team has been established, time should be taken to inventory available datasets within your State in addition to National datasets that could also be leveraged in the framework of the goals and objectives outlined in a worksheet. This initial step should be focused on cataloging all potential data layers including their respective name(s), intended use, type (raster or vector), accuracy, use restrictions, data source contact and temporal or currency aspects of the data. All of these descriptors are typically found within the metadata file associated with a given data layer. Begin filling out the inventory grid with known data that could assist in the creation of your State's WRR. If you need help locating and understanding available data in your State, consider visiting the National States Geographic Information Council (NSGIC), website at http://www.nsgic.org/state-representatives to determine your state's designated GIS representative.
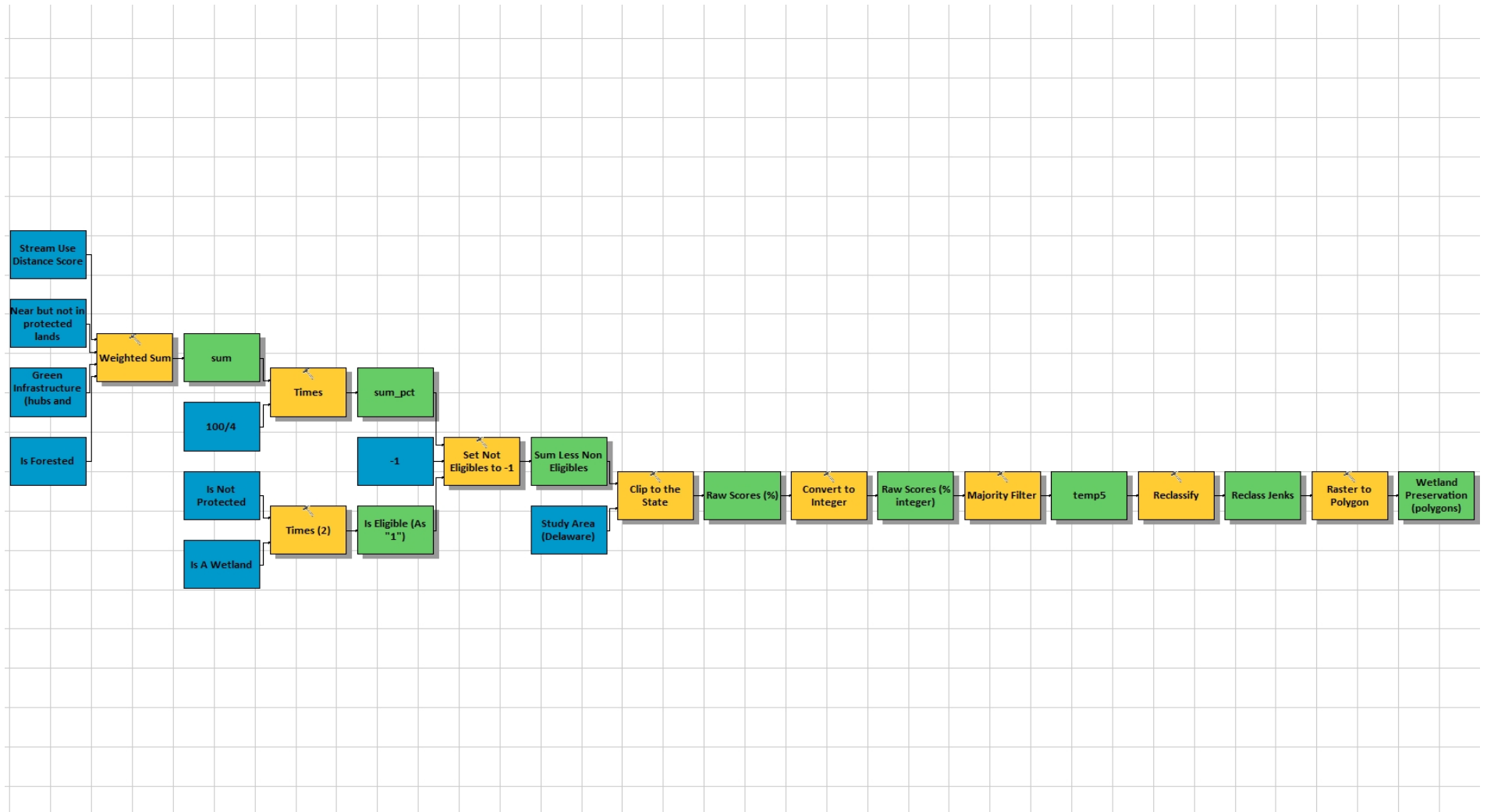
Layer Name	Intended Use	Data Type	Accuracy	Use Restrictions Y or N	Data Source Contact	Currency of the Data	Data Downloaded Y or N

Layer Name	Intended Use	Data Type	Accuracy	Use Restrictions Y or N	Data Source Contact	Currency of the Data	Data Downloaded Y or N

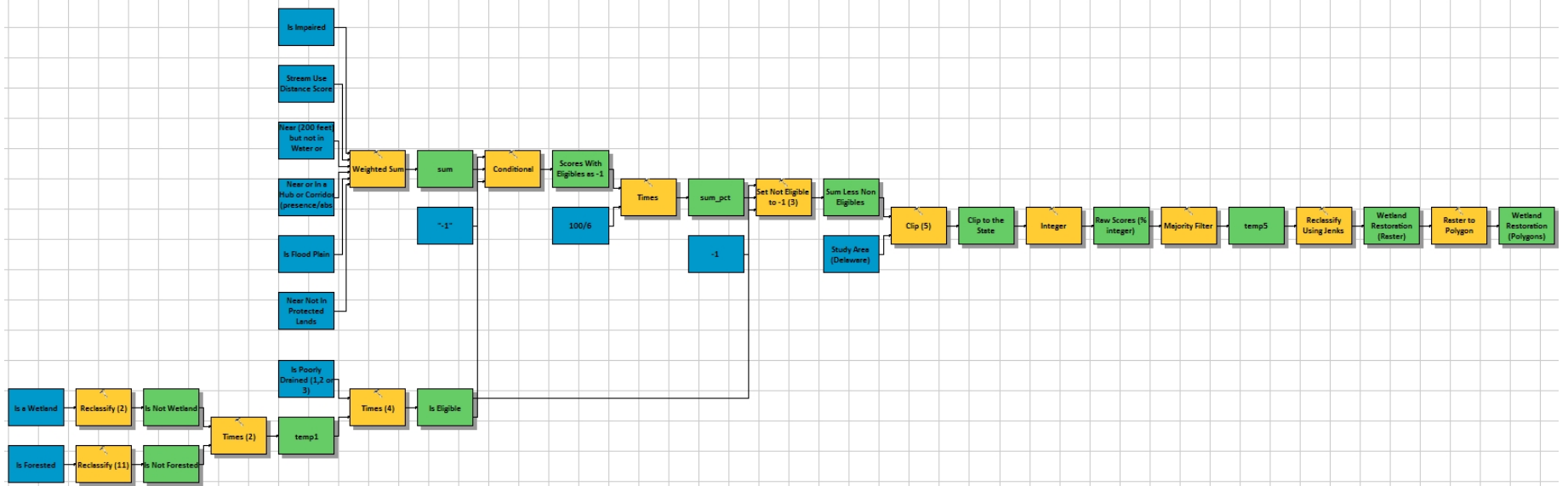|	**Factors for Wetland Preservation**
Relative	• is forested (NLCD) • in a Green Infrastructure area (State-Based Data) • near (within 200') but not in a protected lands (USGS) • within 200' or within 600' of a stream (NHD) • _____ • _____ • _____ • _____ • _____ • _____ • _____ • _____
Absolute	• must be a wetland (NWI) • cannot already be protected (USGS) • _____ • _____ • _____ • _____

Wetland Preservation

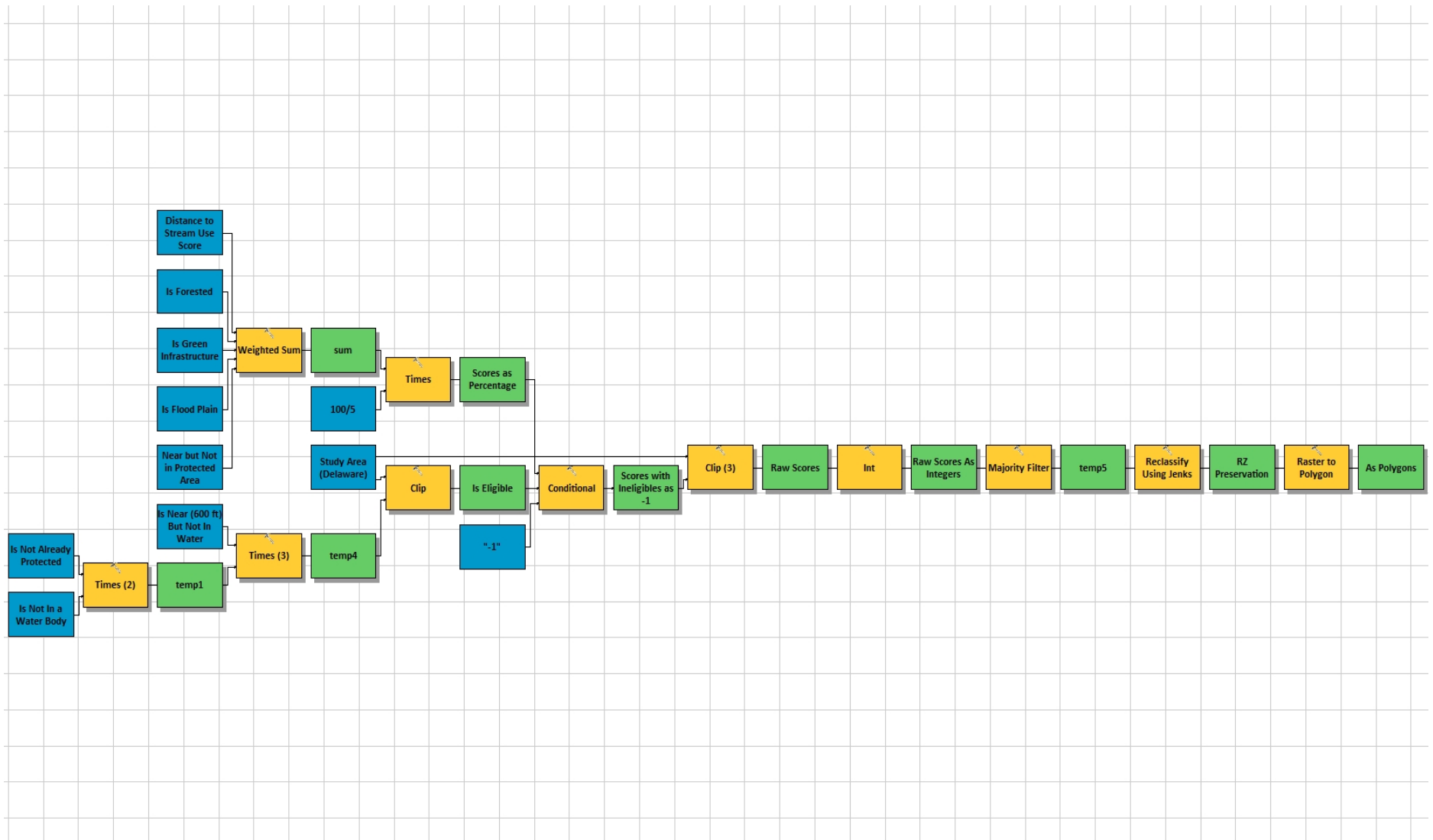|	**Factors for Wetland Restoration**
Relative	- near (200') or in a Green Infrastructure hub or corridor (State-Based Data) - in a Green Infrastructure "gap" area (State-Based Data) - in a 100-year or 500-year floodplain (FEMA) - in an impaired watershed (as indicated by §303-d) (EPA) - near (200') but not in a protected land (USGS) - near (200') but not in a stream or wetland (NHD/NWI) - within 200' or within 600' of a stream (NHD) _____ _____ _____ _____ _____ _____
Absolute	- cannot be a wetland (NWI) - cannot be forested (NLCD) - must be on a very poorly drained soil, somewhat poorly drained soil or poorly drained soil (USDA) _____ _____ _____ _____

Wetland Restoration

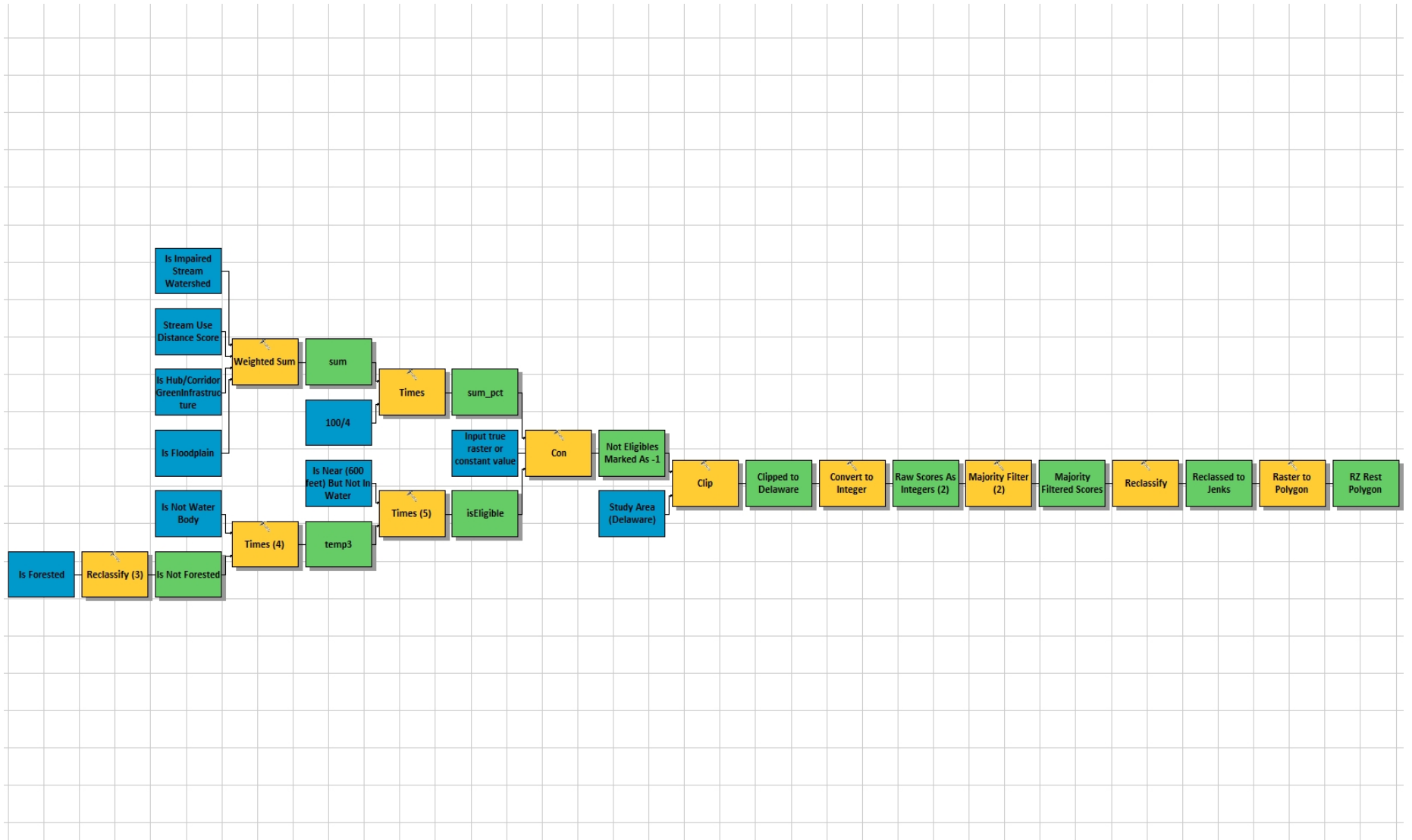|	**Factors for Riparian Zone Preservation**
Relative	• in a 100-year or 500-year flood plain (FEMA) • is forested (NLCD) • in a Green Infrastructure hub or a corridor (State-Based Data) • within 200' or within 600' of the stream (NHD) • near (200') but not in a protected area (USGS) • _____ • _____ • _____ • _____ • _____ • _____ • _____ • _____ • _____
Absolute	• cannot be protected (USGS) • must be near (600') but not in a stream or water body (NHD) • _____ • _____ • _____ • _____ • _____

Riparian Zone Preservation

Distance to Stream Use Score

Is Forested

Is Green Infrastructure

Is Flood Plain

Near but Not in Protected Area

Weighted Sum

sum

100/5

Times

Scores as Percentage

Study Area (Delaware)

Clip

Is Eligible

Conditional

Scores with Ineligibles as -1

Clip (3)

Raw Scores

Int

Raw Scores As Integers

Majority Filter

temp5

Reclassify Using Jenks

RZ Preservation

Raster to Polygon

As Polygons

"-1"

Is Near (600 ft) But Not In Water

Times (3)

temp4

Is Not Already Protected

Times (2)

temp1

Is Not In a Water Body

Factors for Riparian Zone Restoration	
Relative	• in a 100-year or 500-year flood plain (FEMA) • in a Green Infrastructure hub or a corridor (State-Based Data) • in an impaired watershed (as indicated by §303-d) (EPA) • is within 200' or within 600' of a stream (NHD) • _____ • _____ • _____ • _____ • _____ • _____ • _____ • _____
Absolute	• must be near (600') but not in a stream or water body (NHD) • cannot be forested (NLCD) • _____ • _____ • _____ • _____

Riparian Zone Restoration

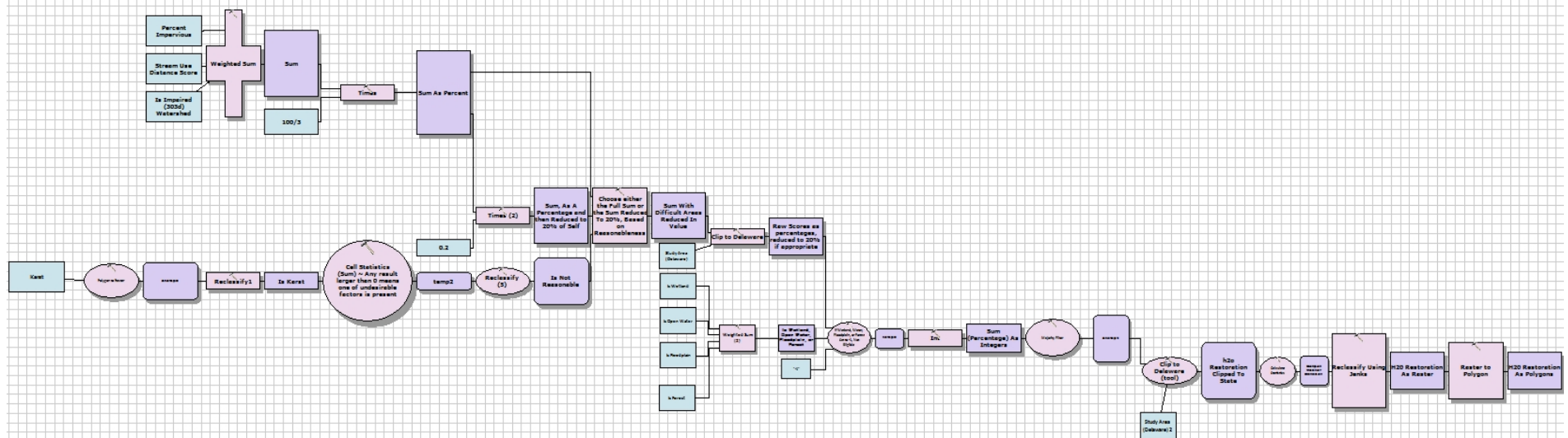|	**Factors for Preserving Healthy Natural Stormwater Infrastructure**
Relative	- in a 100-year or 500-year floodplain (FEMA) - is forested (NLCD) - within 200' or 600' of an impaired (303-d) stream (EPA) - is forested riparian buffer (within 200' of stream, within 400' of stream and within 600' of stream) (NLCD) - is relatively high in impervious surfaces (NLCD) - is forested near (200') or in an area where impervious surfaces are relatively higher (NLCD) - in a wetland (NWI) - in area with well drained soils (USDA) - in a Green Infrastructure hub or corridor (State-Based Data) _____ _____ _____ _____
Absolute	- cannot already be protected (USGS) - cannot be open water (NHD) _____ _____ _____ _____

Stormwater Preservation

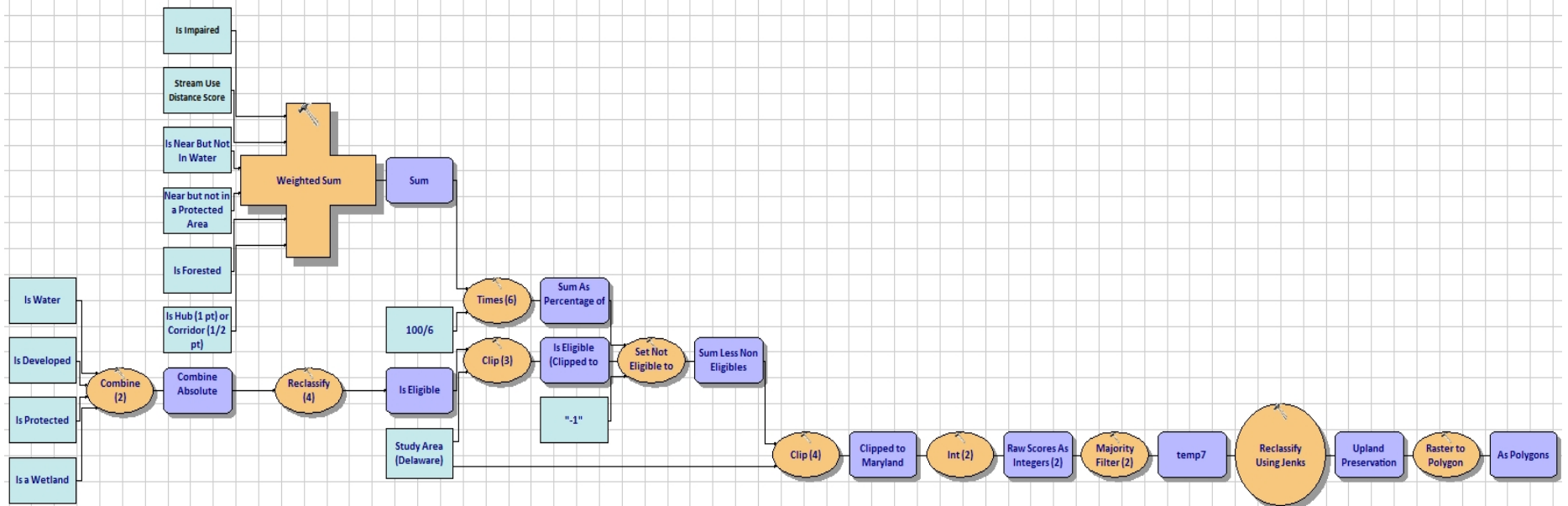| **Factors for Restoring Degraded/Failing Stormwater Infrastructure Systems**	
Relative	• is area of relatively higher impervious surfaces (NLCD) • in an impaired watershed (as indicated by §303-d) (EPA) • is within 200' or within 600' of a stream (NHD) • _____ • _____ • _____ • _____ • _____ • _____ • _____ • _____ • _____
Absolute	• flood plains (FEMA) • forested areas (NLCD) • karst geology (USGS) • in a wetland (NWI) • _____ • _____ • _____ • _____ • _____

Stormwater Restoration

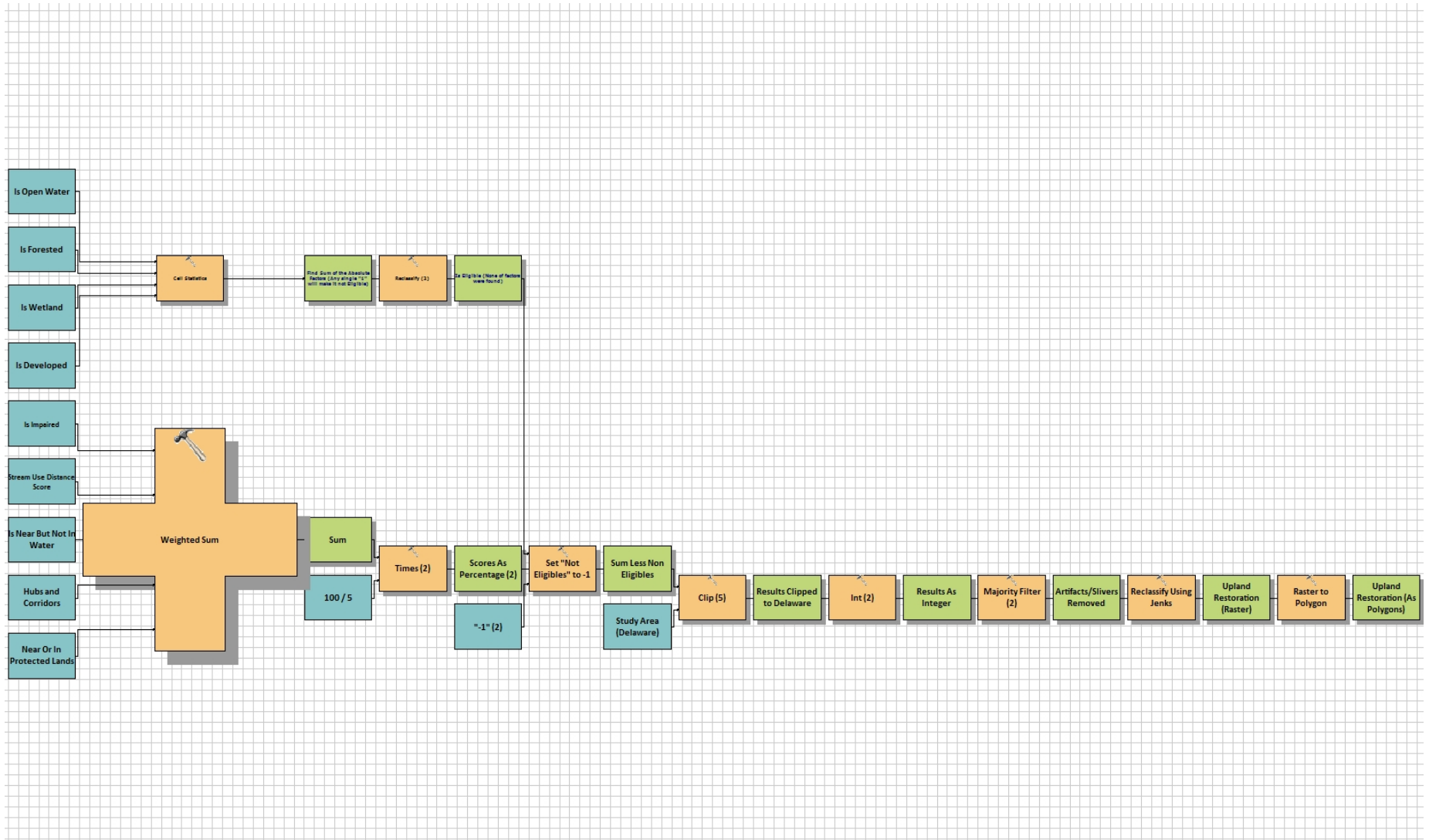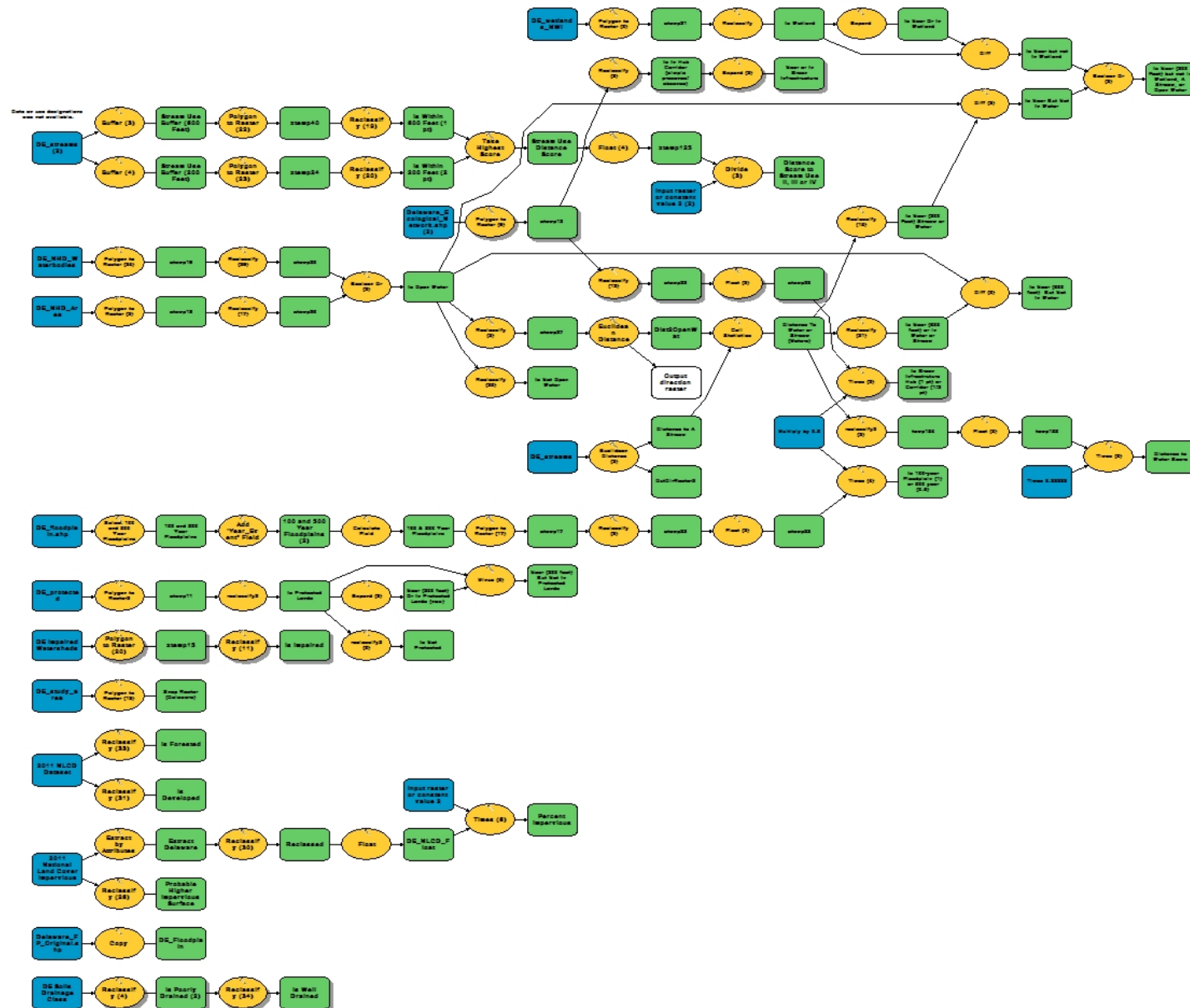|	Factors for Upland Preservation
Relative	• is forested (NLCD) • in a Green Infrastructure hub or a corridor (State-Based Data) • in an impaired watershed (as indicated by §303-d) (EPA) • near (within 400') but not in a protected area (USGS) • is near (200') but not in stream or water body (NHD) • within 200' or within 600' of a stream (NHD) • _____ • _____ • _____ • _____ • _____ • _____ • _____ • _____ • _____
Absolute	• cannot be developed (commercial, institutional, high or medium density residential, transportation) (NLCD) • cannot already be protected (USGS) • cannot be a wetland or open water (NWI/NHD) • _____ • _____ • _____

Upland Preservation

	Factors for Upland Restoration	
Relative	- in an impaired watershed (as indicated by §303-d) (EPA) - in a Green Infrastructure hub or a corridor (State-Based Data) - in or near (within 200') or an already protected area (USGS) - within 200' or within 600' of a stream (NHD) - near (within 200') but not in a water body _____ _____ _____ _____ _____ _____ _____ _____	
Absolute	- cannot be forested (NLCD) - cannot be a wetland or open water (NWI/NHD) - cannot be developed (NLCD) _____ _____ _____ _____ _____ _____	

Upland Restoration

Model Diagrams

Shared Processes

Maryland-Based Criteria Sheets

Watershed Resources Registry
Factors for Wetland Preservation

Relative Factors

- In a Biodiversity Conservation Network area (BionNet 1, 2, or 3)
- In Biodiversity Conservation Network area (BioNet 4, 5 or new FIDS get ½ point)
- In a Blue Infrastructure high priority watershed
- In Chesapeake Bay Commission Critical Area (LDA or RCA only)
- In Biological Restoration Initiative Watershed
- in a 100-year floodplain
- In a Green Infrastructure area (1 point for "hub"; ½ point for "corridor")

- In a Healthy Watershed (Stronghold, spawning, cold water or Class III Trout)
- In a Wetland of Special State Concern (WSSC)
- Near (within 200') but not in protected lands
- In Potential Migration Zones for wetlands, marshes, etc.
- Near (within 200') but not in a stream or water body
- Near (200') or in a GreenPrint Target Ecological Area
- is forested

Absolute Factors

- Must be a wetland
- Cannot already be protected

Watershed Resources Registry
Factors for Wetland Restoration

Relative Factors

- In Biodiversity Conservation Network area (BioNet 4, 5 or new FIDS get ½ point)
- In a Blue Infrastructure high priority watershed
- In Chesapeake Bay Commission Critical Area (LDA or RCA only)
- In a Biological Restoration Initiative Watershed
- in a 100-year floodplain
- In a Green Infrastructure "gap" area
- Near or in a Green Infrastructure "hub" or "corridor

- Near (200') but not in a Wetland of Special State Concern
- Near (200') but not in protected lands
- In Potential Migration Zones for wetlands, marshes, etc.
- Near (200') but not in a stream or wetland
- Near (200') or in a GreenPrint Target Ecological Area
- Is locally impaired: impaired for Nitrogen, Phosphorus, or sedimentation

Absolute Factors

- Cannot be forested
- Cannot be a wetland
- Cannot be developed
- Must be on a very poorly drained, somewhat poorly drained, or poorly drained soils

Watershed Resources Registry

Factors for Riparian Zone Preservation

Relative Factors

- In a Biodiversity Conservation Network area (BionNet 1, 2, or 3)
- In Biodiversity Conservation Network area (BioNet 4, 5 or new FIDS get ½ point)
- In a Blue Infrastructure high priority watershed
- In Chesapeake Bay Commission Critical Area (LDA or RCA only)
- In a Biological Restoration Initiative Watershed
- in a 100-year floodplain
- is forested

- In a Green Infrastructure "hub" (1 point) or "corridor" (1/2 point)
- in a Wetland of Special State Concern
- Near (200') but not in protected lands
- In Potential Migration Zones for wetlands, marshes, etc.
- Near (200') or in a GreenPrint Target Ecological Area
- In a Healthy Watershed (Stronghold, spawning, cold water, or Class III trout)
- is within 200' (1 point), 400' (2/3 point) or 600' (1/3 point) of a stream

Absolute Factors

- Cannot be protected
- Must be near (600') but not in a stream or water body

Watershed Resources Registry

Factors for Riparian Zone Restoration

Relative Factors

- In Biodiversity Conservation Network area (BioNet 4, 5 or new FIDS get ½ point)
- In a Blue Infrastructure high priority watershed
- In Chesapeake Bay Commission Critical Area (LDA or RCA only)
- In a Biological Restoration Initiative Watershed
- In a 100-year floodplain
- In a stressed stream channel: channelization and/or has a lack of riparian buffer
- Near (200') but not in protected lands

- In a Green Infrastructure "hub" (1 point) or "corridor" (1/2 point)
- Near but not in a Wetland of Special State Concern
- In Potential Migration Zones for wetlands, marshes, etc.
- Near (200') or in a GreenPrint Target Ecological Area
- Is within 200' (1 point), 400' (2/3 point) or 600' (1/3 point) of a stream
- Is locally impaired: impaired for Nitrogren, Phosphorus, or sedimentation

Absolute Factors

- Cannot be forested
- Must be near (600') but not in a stream or water body

Watershed Resources Registry

Factors for Upland Preservation

Relative Factors

- In a Biodiversity Conservation Network area (BionNet 1, 2, or 3)
- In Biodiversity Conservation Network area (BioNet 4, 5 or new FIDS get ½ point)
- In a Blue Infrastructure high priority watershed
- In Chesapeake Bay Commission Critical Area (LDA or RCA only)
- In Biological Restoration Initiative Watershed
- Is forested
- In a Green Infrastructure area (1 point for "hub"; ½ point for "corridor")

- In Healthy Watershed (Stronghold, spawning, cold water or Class III Trout)
- In a Wetland of Special State Concern
- Near (within 200') but not in protected lands
- In Potential Migration Zones for wetlands, marshes, etc.
- Near (within 200') but not in a stream or water body
- Near (200') or in a GreenPrint Target Ecological Area

Absolute Factors

- Cannot be developed (commercial, institutional, high or medium density residential, transportation)
- Cannot be a protected
- Cannot be a wetland or open water

Watershed Resources Registry

Factors for Upland Restoration

Relative Factors

- In Biodiversity Conservation Network area (BioNet 4, 5 or new FIDS get ½ point)
- In a Blue Infrastructure high priority watershed
- In Chesapeake Bay Commission Critical Area (LDA or RCA only)
- In Biological Restoration Initiative Watershed
- In a Green Infrastructure area (1 point for "hub"; ½ point for "corridor")
- Is locally impaired: impaired for Nitrogen, Phosphorus, or sedimentation

- Near (200') but not in a Wetland of Special State Concern
- Near (200') but not in protected lands
- In Potential Migration Zones for wetlands, marshes, etc.
- Near (within 200') but not in a stream or water body
- Near (200') or in a GreenPrint Target Ecological Area

Absolute Factors

- Cannot be forested
- Cannot be a wetland
- Cannot be developed

watershed resources registry

Factors for Restoring Degraded/Failing Stormwater Infrastructure Systems

Relative Factors

- in a Blue Infrastructure watershed
- in a Biological Restoration Initiative (BRI) watershed
- in an area that was probably developed before 1985 (1 point) or between 1985 and 2000 (½ point)
- is area of relatively higher impervious surfaces
- in an impaired watershed (as indicated by §303-d)
- Is within 200' (1 point) or within 600' (½ point) of a stream designated for uses II, II or IV
- In a Stronghold Watershed (1 point for "1"; ½ point for "2")
- in a Tier II watershed

Absolute Factors

- Cannot be in a floodplain
- Cannot be a wetland
- Cannot be forested
- Cannot be in open water

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watershed resources registry

Factors for Preserving Healthy Natural Stormwater Infrastructure

Relative Factors

- in a Blue Infrastructure watershed
- in area with well-drained soils
- in a 100-year (1 points) or 500-year (½ point) flood plain
- within 100 feet (1point) or 500 feet (½ point) of a impaired (303-D listed) stream
- in an area that drains to a 303-D listed stream
- in a Tier II watershed
- In a Stronghold Watershed (1 point for "1"; ½ point for "2")
- in Chesapeake Bay Commission Critical Area (LDA or RCA only)
- in a Green Infrastructure hub or corridor
- in an area of potential Forest Interior Dwellings Species Habitat

- is forested riparian buffer (1 point if within 200' of stream, 2/3 point if within 400' of stream and 1/3 point if within 600' of stream)
- is forested
- is relatively high in impervious surfaces
- is forested near (200') or in an area where impervious surfaces are relatively higher
- in an unprotected Targeted Ecologic Area (GreenPrint)
- within 200 feet of a protected Targeted Ecologic Area (GreenPrint)
- is near (200') but not in a protected Targeted Ecologic Area (GreenPrint)
- in a Priority Funding Area
- in a wetland

Absolute Factors

- cannot already be protected
- cannot be open water