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### **DRAFT - FOR CONSIDERATION AT THE MAY 1, 2008 MEETING OF THE HIGHLANDS COUNCIL**

## **Conservation Plans and Best Management Practices**

The Final Draft Regional Master Plan (RMP) include objectives that require specific conservation plans when a portion of an existing area of agricultural land is preserved and the remainder is proposed for clustered residential development in the Agricultural Resource Area (Objective 3A10c), and for clustered development in general (Obj. 2J4b): “Where agricultural purposes are involved, increased impervious surfaces of greater than 3% but less than 9% of the agricultural lands requires the approval of a Farm Conservation Plan from the USDA Natural Resource Conservation Service and impervious surfaces of 9% or greater requires the approval of a Resource Management System Plan from the USDA Natural Resource Conservation Service.” The Highlands Act states the impervious cover is measured after the date of enactment of the Act, so it would not include impervious cover prior to August 10, 2004. The 3% and 9% are established by the Highlands Act for agricultural development, but may not be the most appropriate triggers with regard to Objectives 2J4b and 3A10c to require best management practices that enhance and restore natural resources in the Highlands Region. In determining appropriate triggers the preservation of the agricultural landscape and the sustainability of the agricultural industry must be considered.

The purpose of this white paper is to define the Farm Conservation Plan and the Resource Management System Plan and the differences between these two plans. In addition, the paper examines if the 3% and 9% impervious cover triggers are appropriate, the best management practices (BMPs) currently used in the region, and the difference in pollutant levels when these plans are implemented properly. If the conservation plans and the impervious cover limits are not appropriate targets for enhancing and restoring natural resources in the Highlands Region, the RMP should provide new language for goals, policies, and objectives and promote ways to encourage BMPs. Council staff recommends that, for the purposes of Objective 2J4b and similar objectives regarding non-agricultural compact or clustered development, the approval of the cluster development should trigger development and implementation of a Farm Conservation Plan that is focused on water and soil resource protection, to address the issues of greatest concern for the Highlands Region.

### **Farm Conservation Plan (FCP) vs. Resource Management System Plan (RMSP)**

There are two types of conservation plans: a Farmland Conservation Plan (FCP) and a Resource Management System Plan (RMSP). Conservation plans are developed to make the farm eligible for United States Department of Agriculture (USDA) cost-share grants, for farms preserved through the State Agriculture Development Committee (SADC) Farmland Preservation Program, and for farms that use USDA Natural Resources Conservation Service (NRCS) Farm and Ranchland Protection Program (FRPP) monies

through preservation. The basic difference between an FCP and an RMSP is the FCP will not address the following five resources on the entire farm: soil, water, air, animals, and plants (SWAAP).

Typically the FCP will address soil erosion on the farm to meet the requirements of the USDA Farm Program. The USDA Farm Program compliance allows a higher erosion level than the sustainable erosion rate, which the New Jersey office of the Natural Resources Conservation Service (NJNRCS) refers to as 'T'. An example of a typical conservation plan would examine a farm with a poor erosion rate. Through the implementation of the FCP the farmer would employ a number of practices to get closer to, but not meet the 'T' (sustainable erosion rate). The farm would then meet the minimum compliance for USDA programs, but off-site erosion problems would still exist.

The NJNRCS uses New Jersey Quality Criteria for the SWAAP resources. Each resource has the following number of criteria assigned to it: soil (seventeen), water (twenty-five), air (twelve), animal (eleven), and plant (six). Some of the criteria mimic the national criteria and other criteria are specific to New Jersey, such as the water quantity and water quality criteria (300' buffer) specific to the Highlands Preservation Area. Out of seventy-one criteria, six are specific to New Jersey and the remaining criteria are based on national criteria. When a conservation plan is developed that meets the New Jersey Quality Criteria for all five resources, the plan is considered an RMSP. The requirements for the RMSP are much more stringent, the plan is more complex, and implementation is financially taxing for the owner.

NJNRCS considers the financial hardship on a farming operation when deciding to develop an FCP or an RMSP. The goal of the NRCS is to "develop the most optimal conservation system for an operation" and maintain or enhance the financial sustainability of the operation. The development of the conservation plan and the final paper copy (FCP or RMSP) is at no cost to the farmer. The greatest cost is plan implementation. Plan implementation can span several years and is dependant on a schedule of target dates to develop and implement the plan's conservation practices. The USDA has several cost-share grant programs administered by the NRCS and the Farm Service Agency (FSA) to subsidize the cost of conservation plan implementation. State cost-share funding may also be used for this purpose, and in one case a water purveyor (NJ Water Supply Authority) has provided cost-share funding for RMSP implementation.

### **FCP vs. RMSP - Development and Implementation**

There is no uniform template for the FCP or the RMSP; however there is a standard approach. A computer program allows the NRCS to populate fields and create a plan unique to each farm. Therefore, no two plans are exactly alike. Once the plan is created and printed for the file, it might not be revisited again unless there is a USDA conservation program cost-share contract associated with the plan or if the farm is participating in the SADC Farmland Preservation Program. This essentially means the plan may sit in a drawer and not be re-evaluated. There is no NJNRCS procedure in place to re-evaluate the plan for implementation status. Only a select few farms have cost-share grants (data presented below) or participate in farmland preservation programs.

There is no NJNRCS database summarizing information about the conservation plan or agricultural uses, such as the type of plan, requirements to implement the plan, or the location, size, or type of farming operation. This is due to several factors. The privacy restrictions of the Farm Security Rural Investment Act of 2002 requires NRCS to keep these plans confidential, though applications for cost-share funds from State or other sources may include one or more parts of the plans. For instance, USDA statistics on several of the conservation programs for best management practices will not have information for entire states. While most of the data exists for New Jersey, specific counties are excluded and specific data about each individual plan is not available to the general public. The second factor is that the NJNRCS does not have the funding or resources to track conservation plan status or implementation.

### **FCP vs. RMSP - Quantifying Benefits and Differences in Pollutants**

How can the benefits from implementation of these plans be measured in the Highlands, New Jersey, or on a national level? To answer this question, four aspects are analyzed in the Highlands: the types of agriculture in the Highlands, the impervious cover typically associated with it, the types of conservation programs, and the degree to which the programs are being used. The Highlands Act and the RMP require an FCP with increased impervious cover between 3% and 9%, and a RMSP with increased impervious cover greater than 9%. The Highlands Act states the impervious cover is measured after the date of enactment of the Act, so it would not include impervious cover prior to August 10, 2004. These thresholds apply to agricultural development, and may not be the best target points within the Highlands Region for triggering plans related to cluster development.

### **Agriculture Types and Impervious Cover**

The NJNRCS stated there are few farms in the Highlands Region with high impervious cover. Agricultural uses associated with high impervious cover include nurseries or greenhouse operations, equine (farms for breeding, training, and boarding horses), semi-confined or confined feeding operations (cattle, poultry, and specialty farms), and aquaculture (fish hatcheries). A table generated from NJDEP 2002 LULC data in the Highlands Sustainable Agriculture technical report illustrates the breakdown of agricultural uses in the region (see Page 12). Out of approximately 118,216 acres of agricultural land in the Highlands (805,682 acres in NJ) approximately 7.5% is attributed to uses that would have a high impervious cover. The 7.5% as shown in the table below also includes other uses such as orchards and experimental fields, so the percentage may be closer to approximately 5% to 6%. The NJDA prepared figures by Highland's municipalities for agricultural land use based on the New Jersey Farmland Assessment Summary for the 2004 tax year. Out of approximately 119,571 acres of agricultural land under farmland assessment in the Highlands, equine land use accounted for 0.42% or 922 acres. The breakdown of other agricultural land uses with high impervious cover was not available.

There are few statistics in the Region noting the impervious cover on farms. In 2005, in response to the SADC equine rules, Morris County did a study on the equine operations in the County. The study covered preserved and non-preserved equine farms to determine impervious cover figures. Out of twenty-three equine farms, only four farms had impervious cover above 3%. The three of the farms with impervious cover above 3% ranged from 3.5% to 3.8% and the fourth had the highest impervious cover rate at 5.8%.

The average size of a farm in the Highlands Region is 55 acres. A typical 55-acre farm including a residence (2-car garage/driveway) and two small general purpose barns would have an impervious coverage of approximately 0.33% (8,000 sq. ft.). Adding a very large general purpose hay barn or pole barn (20,000 sq. ft.) would be approximately 0.83% new impervious coverage. A 25-acre farm with identical structures as the 55-acre farm would have approximately 0.73% (8,000 sq. ft.) existing impervious cover and 1.84% (20,000 sq. ft.) new impervious cover to add a very large general purpose hay barn. The largest type of agricultural structure would be a general purpose barn or livestock barn for high-intensity crop production for a feeding operation (150,000 sq. ft. cattle/poultry). A 25-acre farm with this type of structure would yield 13.76% additional impervious cover and a 55-acre farm would yield 6.25% impervious cover. The Highlands Region has minimal to no high-density agricultural uses; for example, confined feeding operations at 0.17% of the agricultural land base.

If the farmer constructed two 20,000 sq. ft. barns this would increase impervious cover more than 3% on a 25-acre farm. The types of agriculture in the Highlands largely don't require multiple structures of this size. The majority of the agricultural land in the region under the 2002 LULC data is classified as cropland/pastureland at approximately 100,824 acres or 85%. The NJDA prepared figures by Highland's municipalities for agricultural land use based on the New Jersey Farmland Assessment Summary for the 2004 tax year. The total pastureland/cropland under farmland assessment for the tax year of 2004 was

118,649 acres.<sup>1</sup> Under the above impervious cover scenarios, assuming the farm unit constructs a very large general purpose hay barn (maximum size 20,000 sq. ft.), the impervious cover will not exceed 3% to trigger an FCP. These calculations used maximum square footage figures from the New Jersey Real Property Manual for appraisals. See the table below with impervious surface calculations for agricultural structures (page 11).

The primary agricultural development that would add more than 3% or 9% impervious cover will be greenhouse operations, high-intensity feeding operations, and equine operations on small farm parcels.

If the impervious cover limits of 3% and 9% are not met, few farms will be required to develop conservation plans and implement best management practices (BMPs) that maintain and enhance soil and water quality in the Region. Farms in the region will need incentives to develop conservation plans and implement BMPs, such as a tax credit program. Maryland and Pennsylvania have similar programs. Technical support and grant funding opportunities would also be important. With the USDA privacy restrictions these programs would need to be administered by the NRCS or the Farm Services Agency (FSA), or a non-profit such as the North Jersey Resource Conservation & Development (NJRC&D). To explore the use and benefits of best management practices in New Jersey and the Highlands the section below analyzes New Jersey farms enrolled in four significant USDA Conservation Programs.

### **New Jersey Enrollment in USDA Conservation Programs**

There are a number of USDA Conservation Programs authorized through the Farm Bill. These programs are administered by the NRCS and the FSA. Data on many of these programs are limited due to the privacy restrictions required by the Farm Security and Rural Investment Act of 2002. The four most significant programs in terms of funding, acreage, and best management practices are the Conservation Security Program (CSP), the Conservation Reserve Program (CRP), the Conservation Reserve Enhancement Program (CREP), and the Wildlife Habitat Incentive Program (WHIP). The statistics below are broken down between national, the northeastern states (CT, DE, ME, MD, MA, NH, NJ, NY, PA, RI, VT, MA), and New Jersey. Federal funding for all of these programs fluctuates due to budget constraints and interest in the programs. Funding for these programs is allocated through annual payments based on five to ten year contracts.

### **Conservation Security Program (CSP)**

The first green payment program created through the 2002 Farm Bill is the CSP administered by the USDA NRCS. CSP rewards farmers who use best management practices (BMPs) on their farms and creates incentives for others to develop these practices to protect soil and water quality. Only specific watersheds are eligible for the funding. This program was not launched until 2004, so the first year of funding began in 2005. Funding allocation in New Jersey was allocated to the Cohansey-Maurice Watershed (South Jersey) in 2005, the Raritan Watershed in 2006, and the Lower Delaware in 2007. The allocations are based on the budget for this program, but also on the interest and participation in these areas. There are approximately 6,144 acres currently enrolled in CSP in the Cohansey-Maurice Watershed and the Raritan Watershed.

In 2005 out of approximately \$146 Million (M) payments approved nationwide, \$7 M (4.8%) was allocated to the northeastern states and \$57,397 (0.82%) to New Jersey (NJ). The northeastern states had 197,036 acres enrolled or 1.9% of the total acreage (9.9 M acres) enrolled nationwide. The Cohansey-Maurice Watershed had 820 acres enrolled in 2005 or 0.42% of the total northeast acreage. In 2006 out of \$45 M payments approved nationwide, \$6 M (13%) was allocated to the northeastern states, and \$104,464 (0.82%) to NJ. The northeastern states had 203,441 acres enrolled or 5.6% of the total acreage (3.6 M acres) enrolled nationwide. The Raritan Watershed had 5,324 acres enrolled in 2006 or 2.6% of the total northeast acreage. In 2007 approximately \$237 M payments were approved, \$12.6 M to the northeastern states (5.3%), and \$168,052 (0.82%) to NJ. There are no acreage figures readily available for 2007, but of the total acreage

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<sup>1</sup> This figure includes modified agricultural wetlands; a total percentage of cropland/pastureland to the total agricultural land use is not available.

enrolled nationwide from 2005 through 2006 (13.5 M acres) only 2.96% is enrolled in the northeastern states and 0.05% in New Jersey.

In the northeast, New Jersey is consistent for allocation and acreage with Vermont and New Hampshire. Maryland, Pennsylvania, and New York have the highest allocations, but also have a much larger amount of agricultural acreage. The USDA NRCS data on New Jersey are not available by county, but the 2006 allocation to the Raritan Watershed included eighteen contracts distributed in the following Highlands counties: eight in Hunterdon County (2,497 acres), three in Morris County (550 acres), and two in Somerset County (2,032 acres). The distribution in New Jersey as compared to the northeast is relatively low in allocations and acreage and only covers the counties in the Raritan Watershed (Hunterdon, Mercer, Middlesex, Monmouth, Morris, Somerset, and Union). Therefore the program is not available to several Highlands counties including Warren County, which has the largest amount of cropland/pastureland (45%) of the total Highlands Region.

### **Conservation Reserve Program (CRP)**

CRP provides cost-share assistance to farmers that establish long-term resource conservation mechanisms on eligible agricultural land and is administered by the New Jersey Office of the FSA. The CRP began in 1987 and seeks to protect topsoil from erosion by reducing water runoff and sedimentation. There are approximately 2,253 acres of agricultural land currently enrolled in New Jersey.

In 2005 out of approximately \$1.8 Billion (B) payments approved nationwide, \$37 M (2.1%) were allocated to the northeastern states and \$120,000 (0.69%) to NJ. The northeastern states had 385,045 acres enrolled or 1.1% of the total acreage (34.9 M acres) enrolled nationwide. New Jersey had 2,295 or 0.56% of the total northeast acreage. In 2006 out of \$1.8 B payments approved, \$44 M (2.4%) to the northeastern states, and \$303,000 (0.69%) to NJ. New Jersey had 2,535 or 0.56% of the total northeast acreage. No summary figures are readily available for 2007.

As of February 2008 approximately \$1.8 B payments were approved nationwide, \$38 M to the northeastern states (2.2%), and \$138,000 (0.69%) to NJ. In the northeast New Jersey is consistent for allocation and acreage with Vermont. Maryland, Pennsylvania, and New York have the highest allocations. The USDA FSA data on New Jersey is presented by county, but much of the county data is kept confidential. Of the total 2,253 acres enrolled in the CRP as of February 2008 four Highlands counties have active contracts: Hunterdon County (1,250 acres), Somerset County (169 acres), Sussex (29 acres), and Warren (105 acres). Again the distribution within these counties is low, especially for Warren which occupies 45% of the cropland/pastureland in the Highlands Region. CRP enrollment tends to be low in high-cost states due to limitations on the amount of rent available per acre.

### **Conservation Reserve Enhancement Program (CREP)**

CREP is a subset of the CRP and also administered by the FSA. Land is placed under a rental contract or under a permanent easement with a contract agreement to reduce non-point source impairment through the preservation of stream buffers and implementation of conservation practices on existing farmland. There are approximately 399 acres of agricultural land currently enrolled in New Jersey. The CREP relies on more advanced levels and methods of conservation than CRP or CSP and requires a greater commitment from the farmer. CREP has higher rental schedules than CRP (through funding from NJDA and NJDEP) and provides funding for implementation of stream buffers.

In 2005 out of approximately \$81 M payments approved nationwide, \$25 M (31%) were allocated to the northeastern states and \$2,000 (0.10%) to NJ. The northeastern states had 225,409 acres enrolled or 33% of the total acreage (675,977 acres) enrolled nationwide. New Jersey had 15 acres or 0.14% of the total northeast acreage. In 2006 out of \$100 M payments approved, \$28 M (28%) to the northeastern states, and \$28,000 (0.10%) to NJ. The northeastern states had 252,281 acres enrolled or 30% of the total acreage (831,577 acres) enrolled nationwide. New Jersey had 215 acres or 0.14% of the total northeast acreage. No

summary figures are available for 2007. As of February 2008 approximately \$135 M payments approved, \$32 M in the northeastern states (24%), and \$53,000 (0.10%) to NJ. The northeastern states had 285,718 acres enrolled or 26% of the total acreage (1.1 M acres) enrolled nationwide. New Jersey had 399 acres or 0.14% of the total northeast acreage.

In the northeast New Jersey has the lowest funding allocation and acreage for the CREP with the exception of the states that do not participate: Connecticut, Delaware, Massachusetts, and New Hampshire. Maryland, Pennsylvania, and New York have the highest allocations and Vermont has about 1,000 acres enrolled. The USDA FSA figures on New Jersey are presented by county, but much of the county data is kept confidential. Of the total 399 acres enrolled in the CREP as of February 2008, only two Highlands counties have active contracts: Hunterdon County (12 acres) and Warren (16 acres). The majority of the acreage (324 acres) is in Salem County. The participation in this program is significantly low in New Jersey as compared to the other northeastern states. The low figures in New Jersey may be due to CREP being a more stringent program that addresses high priority conservation issues. The NJ Office of the FSA has also been slower to promote and develop this program than other states, such as Maryland. However, it is pertinent in the Highlands Region that these programs are incentivized and used much more frequently.

#### **Wildlife Habitat Incentives Program (WHIP)**

NRCS administers the WHIP and assists landowners through funding and technical assistance with habitat restoration and management activities specifically targeting fish and wildlife, including threatened and endangered species. WHIP is one of the most popular programs in New Jersey and has been widely accepted and highly effective throughout the country, because it provides benefits for protecting habitat on land that requires less cultivation. However, reports are not as readily available on WHIP as the other programs. Allocation history is only published by state and it would require manipulation to understand how New Jersey ranks amongst the other northeastern states.

In New Jersey sixteen out of the twenty-one counties participate in WHIP and all of the Highlands counties participate with the exception of Bergen and Passaic. Only figures for 2004 and 2005 are available by county. The allocations for 2004 were approximately \$360,500 and the Highlands counties accounted for 65% or \$236,000 of the allocation. In 2005 there was approximately \$348,000 allocated to New Jersey and the Highlands counties accounted for 66% or \$230,000. The funding allocations for New Jersey increased significantly in 2006 (approximately \$750,000), but the acreage decreased. No exact acreage numbers are available.

The majority of these USDA cost-share conservation programs are relatively new and New Jersey has increased the acreage enrolled in these programs in the last few years, except for CREP which has substantially low acreage enrolled. However, the funding and acreage at the northeastern level and the nationwide level are staggering compared to the percentages attributed to New Jersey. With the exception of WHIP, farms in only a few Highlands counties, mainly Hunterdon, are taking advantage of these programs. Warren County has the highest percentage of cropland/pastureland, (45% or 44,758 acres) 2002 LULC figures and (46% or 54,017 acres) 2004 Farmland Assessment figures, in the Highlands Region and has farmland enrolled in CRP, CREP, and WHIP. Only 121 acres are enrolled in Warren County in the CRP and CREP. Hunterdon County has the second largest amount of cropland/pastureland, (29% or 29,098 acres) 2002 LULC figures and (26% or 31,231 acres) 2004 Farmland Assessment figures, in the Highlands Region and is participating in all of the programs, but only 3,759 acres are enrolled in the entire county in the CSP, CRP, and CREP.

Pennsylvania, Maryland, and New York are the leaders in these programs in the northeast and have significantly more agricultural land. New Jersey is one of the leaders in the nation in the preservation of the agricultural landscape, and is significantly ahead of all the northeastern states with the exception of Maryland, Pennsylvania, and New York. The USDA conservation programs need greater promotion throughout New Jersey. One specific roadblock in New Jersey is the shortage of staff to promote the

programs. Some of the programs have sufficient implementation funds, but lack funding for technical support; NJDEP and other entities have been providing funds for this purpose, but resources are still limited.

### **USDA NRCS Natural Resources Inventory (NRI)**

The NRI is a national statistical survey of data on natural resource conditions and trends on all public (includes state and local governments) and privately owned non-federal land in the United States. Several legislative acts authorize the NRI survey. The NRI is used to develop national conservation policies and programs and serves as a basis for the USDA NRCS/FSA cost-share programs and the CEAP described below.

Data have been compiled in five-year periods from 1977 through 1997. The NRI data include total surface area by land cover/use by state and includes survey data from approximately 800,000 sample sites. Starting in 1997, data were collected annually and are available through 2003. Annual data are only collected on approximately 25% of the 800,000 sample sites. The locations of these sites are kept confidential and not released to the public due to privacy restrictions. Data are collected through remote-sensing and on-site field investigations. The survey data are then analyzed to develop trends for natural resources, most predominantly soil and water.

### **USDA NRCS Conservation Effects Assessment Project (CEAP)**

In 2003 the USDA launched the CEAP, a multi-agency study to quantify the environmental effects of conservation practices used by private landowners participating in selected USDA NRCS/FSA conservation programs. CEAP has three components and uses NRI data and watershed modeling methods to quantify the effects of conservation practices. The first component is a national assessment to quantify the benefits of conservation practices associated with USDA conservation programs. The second component consists of a series of watershed assessment studies. Watersheds were selected nationwide and conservation practices in these watersheds are being studied to develop a framework to evaluate and improve the performance of national assessment models. The third component will develop an index of references on conservation programs.

Prior to the development of this study in 2003, there were no national studies to quantify the benefits of conservation plans and programs since a similar but less detailed project in the 1980's. The CEAP described below is the first of its kind. No watersheds in New Jersey are part of this national study, mainly due to the location of the NRI sample sites. However, the North Jersey Resource Conservation and Development Council (NJRC&D) has recently applied for a grant from the USDA to undertake such a study in the North Jersey region. Data collection has recently begun in many of these studies and will continue over many years. The bulk of the CEAP watershed studies are in the Midwest. There are approximately thirty-seven watershed studies and fourteen benchmark watershed studies. The purpose of the fourteen benchmark watersheds studies is to provide a more in-depth assessment of soil, water, air quality, and wildlife habitat; and create a framework for national assessment models. Several of the benchmark watershed studies received grant funding in 2006 and 2007; therefore only preliminary results are available. The NJ NRCS was contacted to isolate CEAP watershed studies that could be similar to the Highlands Region. Three studies were identified: Choptank River Watershed in Maryland, Town Brook Watershed in New York, and Spring Creek in Pennsylvania.

### **Choptank River Watershed (CRW), Maryland**

A major tributary of the Chesapeake Bay, the Choptank River is located on the Delmarva Peninsula and spans 675 square miles (580,000 acres). The CRW is one of the fourteen benchmark studies and data collection began in 2006 and will sunset 2011. Agricultural use accounts for 58% of the CRW and the remaining land uses are urban (9%) and forested (33%). The types of agricultural use are cover crops (approximately 40% corn and 40% soybeans, remainder wheat and barley) and poultry industry confined feeding operations. Portions of the Choptank River have been identified as an impaired water body under the Clean Water Act for a high level of nutrients and sediments. Several stakeholders are involved in this

process including the University of Maryland, NRCS, National Oceanic and Atmospheric Administration (NOAA), US EPA, and the Maryland Department of Agriculture (MDA). For this study NRCS is collecting individual datasets at the county level for the CSP, CRP, and CREP.

The study is using the USDA Agricultural Research Service (ARS) AnnAGNPS REMM water quality model to quantify the effects of riparian buffers, cover crops, and nutrient management on water quality. AnnAGNPS REMM stands for Annualized Agriculture Non-Point Source, Riparian Ecosystem Management Model. The model requires climate data and parameters for the physical watershed, land use, soil, and management data. After data are collected and entered into the model, the model can determine which conservation practices and what combination of conservation practices will reduce nitrogen loads and establish Total Maximum Daily Loads (TMDLs). The model can be used to create a planning tool that depicts Best Management Practice (BMP) placement in the landscape. For instance, winter cover crops were shown to improve water quality within the CRW. In 2006 the MDA implemented a state-wide commodities winter grain/cover crop program allowing grain harvest, in addition to the traditional cover crop program without harvest. Although the distribution of agricultural land in this watershed is much greater than in the Highlands Region, the method of study would be compatible with the Highlands to determine how nitrogen loads are being reduced by BMPs and the specific types of BMPs that should be implemented to improve water, soil, and air quality.

#### **Town Brook Watershed (TBW), New York**

The TBW lies within the Upper West Branch of the Delaware River and drains into the Cannonsville Reservoir, which is a major part of New York City's drinking water supply system. TBW is also one of the fourteen benchmark studies and is substantially smaller than Choptank at 14.3 square miles (9,143 acres). Land use in the watershed consists of 49% agro-forestry, 48% cropland (2% corn and alfalfa, 48% pasture and hay), and 1% developed. There are approximately 230 dairy (2/3) and beef (1/3) animal feeding operations (confined and semi-confined). The Cannonsville Reservoir is designated as phosphorus-restricted because of algal blooms, which interfere with non-filtered water treatment. The TBW is also participating in Section 319 of the Clean Water Act – Nonpoint Source Pollution Program. Partners in this collaboration include NRCS, ARS, US Geological Survey, Delaware County Soil and Water Conservation Districts, the NYC DEP and the NY State DEP, Cornell University, and the Watershed Agricultural Council (WAC) - a non-profit supporting the NYC watershed region. The success of this project and others is highly dependant on collaboration between agencies; \$750,000 has been provided through New York State to ARS from its Safe Drinking Water Act funds. Studies on this watershed began in 2003 and will be completed in July 2008. There was an interim progress report available outlining progress in the TBW.

The study is using the USDA ARS Soil and Water Assessment Tool (SWAT) watershed manual to evaluate areas in the watershed where phosphorus levels and erosion levels can be lowered at minimal costs through BMPs. New York City is supporting a 100% cost-share program to implement BMPs through a whole-farm planning process supported by the WAC and Delaware County. Of the 230 feeding operations, the majority of the stock is concentrated in seven primary farms. The seven primary farms are all enrolled in CREP and/or Environmental Quality Incentives Programs (EQIP). Since the whole-farm program was instituted approximately 160 out of the 230 (70%) feeding operations are also enrolled in the CREP and/or EQIP. WAC has set a goal of participation for the program at 85% or 196 of the 230 farms. The main concerns associated with these farms are soil quality due to erosion from corn silage and water quality due to the high levels of phosphorus from the dairy farms. A critical component identified in the study is the sustainability and economic viability of these farms as they implement BMPs. Currently these farms are implementing eighteen different types of BMPs. All of the farms are under private ownership, but watershed planners have developed good working relationships with the farmers, which permits smooth implementation of BMPs in most instances.

### **Spring Creek Watershed (SCW), Pennsylvania**

The SCW is centrally located in Centre County, Pennsylvania and the Spring Creek drains into the Susquehanna River. SCW is not one of the fourteen benchmark studies. Land use in the watershed consists of 41% forested, 52% agriculture (44% cover crops, 7% hay, 1% other grass), and 7% development (5% low-intensity, 2% high-intensity). There are approximately 1,215 farms (164,000 acres) and approximately half of the farms (600) have confined or semi-confined feeding operations (91% dairy and beef cattle the largest distribution). Information is not readily available on this project. Pennsylvania State University is compiling the data and collaborating with the USGS, NOAA, PA DEP, the Centre County Planning Office, the Clear Water Conservancy (CWC), and two Spring Creek non-profit organizations: the SCW Community, and the SCW Commission.

Similar to the other two studies above, SCW is analyzing stream condition relative to the implementation of nutrient management and conservation buffer BMPs. There were no preliminary results readily available for this study. However, long-term datasets are available to use in several different models to evaluate the effects of several types of BMPs. One of the major factors in all of these studies is to examine how implementation, maintenance, and performance of BMPs affect landowners and the viability of the farm unit. Although these three studies have a significant amount of feeding operations, the studies also have significant nitrate levels from the use of pesticides on cropland. The Highlands could use the ARS models developed through these projects to evaluate BMPs. New Jersey is not part of the CEAP, because there is a limited percent of site surveys being conducted across the country, only 25% of 800,000 sites annually.

### **Conclusion – Conservation Plans and Best Management Practices**

Wells in the Highlands Region have been measured for shallow ground-water quality. Of the twenty-three wells in the Highlands, eight are in agricultural areas, six are undeveloped, and nine are in urban areas. Three of the eight (38%) of the wells in agricultural areas exceed the water standard of 10mg/L for nitrate plus nitrate. Pesticides were detected in seven out of eight (88%) of the wells in agricultural areas. These data provided direct evidence that shallow ground-water is being affected by nitrogen-based fertilizers in agricultural land areas within the Highlands. The approximate highest concentration of nitrates was less than 30 mg/L with a median around 10mg/L. Sewer-system leakage in urban areas is also considered a major source of nitrogen pollutant.

A paper published in 2007 by the magazine of *Food, Farm, and Resource Issues* estimated nitrate loadings for farms from approximately 120 to 135 lbs/acre using the NRCS Natural Resource Inventory and the Soil and Water Assessment Tool (SWAT) model. This figure is derived from what is applied and not the amount that moves below the root zone. If the pesticide is diluted only by drought recharge and the entire load goes past the root zone, the nitrate loadings would be between 1,600 and 1,800 mg/L. These figures were determined by entering the 120 to 135 lbs/acre figure, and a drought recharge assumption of 9.4 inches/year into the Trela-Douglas model. Crops can and do uptake more nitrate than they actually need. Using the same model to look at the mixed nitrate concentration of a 200 acre farm parcel; assuming a 40 acre cluster development with a maximum target nitrate concentration of 10 mg/L from septic systems and a 160 acre active farm, an impervious surface of 5.5% would result in 10 mg/L over the 40 acre developed area. If the mixed nitrate concentration of the 160 acre farm and 40 acre cluster is plotted against the nitrate concentration for the 200 acre farm parcel, the septic system input provides a net benefit once the agricultural concentration is above 10 mg/L, but above 10 mg/L already exceeds the Safe Drinking Water Standards. Therefore no net benefit would be realized. Although the Private Well Testing Act will ensure that no wells are used that exceed the 10 mg/L, one question that does occur regarding both clustered and non-clustered development in agricultural areas is whether the RMP should include special policies for well construction in these areas, to require that the wells tap aquifers at a depth or location that minimizes the potential for agricultural contamination.

Certain USDA conservation programs provide incentives for farmers applying lower levels of pesticides based on the actual amount crops require. The overview of the USDA conservation programs above shows

minimal acreage enrolled in New Jersey. These programs need to be encouraged throughout the Highlands. Currently, the USDA ARS Annualized Agriculture Non-Point Source, Riparian Ecosystem Management Model (AnnAGNPS REMM) and the USDA ARS SWAT watershed manual are not being used to evaluate farms in the Highlands Region. One proposal would be to examine cost effectiveness and reductions in pollutants for several farms in the Highlands Region. The AnnAGNPS REMM and the SWAT watershed manual could be used to determine the benefits of the BMPs, and what BMPs to apply to other farms in the Region. Warren County and Hunterdon County would be good models for this type of analysis, since these two counties include approximately 75% of the cropland/pastureland in the Region. The NJRC&D would be a good partner for this type of program, since they are formally supported by the NRCS and are familiar with the USDA NRCS/FSA cost-share programs. In addition privacy restrictions would prevent most stakeholders, except those affiliated with NRCS from collecting the data and reviewing the conservation plans.

If the run-off from impervious surface on an agricultural landscape is still a major issue the Farmland Conservation Plan could address a single resource concern such as excess water (water quantity). Since few, if any farms will exceed the 9% impervious cover trigger for a RMSP and few will trigger the 3% impervious cover trigger for an FCP, other alternatives to trigger these conservation plans should be evaluated. If the 3% and 9% triggers are not met, reducing pollutants from agricultural lands linked to a cluster will be a difficult task.

A Farm Conservation Plan is required when agriculture is preserved in perpetuity. The recommendation of this white paper would be to require the development and implementation of a USDA NRCS Farm Conservation Plan that focuses on the protection of water and soil resources, instead of the typical plan which focuses on soil resources. The language in the RMP goals, policies, and objectives, and the cluster program would be changed to reflect this recommendation. Once the RMP is adopted the Highlands Council staff should conduct further research and develop a grant program to analyze model farms, determine the benefits of BMPs on those farms, and identify what BMPs to apply to other farms in the Region. In order for implementation to be successful, there needs to be incentives for conservation plan implementation including grants or dedicated funding, technical assistance, and a tax credit program for best management practices.

In the cluster scenario, one option to fund implementation of the conservation plan is for the developer to create an escrow account. The escrow could also be funded from the homeowners that are part of the homeowner's association within the cluster. If the homeowner desires the view of the agricultural landscape, they should support the enhancement of the landscape with a minimal fee. New York City and New York State provide watershed funding in the Town Brook Watershed project. The New Jersey Water Supply Authority is currently working on a program with the NJ RC&D to assist farmers in providing 90% of the funding for implementation of conservation plans. The Authority would assist the landowner in maximizing federal and state funds and guarantee up to 90% of the funding. This model program has been put in place on several farms in Lebanon Township, Hunterdon County and could be translated to a regional scale to the South Branch Raritan watershed and the Spruce Run and Round Valley Reservoirs.

The Highlands Region has received national recognition. In order to protect and enhance the quality of the natural resources within the Region, best management practices (BMPs) are a necessity. Preliminary studies of the nitrate levels in the Region show the need for BMPs. Simultaneously, the viability of the agricultural industry must be protected and enhanced. Few conservation plans are being implemented in the Highlands and the farmers are not taking advantage of USDA cost-share programs to implement these plans. The Highlands Council must develop model examples for farm conservation plans and model examples of cost-effective implementation of BMPs. The goals, policies, and objectives and the programs in the RMP should reflect these issues and provide specific funding and incentives for the Highlands Region that will simultaneously sustain the agricultural industry and protect natural resources.

**Impervious Surface Calculations - Agricultural Structures**

| Size of Farm (Acres)   | Average               |                |                      |                      |                      |
|--|-----------------------|----------------|----------------------|----------------------|----------------------|
|  | 55                    | 25             | 75                   | 100                  |                      |
| <b>Low Impervious Cover Use</b>  | <b>55-acre</b>        | <b>25-acre</b> | <b>75-acre</b>       | <b>100-acre</b>      |                      |
| Cover Crops, 2 Large Barns   | 5,000                 | 5,000          | 5,000                | 5,000                |                      |
| residence + 2 car garage (3,500 sq. ft./2,500 foundation)                  | 2,500                 | 2,500          | 2,500                | 2,500                |                      |
| driveway   | 500                   | 500            | 500                  | 500                  |                      |
| total square footage   | 8,000                 | 8,000          | 8,000                | 8,000                |                      |
| convert to acres:  | 0.1837                | 0.1837         | 0.1837               | 0.1837               |                      |
| % Impervious Cover   | 0.33%                 | 0.73%          | 0.24%                | 0.18%                |                      |
| <b>High Impervious Cover Use</b>   | <b>55-acre</b>        | <b>25-acre</b> | <b>75-acre</b>       | <b>100-acre</b>      |                      |
| total square footage   | 10,000                | 10,000         | 10,000               | 10,000               |                      |
| convert to acres:  | 0.2296                | 0.2296         | 0.2296               | 0.2296               |                      |
| % Impervious Cover   | 0.42%                 | 0.92%          | 0.31%                | 0.23%                |                      |
| total square footage   | 20,000                | 20,000         | 20,000               | 20,000               |                      |
| convert to acres:  | 0.4591                | 0.4591         | 0.4591               | 0.4591               |                      |
| % Impervious Cover   | 0.83%                 | 1.84%          | 0.61%                | 0.46%                |                      |
| <b>Adding the maximum size pole barn and hay barn (cover crops)</b>        | <b>55-acre</b>        | <b>25-acre</b> | <b>75-acre</b>       | <b>100-acre</b>      |                      |
| total square footage   | 40,000                | 40,000         | 40,000               | 40,000               |                      |
| convert to acres:  | 0.9183                | 0.9183         | 0.9183               | 0.9183               |                      |
| % Impervious Cover   | 1.67%                 | 3.67%          | 1.22%                | 0.92%                |                      |
| <b>Adding the maximum size stall barn, hay barn, riding arena (equine)</b> | <b>55-acre</b>        | <b>25-acre</b> | <b>75-acre</b>       | <b>100-acre</b>      |                      |
| total square footage   | 55,000                | 55,000         | 55,000               | 55,000               |                      |
| convert to acres:  | 1.263                 | 1.263          | 1.263                | 1.263                |                      |
| % Impervious Cover   | 2.30%                 | 5.05%          | 1.68%                | 1.26%                |                      |
| <b>NJ Real Property Manual</b>   | <b>Square Footage</b> | <b>Acres</b>   | <b>% on 55-Acres</b> | <b>% on 25-Acres</b> | <b>% on 75-Acres</b> |
| Max General Purpose Barn (Class 150) High-Density Feeding Op               | 150,000               | 3.44           | 6.25%                | 13.76%               | 4.59%                |
| Max Livestock Barn (Class 151) High-Density Feeding Op                     | 150,000               | 3.44           | 6.25%                | 13.76%               | 4.59%                |
| Max Size Farm Shed/Outbuildings  | 3,000                 | 0.07           | 0.13%                | 0.28%                | 0.09%                |
| Max size of a Stall Barn/Stable (cattle/equine)                            | 15,000                | 0.34           | 0.63%                | 1.38%                | 0.46%                |
| Max size of an Indoor Riding Arena (equine)                                | 20,000                | 0.46           | 0.83%                | 1.84%                | 0.61%                |
| Max size of a Turn Out Shed (equine)                                       | 720                   | 0.02           | 0.03%                | 0.07%                | 0.02%                |
| Max size of a General Purpose Hay Barn (Class PF 160)                      | 20,000                | 0.46           | 0.83%                | 1.84%                | 0.61%                |
| Max size of a Livestock Barn w/storage (Class 161)                         | 20,000                | 0.46           | 0.83%                | 1.84%                | 0.61%                |
| Max size of a Poultry House, Pole Barn                                     | 20,000                | 0.46           | 0.83%                | 1.84%                | 0.61%                |
| Max size of a Greenhouse   | 10,000                | 0.23           | 0.42%                | 0.92%                | 0.31%                |
| Temporary Seed Greenhouses (no max or min)                                 |                       |                |                      |                      |                      |

**NJDEP LULC Data for Agriculture by Type - 2002**

| County       | Total Cropland/Pastureland | % Total        | Total Wetlands | % Total        | Total Former Ag Wetlands | % Total        | Total Orchards, Vineyards, Nurseries, Horticulture | % Total        | Total Confined Feeding Ops | % Total        | Total Other (Equine, Dikes, Access Rds, Experimental Fields) | % Total        |
|--------------|----------------------------|----------------|----------------|----------------|--------------------------|----------------|--|----------------|----------------------------|----------------|--|----------------|
| Bergen       | 98                         | 0.10%          | 41             | 0.52%          | 0                        | 0.00%          | 24   | 0.81%          | 0                          | 0.00%          | 37   | 0.65%          |
| Hunterdon    | 29,098                     | 28.86%         | 1,063          | 13.48%         | 76                       | 11.64%         | 1,094  | 36.72%         | 11                         | 5.34%          | 1,681  | 29.62%         |
| Morris       | 11,306                     | 11.21%         | 798            | 10.12%         | 67                       | 10.33%         | 642  | 21.56%         | 4                          | 1.97%          | 987  | 17.38%         |
| Passaic      | 158                        | 0.16%          | 94             | 1.20%          | 2                        | 0.38%          | 19   | 0.65%          | 0                          | 0.00%          | 159  | 2.81%          |
| Somerset     | 8,328                      | 8.26%          | 268            | 3.40%          | 18                       | 2.78%          | 179  | 6.00%          | 0                          | 0.00%          | 671  | 11.82%         |
| Sussex       | 7,079                      | 7.02%          | 1,694          | 21.48%         | 256                      | 39.43%         | 161  | 5.40%          | 4                          | 2.13%          | 477  | 8.40%          |
| Warren       | 44,758                     | 44.39%         | 3,926          | 49.79%         | 230                      | 35.44%         | 859  | 28.85%         | 184                        | 90.57%         | 1,664  | 29.32%         |
| <b>Total</b> | <b>100,825</b>             | <b>100.00%</b> | <b>7,885</b>   | <b>100.00%</b> | <b>649</b>               | <b>100.00%</b> | <b>2,978</b>                                       | <b>100.00%</b> | <b>204</b>                 | <b>100.00%</b> | <b>5,676</b>   | <b>100.00%</b> |

**Tot Acres: 118,216**

**Agricultural Use % of Total Acres**

Crop/Past: **85.29%** Wetlands: **6.67%** Former Wet: **0.55%** Orchard: **2.52%** Confined: **0.17%** Other: **4.80%** 100.00%

**Approximate % Associated with High Impervious**

Orchard/Confined/Equine **7.49%**

**Approximate % Associated with Cropland (nutrient mgmnt/nitrogen load)**

Crop/Pasture **85.29%**