

**NRV Hazard Mitigation Projects
Floyd County**

Project #	Project Name	Year Added	Hazards Mitigated; Plan Goal/Objective	Benefit	Cost	Benefit to Cost Ratio	Priority	Funding Partners	Implementation/ Lead Agency	Proposed Timeframe	Project Status	Comments
1	Water Resource Study	2005	Drought, Wildfire, Flooding	Identify critical run-off, recharge areas and potential public well and reserves to meet demand; initial implementation; agricultural losses in recent drought = \$4,000,000	\$1,000,000	4.0	High	USDA, USGS, FEMA, VDEM	County administration	As funding becomes available	In progress (2008)	In Progress (2010) via Regional Water Supply Plan (PDC), Source Water Protection Plan (with Virginia Rural Water.) Related to Wildfire threats during drought, one of the most vulnerable communities in the County (Slatemont) has completed the Firewise program.
2	Communication equipment interoperability with surrounding areas	2005	All natural and human-caused	Improved coordination within and among jurisdictions; increased communication reliability; quicker response times and improved access to total services; multiple lives = \$8,000,000	\$500,000	16.0	High	FEMA, Homeland Security	County administration	As funding becomes available	On-going	Emergency Services have established interoperability for federal agencies should the need arise; also have interoperability with some adjacent localities and will extend that when funds are available.
3	Develop Drought Contingency Plan	2005	Drought, Wildfire	Given that 95% of the County lacks public water, a drought contingency plan is particularly important. In the recent drought, 500 private wells had to be replaced at an estimate cost of \$2,500,000	\$50,000	50.0	High	USDA, FEMA, VDEM	County administration	As funding becomes available	In progress (2008)	Some drought planning has occurred via the Regional Water Supply Planning (PDC) and the Source Water Protection Plan;
4	Additional water sources and reserves	2005	Drought, Wildfire	Given that 95% of the County lacks public water, a drought contingency plan is particularly important. In the recent drought, 500 private wells had to be replaced at an estimate cost of \$2,500,000; agricultural losses at \$4,000,000 annually; threat of loss of 60 jobs in agri-tourism industry at \$600,000 = total = \$7,100,000	\$2,500,000	2.8	High	CDBG, ARC, Tobacco Comm., USDA, FEMA, VDEM		As funding becomes available	Cancelled	Replaced by project identifying specific need to expand water and wastewater capacity and service area.

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5	Expanding Public Water and Wastewater Capacity and Service Area	2010	Drought	Being at the top of the watershed and with a recent history of residences having to do 500 replacement wells in 3.5 years of severe drought, we must develop additional water resources and expand the service area of public water and sewer.	\$5,000,000		High	USDA, DHCD	Floyd-Floyd County PSA	As funding becomes available; ideally in next 2 to 5 years		Replaces "Additional water sources and reserves"
6	Work with RC&D for Firewise training at more woodland home locations.	2010	Wildfire	Protecting woodland homes and residents from wildfire danger.	\$10,000		High	VA Dept of Forestry	VA Department of Forestry	2011-2012		
7	Hazard related GIS layers	2005	All natural and human-caused	More accurate flood maps to enable more effective development regulation; protect homes and lives; ground and surface water resource data; water-resource useage by area; future water need; estimate = \$10,000,000	\$200,000	50.0	Medium	USGS, FEMA, VDOF, VMME, VDEM	County administration	As funding becomes available	On-going	FEMA provided a flood map update in 2008; it did not provide additional studies, but we do now have the layers electronically. Further, we now have electronic soil layers, mineral layers, and historic mine/claim layers. Also, the PDC and Radford University have developed some important private well-related layers.
8	Additional dry hydrants	2005	Wildfire	Give the lack of a central water system in 95% of the County, additional dry hydrants are needed to supply firefighting efforts. Based on 100 home at high risk * \$100,000; estimate = \$10,000,000	\$50,000	200.0	Medium	VDOF	VDOF	As funding becomes available	4 new hydrants in place (2007)	The addition of new dry hydrants is depend on funding and a private source of funding has ended so no new hydrants have been added recently.
9	Table-top exercise to identify needs related to private gas and oil tanks in/near Town of Floyd.	2010	Human-caused	Minimize damages should a gas leak or fire occur.	\$5,000		Medium	VDEM	County and VDEM	2011-2013		

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10	Monitor and update applicable ordinances as needed to reflect any change in NFIP standards	2010	Flooding		not applicable		Medium		County administration	As needed		

**NRV Hazard Mitigation Projects
Giles County**

Project #	Project Name	Year Added	Hazards Mitigated; Plan Goal/Objective	Benefit	Cost	Benefit to Cost Ratio	Priority	Funding Partners	Implementation/ Lead Agency	Proposed Timeframe	Project Status	Comments
1	Identify culvert replacement needs to reduce flooding	2005	Flooding	Engineering studies to determine appropriate size for problem culvert areas. Reduce future flooding; estimate = \$2,000,000+	\$200,000	10.0	High	VDOT, USACOE	USACOE, VDOT, County administration	July 2005	Completed, Deferred	Completed inventory by County Staff and VDOT of several problem culverts. Entire drainage study deferred due to lack of funding.
2	Replace culverts to reduce flooding	2005	Flooding	Reduce "damming" effect; reduce future flooding; estimate = \$2,000,000+	25 culverts at \$30,000 = \$750,000	2.7	High	USACOE, VDOT, FEMA, VDEM	VDOT, County administration, USACOE	Ongoing	Still progressing (2010)	Several problem culverts have been upgraded (Bowens Rd, McCall Motors, Kow Kamp, Lucas Street), will proceed as additional funding becomes available.
3	Structure Acquisition	2005	Flooding		\$100,000	8.0	High	FEMA, VDEM	County administration, engineering	As funding becomes available	Completed	
4	A full-time state forester for Giles County	2005	Wildfire	Person to coordinate wildfire education, mitigation, and response; estimate (life saved) = \$2,000,000	\$75,000	26.7	High	VDOF	VDOF, County Administration	As funding becomes available	Deferred	Lack of funding
5	Emergency Services Coordinator Position	2005	All natural and human-caused	Person to align and integrate emergency services; estimate (life saved) = \$2,000,000	\$60,000	20.0	Medium	FEMA, VDEM, County	County administration	January 2006	Deferred	Lack of funding to establish new position
6	Pursue additional water sources	2005	Drought, Wildfire	Reducing dependence on sole water supply well for public system through planning; improve long-term security; estimate = \$6,900,000	\$50,000 (PER)	40.0	Medium	USDA, FEMA, VDEM	County administration, Giles County PSA	Ongoing	Ongoing planning (2010)	River withdrawal planning/design underway. Funding application to USDA/Rural Development has been submitted.
7	Monitor and update applicable ordinances as needed to reflect any change in NFIP standards	2010	Flooding		not applicable		Medium		County planning	As needed		

**NRV Hazard Mitigation Projects
Town of Narrows**

Project #	Project Name	Year Added	Hazards Mitigated; Plan Goal/Objective	Benefit	Cost	Benefit to Cost Ratio	Priority	Funding Partners	Implementation/ Lead Agency	Proposed Timeframe	Project Status	Comments
1	Stormwater facilities	2005	Flooding	Currently stormwater largely flows in open ditches on private property, resulting in frequent flooding; facilities would reduce frequency and impact of flooding to at least 97 structures; estimate value = \$970,000 per event; overall estimates = \$9,700,000	\$2,500,000	3.9	High	CDBG, FEMA, VDEM	Town manager's office	As funding becomes available	In progress (2008)	
2	Replacement of Wastewater Treatment Plant	2005	Flooding	The Wastewater Treatment plan is currently in the floodway, and is subject to flooding. Estimate value = \$2,000,000+	\$1,500,000	1.3	High	USDA, FEMA, VDEM	Town manager's office, PSA	As funding becomes available	Cancelled	Lack of funding
3	Debris containment	2010	Flooding	The Town is subject to recurring flooding during periods of heavy precipitation. Much of the flooding is due to debris being carried downstream into Town and blocks normal drainage causing most of the flooding in Town.	unknown		High	VDEM, FEMA	Town staff	As funding becomes available		
4	Replacement for Critical Facilities Buildings in High-Hazard areas	2005	Flooding, Earthquake	The Town municipal building is located in the floodplain and is prone to frequent damage; the neighboring firehouse is also near a stream, plus it's a block/brick structure prone to Quake damage; either could be rendered totally ineffective by hazard events; estimate value = \$2,000,000+	1000000	2	Medium	USDA, FEMA, VDEM	Town manager's office, local squad	As funding becomes available	Cancelled	Lack of funding
5	Monitor and update applicable ordinances as needed to reflect any change in NFIP standards	2010	Flooding		not applicable		Medium		Town manager's office	As needed		

**NRV Hazard Mitigation Projects
Town of Pearisburg**

Project #	Project Name	Year Added	Hazards Mitigated; Plan Goal/Objective	Benefit	Cost	Benefit to Cost Ratio	Priority	Funding Partners	Implementation/ Lead Agency	Proposed Timeframe	Project Status	Comments
1	Replacement of Wastewater Treatment Plant	2005	Flooding	The Wastewater Treatment plan is currently in the floodway, and is subject to flooding. Estimate value = \$2,000,000+	\$1,500,000	1.3	High	USDA, FEMA, VDEM	Town management, PSA	As funding becomes available	Cancelled	No longer needed; plant was upgraded and has 20 years useful life
2	Upgrade Stormwater System	2005	Flooding	Improvements needed in 3 watersheds: Grand Avenue, Midtown, and Orchard Avenue to fix drainage system impacting 60+ structures. Estimate value = \$3,000,000	\$1,500,000	2.0	High	USDA, FEMA, VDEM	Town management	As funding becomes available	Deferred	Lack of funding
3	Business 460 stormwater mitigation	2008	Flooding	Study to mitigate stormwater flooding on Business 460 on west side of town	\$50,000		High		Town management	As funding becomes available	Deferred	Lack of funding
4	Monitor and update the Town's zoning ordinance as needed to reflect any change in NFIP standards	2010	Flooding		not applicable		Medium		Town management	As needed		

**NRV Hazard Mitigation Projects
Town of Pembroke**

Project #	Project Name	Year Added	Hazards Mitigated; Plan Goal/Objective	Benefit	Cost	Benefit to Cost Ratio	Priority	Funding Partners	Implementation/ Lead Agency	Proposed Timeframe	Project Status	Comments
1	Engineering study of structural needs	2005	Flooding	Corps of Engineers Study to assess structural remedies to flooding; most recent damage exceeded \$400,000; overall estimate = \$4,000,000	\$100,000	40.0	High	USACOE, FEMA, VDEM, VDOT	USACOE, VDOT, County administration	As funding becomes available	Not started	Lack of manpower
2	Replace culverts/drainage	2005	Flooding	Reduce "damming" effect causing; overall estimate = \$4,000,000	10 culverts at \$30,000 = \$300,000	13.3	High	USACOE, FEMA, VDEM, VDOT	VDOT, County administration, USACOE	As funding becomes available	Completed	
3	Early warning system	2005	Flooding	Automated communication system for emergency notification; life save, estimated = \$2,000,000	\$50,000	40.0	High	FEMA, VDEM	Town manager's office, County coordinator	As funding becomes available	Not started	Lack of manpower
4	Streambank clearance	2005	Flooding	Clearing debris and maintaining banks to prevent erosion and flooding. Estimated value = \$1,000,000	\$100,000	10.0	Medium	NRCS	Town manager's office, County administration	As funding becomes available	Completed	
5	Monitor and update applicable ordinances as needed to reflect any change in NFIP standards	2010	Flooding		not applicable		Medium		Town manager's office	As needed		

**NRV Hazard Mitigation Projects
Town of Rich Creek**

Project #	Project Name	Year Added	Hazards Mitigated; Plan Goal/Objective	Benefit	Cost	Benefit to Cost Ratio	Priority	Funding Partners	Implementation/ Lead Agency	Proposed Timeframe	Project Status	Comments
1	Replacement of Wastewater Treatment Plant	2005	Flooding	The Wastewater Treatment plan is currently in the floodway, and is subject to flooding. Estimated value=\$10,000,000+	\$7,000,000	1.3	High	USDA and Towns of Glen Lyn & Rich Creek	Towns of Glen Lyn and Rich Creek	As funding becomes available	Started	USDA Grant Awarded
2	Storm Water Drain Replacement	2010	Flooding	The storm drains in the downtown area are deteriorated and under sized.	\$450,000	1.3	Medium	VDOT Tea-21 & Town of Rich Creek	Town of Rich Creek	5 Years as funding is available	Started	Tea-21 Grant Awarded
3	Adoption and enforcement of floodplain management requirements, including regulating all and substantially improved construction in the Special Flood Hazard Area	2010	Flooding		not applicable		Medium		Town of Rich Creek	As needed		
4	Floodplain identification and mapping, including any local requests for map updates, if needed	2010	Flooding		not applicable		Medium		Town of Rich Creek	As needed		

**NRV Hazard Mitigation Projects
Montgomery County**

Project #	Project Name	Year Added	Hazards Mitigated; Plan Goal/Objective	Benefit	Cost	Benefit to Cost Ratio	Priority	Funding Partners	Implementation/ Lead Agency	Proposed Timeframe	Project Status	Comments
1	Equalization basin	2005	Flooding	Will enable protection of wastewater treatment plan in 100-year events; protecting thousands of public water drinkers downstream; estimate = \$100,000/day; \$1,000,000+	Design, excavation, tank, & installation = \$250,000	4.0	High	FEMA, VDEM, County	PSA	2006	Not started	Lack of funding & manpower
2	Develop swift-water rescue capacity (regional)	2005	Flooding	At least 5 lives have been lost in swift water in the NRV this year; estimate (life saved) = \$2,000,000	\$100,000	20.0	High	FEMA, VDEM, County	County ESC	2004-2005	Completed	
3	Identification and study of Village floodplains; including GIS	2005	Flooding	Already at least \$14,000,000 in development in floodplain; more accurate maps would enable more effective regulation = est. \$1,000,000 in future development	\$50,000	33.3	High	FEMA, VDEM, County	County Planning	2005-2007	Completed	All new floodplain maps, effective 9.25.2009, have been mapped in GIS. A new study done in Plum Creek during 2009.
4	Flood map modernization	2005	Flooding	More accurate flood maps to enable more effective development regulation; protect homes and lives; estimate (10 homes @\$150,000) = \$1,500,000	\$150,000	10.0	High	FEMA	VT, County Planning	2005-2008	Completed	Completed with the adoption of a revised floodplain ordinance and revised maps in September 2009.
5	Property acquisition in floodprone area	2005	Flooding	Residential property acquisition in high risk areas of Roanoke River watershed, wherever there is citizen willingness	\$1,000,000		High	FEMA, VDEM, County	County ESC, Planning	2005-2010	Not started	Lack of funding & manpower
6	Reverse 911 as emergency warning tool	2005	All natural and human-caused	Will enable automated calling of 900 households per hour vs the current slow, dangerous, door-to-door notification by Sheriff's Dept; estimate = \$2,000,000+	\$51,000	39.92	High	FEMA, VDEM, County	County ESC, Sheriff	HMGP grant approved 2004; Implementation in 2005	Completed	
7	Pre-development database	2005	Flooding, Geologic, Wildfire, Drought	Full integration of zoning, permitting, building, 911, & real property info	\$100,000		High	VDCR, FEMA, VDEM, VMME, VT	County ESC & Planning	Implementation 2005	Partially Completed	Shrink swell soils and flood zone designation are reviewed during the process of obtaining a zoning and building permit. Wildfire risk is not assessed at this time.
8	Develop and promote pipeline safety	2010	Human-caused	We have one underground gas transmission line that runs through Montgomery County and into Pulaski Co. Staff will work with NaCo to create report that is due out very soon called Pipelines and Informed Planning Alliance (PIPA).	\$25,000	30	High	NaCo, County	County Planning	2010		
9	Montgomery County Certified as Storm Ready Community	2010	Flood, Snowfall, Ice Storms	To be better prepared to save lives from the onslaught of severe weather through advanced planning, education and awareness.	unknown	10	High	NOAA, NWS, County	ESC/County Planning	2010	Completed	

**NRV Hazard Mitigation Projects
Montgomery County**

Project #	Project Name	Year Added	Hazards Mitigated; Plan Goal/Objective	Benefit	Cost	Benefit to Cost Ratio	Priority	Funding Partners	Implementation/Lead Agency	Proposed Timeframe	Project Status	Comments
10	Expand current karst mapping	2005	Geologic	A karst feature inventory to enable, inform better development regulations & ordinance to limit future risks; value of one home lost to sink hole, estimate = \$150,000+	\$50,000	3	Low	VDCR, FEMA, VDEM, VT	County Planning	2007	Not started	Lack of manpower
11	Streambed/streambank restoration	2005	Flooding, Drought	Reducing peak-flows and increasing recharge	\$50,000		Low	USACOE, VDOT, FEMA, VDEM	County Planning	2007-2010	Partially Completed	Montgomery County does not have a program; however they have supported many conservation easements wherein landowners participate in VDOT and USDA streambank restoration/mitigation programs.
12	Acquisition of Plum Creek area businesses	2005	Flooding	Reducing repetitive loss structures and threats to life; estimate = \$2,000,000	At least 13 structures = \$600,000	3.3	Low	FEMA, VDEM	County Planning	2010-2015	Not started	Lack of funding
13	Residential acquisition (landslide) on Elliot Creek	2005	Flooding, Geologic	Reducing repetitive loss structure (flooding and landslide) and threats to life; estimate = \$2,000,000	Acquisition & demolition of 2 structures = \$153,000	13.1	Low	FEMA, VDEM, County	County Planning	2010-2015	Not started	Lack of funding; HMGP funding denied 2004
14	Shrink-swell soil mapping	2005	Geologic	More accurate shrink-swell soil maps to enable more effective development regulation; protect homes and businesses; past damage unknown; potential home values in high hazard areas estimated to exceed \$5,000,000	\$50,000		Medium	VDCR, FEMA, VDEM, VT	County Planning	2005	Completed	Shrink swell soils are reviewed at the time a zoning permit is issued and logged into a database.
15	More hazard related GIS data	2005	Flooding, Geologic, Wildfire, Drought	Capturing damage data, more detailed risk data, critical infrastructure data, etc.	\$100,000		Medium	VDCR, FEMA, VDEM, VMME, VT	County ESC & Planning	2004-2010	Completed	A elevation certificate database has been created, and locations of pipelines have been mapped.

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Montgomery County**

Project #	Project Name	Year Added	Hazards Mitigated; Plan Goal/Objective	Benefit	Cost	Benefit to Cost Ratio	Priority	Funding Partners	Implementation/ Lead Agency	Proposed Timeframe	Project Status	Comments
16	Public education: flooding, wildfire, karst	2005	All natural and human-caused	Educating the public about hazards and threats to life and property and ways to minimize those threats; estimate = \$2,000,000	\$100,000	20.0	Medium	FEMA, VDEM, County	County ESC	2005-2010	Completed	A series of meetings discussing floodplains were held in 2009 with the adoption of new maps, all property owners with land in the floodplain were notified by mail. FP property owners are also made aware when they come in for zoning permits. There is literature available at the office as well.
17	Additional I-FLOWS gauges	2005	Flooding	Enhance prediction and warning abilities; better protection of lives; estimate + \$2,000,000+	\$50,000	40.0	Medium	NOAA, NWS	NOAA/NWS, County ESC	2010-2015	Not started	Lack of funding
18	Utilize zoning ordinances to further restrict undeveloped floodplains	2010	Flooding		not applicable		Medium		County planning dept.	As needed		
19	Encourage standards above NFIP standards when considering floodplain development	2010	Flooding		not applicable		Medium		County planning dept.	As needed		

**NRV Hazard Mitigation Projects
Town of Blacksburg**

Project #	Project Name	Year Added	Hazards Mitigated; Plan Goal/Objective	Benefit	Cost	Benefit to Cost Ratio	Priority	Funding Partners	Implementation/ Lead Agency	Proposed Timeframe	Project Status	Comments
1	Series of stormwater detention ponds	2005	Flooding	Create a series of stormwater detention ponds to reduce peak-flow especially during 100-year event; last significant flood caused \$4,000,000 in damage at VT	\$1,000,000	4.0	High	USACOE, FEMA, VDEM	Town of Blacksburg, Engineering & GIS depts	As funding becomes available	In Progress	Stormwater Task Force Committee formed to review funding options. Completed work in 2010, but Town Council has made no final decision.
2	Hazard related GIS layers	2005	All natural and human-caused	More accurate flood, groundwater, geologic maps to enable more effective development regulation; protecting lives, natural resources, & homes; estimate \$1,000,000 in future development redirected	\$100,000	10.0	High	USGS, FEMA, VDOF, VMME, VDEM	Town of Blacksburg, Engineering & GIS depts	As funding becomes available	In Progress	Floodmap, geology, soils, aerials of forest cover, open streams are complete. Stormwater and subsurface mapping in progress
3	New Rescue Station	2010	All natural and human-caused	Provide emergency shelter for citizens, provide training areas for regional rescue members and enhance response times; \$10,000,000	\$5,000,000	2	High		Town of Blacksburg, Engineering & GIS depts	As funding becomes available	In progress	
4	Development of water supply plan which includes a drought ordinance	2010	All natural and human-caused	Provides continuous water supply to all homes, business and Virginia Tech. The drought ordinance provides guidance of water saving measures in times of drought; \$5,000,000 as water is essential to all residents, businesses and Virginia Tech.	\$25,000	200	High		Town of Blacksburg & Town of Christiansburg, Virginia Tech, BCVPIWA	Fall, 2011	In progress	
5	Creation of development guidelines for wildfire prevention	2005	Wildfire	Improving ability and means to prevent future wildfire damage through development guidance; 10 homes saved at \$250,000 = \$2,500,000	\$25,000	100.0	Low	FEMA, VDEM, VDOF	NRVPDC	As funding becomes available	Deferred	No funding available
6	Undergrounding utilities	2005	Wildfire, wind, winter weather	Burying major utility lines to prevent outages and accidents related to natural hazards; estimate = \$10,000,000 (safety and business not lost)	\$7,500,000	1.3	Low	FEMA, VDEM, CDBG, TEA-21	Town of Blacksburg, Engineering & GIS depts	As funding becomes available	In Progress	note that existing Town Zoning Ordinance regulations require new utilities to be placed underground.
7	Implement remote monitoring system for utility operation	2005	All natural and human-caused	Allow monitoring of wastewater pump stations operations and water system pressures during power outages; estimate = \$500,000	\$70,000	7.1	Medium	BCVPIWA, BVPISA	Town of Blacksburg, Engineering & GIS depts	As funding becomes available	In Progress (2010)	
8	Provision of back-up power for critical infrastructures	2005	All natural and human-caused	Allow water and wastewater systems to continue operations during major power outages; estimate = \$2,000,000 (safety and business not lost)	\$200,000	10.0	Medium	FEMA, VDEM	BCVPIWA	As funding becomes available	In Progress (2010)	with generators in place at critical facilities and utilities.

**NRV Hazard Mitigation Projects
Town of Blacksburg**

Project #	Project Name	Year Added	Hazards Mitigated; Plan Goal/Objective	Benefit	Cost	Benefit to Cost Ratio	Priority	Funding Partners	Implementation/Lead Agency	Proposed Timeframe	Project Status	Comments
9	Increase water storage	2005	All natural and human-caused	Increasing water storage capacity to serve both the Town and VT; estimate = \$5,000,000 (security)	\$2,000,000	2.5	Medium	FEMA, VDEM, CDBG	PSA	As funding becomes available	Completed	The new tanks that have been constructed are the Highland Park Tanks. There were originally 2 tanks on the site, 1- one million gallon tank and 1- 0.5 million gallon tank. We constructed 3 new tanks; 1- 2.0 million gallon tank, and 2-1.0 million gallon tanks. So we have added an additional 2.5 million gallons worth of storage.
10	Increase fireflow for Town's High System	2010	All natural and human-caused	Increase fireflow available to the Town's High Water system in the Southeast Quadrant; estimate=10 Homes saved at \$500,000 each, \$5,000,000	\$700,000	7.14	Medium		Town of Blacksburg, Engineering & GIS depts	As funding becomes available	Proposed in Town CIP for 2013	
11	Emergency water interconnection between High System and Low System	2010	All natural and human-caused	Serve users on either system in case of interruption on either system; home saved and health and safety, minimum disruption to homes, business and Virginia Tech, \$5,000,000	\$500,000	10	Medium	Town of Blacksburg, Virginia Tech	Town of Blacksburg, Engineering & GIS depts	As funding becomes available		
12	Provision of back up power at critical intersections	2010	All natural and human-caused	Through natural gas backup generator at major signalized intersections, traffic will be able to flow as normal without the addition of emergency personnel who may be needed elsewhere. Allows businesses and residents to continue operations at \$1,000,000 per event	\$220,000	4.55	Medium		Town of Blacksburg, Engineering & GIS depts	As funding becomes available for existing signages, but as other signals are replaced or proposed, all new signals to be constructed with backup systems in case of power outages.	Proposed in Town CIP 2012 to retrofit 4 signals per year, for 5 years	Existing and proposed roundabouts are not signalized and provide for normal traffic flow routinely and in case of power outages.
13	Monitor and update applicable ordinances as needed to reflect any change in NFIP standards	2010	Flooding		not applicable		Medium		Town of Blacksburg planning dept.	As needed		

**NRV Hazard Mitigation Projects
Town of Christiansburg**

Project #	Project Name	Year Added	Hazards Mitigated; Plan Goal/Objective	Benefit	Cost	Benefit to Cost Ratio	Priority	Funding Partners	Implementation/ Lead Agency	Proposed Timeframe	Project Status	Comments
1	Floodplain GIS layer	2005	Flooding	More accurate flood maps to enable more effective development regulation; protect homes and lives; estimate (5 homes @ \$150,000) = \$750,000	\$50,000	15.0	High	FEMA, VDEM	Town planners & GIS	FY 2007 (pending FEMA coordination)	completed	
2	Study of series of stormwater ponds	2005	Flooding	Reduce flooding on College St.	\$100,000		Medium	USACOE, FEMA, VDEM	Town management	As funding becomes available	Cancelled	Lack of support
3	Home acquisition	2005	Flooding	Purchase 8 homes (@ \$150,000); no information available on exact damage, but recurrent flooding and damage estimate at 15% of value + life saved; estimate = ~\$2,000,000	\$1,200,000	1.7	Low	FEMA, VDEM	Town management	As funding becomes available	Deferred	Lack of funding
4	Undergrounding utilities	2005	Wildfire, wind, winter weather	Burying utility lines to prevent outages and accidents; estimate = \$4,000,000 (accidents & lost revenue)	\$2,000,000	2	Low	FEMA, VDEM	Town management	As development occurs	In progress	
5	Monitor and update the Town's zoning ordinance as needed to reflect any change in NFIP standards	2010	Flooding		not applicable		Medium		Town planning dept.	As needed		

**NRV Hazard Mitigation Projects
Pulaski County**

Project #	Project Name	Year Added	Hazards Mitigated; Plan Goal/Objective	Benefit	Cost	Benefit to Cost Ratio	Priority	Funding Partners	Implementation/ Lead Agency	Proposed Timeframe	Project Status	Comments
1	Reverse 911/Early warning system	2005	All natural and human-caused	Will enable automated calling of 900 households per hour vs the current slow, dangerous, door-to-door notification by the Sheriff's Dept.; estimate = \$2,000,000+	Includes new system plus upgrading GIS records for integration = \$75,000	26.7	High	FEMA, VDEM, USDA	County administration	June 2007	Completed	
2	Upgraded rescue and utility communication equipment	2005	All natural and human-caused	Improved coordination within and among jurisdictions; increased communication reliability' quicker response times & improved access to total services; multiple lives saved; estimate = \$5,000,000	Includes broadband and wireless technology for emergency operations & utilities = \$2,000,000	2.5	High	FEMA, VDEM, USDA	County administration	June 2005	On going	Mostly completed, finished as funding allows
3	Elevating homes	2005	Flooding	Elevating homes in high-hazard areas; willing participants not yet identified	unknown		High	FEMA, VDEM	Planning	Ongoing	Not started	Lack of participants
4	Upgrading New River Trail	2005	Flooding	Upgrading the New River Trail for use during floods as a means of emergency transportation for residents in Allisonia; estimate = \$2,000,000	\$500,000	4.0	High	FEMA, VDEM, TEA-21	Planning	May 2008	Completed	
5	Relocate ECC/Sheriff's Office	2008	All natural and human-caused		\$2,000,000		High	Local budget	Sheriff/County Admin	Dec 2012 (proposed)	In planning	To be completed by 2012 (goal)
6	Additional I-FLOWS rain and stream gauges	2005	Flooding	Enhance prediction and warning abilities; better protection of lives; estimate = \$2,000,000+	\$50,000	40.0	Low	NOAA, NWS	NOAA/NWS, Emergency Coordinator	April 2005	Completed	
7	Dredging of upper Claytor Lake	2005	Flooding	Dredging the upper end of Claytor Lake to enable additional storage capacity in flood events; help downstream areas including Radford and Giles County; estimate = \$5,000,000	\$1,500,000	3.3	Low	USACOE, FEMA, AEP	Planning	January 2010	Planning in progress (2008)	Still planning, pending funding from USACOE
8	Wildfire Mitigation -- Creating Defensible Space for High Risk Communities	2008	Wildfire		\$455,000		medium	VDOF	Emergency services Coordinator	Planning started 2010	Not started	Applied for VDEM funding
9	Ready Pulaski!	2008	All natural and human-caused	Education/Survival Kit program	\$25,000		medium	NWS	Emergency services Coordinator	As funding becomes available	Deferred	Lack of funding/staffing
10	Monitor and update applicable ordinances as needed to reflect any change in NFIP standards	2010	Flooding		not applicable		Medium		County planning dept.	As needed		

**NRV Hazard Mitigation Projects
Town of Pulaski**

Project #	Project Name	Year Added	Hazards Mitigated; Plan Goal/Objective	Benefit	Cost	Benefit to Cost Ratio	Priority	Funding Partners	Implementation/Lead Agency	Proposed Timeframe	Project Status	Comments
1	Integrated Early Warning system or Reverse 911	2005	All natural and human-caused	Automate communication system for emergency notification; live saved = \$2,000,000	\$50,000	40.0	High	FEMA, VDEM	Town and County emergency coordinator	not applicable	Completed	
2	Channel dredging, straightening	2005	Flooding	Very old channel through Town does not hold major rain events; peak flow could be reduced by more rapid discharge of flood waters; channel contains questionable sediment washed to downstream water supplies in flood; estimate = \$6,000,000	2 miles by 40' width by 5' depth = \$5,000,000	1.2	High	USACOE, FEMA, VDEM, VDOT, EPA, DEQ	Town management, engineering	As funding becomes available	Deferred	Lack of Funding.
3	Replace or rehabilitate railroad bridge (acting as dam)	2005	Flooding	Reduce elevation of flood waters by opening flow impeded by railroad structure; probably the difference between downtown damage or not in 100-year event; estimate = \$10,000,000 at risk	\$1,000,000	10.0	High	USACOE, FEMA, VDEM, VDOT, N&S	Town management, engineering	As funding becomes available	Deferred	Lack of Funding.
4	Acquisition of other Repetitive Loss properties	2005	Flooding	Reduce repetitive loss and decrease danger to lives; estimate = \$2,000,000+	\$250,000	8.0	High	FEMA, VDEM	Town management, engineering	As funding becomes available	Deferred	Lack of Funds to Purchase Repetitive Loss Properties.
5	Flood education/outreach	2005	Flooding	Educating the public about hazards and threats to life and property and ways to minimize those threats; estimate = \$2,000,000+	\$50,000	40.0	Medium	FEMA, VDEM	Town and County emergency coordinator	Ongoing	Deferred.	Personnel reductions; lack of funding.
6	Acquisition of other Repetitive Loss properties for Lottier Bottom	2005	Flooding	Reduce repetitive loss in Lottier Bottom area; decrease danger to lives.	unknown			FEMA, VDEM	Town and County emergency coordinator	As funding becomes available	Completed.	Three homes removed from Lottier Bottom area.
7	Monitor and update applicable ordinances as needed to reflect any change in NFIP standards	2010	Flooding		not applicable		Medium		Town planning dept.	As needed		

**NRV Hazard Mitigation Projects
City of Radford**

Project #	Project Name	Year Added	Hazards Mitigated; Plan Goal/Objective	Benefit	Cost	Benefit to Cost Ratio	Priority	Funding Partners	Implementation/ Lead Agency	Proposed Timeframe	Project Status	Comments
1	Detention pond at Sunset Park	2005	Flooding	Reduce periodic flooding	\$1,000,000		High	CIP	Engineering Dept	2004-2005	Completed	
2	Swift water rescue equipment & training (regional)	2005	Flooding	At least 5 lives have been lost in swift water in the NRV this year; estimate (life saved) = \$2,000,000	\$500,000	4.0	High	FEMA, VDEM	Fire Chief	2005-2006	Completed	
3	Tie-pile removal along New River	2005	Flooding, Wildfire	Reduce flooding and wildfire risk of 1,000,000+ old railroad ties, piled along New River; also possible burning toxins putting lives at risk; estimate = \$10,000,000	\$2,000,000	5.0	High	EPA, DEQ, FEMA, VDEM	City Mangers Office	2008-2009	Deferred, seeking funds for 2011	
4	Code Red	2009	All natural and human-caused	Emergency notification system	unknown		High	General Fund	GIS Dept and City Managers Office	2009	Complete	
5	Flood Insurance Relief Map Update	2009	Flooding	Community planning resource, meet new federal insurance requirements.	unknown		High		Engineering Dept, GIS Dept, FEMA	2009	Complete	
6	Improvements to Dispatch Software and Equipment	2009	All natural and human-caused	Upgraded the GIS software and servers for E911 to improve response times and access to information	\$30,000		High	GRANT?	Police Dept, GIS, Dept and ?	2009	Complete	
7	Little River Dam Study	2009	Flooding	Evaluated working components, structural integrity and assessed other general metrics related to the function and safety of the dam	\$100,000		High	Electric Dept	Electric Dept	2008-2010	Complete	
8	Intermediate Water System Improvement Project	2009	Flooding, Drought	Public Health	\$1.8 M		High	CIP, ARRA	City Engineer, Water Department	2009-2010	In progress	
9	Regional stormwater detention project: Connelly's Run	2005	Flooding	Reducing peak flows from 5.45AC drainage area to reduce flooding in lower reaches	\$2,500,000		Low	FEMA, VDEM, USACOE	Engineering Dept	2008-2009	Seeking funds for 2011	Need regional cooperation 177 Corridor plan
10	Inventory of City Trees	2007	Flooding	Evaluate existing city owned tree canopy, determine benefit to neighborhoods, community development, costs to maintain.	none, received Departme of Forest grant to perform study.		Low		City Engineer, Commission on Forestry and Civic Beautification	2008-2010	Completed 2010	
11	New stormwater drainage structures	2008	Flooding		\$15,000/year		Medium	General fund	Public Works	Ongoing	Complete (annual project)	
12	Improvements to Impervious Surface Maps	2009	Flooding	improve quality of runoff quality and quantity.	unknown		Medium	none	City Engineer	2009-2010	In progress	
13	Little River Dam Improvements	2010	Flooding	Maintenance and improvements to the flood gates	\$30,000-50,000		Medium	Electric Dept	Electric Department	2011	Planning Stages	
14	Storm Drainage Basin Map Improvements	2009-2010	Flooding	community development, quality of life, sustainability	unknown		Medium	City Engineer, Virginia Department of Forestry	City Engineer	2009-2011	Phase I completed 2010	
15	Gibsondale Sanitary Sewer Project	2006	Flooding		unknown			CIP	City Engineer	not applicable	Completed 2008	
16	Mutual Aid Agreements for Emergency Response	2009	All natural and human-caused	improve respone time for emergencies	unknown		Low			2012-2015		
17	Monitor and update applicable ordinances as needed to reflect any change in NFIP standards	2010	Flooding		not applicable		Medium		City planning dept.	As needed		

**NRV Hazard Mitigation Projects
Region-wide**

Project #	Project Name	Year Added	Hazards Mitigated; Plan Goal/Objective	Benefit	Cost	Benefit to Cost Ratio	Priority	Funding Partners	Implementation/ Lead Agency	Proposed Timeframe	Project Status	Comments
1	Updated flood maps	2005	Flooding	More accurate flood maps to enable more effective development regulation; protective homes and lives; estimate (33 homes @ \$150,000) = \$5,000,000	\$50,000 per jurisdiction = \$750,000	6.7	High	FEMA	NRVPDC and/or local govt.	3-5 years	Completed by FEMA	
2	Additional hazard, risk, damage and scientific data points	2005	Flooding, Geologic, Wildfire, Drought	Capturing damage data, more detailed risk data, critical infrastructure data, etc.; estimate = \$2,000,000+ (guiding development away from risk areas)	\$200,000	10.0	High	FEMA, VDEM	NRVPDC and/or local govt.	Ongoing	Ongoing as part of hazard mitigation planning	
3	Regional Swift Water Rescue Team	2005	Flooding	Atleast 5 lives have been lost in swift water in the NRV this year; estimate = \$2,000,000	Training and Equipment for 7 fire and rescue squad rep's = \$500,000	4.0	High	FEMA, VDEM	Local Fire and Rescue Teams	Ongoing	Completed	
4	Regional Reverse-911	2005	All natural and human-caused	Rapid dispatch to protect many lives; estimate = \$10,000,000	17 entities (including VT & RU) @ \$75,000 = \$1,275,000	7.8	High	FEMA, VDEM	NRVPDC and local govt's.	2-3 years	Completed	
5	Regional Water Supply Planning	2005	Drought, Wildfire	Research, coordination and planning to secure safe and adequate water supplies for drinking water, household, agricultural, commercial and industrial uses; agricultural losses alone in most recent drought exceeded \$10,000,000; estimate = \$20,000,000 +	\$500,000	40.0	High	USDA, FEMA, VDEM	NRVPDC, Local govt's and PSA's	Ongoing	In progress, to be completed 2011	
6	Regional Telecommunication Capacity and Interoperability	2005	All natural and human-caused	Improved coordination within and among jurisdictions; increased communication reliability; quicker response times and improved access to total services; estimated 20 lives saved; estimate = \$40,000,000	Broad-band and wireless services for local emergency services operations = \$10,000,000	4.0	Medium	EDA, ARC, CDBG, FEMA, VDEM	NRVPDC and local govt's.	2-4 years	Ongoing by localities	
7	Regional Damage Assessment Team	2005	All natural and human-caused	Establishing a trained, equipped, and ready-to-respond group to open and speed assessment and access to fed and state help; estimate = \$1,000,000	25 (5 per major juris) = \$120,000	8.3	Low	VDEM	NRVPDC and/or VDEM.	1 year	Deferred	Funding unavailable
8	Regional Infrastructure and Debris Management Planning Model	2005	All natural and human-caused	Expedite removal of storm debris by identifying high-risk and neighborhood staging areas; with a goal of quick recovery and reduction of unnecessary landfill utilization; estimate (every acre saved) = \$1,000,000	\$50,000 for each of 5 major jurisdiction \$250,000	4.0	Low	FEMA, VDEM	NRVPDC	5 years	Deferred	Funding unavailable
9	Regional inventory of emergency response equipment and personnel	2010	All natural and human-caused		unknown		Medium		Emergency responders	As funding becomes available		
10	Create all hazards educational materials	2010	All natural and human-caused		unknown		High		NRVPDC	As funding becomes available		
11	Provide weather radios to vulnerable populations	2010	All natural and human-caused		unknown		Medium		NWS/Emergency responders	As funding becomes available		
12	Develop a regional strategy for participation in "Turn Around, Don't Drown"	2010	Flooding		unknown		High		NRVPDC	As funding becomes available		
13	Create all hazards educational program & distribute preparedness kits	2010	All natural and human-caused		unknown		Medium		NRVPDC/Emergency Responders	As funding becomes available		
14	Inventory culverts & identify those that need attention	2010	Flooding		unknown		Medium		NRVPDC/Localities	As funding becomes available		
15	Create maps of inaccessible areas for emergency equipment	2010	All natural and human-caused		unknown		Low		NRVPDC/Emergency Responders	As funding becomes available		
16	Rockfall inventory for secondary roads	2010	Rockfall/Geologic		unknown		Low		NRVPDC/Radford University	As funding becomes available		

**NRV Hazard Mitigation Projects
Region-wide**

Project #	Project Name	Year Added	Hazards Mitigated; Plan Goal/Objective	Benefit	Cost	Benefit to Cost Ratio	Priority	Funding Partners	Implementation/ Lead Agency	Proposed Timeframe	Project Status	Comments
17	Improve detour signage	2010	All natural and human-caused		unknown		Low		VDOT	As funding becomes available		
18	Identify emergency shelters & coordinate their use and equipment	2010	All natural and human-caused		unknown		Medium		Emergency responders	As funding becomes available		
19	Install notification systems at likely rockfall locations	2010	Rockfall/Geologic		unknown		Low		Localities	As funding becomes available		
20	Inventory potential rockfall areas for mitigation benefits	2010	Rockfall/Geologic		unknown		Medium		NRVPDC/Localities	As funding becomes available		
21	Identify rockfall issues on trails and walkways	2010	Rockfall/Geologic		unknown		Medium		NRVPDC/Localities	As funding becomes available		
22	Inventory smaller and private bridges	2010	Flooding		unknown		Low		NRVPDC/Localities	As funding becomes available		
23	Coordinate with VDEM to identify companies to provide large, reliable water supplies	2010	Drought		unknown		Medium		NRVPDC/Localities	As funding becomes available		
24	Create karst program to actively map and educate landowners	2010	Karst/Geologic		unknown		Medium		NRVPDC/Localities	As funding becomes available		
25	Wildfire prevention and mitigation such as Firewise training at more woodland home communities, creating defensible space, hazardous fuels reduction, and ignition resistant retrofitting	2010	Wildfire		unknown		High		NRVPDC/Localities	As funding becomes available		
26	Acquisition and demolition, acquisition and relocation, retrofitting, elevation, floodproofing, mitigation reconstruction of NFIP defined SRL properties, or other mitigation for properties in flood-prone areas	2010	Flooding		unknown		High		NRVPDC/Localities	As funding becomes available		
27	Minor localized flood control projects to include but not limited to stormwater management improvements	2010	Flooding		unknown		Medium		NRVPDC/Localities	As funding becomes available		
28	Upgrade and implementation of emergency response systems	2010	All		unknown		Medium		NRVPDC/Localities	As funding becomes available		
29	Hazard education and outreach	2010	All		unknown		Medium		NRVPDC/Localities	As funding becomes available		