

## I. INTRODUCTION

Floods are a very common disaster in America. Flooding is caused by heavy rain or continuous light rain that causes a river to overflow. This can also be caused by melting snow. Jennifer Wriggins discusses the seriousness of floods in *Flood Money: The Challenge of U.S. Flood Insurance Reform in a Warming World*. She points out that floods are the most costly natural disaster in the country, and that they may become more frequent, severe, and expensive in the future due to climate change and the growth of the population.<sup>1</sup>

Flooding accounts for roughly ninety percent of all catastrophic losses annually.<sup>2</sup> On average, floods have caused over \$8 billion in damages annually for the past thirty years.<sup>3</sup> Hurricanes Katrina and Sandy alone are responsible for over \$160 billion in damages.<sup>4</sup> Currently, there are different approaches to dealing with this problem. However, floodplain restoration is a cost effective and environmentally friendly manner of mitigating floods in order to avoid such damages. This narrative will further discuss the problems associated with flooding, the problems resulting from current approaches to combat flood damage, why new approaches are needed, how other jurisdictions are addressing the same problems, policy issues to address while crafting an adequate ordinance, and suggestions for funding for the ordinance or any restoration projects associated with it. Floodplain restoration and prohibition of construction within floodplains will not only heavily reduce the risk of flood damage and loss of life, but will arguably be more cost effective than maintenance of manmade flood control structures.

---

<sup>1</sup> Flood Money: The Challenge of U.S. Flood Insurance Reform in a Warming World, 119 Penn St. L. Rev. 361, 366

<sup>2</sup> INSURING FLOODS: THE MOST COMMON AND DEVASTATING NATURAL CATASTROPHES IN AMERICA, 60 Vill. L. Rev. 53, 53

<sup>3</sup> Id.

<sup>4</sup> Id.

## II. THE PROBLEM: DEVELOPING WITHIN FLOODPLAINS AND USE OF MANMADE FLOOD CONTROL METHODS WORSENS FLOOD DAMAGE RISKS

A floodplain is an area of low-lying ground adjacent to a river. It is formed mainly of river sediments and is prone to flooding. Two kinds of floodplains are the 100 year floodplain and the 500 year floodplain. FEMA defines a 500 year floodplain as an area with a 0.2% or 1 in 500 chance of flooding per year, and a 100 year floodplain with a 1% chance in flooding per year.<sup>5</sup> Development upon floodplains not only subjects the buildings erected to a much higher flood risk, but the flood protection measures typically employed can also increase the possibility of flooding. On their website, Hillsdale County Community Center discusses the problems of developing on the floodplains and implementing manmade methods of storm water control such as levees to protect against flood damage. To elaborate, they point out that this leads to a higher risk of water overflowing riverbanks and thus resulting in more dangerous floods.<sup>6</sup> They name other factors that increase flooding such as the building of structures that deflect floodwaters because they change flood paths, and construction of bridges, culverts, buildings, and other structures on floodplains because they reduce the storage area for water within a floodplain.<sup>7</sup> The end result of development within the floodplain, they say, is that the floodplain loses the ability to soak up rain, leading to much larger, more frequent flooding.<sup>8</sup> A solution they suggest is to prohibit building within the floodplain, which only a few of the municipalities, including within the Dowagiac River watershed, have actually done.<sup>9</sup>

---

<sup>5</sup> FEMA Hazard Guide, [https://efotg.sc.egov.usda.gov/references/public/NM/FEMA\\_FLD\\_HAZ\\_guide.pdf](https://efotg.sc.egov.usda.gov/references/public/NM/FEMA_FLD_HAZ_guide.pdf)

<sup>6</sup> Hillsdale County Community Center, <http://www.hillsdalecounty.info/planningeduc0010.asp>

<sup>7</sup> Id.

<sup>8</sup> Id.

<sup>9</sup> Id.

While small floods can be beneficial to wildlife, fish, and people, and are essential for a river's health, large floods can be dangerous. Small floods are very beneficial. Not only do they provide water that can be used and stored by people, but they also can help filter out pollutants and invasive plants and animals. This can benefit native species. Also, flooding plays an important part in the reproductive cycles of plants such as the willow tree, and a number of fish such as the sturgeon. Large floods, on the other hand, are not as beneficial. These will cause the river to spread out over large areas and pose a threat to homes, businesses, and safety of nearby people.

To address the problem of flooding, Congress has enacted legislation called the Flood Plain Management Act. However, by its very nature, this statute allows for building upon floodplains.<sup>10</sup> The problem with building on a floodplain is that residents face the very real risk of flooding and the resulting devastation. Flooding can cause homes to be damaged or destroyed, along with property being ruined.<sup>11</sup>

The above information is especially crucial to Pennsylvania, as it is one of the most flood prone states in the country. Due to Pennsylvania having 45,000 miles of rivers and streams, and an average 42 inches of annual rainfall, a flood can occur anywhere in Pennsylvania at any time.<sup>12</sup> An example of the seriousness of the problem took place in Western Pennsylvania, where more than fifty families became homeless last month due to a flash flood caused by roughly five inches of rain over two hours. Thirty of these families were in Connellsville, the rest were in

---

<sup>10</sup> 32 Pa. Stat. Ann. § 679.101

<sup>11</sup> Texas Water Development Board, [http://www.twdb.texas.gov/flood/doc/084\\_LivinginaFloodplain\\_handout.pdf](http://www.twdb.texas.gov/flood/doc/084_LivinginaFloodplain_handout.pdf)

<sup>12</sup> 2014 Report Card for Pennsylvania's Infrastructure  
[http://www.pareportcard.org/PARC2014/downloads/PA\\_2014\\_RC\\_Levees.pdf](http://www.pareportcard.org/PARC2014/downloads/PA_2014_RC_Levees.pdf)

Bullskin Township.<sup>13</sup> Currently, Dunbar Borough, where this took place has no flood protection measures in place.<sup>14</sup> The borough is, however, proposing a flood protection project that would consist of the placement of concrete walls and the construction of a trash and debris barrier.<sup>15</sup> Other manmade options Pennsylvania currently employs include levees and dams.<sup>16</sup> However, these can contribute to the problem as explained above, and are inadequate as will be discussed later.

There are areas where the current methods of dealing with floods are nonexistent, and the proposed manmade methods such as in Dunbar Borough are economically ineffective in addition to being inadequate, and in some cases, counterproductive. The reasons for this will be discussed later. Due to the precipitation levels Pennsylvania faces annually, the inadequacy of the current legislation to combat flooding, the damages flooding does, combined with the drawbacks of manmade flood control or no flood control at all, a new approach must be taken. The proposed approach is the use of floodplains to slow the flow of water, and for a phasing out of the current laws that allow for building upon a floodplain. The reason is development within floodplains is an isolation from their respective river, rendering them unable to adequately absorb water. In addition is the use of green infrastructure on structures already within floodplains in order to mitigate flooding.

As such, further development within floodplains should be either prohibited or, at the very least, very strictly regulated because allowing development subjects more structures to

---

<sup>13</sup> WPXI, <http://www.wpxi.com/news/fayette-county-hit-hard-by-flooding-connellsville-declares-state-of-emergency/431229196>

<sup>14</sup> Id.

<sup>15</sup> Id.

<sup>16</sup> American Rivers, <https://www.americanrivers.org/threats-solutions/restoring-damaged-rivers/benefits-of-restoring-floodplains/>

higher flood risks and lessens a floodplain's ability to mitigate flooding. Also, structures already within floodplains should employ green infrastructure in order to be more flood resistant. This should also be the case for the very few new structures permitted to be built within a floodplain. The goal is to solve the problem caused by continued development within floodplains, the isolation of a floodplain from its respective river, and the higher flood damage risk that structures within floodplains face.

### III. WHY NEW ORDINANCES ARE NEEDED

A new ordinance is needed because the current ordinances either allow for construction within floodplains or restrict further construction but do not require green infrastructure to protect structures currently within floodplains. Also, manmade structures are failing due to age and also disconnect floodplains from their respective rivers. As a result, the floodplains are unable to provide flood protection. Also, buildings within a floodplain are the first to be hit in the event of a flood. As such, further development within a floodplain should be prohibited so that they can be restored to their respective rivers. Also, structures already within floodplains should be made more resistant to flooding. There are areas that have employed measures to restore floodplains, and their results regarding flood damage aversion are below.

Manmade flood control structures such as dams and levees can and do fail. In addition to the fact that these can separate a floodplain from its respective river, this can also be dangerous in other ways. Aging dams can be overwhelmed and the resulting water flow can be lethal in addition to costing considerable property damage. Levees can be overtopped when rising flood water rises above the top, they can be breached by weak points in their structure which can be a

result of age, and over time, water can seep through or underneath a levee. The latter can be caused by a river flooding for extended periods of time.

Pennsylvania has 3,347 dams, 776 of them are classified as high hazard.<sup>17</sup> Sixty-seven percent of them, equal to 518 high hazard dams, are classified as deficient.<sup>18</sup> Furthermore, to repair all of the high hazard dams classified as deficient will cost over \$1.4 billion dollars over the next five years. A deficient dam is one where the existing condition could result in the failure of the dam which would lead to significant property damage and loss of life. In other words, such a dam has people living downstream.<sup>19</sup> In order to be classified as unsafe, a dam must be in danger of failing. This is determined by whether or not it is unable to withstand projected flood levels or it suffers from bowing, cracks, or seepage.<sup>20</sup> The above number of deficient high hazard dams is almost double the amount found in 2010, where it was 302<sup>21</sup> and since then, there has only been one additional high hazard dam built. In other words, as time goes on, the problem can be expected to worsen, resulting in an increase in risk. In 2010, the predicted cost of repairing the dams is over \$1.3 billion.<sup>22</sup>

To delve deeper into the problems posed by dams, Coleen P. Engvall discusses the causes of the problem in *The Issue: High-Hazard Unsafe Dams*. In *The Issue*, she points out that the average US dam is 52 years old, and discusses how the problem of high hazard unsafe dams is a

---

<sup>17</sup> 2014 Report Card for Pennsylvania's Infrastructure,  
[http://www.pareportcard.org/PARC2014/downloads/PA\\_2014\\_RC\\_Dams.pdf](http://www.pareportcard.org/PARC2014/downloads/PA_2014_RC_Dams.pdf)

<sup>18</sup> Id.

<sup>19</sup> The Issue: High Hazard Unsafe Dams,  
<http://jcc.legis.state.pa.us/resources/ftp/documents/Reports/Green%20Paper%20-%20Fall%202015%20-%20High%20Hazard%20Dams.pdf>

<sup>20</sup> Id.

<sup>21</sup> 2010 Report Card for Pennsylvania's Infrastructure  
<http://www.pareportcard.org/PDFs/DamsLevees%20FINAL%20w%20NAT.pdf>

<sup>22</sup> Id.

growing one.<sup>23</sup> The deadliest dam failure in US history took place in Johnstown in 1889, and another flood in 1936. Together, they claimed the lives of over 2,000 citizens of Johnstown.<sup>24</sup>

*The Issue: High Hazard Unsafe Dams* describes a plan that will fix up to ten high hazard unsafe dams that are owned by the Commonwealth and are managed by the PA Fish and Boat Commission.<sup>25</sup> The problem is this is only a few high hazard dams, and as noted earlier, there are almost 600 that are deficient. Again, this is almost twice the number of high hazard deficient dams as there were 4 years before that report was done. As such, this problem will only increase and the cost of remedying the situation is very high.

Levees are not much safer of a bet. In Pennsylvania, this is the most commonly available protection against flooding, especially within a floodplain.<sup>26</sup> Fifty-one percent of Pennsylvania's sixty-seven counties have levees in place.<sup>27</sup> Three counties combined account for twenty-five percent of these with Luzerne County having 32, Lackawanna County having 25, and Lycoming having 23.<sup>28</sup> A levee is an embankment built to prevent the overflow of a river. These structures are problematic in that they, like dams, unnaturally keep rivers within a narrow channel. The result is that water rises higher and flows faster than it would otherwise. This, in turn, causes more powerful flooding downstream or a bottleneck which causes more flooding upstream. It can also be a ridge of sediment deposited naturally alongside a river by overflow. Finally, a levee separates the river from its floodplain, which starves it of water. The result is a reduction in floodplain ecosystems, and the ability to hold water during floods.

---

<sup>23</sup> *The Issue: High Hazard Unsafe Dams*,  
<http://jcc.legis.state.pa.us/resources/ftp/documents/Reports/Green%20Paper%20-%20Fall%202015%20-%20High%20Hazard%20Dams.pdf>

<sup>24</sup> *Id.*

<sup>25</sup> *Id.*

<sup>26</sup> 2014 Report Card for Pennsylvania's Infrastructure  
[http://www.pareportcard.org/PARC2014/downloads/PA\\_2014\\_RC\\_Levees.pdf](http://www.pareportcard.org/PARC2014/downloads/PA_2014_RC_Levees.pdf)

<sup>27</sup> *Id.*

<sup>28</sup> *Id.*

The problems with levees include age, deterioration over time, and an increase in water levels. As referenced earlier, this can lead to breaches, resulting in destruction of property to the buildings nearby. To be specific, the average levee in Pennsylvania is forty-eight years of age, and more than one third of them are over fifty years of age. The deterioration of the levees resulting from age, coupled with the climate change, results in an increased risk of flooding and levee overtopping and failure.<sup>29</sup> In other words, as climate change goes on, water levels will rise and more levees will be overtopped.

As demonstrated above, manmade methods of flood control are very costly to maintain. Fortunately, there is a more environmentally friendly method of flood mitigation known as floodplain restoration. However, in order to effectively restore them, construction upon one must be either prohibited or very limited. An ordinance is needed to ensure this goal is met. In *Flood Plain Form, Function, and Connectivity in River Restoration*, Kirsty Bramlet further discusses reasons why an ordinance is needed for floodplain restoration. To do so, she discusses changes that have been made to rivers that affected their connectivity to floodplains and altered the natural phases of floodplain functions.<sup>30</sup> She goes on to state that man-made changes to the land uses along rivers and manmade alterations of river flow disconnects a river from its floodplain.<sup>31</sup> Levees, specifically, have been put in place to control flooding, but this disconnects the river from its floodplain.<sup>32</sup> She further states that there are floodplains that have been permanently

---

<sup>29</sup> Id.

<sup>30</sup> Kirsty Bramlet, *Flood Plain Form, Function, and Connectivity in River Restoration*, <https://riverrestoration.wikispaces.com/Floodplain+connectivity>

<sup>31</sup> Id.

<sup>32</sup> Id.



flooded by the reservoirs created as a result of dams, or disconnected by dikes.<sup>33</sup> The end result, she concludes, is that they are one of the most endangered ecosystems in the world.<sup>34</sup>

Restoration of floodplains does not pose any of the drawbacks of manmade flood control. Also, this is an effective method of flood prevention due to the benefits floodplains provide. They can store and slow flood waters, improve water quality, safeguard people and property, create fertile soils for crops, nurturing life, providing recreation, and recharging groundwater.<sup>35</sup> During floods, the way in which a floodplain makes for effective flood control is they spread the water and also absorb it. As a result, less water if any at all reaches businesses or homes, preventing flood damage.<sup>36</sup>

In addition to providing effective flood control, floodplains also absorb harmful chemicals and other pollutants. This results in water better suited for drinking and swimming, and more beneficial to plants and animals. Furthermore, they provide recreational benefits because they tend to be wonderful for hiking, paddling, fishing, and exercising.<sup>37</sup>

In *Rivers and Resilience: Lessons Learned from Tropical Storm Irene*, David K. Mears and Sarah McKearnan confirmed the above benefits of a floodplain. They also gave an example of a floodplain's ability to control floods in Vermont. This example took place during Hurricane Irene, where they stated, "During the storm, flow rates in Rutland were over 16,000 cubic feet per second and the water level was nine feet above the flood line. Forty miles downstream, Otter Creek runs through Middlebury. A flow rate of 16,000 cubic feet per second would have devastated the college town; fortunately, the flow rate through Middlebury was around 6,000

---

<sup>33</sup> Id.

<sup>34</sup> Id.

<sup>35</sup> American Rivers, <https://www.americanrivers.org/threats-solutions/restoring-damaged-rivers/benefits-of-restoring-floodplains/>

<sup>36</sup> Id.

<sup>37</sup> Id.

cubic feet per second. The flow rate was reduced because the creek spilled over into intact floodplains, including intact wetlands and forested swamp. The floodplain absorbed some of the water and reduced the creek's energy.”<sup>38</sup> Because of the documented success of a floodplain, they laid out a few methods of floodplain protection. These methods include, “strengthening local and state regulations that limit building projects; developing policies that encourage and promote infill development in safe downtown locations; conserving floodplains upstream from developed areas through either the outright purchase of land or conservation easements negotiated with private landowners; and developing long-term transportation infrastructure plans that aim to keep roads out of hazardous floodplain areas whenever possible.”<sup>39</sup> They go on to mention that private landowners may be willing to assist in financing floodplain restoration projects if it could be proven to them that less land would be eroded as a result. *Id.*

In short, manmade flood control methods are not the safest, and to repair them is costly. Furthermore, they can disconnect floodplains from their respective rivers, causing higher water levels during floods.

The current legislation does not adequately address the above problem either, as will be discussed shortly. Arguably, it helps to contribute to the problem. In order to reduce the risk for flooding in Pennsylvania, Congress has enacted legislation called the Floodplain Management Act. Its main purpose is to encourage planning and development in floodplains which are consistent with sound land use practices.<sup>40</sup> This requires all municipalities identified as having an area or areas at risk for flooding participate in the National Flood Insurance Program by enacting

---

<sup>38</sup> ARTICLE: RIVERS AND RESILIENCE: LESSONS LEARNED FROM TROPICAL STORM IRENE, 14 *Vt. J. Envtl. L.* 177, 187.

<sup>39</sup> *Id.* at 192.

<sup>40</sup> 32 Pa. Stat. Ann. § 679.103(a)

floodplain management ordinances that comply with its minimum standards.<sup>41</sup> Such a municipality has to gain eligibility by applying within six months from the date of notification by FEMA that it has been identified as having areas subject to flooding.<sup>42</sup>

In order to become eligible with the NFIP, the municipalities must adopt the floodplain management and must then forward a copy to FEMA for approval.<sup>43</sup> If FEMA approves the regulations, the Department of Community and Economic Development of the Commonwealth will notify the appropriate county planning commission.<sup>44</sup>

This legislation, of course, has its drawbacks. Jennifer Wriggins discusses the problems with the Floodplain Management Act in *Flood Money: The Challenge of U.S. Flood Insurance Reform in a Warming World*. She names the three main goals, “providing insurance to people in flood-prone areas who otherwise couldn’t get it on ‘reasonable terms and conditions’, reducing disaster relief costs, and improving floodplain management to reduce disaster relief costs”.<sup>45</sup> She goes on to point out how counterproductive the plan is in terms of saving money on disaster relief by discussing three problems with the statute. She says,

“If below-market insurance is available and federal management such as the construction of levees encourages migration to flood prone areas, more property will be at risk of flood damage. Also, supplying inexpensive insurance for older buildings may discourage replacing or renovating them to increase flood resistance. Furthermore, the program had no practical way to compel safer construction in flood-prone areas, again resulting in more at-risk property. Finally, one of the enduring problems with the flood insurance is the lack of demand which results in many losses being uninsured. The result is that the federal money that was to be saved by the statute would instead not be saved due to offering below-market insurance in high-risk areas in addition to the lack of enforcement of such practices that may reduce flood damage”.<sup>46</sup>

---

<sup>41</sup> 12 Pa. Code § 113.3(a)

<sup>42</sup> *Id.*

<sup>43</sup> 12 Pa. Code § 113.3(d)

<sup>44</sup> *Id.*

<sup>45</sup> Article: *Flood Money: The Challenge of U.S. Flood Insurance Reform in a Warming World*, 119 Penn St. L. Rev. 361

<sup>46</sup> *Id.* at 385

Furthermore, many agree that NFIP has contributed to development in flood-prone areas, and incentives for not replacing older buildings in these areas rather than guiding development away from flood prone areas.<sup>47</sup> Although economists and students of natural disasters argue that it flies in the face of logic economically to encourage people to reside in a dangerous area such as a floodplain and then expect to be compensated when damage occurs, the laws have shown that such choices will be rewarded.<sup>48</sup>

David Mears and Sarah McKearnan also elaborated upon the risk that building upon a floodplain poses. They point out that, “allowing construction in floodplains not only exposes new buildings to flood risks, it also reduces floodplain storage, aggravating the risks to existing buildings, roads, and other infrastructure downstream of the development.”<sup>49</sup> This is especially dangerous in Pennsylvania, given its statistics on flooding.

Pennsylvania has enacted its own floodplain management ordinances to be in compliance with the Floodplain Management Act. Bullskin Township, PA is within flood map number 4216220005A, effective on April 16, 1991.<sup>50</sup> Connellsville, PA is within flood map number 4204590001B, effective on March 1, 1978.<sup>51</sup> Article IV, Section 1000-402(G) of Fayette County, PA’s Zoning Ordinance discusses the permitted land developments in floodplains subject to the 100-year flood prone areas. They are as follows, “Wildlife sanctuary, woodland preserve, arboretum; game farm, fish hatchery (excluding rearing structures), hunting and fishing reserves; forestry, lumbering and reforestation excluding storage and mill structures; harvesting of any

---

<sup>47</sup> Id. at 394

<sup>48</sup> SYMPOSIUM: OF SALMON, THE SOUND, AND THE SHIFTING SANDS OF ENVIRONMENTAL LAW-- A NATIONAL PERSPECTIVE: ESSAY: LAND USE REGULATION: THE WEAK LINK IN ENVIRONMENTAL PROTECTION, 82 Wash. L. Rev. 651, 662-663.

<sup>49</sup> ARTICLE: RIVERS AND RESILIENCE: LESSONS LEARNED FROM TROPICAL STORM IRENE, 14 Vt. J. Env'tl. L. 177, 199.

<sup>50</sup> FEMA, <http://msc.fema.gov/portal/search?AddressQuery=connellsville%2C%20pa#searchresultsanchor>

<sup>51</sup> FEMA, <http://msc.fema.gov/portal/search?AddressQuery=connellsville%2C%20pa#searchresultsanchor>

wild crops such as marsh hay, ferns, moss, berries or wild rice; outdoor plant nursery or orchards; pasture or grazing land; recreation uses such as: park, day camp, picnic grove, golf course, hunting, fishing and boating club, excluding structures; outlet facilities for sewage treatment plants, sealed public water supply wells; utility transmission lines; storm and sanitary sewer lines; storm water management areas; and unpaved parking lots.<sup>52</sup> Prohibited land uses include, “All structures, including mobile homes, except for flood retention dams, culverts, and bridges as approved by the Pennsylvania Department of Environmental Protection, Department of Conservation and Natural Resources, Department of Transportation, Department of Community and Economic Development, and the County Engineer”.<sup>53</sup>

Although Dunbar Borough, where both Bullskin Township and Connellsville are located has no flood control methods, Fayette County has enacted the above legislation to restrict development within floodplains. However, this seems to be the extent of their flood protection plan. As seen by last month’s storm, this is inadequate. Seeing as the zoning ordinance already prohibits the development of land within the area, restoration of the floodplain for purposes of absorbing the flood may be an idea. Also, for structures already within a floodplain, green infrastructure is a possibility in order to reduce flooding. This idea is discussed later in this narrative.

Montgomery County, Pennsylvania has also made zoning ordinances for development upon floodplains, albeit more lenient than those of Fayette County. Section 5.01 (D)(2) of the Montgomery County zoning ordinance allows for floodplain crossings such as driveways serving

---

<sup>52</sup> Fayette County, PA’s Zoning Ordinance, Article IV, Section 1000-402(G)

<sup>53</sup> Id.

single family detached dwelling units, roadways, recreational trails, and railroads.<sup>54</sup> Section 5.02 (B) prohibits new construction of buildings or placement of fill within the 100-year floodplain.<sup>55</sup> Section 5.01 (G) permits development of elevated and flood-proofed buildings on brownfield sites in redevelopment areas encouraging economic revitalization, in compliance with Section 9.02.<sup>56</sup> Section 9.02 requires permits for construction within the Floodplain Conservation District.<sup>57</sup> However, green infrastructure for the paths allowed within the floodplain is not mentioned, which leaves open the large possibility of impervious paving.

In short, the current state legislation for flood control fails to meet its goals. In fact, it actually cancels out its plan for saving money because the insurance is cheaper for buildings more likely to suffer more serious damage in a flood due to age, and it also encourages people to live in an area at high risk for flooding as a result of the cheaper flood insurance. A major cause for flood damage is proximity. To live close to or in an area at high risk for floods, especially due to likelihood of rising water levels of nearby rivers or streams in heavy rain is risky because in the event such a rain should occur, these areas will be the first affected. The result is that the money spent on claims is likely substantial. As such, the current legislation to prevent flood damage seems to increase its risks. Fortunately, there is another method of flood control known as floodplain restoration. Below are the benefits that floodplains provide, and restoration methods.

There are multiple methods of floodplain restoration. On its website, *American Rivers* names setting back or notching levees, repairing incised channels, reforestation, and the

---

<sup>54</sup> Montgomery County, Pennsylvania Flood Ordinance, Section 5.01(D)(2)  
<http://www.montcopa.org/DocumentCenter/View/4445>

<sup>55</sup> Id. at Section 5.02(B)

<sup>56</sup> Id. at Section 5.01(G)

<sup>57</sup> Id. at Section 9.02

relocation of infrastructure out of the floodplains as methods of restoring floodplains and reconnecting them to their respective rivers.<sup>58</sup>

*American Rivers* elaborates on all of these, describes how they are beneficial, and in some cases, even names locations that have employed these methods. They explain setting back or notching levees to entail relocating a levee further away from a river so that it can better accommodate flood waters as there will be less risk of overtopping, while still providing protection for whatever infrastructure is behind it.<sup>59</sup> If there is no infrastructure, this practice entails either putting holes in the levee or removing it entirely so that the water can reach the floodplain.<sup>60</sup> This has been used on the Yakima River, Missouri River, and Maquoketa River, among several others.<sup>61</sup>

They go on to describe the repairing of incised channels as raising the river bed or excavating the river banks.<sup>62</sup> This can help the river once again flow onto its floodplain.<sup>63</sup> This is necessary because a river eroding deeper into its channel can disconnect it from its floodplain.<sup>64</sup>

If all else fails, *American Rivers* discusses moving infrastructure out of the floodplain. They describe this as the relocation of flood prone buildings to higher ground being a step in the direction of restoring a floodplain to a more natural habitat.<sup>65</sup> Tacoma, Washington, Tulsa, Oklahoma, Soldier's Grove, Wisconsin, and Cedar Falls, Iowa have all taken this step and moved businesses and homes away from areas prone to flooding.<sup>66</sup>

---

<sup>58</sup> American Rivers, <https://www.americanrivers.org/threats-solutions/restoring-damaged-rivers/benefits-of-restoring-floodplains/>

<sup>59</sup> Id.

<sup>60</sup> Id.

<sup>61</sup> Id.

<sup>62</sup> Id.

<sup>63</sup> Id.

<sup>64</sup> Id.

<sup>65</sup> Id.

<sup>66</sup> Id.

The Federal Emergency Management Agency (FEMA) exists to help prepare for, guard against, recover from, and mitigate hazards.<sup>67</sup> They name two ways the local municipalities can address the restoration and preservation of floodplains in Strategies and Tools to Maintain or Restore Floodplain Resources. These ways are tax adjustments and administrative measures. They describe tax adjustments possibilities such as undeveloped floodplains possibly qualifying for reduced taxation pursuant to state real estate tax incentive programs for open space uses.<sup>68</sup> Regarding administrative measures, they give three that can be used at the local level, “delegation of responsibilities for floodplain activities to a specific office with sufficient authority to plan and carry out an active leadership role both inside and outside the agency; restrictions or conditions in contracts, grants, loans, permits, and licenses; and applications of appropriate encumbrances during land conveyance.”<sup>69</sup> In short, current flood mitigation legislation does not adequately address the problem, and in some cases, contributes to it. Floodplain restoration, on the other hand, provides many economic, social, and safety benefits. As such, it should be the primary method of mitigating flood damage, and an ordinance is needed to ensure that its ability to mitigate floods is not hampered by construction within floodplains. Furthermore, green infrastructure is a good way to reduce flooding on floodplains, and some examples are below. An ordinance will be needed to ensure green infrastructure is put into practice as well.

#### IV. HOW THIS PROBLEM IS BEING ADDRESSED IN OTHER JURISDICTIONS

Other jurisdictions have taken steps to combat flood damage by restoring floodplains, restricting construction within floodplains, addressing debris buildup within storm drains, and

---

<sup>67</sup> FEMA, [http://doee.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/Q-A\\_stormwater.pdf](http://doee.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/Q-A_stormwater.pdf)

<sup>68</sup> FEMA, <https://training.fema.gov/hiedu/docs/fmc/chapter%209%20-%20strategies%20and%20tools%20to%20maintain%20or%20restore%20flood.pdf>

<sup>69</sup> Id.



implementing green infrastructure to absorb storm water runoff. To do this, there have been ordinances enacted and projects put into practice.

Ventura County in California, for example, has enacted a floodplain management ordinance in February of 1988, titled County of Ventura Floodplain Management Ordinance 3841.<sup>70</sup> This ordinance restricts construction within floodplains or areas identified as “special flood hazards” under Section 4.1 of the ordinance.<sup>71</sup> A proposed construction project must meet certain regulations in order to be granted a permit by the public works director in order to keep flood damage risks low, under the above-mentioned section.<sup>72</sup> However, it does not apply to construction that was authorized before or on September of 1985.<sup>73</sup> The Nature Conservancy is implementing a floodplain restoration project within Ventura County called the Santa Clara River Flood Protection Project, which consists of the acquisition of the Toltcom, Circle, and Contreras floodplain properties in order to restore and protect the floodplains by protecting the riparian habitat.<sup>74</sup> Estimated completion is in June of 2017.<sup>75</sup> The acquisition of these areas is so that the levees can be removed and to expand the floodplain.<sup>76</sup> The Nature Conservancy has found, through results of a model, that this will result in a six or seven foot reduction in flood waters and a reduction in the speed of water flow.<sup>77</sup> The total 134 acres the project seeks to acquire is in addition to the 243 acres of floodplain that The Nature Conservancy has acquired.<sup>78</sup>

---

<sup>70</sup> Ventura County General Plan, Goals, Policies, and Programs p. 37, <http://vcrma.org/planning/pdf/plans/Goals-Policies-and-Programs.pdf>

<sup>71</sup> County of Ventura Floodplain Management Ordinance 3841 Section 4.1, <http://www.vcfloodinfo.com/pdf/VenturaCountyFloodPlainManagementOrdinance.pdf>

<sup>72</sup> Id.

<sup>73</sup> Id. at Section 3.3

<sup>74</sup> Bond Accountability, Santa Clara River Flood Protection Project, <http://bondaccountability.resources.ca.gov/Project.aspx?ProjectPK=8590&PropositionPK=5>

<sup>75</sup> Id.

<sup>76</sup> Santa Clara River Flood Protection Project, [http://www.water.ca.gov/floodmgmt/fpo/sgb/fpcp/docs/Summary\\_SantaClara.pdf](http://www.water.ca.gov/floodmgmt/fpo/sgb/fpcp/docs/Summary_SantaClara.pdf)

<sup>77</sup> Id.

<sup>78</sup> Id.

Success will likely be determined by flood levels and flow speed before the project versus after completion.

California is not the only state to be seeking solutions for floodplain restoration in order to counteract flood damage. There is currently a public/private partnership in Washington working to reduce the risk of floods and to restore the habitats along Washington's major rivers. They are called Floodplain by Design (FbD). In 2013, the Washington Legislature appropriated \$33 million to the Department of Ecology to fund grants for the FbD's integrated floodplain projects. This project funding has supported 9 projects which have restored natural floodplain functions. The project has resulted in 780 jobs, a reduction in flood risks, and has protected homes and buildings totaling a worth of more than \$115 million. The projects have also seen 160 acres of floodplains reconnected to the river, and the plan is to connect another 700 acres. This has resulted in river access at six new locations, along with 1.5 miles of new riverside trails.<sup>79</sup>

King's County is the location of the above project. In *Monitoring & Maintenance Report, Rainbow Bend Levee Removal and Floodplain Reconnection Project*, this project's methods of operation are better described. The first phase involved moving residents out of harm's way by the county purchasing properties prone to flooding and helping the residents relocate to safer areas. The second phase was a ten-year restoration project which was completed in 2013. This consisted of removal of the levee on the Cedar river, the building of four loggins, the creation of two new channels and backwater habitat, and the installation of tens of thousands of native plants.<sup>80</sup>

---

<sup>79</sup> *Monitoring & Maintenance Report, Rainbow Bend Levee Removal and Floodplain Reconnection Project*  
<http://your.kingcounty.gov/dnrp/library/water-and-land/flooding/capital-projects/rainbow-bend/rainbow-bend-monitoring-rpt-may-2016.pdf>

<sup>80</sup> Id.

The results are that during a two-week flood in March 2014, the river was wider and shallower where the levee was removed. Home buyouts and asserted relocation has resulted in reduced risks. Removing the levee and adding new channels helped decrease water surface elevation during high flows. The water surface will be monitored over time for further changes in elevation.<sup>81</sup>

The *Monitoring & Maintenance Report for the Floodplain Reconnection and Rainbow Bend Levee Removal Project* found that not only did removing the old levee diminish long term maintenance costs, but that its presence contributed to fast, erosive flows.<sup>82</sup> The result is a contribution to water surface elevation during high flows.

In addition to restoring floodplains and moving construction out of floodplains, green infrastructure is another method of combatting flood damage. This is useful for structures still located within floodplains. To address storm water runoff through green infrastructure, some jurisdictions have employed ordinances. An example is Chicago's Storm Water Management Ordinance, which required any new development or redevelopment that takes 15,000 square feet or more or a parking lot that takes up 7,500 square feet or more to detain at least the first half inch of rain.<sup>83</sup> The ordinance provides an alternative, a fifteen percent reduction of the prior impenetrability of the site.<sup>84</sup> This ordinance was put into practice in January of 2008.<sup>85</sup>

Another green infrastructure project by Chicago is the Green Alley Program, the installation of more than one hundred green alley designs throughout the city by the end of 2009.

---

<sup>81</sup> Id.

<sup>82</sup> *Monitoring & Maintenance Report for the Floodplain Reconnection and Rainbow Bend Levee Removal Project* <http://www.govlink.org/watersheds/8/reports/1603-rainbow-bend-report.pdf>

<sup>83</sup> Green Infrastructure Case Studies: Municipal Policies for Managing Storm Water with Green Infrastructure <http://www2.ku.edu/~kutc/pdffiles/Green%20Infrastructure%20Case%20Studies.pdf>

<sup>84</sup> Id. at 37.

<sup>85</sup> Id.

<sup>86</sup> This is the use of permeable pavement to reduce alley flooding.<sup>87</sup> Funding for this program has come from the Chicago Department of Transportation and Alderman Funds.<sup>88</sup>

Chicago's above green infrastructure practices, among others, have resulted in a fifty percent reduction of storm water runoff and has reduced the use of energy.<sup>89</sup> Another result is that the city saves almost \$6,000 annually on heating and cooling expenses.<sup>90</sup>

Keeping drains clear for structures within floodplains is also important. As such, Saginaw County in Michigan has enacted an ordinance for this purpose. They point out the benefit of keeping the drains free of debris, that it improves the flowing of run-off water from low-lying areas.<sup>91</sup> As such, the ordinance makes it illegal to litter in these drains and ditches, and the drains are maintained in a way that removes vegetation and man-made debris.<sup>92</sup>

In short, other jurisdictions have realized the importance of floodplains as a matter of counteracting flood damage. As such, they have employed methods of reducing flood damage by way of ordinances limiting construction within floodplains and green infrastructure. Also, there have been projects by different organizations which go a step further and relocate structures from within floodplains in order to remove the manmade flood control structures that actually separate rivers from their floodplains.

## V. KEY POLICY ISSUES

### A. WHAT TO ADDRESS IN ENACTING THE ORDINANCE

---

<sup>86</sup> Id. at 38.

<sup>87</sup> Id.

<sup>88</sup> Green Alley Programs: Planning for a sustainable urban infrastructure?  
[http://nacto.org/docs/usdg/green\\_alley\\_programs\\_planning\\_for\\_a\\_sustainable\\_urban\\_infrastructure\\_newell.pdf](http://nacto.org/docs/usdg/green_alley_programs_planning_for_a_sustainable_urban_infrastructure_newell.pdf)  
(page 4)

<sup>89</sup> Id. at 39.

<sup>90</sup> Id.

<sup>91</sup> Saginaw Township,  
[http://www.saginawtownship.org/departments/community\\_development/floodplain\\_information.php](http://www.saginawtownship.org/departments/community_development/floodplain_information.php)

<sup>92</sup> Id. See also Ordinance No. 746 Saginaw Charter Township Saginaw County Michigan Section 304.7.

Floodplains, as shown above, are effective tools of flood control. They are not as costly to maintain as dams or levees, and they also provide environmental and recreational benefits. In drafting legislation to restore floodplains and to relocate homes and buildings upon them as a method of reducing flood risks, there are a few things the legislators will have to take into account. First and foremost is the cost of acquisition of targeted land and/or relocation of citizens and businesses. In Washington, this was the first step of Floodplains by Design's project. The same is true for Santa Clara River Flood Protection Project. The ways in which both projects secured funding will be discussed in the following section.

Another important point is the regulation of what structures are permitted within the floodplains, the reasons, and enforcement. More specifically, the regulations that a proposed construction project must meet in order to be granted a permit are important in order to keep flood damage risks low. The degree of knowledge on the subject that the authority granting or denying permits is important for the above reason. In Ventura County, where the Santa Clara River Flood Protection Project is located, this power is vested in the Director of Public Works.<sup>93</sup> The most recent hire for this position, Tully Clifford, once served as the director of Ventura County's Watershed Protection District.<sup>94</sup> This position entailed management of different budgets, including water, sewer, streets budgets.<sup>95</sup> He has a bachelor's degree of engineering and a master's degree in civil engineering and business administration.<sup>96</sup> Arguably his educational and work background, in conjunction with the requirement of certification by engineers or

---

<sup>93</sup> County of Ventura Floodplain Management Ordinance 3841 Section 4.2, <http://www.vcfloodinfo.com/pdf/VenturaCountyFloodPlainManagementOrdinance.pdf>

<sup>94</sup> Ventura Hires Public Works Director, <http://www.vcstar.com/story/news/local/communities/ventura/2016/09/19/ventura-hires-public-works-director/90714010/>

<sup>95</sup> Id.

<sup>96</sup> Id.

architects to ensure that any new structures will be flood resistant<sup>97</sup> helps reduce flood risks by guaranteeing only structures that are proven to be capable of mitigating flood damage are permitted. Examples of regulations intended to meet this goal include the use and maintenance of drains, green water infrastructure such as permeable pavement, and raised structures.

Flood insurance should also be taken into account by the legislators in drafting a statute. Under the NFIP, those living in high risk areas can get insurance for much cheaper. As demonstrated earlier, this is not effective. In the long run, it actually costs more than it saves. To prohibit development on floodplains or other high risk areas reduces the risk of flood damage. It also may lower insurance rates should homeowners look for insurance when they are in an area less likely to flood.

## B. FUNDING OPTIONS

The proposed ordinance will require funding. Other jurisdictions give examples of options for this required funding. For example, funding for Chicago's Green Alley Program has come from the Chicago Department of Transportation and Alderman Funds.<sup>98</sup> Such a program could be funded by the Pennsylvania Department of Transportation, replacing once impervious roadways within floodplains with permeable roadways.

An example of where funding could come from for purposes of relocating structures within floodplains is present in the Floodplain by Design project in Washington. There, the

---

<sup>97</sup> County of Ventura Floodplain Management Ordinance 3841 Section 4.1.3,  
<http://www.vcfloodinfo.com/pdf/VenturaCountyFloodPlainManagementOrdinance.pdf>

<sup>98</sup> Green Alley Programs: Planning for a sustainable urban infrastructure?  
[http://nacto.org/docs/usdg/green\\_alley\\_programs\\_planning\\_for\\_a\\_sustainable\\_urban\\_infrastructure\\_newell.pdf](http://nacto.org/docs/usdg/green_alley_programs_planning_for_a_sustainable_urban_infrastructure_newell.pdf)  
(page 4)

Washington Legislature appropriated \$33 million to the Department of Ecology to fund grants for the FbD's integrated floodplain projects.<sup>99</sup>

Santa Clara River Flood Protection Project provides another example of funding options. The \$8,638,599 in funding that their project received came from local contributions, other state funds, and both a Proposition 1E grant and a Proposition 13 grant.<sup>100</sup> The Proposition 13 grant can be applied for by local agencies or nonprofit organizations who have an interest in managing floods and wish to enact projects regarding the acquisition of property in order to restore floodplains with the goal of mitigating flood damage.<sup>101</sup> Funding is capped at \$5 million per project.<sup>102</sup>

Funding can also come from the federal level. Under the Flood Mitigation Assistance Grant Program, states, territories, federally recognized tribes, and local communities can receive funding for projects intended to reduce or eliminate long-term risk of flood damage.<sup>103</sup> Applications will go to FEMA, which will also require hazard mitigation plans as a condition for receiving funding for such projects.<sup>104</sup>

## VI. CONCLUSION

In conclusion, manmade flood control is very costly either by way of maintenance or its failure. Also, our current legislative method of flood control, the Floodplain Management Act, still allows for building upon floodplains. Although it is regulated to a degree, the risk is still

---

<sup>99</sup> *Monitoring & Maintenance Report, Rainbow Bend Levee Removal and Floodplain Reconnection Project*, <http://your.kingcounty.gov/dnrp/library/water-and-land/flooding/capital-projects/rainbow-bend/rainbow-bend-monitoring-rpt-may-2016.pdf>

<sup>100</sup> Bond Accountability, Santa Clara River Flood Protection Project, <http://bondaccountability.resources.ca.gov/Project.aspx?ProjectPK=8590&PropositionPK=5>

<sup>101</sup> California Department of Water Resources, Proposition 13, <http://www.water.ca.gov/floodmgmt/fpo/sgb/fpcp/prop13/>

<sup>102</sup> *Id.*

<sup>103</sup> Flood Mitigation Assistance Grant Program, <https://www.fema.gov/flood-mitigation-assistance-grant-program>

<sup>104</sup> *Id.*

there. Although there are municipalities which prohibit building upon floodplains, this is only half the battle. The floodplains should be restored in order to control floodwaters as well. While we are in no way arguing that the deteriorating dams should be left to further deteriorate, there certainly is an argument to be made for removal of some of the levees. The reason is that it can reduce water surface levels, which is beneficial in the event of a flood. In Pennsylvania, one of the most at-risk states for flooding in the nation,<sup>105</sup> to build upon a floodplain is dangerous. This is because during a flood, these areas are the first to become submerged. As such, we propose legislation to restrict further development on floodplains, and to restore them to their respective rivers so they can mitigate flood damage. We also propose that green infrastructure be implemented, especially for structures and easements already within floodplains, as another method of flood mitigation.

---

<sup>105</sup> 2014 Report Card for Pennsylvania's Infrastructure  
[http://www.pareportcard.org/PARC2014/downloads/PA\\_2014\\_RC\\_Levees.pdf](http://www.pareportcard.org/PARC2014/downloads/PA_2014_RC_Levees.pdf)



Joseph Donegan and Wesley Amaefuna

APPENDIX

CHAPTER 1

Floodplain Restoration

Ordinance No: \_\_\_\_\_

**FLOODPLAIN RESTORATION ORDINANCE**

An ordinance that is designed to comply with [Name of Township/Municipality/Borough] property maintenance code<sup>106</sup> in order to support and effectuate the powers given to municipalities in accordance with the Pennsylvania Floodplain Management Act of 1978.

**SECTION 2. Intent**

The intent of this Ordinance is to:

- (a) Protect areas of the floodplain necessary to contain floodwaters and overflow.
- (b) To offer a new Ordinance to ensure preservation of Floodplains.
- (c) To permit uses within the floodplain meant to preserve the natural conditions and stream flow.
- (d) Instead of preventing development altogether in areas prone to flooding, this Ordinance is meant to promote the general health, welfare, and safety of the communities located within a floodplain.
- (e) Encourage the use of appropriate construction practice to protect, prevent, or minimize from future damage caused by flooding.
- (f) Minimize danger to public health through protecting the public's water supply and natural drainage.

**SECTION 3. Definitions.**

---

<sup>106</sup> In order to utilize this ordinance, a municipality must either: (1) adopt its own existing property maintenance code, (2) adopt one of several national property maintenance codes such as: International Building Code (IBC) or International Residential Code (IRC), or (3) create and adopt a hybrid property maintenance code of original and national model codes.

The following words and phrases when used in this act shall have the meanings given to them:

**“Base Flood Elevation (BFE)”.**

Elevation in which an anticipated flood will rise.

**“Berms”.**

A flat strip of land, raised bank, or terrace bordering a river or canal.

**“Embankments”.**

A wall or bank of earth or stone built to prevent a river flooding in an area.

**“Encroachments”.**

To gradually move or go into an area that is beyond the usual or desired limits.

**“Existing Structure”.**

A structure for which the start of construction commenced before the effective date of the Floodplain Insurance Rate Map or before January 1, 1975, for FIRMs effective before that date. "Existing structure" may also be referred to as "existing constriction"<sup>107</sup>.

**“Federal Emergency Management Agency (FEMA)”.**

Agency of the United States designed to respond to disasters occurring in the United States.

**“Flood-resistant”.**

Material including any building product capable of withstanding direct and prolonged contact with floodwaters without sustaining significant damage<sup>108</sup>.

**“Floodplain”.**

An area of low-lying ground adjacent to a river, formed mainly of river sediments and subject to flooding.

**“Flood”.**

A general but temporary condition, partial or complete inundation of normally dry land areas from the overflow of streams, rivers or other waters of the Commonwealth.

**“Floodplain Administrator”.**

An appointed position where appointee carries out and enforces the provisions set forth in this Ordinance.

---

<sup>107</sup> Berks County, Pa., Municipal Code § 117-34

<sup>108</sup> <https://www.fema.gov/flood-resistant-material>

**“Floodplain Insurance Study”.**

Compilation and presentation of flood risk data for specific water bodies.

**“Flood Insurance Rate Maps (FIRMS)”.**

An official map of a municipality on which FEMA has delineated both the floodplain and the risk premium zones applicable to the municipality<sup>109</sup>.

**“Floodplain Conservation District”.**

Area established by [Name of Township/Municipality/Borough] that are subject to the 1% annual chance flood as defined on the Flood Insurance Rate Map (FIRM).

**“Fill”.**

Sand, gravel, earth or other material placed or deposited so as to form an embankment or raise the elevation of the land surface.

**“Green Infrastructure”.**

An approach to water management that protects, or mimics the natural water cycle.

**“IBC”.**

Addresses fire prevention in regard to construction and design.

**“IRC”.**

Residential code addressing the design and construction of one- and two-family dwellings and is designed to meet those needs to safeguard public health and safety.

**“Market Value”.**

The building value, excluding the land, as established by what the local real estate market will bear.

**“New Construction”.**

Structures for which the start of construction commenced on or after July 3, 2012.

**“One-hundred year floodplain”.**

The highest level of flooding that, on the average, is likely to occur every 100 years, that is, that has a 1% chance of occurring each year<sup>110</sup>.

**“Outfall Facilities”.**

Facilities that discharge waste into a stream or body of water. This is where storm water exits facilities through pipes, drains, etc.

**“Prescribed Industry Standards”.**

---

<sup>109</sup> 32 P.S. § 679.104

<sup>110</sup> 32 P.S. § 679.104

Standards set by the Pennsylvania Department of Environmental Protection.

**“Special Flood Hazard Areas (SFHA)”.**

An area in the floodplain subject to a one-percent-or-greater chance of flooding in any given year. It is shown on the FIRM as Zone A, AO, AE, or, AH<sup>111</sup>.

**“Subsurface Sewage disposal areas”.**

Underground systems that treat and disperse wastewater from individual or small numbers of homes.

**“Storm water Basins”.**

A retention basin is used to manage storm water runoff to prevent flooding and downstream erosion and improve water quality in adjacent river, stream, lake, or bay.

**“Public Utilities”.**

Includes: water, electrical, natural gas, telephone services, and other essentials.

**“U.S. Clean Water Act”.**

Establishes the basic structure for regulating pollutant discharges into the waters of the United States.

**“Yard Setback”.**

The distance which a building or other structure is set back from a street or road, a river or stream, a shore or floodplain, or any other place which is deemed to need protection.

**SECTION 4. Applicability.**

General Rule. – This ordinance shall apply to all of the following:

- (1) A person who owns or rents residential dwellings in [Name of Township/Municipality/Borough] of the Commonwealth.
- (2) It shall be unlawful for any person, partnership, business or corporation to undertake, or cause to be undertaken, any construction or development<sup>112</sup> within [Name of Township/Name of County/Borough] Floodplains unless a permit has been issued.
- (3) Aerial photographs will be viewed to determine whether new construction has been started within a floodplain area.

---

<sup>111</sup> Berks County, Pa., Municipal Code § 117-34

<sup>112</sup> Borough of Darby, Pa., Municipal Code § 77-749

- (4) The Floodplain administrator will regularly visit areas prone to flooding<sup>113</sup> to monitor development of existing structures.
- (5) The County Commission and/or Floodplain administrator will regularly visit areas prone to flooding to monitor Floodplain
- (6) A permit shall not be required for minor repairs to existing buildings or structures located within a floodplain, unless repairs are to be considered new editions.

**SECTION 4.1. Identification of Floodplain Areas.**

- (a) Floodplains shall consist of any areas of the [Name of Township/Municipality/Borough] classified as special flood hazard areas (SFHAs) in the Flood Insurance Study (FIS)<sup>114</sup>; and
- (b) Accompanying Flood Insurance Rate Maps (FIRMs) issued by the Federal Emergency Management Agency (FEMA).

**SECTION 4.2. Description of Identified Floodplain Areas.**

The identified floodplain areas shall consist of the following specific areas:

- (1) The Floodway/District identified in the Flood Insurance Study (FIS), represents the channels of a watercourse and the adjacent areas that must be reserved.
- (2) Areas that have been subjected to consistent flooding or stream overflow.
- (3) Areas surrounding bodies of water, which have been built by, man using Dams to contain the water.
- (4) The AE Area/District shall be those areas identified as an AE Zone on the FIRM included in the FIS and prepared by FEMA for which base flood elevations have been provided<sup>115</sup>.
- (5) The A Area/District shall be those areas identified as an A zone on the FIRM included in the FIS and prepared by FEMA for which base flood elevations

---

<sup>113</sup> Monongalia County, WV., Municipal Code § 18-5

<sup>114</sup> Montgomery County, Pa., Municipal Code § 401

<sup>115</sup> Allegheny County, Pa., Municipal Code § 8-402

have not been provided. In these circumstances, elevation and floodway information from other Federal, State, or other comparable sources<sup>116</sup>.

- (6) Areas subject to inundation by the one-percent flooding where average depths are between one and three feet. In floodplains , specifically zones AO and AH, specific drainage paths shall be established by [Name of Township/Municipality/Borough] to guide floodwaters around and away from structures.
- (7) Community-identified flood hazard areas shall be those where [Name of Township/Municipality/Borough] has deemed such areas as those which flooding has reached record highs.

#### **SECTION 5. Abrogation and Greater Restrictions**

- (a) This chapter supersedes any other conflicting provisions, which may be in effect in the Floodplain Conservation District. However, any other ordinance provisions shall remain in full force and effect to the extent that those provisions are more restrictive. If there is any conflict between any of the provisions of this chapter, the more restrictive provision shall apply.

#### **SECTION 6.1. Uses permitted within a Floodplain**

- (a) The following uses are permitted within the Floodplain of [Name of Township/Municipality/Borough]:
  - (1) No more than half of any yard setback on an individual lot may extend into any Floodplain Conservation District;
  - (2) Spaces that are primarily passive in character shall be permitted to extend into the Floodplain Conservation District including:
    - a. Wildlife sanctuaries
    - b. Nature preserves
    - c. Forest preserves
    - d. Areas used for fishing
    - e. Areas used for reforestation

---

<sup>116</sup> *Id.*

- f. Construction of ditches, fields, or notches cut into embankments;
- (3) Forestry operations approved by the [Name of Township/Municipality/Borough];
- (4) Floodplain crossings are permitted, provided that disturbance to any existing woodlands and degradation of water quality are minimized. The following crossings are permitted:
  - a. Agricultural crossings by farm equipment and vehicles.
  - b. Driveways serving single family detached dwelling units, roadways, recreational trails, railroads, and utilities<sup>117</sup>;
- (5) Agricultural uses conducted in compliance with methods prescribed in Pennsylvania Erosion and Sediment Control Requirements<sup>118</sup>, and
- (6) Public sewer and/or water lines and public utility transmission lines.
- (7) Only structures allowed within a Floodplain are those currently already situated in said district as mentioned in Section 6.3.
- (8) Structures as mentioned in Section 6.3, 6.4, 8, and 9 of this Ordinance.

**SECTION 6.2. Uses Prohibited in a Floodplain**

Any use or activity not authorized within Section 6.1 of this chapter, shall be prohibited within the Floodplain Conservation District and the following are prohibited:

- (a) No new construction, alteration, or improvement of buildings and any other type of permanent structure<sup>119</sup>, shall be permitted in the Floodplain Conservation District or the one-hundred (100) year floodplain.
- (b) The commencement of any of the following activities, construction, enlargement, expansion of, or intended use, of any of the following activities<sup>120</sup>:

---

<sup>117</sup> Montgomery County, *Floodplain Model Ordinance*, <http://www.montcopa.org/DocumentCenter/View/4445>, (Last visited Oct. 30, 2016)

<sup>118</sup> 25 Pa. Code § 102.4

<sup>119</sup> Montgomery County, Pa., Municipal Code § 502

<sup>120</sup> Berks County, Pa., Municipal Code § 8-601. Our ordinance is different from that of Berks County because we have included several different uses, constructions, and expansions that Berks did not include.

- a. Hospitals.
  - b. Nursing homes.
  - c. Jails or prisons.
  - d. Parking lots.
  - e. Chemical Plants or Companies using chemicals damaging to the Floodplain.
  - f. Gas stations.
  - g. Schools and Colleges/Universities.
- (c) Placement of any fill within Floodplain Conservation District or the one-hundred (100) year floodplain.
- (d) No encroachment, alteration, or improvement of any kind to any watercourse within the Floodplain Conservation District or the one-hundred (100) year floodplain.
- (e) The clearing of existing vegetation, except where such is necessary to prepare land for use which is permitted under Section 6.1 of this chapter. See Subsection 7.4, exceptions for structures located within Floodplain Conservation District or the one-hundred (100) year floodplain.
- (f) The use of any fertilizers, pesticides, herbicides, and/or other chemicals exceeding the prescribed industry standards, which could cause irreparable harm to vegetation, located within the Floodplain Conservation District or the one-hundred (100) year floodplain.
- (g) Roadways or driveway, except when in compliance with Section 6.1 of this chapter.
- (h) Any motor or all-terrain vehicle in any area not designed to accommodate the traffic.
- (i) Subsurface sewage disposal areas.
- (j) Storm water basins, including necessary berms and outfall facilities.

**SECTION 6.3. Nonconforming structures and uses in the Floodplain**



This Ordinance does not require change or improvements to lawfully existing structures, unless existing structures have previously been damaged multiple times by floods. However, when an improvement is made to any existing structure, the provisions of Section 6.4 of this ordinance and [Township/Municipal of Non-Conforming use standards] shall apply.

- (a) Structures, located within a Floodplain, that have sustained damage, at least two times, from floods are required under this ordinance to do the following:
  - a. If structure is located in the vicinity of a body of water, prone to flooding, the owner must take at least one, or more than one of the following precautions:
    - i. Plant vegetation to assist in soaking up water;
    - ii. The structure's drainage systems shall be checked on a routine basis and shall be free of defects;
    - iii. Ensure yard debris is properly disposed of to prevent drains from clogging;
    - iv. Construct ditches, fields, or notches cut into embankments near rivers or bodies of water; or
    - v. Contact soil engineers if owner of structure notices significant erosion to land surrounding property.
    - vi. Invest in any Green Infrastructure, listed in Section 6.4 (e) of this Ordinance, which may provide protection to structure.
- (b) If owner has taken steps provided in Subsection (a) of this chapter yet to no prevail, and constant flood damages continues, owner is to move structure outside of the Floodplain, vacate structure, or tear structure down.
  - a. Prior to vacating structure, moving structure, or tearing structure down, owner is to contact Floodplain Administrator and allow him to fully inspect the property and the extent of the damages.
  - b. If structure is to be torn down, permits are to be obtained from local government of [Name of Township/Municipality/Borough].
  - c. Cost of tear down will be covered through insurance, subsidies, or personal finances.

**SECTION 6.3.1. Penalties and Enforcement for non-compliance of Section 7.3**

- (a) Penalty. – A person who violates Section 5.3 (a)(i) through (iii), upon conviction thereof, be sentenced to a minimum \$50.00 fine to a maximum of \$100.00.
- (b) At the discretion of [Name of Township/Municipality/Borough], precautions mentioned in Section 6.3 (a) shall be imposed on homeowner or business owner so long as imposition does not place owner in an economic detriment.

**SECTION 6.4. Improvement to existing structures located within a Floodplain District**

The following provisions shall apply whenever any improvement is made to an existing structure located within any Floodplain Conservation District:

- (a) Before any improvement or new construction may commence, owner of structure or contractor must apply for a permit in accordance with Section 7.2 of this Ordinance and deliver such application to the Floodplain Administrator in accordance with Section 7.4.
- (b) There shall be no expansion or modification of existing structure allowed within any floodway area, which could result in an increase of the base flood elevation by one (1) foot.
- (c) There shall be no expansion or enlargement of an existing structure for which direction is toward a stream bank<sup>121</sup>.
- (d) All improvements to structures located within a Floodplain shall be in full compliance with Section 6.2 and 6.3 of this Ordinance.
- (e) All improvements to structures located within a Floodplain shall be in full compliance with Pennsylvania Sewage Facility Act (Act 19660537), Pennsylvania Dam Safety and Encroachment Act (Act 1978-325), Pennsylvania Clean Streams Act (Act 1937-394), and the U.S. Clean Water Act, Section 404, 33 U.S.C. §1344.
- (f) Residential dwellings and Corporate structures must invest in green infrastructure to help preserve the floodplain. Such green infrastructure include<sup>122</sup>:
  - a. Vegetated Swales

---

<sup>121</sup> Allowed expansion should occur only on the side of the structure, which faces away from the streambank or floodplain. Expansion toward the streambank or floodplain may result in greater damage from flooding.

<sup>122</sup> This section is different from most ordinances because this ordinance requires the improvements to structures include some form of green infrastructure, which will help preserve and restore floodplains.

- b. Green Roofs
  - c. Rainwater harvesting
  - d. Permeable Pavement
  - e. Infill and redevelopment
  - f. Green Parking Lots
  - g. Green streets
- (g) This ordinance shall be complied with in full, when any modifications, alterations, reconstruction, or improvements, of any kind when the value of such is the extent that twenty-five (25) percent or more of structures market value.
- (h) Historic structures undergoing repair or rehabilitation that would constitute a substantial improvement under this chapter shall comply with this ordinance, except if documentation from the National Register or State Inventory of Historic Places is provided to [Name of Township/Municipality/Borough].
- a. Documentation showing historic value and/or significance allows substantial repairs to be done without full compliance with this Ordinance, as well as satisfies the requirements if the structure need be torn down due to flood damage.
- (i) The above activity shall also comply with the requirements of the 34 Pa. Code, as amended, and the 2006 IBC and the 2006 IRC<sup>123</sup>.

**SECTION 7. Administration**

**SECTION 7.1. Designation of a Floodplain Administrator**

[Name of Township/Municipality/Borough] shall designate a “Floodplain Administrator” who shall enforce this chapter.

**SECTION 7.2. Permits Required**

A floodplain permit shall be required before any construction or development is undertaken, in accordance to this Ordinance, within [Name of Township/Municipality/Borough] floodplain The

---

<sup>123</sup> Montgomery County, Pa., Municipal Code § 504

issuance of a floodplain permit shall not relieve applicant of the obligation to obtain any and all local, state and/or federal permits.

**SECTION 7.3. Duties of Floodplain Administrator**

- (a) Floodplain Administrator shall issue or deny permits to applicants if the Administrator determines the proposed work will be in full conformance with this Ordinance as well as other applicable Codes and Ordinances.
- (b) Before the approval of any permit, the Floodplain Administrator shall determine if other permits are required, such as those required by the Pennsylvania Sewage Facility Act (Act 1966-537), Pennsylvania Dam Safety and Encroachment Act (Act 1978-325), Pennsylvania Clean Streams Act (Act 1937-394), and the U.S. Clean Water Act, Section 404, 33 U.S.C. §1344<sup>124</sup>.
- (c) In the case of existing structures, the Floodplain Administrator shall look at past records of the structure to see if loss sustained to structure is repetitive.
  - a. If damage is repetitive, Floodplain administrator shall direct applicant to Section 6.3 (b).
- (d) Floodplain Administrator shall visit the construction site once it has commenced to determine if construction is in compliance with this Ordinance as well as other applicable laws.
- (e) Floodplain Administrator shall have the inherent authority to enter construction site once construction has commenced to determine if construction is within accordance with this Ordinance.
- (f) If the Floodplain Administrator determines that construction is not in accordance with this Ordinance, Administrator shall revoke permit and deliver permit request to [Name of Township/Municipality/Borough] supervisors for appropriate action.

**SECTION 7.4. Application procedures for Floodplain Building permit**

- (a) Prior to application for a Floodplain Building permit, owner must have a soil engineer to determine if land is suitable for construction and to determine the BFE of the area.
- (b) Application for a Floodplain Building permit shall be made in writing and delivered to the Floodplain Administrator.

---

<sup>124</sup> Delaware County, Pa., Municipal Code § 138-9 (B)

(c) Permit forms shall be made available by [Name of Township/Municipality/Borough] and shall include:

- a. Name and address of applicants.
- b. If applicants are not the true landowners, the name and address of true landowner is required.
- c. Name and address of contractor.
- d. Site location, including address or plot number.
- e. Other permits if applicable.
- f. A plan showing the size and location of desired construction.
- g. Brief description of proposed work and estimated cost, including:
  - i. What preventative measures will be taken in accordance with this Ordinance,
  - ii. List of previous damages resulting from floods,
  - iii. Market Value of the home prior to damage,
  - iv. All applicable insurances relating to the home.
- h. Application shall include any additional information upon request by Floodplain Administrator.
- i. Applications for permits shall be accompanied by a fee, payable to the [Name of Township/Municipality/Borough], based upon estimated cost of construction.

(d) If proposed construction is located entirely or partially on a floodplain, the following information must be provided to Floodplain Administrator to determine:

- a. Construction is consistent with this chapter to minimize flood damage and in accordance with this Ordinance,
- b. All utilities are constructed to minimize flood damage and any contamination to floodplain or body of water,

- c. Adequate drainage will be provided to reduce flood exposure,
- d. New construction will be properly built and secured to prevent collapse,
- e. Building materials such as the foundation, shingles, wood, etc., are flood-resistant, or
- f. There shall be no encroachment, alteration, or improvement to floodplain land.

### **SECTION 7.5. Enforcement**

(a) When Floodplain Administrator determines, through reasonable grounds, that there has been a violation of any provision of Section 6 through 6.4 of this Ordinance, Floodplain administrator shall give notice of alleged violation. Notice shall:

- a. Be in writing,
- b. Include a statement regarding reason for issuance;
- c. Allow a reasonable time, not to exceed 30 days, for performance to cure any violations;
- d. Be served upon property owner or his/her agent or any other notice method authorized by the laws of this state;
- e. Contain an outline of violations that will occur if cure of violation is not done.

(b) Penalties –

- a. Any person who fails to comply with requirements or provisions of this chapter or denies compliance with notice shall be:
  - i. Guilty of a misdemeanor, and upon conviction,
  - ii. Pay a fine not less than \$25 nor more than \$500, plus costs of prosecution.
- b. Issuance of penalty shall not excuse the violation or permit it to continue. If person fails to remedy violation within the 30 day period, outlined in the

Notice, property shall be deemed to be a public nuisance<sup>125</sup>, under applicable law, and abatable as such.

### **SECTION 7.6. Appeals**

- (a) Any person aggrieved by any action or decision of the Floodplain Administrator concerning the administration of the provisions of this chapter may appeal to the [Name of Township/Municipality/Borough] Council. Such appeal must be filed, in writing, within 30 days after the decision, determination or action of the Floodplain Administrator.
- (b) Upon receipt of such appeal, the [Name of Township/Municipality/Borough] Council shall set a time and place, within not less than 10 or not more than 30 days, for the purpose of considering the appeal. Notice of the time and place at which the appeal will be considered shall be given to all parties.
- (c) Any person aggrieved by any decision of the [Name of Township/Municipality/Borough] may seek relief therefrom by appeal to local Court of Common Pleas, as provided by the laws of this state, including the Pennsylvania Floodplain Management Act.

### **SECTION 8. Variances Generally**

This section provides a variance to certain structures and/or uses within a floodplain. If compliance with requirements of this Ordinance would result in exceptional hardship, upon request, the Zoning Hearing Board of [Name of Township/Municipality/Borough] may grant relief from the strict requirements.

#### **SECTION 8.1. Variance procedure and conditions**

- (a) No variance shall be granted from the Zoning Hearing Board for any construction, development, use, or activity within the Flood District that would cause an increase in the BFE of the Floodplain.
- (b) No variance shall be granted for construction, development, use, or activity in severe flood areas that increase the BFE more than one (1) foot at any point.
- (c) Reviewing a request for a variance, the Zoning Hearing Board shall consider:
  - a. The applicant has shown sufficient cause for the variance.

---

<sup>125</sup> See, 18 Pa.C.S.A. § 6504 “Public Nuisance”

- b. Failure to approve of variance would result in exceptional hardship to applicant.
- c. Granting variance will not do the following:
  - i. Neither result in an increase of the BFE or an increase degradation of the floodplain.,
  - ii. Granting the variance of he structure will not create a nuisance.

**SECTION 8.2. Variance Conditions**

- (a) If a variance is granted, the variance shall involve the least modification needed to provide relief.
- (b) When a variance is granted, Zoning Hearing Board shall notify the applicant of the following:
  - a. There maybe an increase in premium rates of flood insurance for the new construction or existing structure.
  - b. Increase of risks to life and property may occur to new construction or existing structure.

**SECTION 9. Dams**

This section shall apply, if and only if, Township or Municipality has a Dam in its County lines. All actions done by [Name of Township or Municipality] shall be in full conformance with the Pennsylvania Dam Safety and Encroachment Act. [Name of Township/Municipality/Borough] shall do the following<sup>126</sup>:

- (a) [Name of Township/Municipality/Borough] shall inspect dam every six months to ensure integrity of the dam. The Dam’s integrity will be up to standards to ensure its stability and longevity.
- (b) If Dam does not meet standards, [Name of Township/Municipality/Borough] shall provide funding to repair Dam to original state. If funding is not available to repair the Dam, [Name of Township/Municipality/Borough] shall apply for assistance from the County or Commonwealth.

---

<sup>126</sup> This section is specific to this ordinance because our focus is on floodplain restoration and preservation. Since Dams play a significant role in the floodplain areas, it is important that this ordinance encompasses a section which talks about the integrity and maintenance of them.



## **SECTION 10. Special Circumstances**

This section applies to areas that have sustained constant severe floods and can no longer sustain a viable environment for any dwelling or structure.

- (a) In the event that [Name of Township/Municipality/Borough] has deemed a Floodplain to be uninhabitable or structures to be relocated as in Section 6.3 (b), [Name of Township/Municipality/Borough] shall take at least one, or more than one of the following actions:
  - a. Remove structures from the floodplain and restore the channel or body of water to its original configuration. Doing so allows the stream to overflow its banks without any damage to structures.
  - b. [Name of Township/Municipality/Borough] shall plant vegetation as discussed in Section 6.3 (a)(a)(i).
  - c. Create two-stage channels. [Name of Township/Municipality/Borough] shall create an upper channel to provide flood synthesis with a natural low-flow channel as to provide enhancement in the habitat and improved sediment transport.
  - d. Construct Relief channels. In so, [Name of Township/Municipality/Borough] shall construct a high-flow channel, which provides a relief from flooding when the original stream or body of water overflows.
  - e. Build in-stream structures. These structures are intended to divert the flow of a body of water to protect eroding embankments.

## **SECTION 11. Severability**

- (a) If any section, subsection, paragraph, sentence, clause, or phrase of this chapter shall be declared invalid for any reason whatsoever, such a decision shall not affect the remaining portions of this chapter, which shall remain in full force and effect, and for this purpose the provisions of this chapter are hereby declared to be severable.

## **SECTION 12. Repeals.**

All Ordinances or parts of ordinances inconsistent with this ordinance are hereby repealed insofar as they are inconsistent with this ordinance.

## **SECTION 13. Effective Date.**

This Ordinance shall become effective seven days after enactment.

**ENACTED AND ORDAINED THIS \_\_\_\_\_ DAY OF \_\_\_\_\_, 20\_\_\_\_\_.**