2021 Ross Landslide Study Report

Sponsored by the Ross Township Environmental Advisory Council

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Published: May 18, 2021

Table of Contents

Introduction

Purpose

The purpose of this study was to understand the extent of the landslide threat in Ross Township and identify areas of special concern. Once identified, these areas can be prioritized for monitoring, early intervention, and even preventative measures. This study also examines best practices for landslide prevention in order to provide the township with a menu of actionable interventions. The data from the map can be used to help match appropriate interventions with field conditions. This report should be used to inform public policy.

Significance

Over the past three years, the township has spent an average of $408,723 on repairing landslides that impacted roads and public lands. Landslides also represent a significant financial risk and impact to local businesses and homeowners.

Landslides occur when unstable ground is exposed to significant rain fall events like 50 or 100-year storms. While it sounds like these storms should only happen every 50 or 100 years, the 100-year storm actually means that there is a 1-in-100 chance of a storm of that size occurring (USGS). In other words, there is a 26% chance that a 100-year storm will occur during the typical 30-year mortgage. However, due to climate change, the frequency of these large weather events is increasing. According to a study led by Daniel Wright, a hydrologist at the University of Wisconsin-Madison, these storms were occurring 85 percent more often in the eastern United States in 2017, than they did in 1950. If we apply that to the 30-year mortgage scenario, that means there is now a 48.1% chance of a property being hit by a 1950 sized 100-year storm during that time period. The 100-year storm language is therefore seemingly out of date to describe current storm frequency and risk. Because of the way these storms are calculated the volume of water produced by these storms is updated to reflect the most recent data (USGS), a detail that is often misunderstood by homeowners, business owners, and policymakers.

What is more easily observed by the community is that the frequency of large storms, flooding events and adverse effects are increasing, resulting in more damage and expense to public and privately owned property alike. In Ross, that has resulted in $1,226,168 spent on remediation of landslide damage over the last three years alone.

While treating landslides when they occur is imperative, with the increase in storm events and damages, it is also important that we start to take a preventative stance on landslides. Preventative measures often cost a fraction of what repairs do, and potentially represent significant savings for both the township and private owners within its bounds.

Review of Literature

Summary of Best Practices

Steep slope regulations reduce landslide risks by limiting the disturbance of the ground. This is accomplished through ordinances that regulate development including zoning, subdivision, and development. A comprehensive summary of best practices is provided by We Conserve PA https://conservationtools.org/guides/59-steep-slope-ordinance.

In Pennsylvania, the Department of Environmental protection administers a number of acts related to stormwater, floodplains, and water quality. Compliance with these regulations is a baseline requirement. From there local communities protect steep slopes and the community through good zoning, knowledge of risks including soil types, and development approval practices that consider both the upstream and downstream impacts.

Since landslides occur as a result of the ubiquitous interplay of soil and water, preventing and mitigating them requires consideration of numerous and seemingly disparate and activities. The best thinking at this time tells us that traditional considerations such as simply moving water away from land development opportunities are not adequate. Increased risks resulting from more volatile weather have implications for the economic and social wellbeing of all citizens. This is particularly true for those in areas historically hard-hit by natural disasters, which makes this an issue of justice as well as conservation.

Review of Current Ordinances

We recommend that Ross Township continue to address steep slope conditions and landslide-prone areas within the following ordinances:

Grading and Excavating (Chapter 9)
Timber Harvesting (Chapter 14)
Subdivision and Land Development (Chapter 22)
Zoning (Chapter 27)
Protection of Trees (Ordinance 2430)

Methodology

Objectives

In order to understand the extent of the landslide threat in Ross Township and identify areas of special concern, a GIS map was created to help identify parcels with landslide risk factors. The map was then used to create a data set.

Mapping

Mapping was done in conjunction with Matt Sprung, GIS manager from Gibson Thomas Engineering. The following layers were added to the base map. Layers were then colored to show the most concerning areas. Areas with the most overlapping colors, especially slopes and landslide layers were highlighted most dramatically.

Layer Name	**Highlighted Data**
Slopes	40+%, 25-39.99%
Landslide Pomeroy Study	Recent, Prehistoric, Slopes w/ conspicuous soil creep, Outcrop with thick Red Beds, Stable Ground, Steep Slopes Susceptible to Rockfall, Ground with Highly Variable slope Conditions
Contours	5’ intervals
Parcels	Public Parks, Vacant Land
Roads	Centerline
Allegheny County Hydrology Lines	2016
Allegheny County Watersheds	2000
Soils	At, Cmb, CmC, CmD, ErB, ErB, ErC, ErD, EvC, GQF, GSF, GIB, GIC, GID, GpB, GpC, GpD, GvB, GvC, GvD, HaB, Qry, RaA, RaB, UB, UCB, UCD,UCE, UGB, URB, UWB, UaB, WhB, WhC, WhD, Others
World Imagery	For clarity

Parcel Descriptions

Parcels were reviewed based on a number of factors. The initial query identified undeveloped parcels greater than five (5) acres. The reasoning behind the size is that large parcels would make a bigger impact if preserved or if landslide preventative actions were implemented. After the large parcels were identified, the subject parcels were reviewed for the presence of steep slopes, prehistoric slides, slide prone soils, topographic location, environmentally sensitive areas, and the downslope proximity to houses, businesses, roadways, or other structures that could be harmed in the event of a landslide. The data was evaluated based on a GIS desktop review.

Findings

Parcel Rankings

A basic ranking system was assigned to the large parcels. The system tallies the risk of a landslide and the resources that could be damaged due to a landslide. If the site is more prone to a landslide due to the geologic conditions and has a higher risk of damage to the environment or existing development, the score is higher. Therefore, parcels with the highest scores should be the highest priority. The following table is a brief assessment of the Property Identification Code, area (in acres), and the assigned priority.

Ross Township Landslide Evaluation - Large Parcel Review

Property ID	Area (acres)	If a slide were to occur, what resources are downslope/downstream of the potential slide area?								Priority (1-7)*
		Steep Slopes Present	Water Resources	Roadways	House	Businesses	Pre-historic slides	Soil Type - Redbeds	Top of Slope	
0515C00088000000	29.42	Y	Y	Y	Y	N	Y	Y	N	6
0515M00001000000	39.43	Y	N	Y	Y	Y	Y	Y	N	6
0515G00002000000	39.43	Y	N	Y	Y	Y	Y	Y	N	6
0519C00350000000	10.5	N	Y	Y	Y	N	N	N	N	3
0429G00200000000	5	Y	Y	N	N	N	N	N	Y	3
0429G00125000000	5	Y	Y	N	N	N	N	N	Y	3
0429G00272000000	20	Y	Y	N	N	N	N	Y	Y	4
0428M00038000000	6	Y	Y	Y	N	Y	Y	Y	N	6
0428P00285000000	17	Y	Y	Y	N	Y	Y	Y	N	6
0428N00058000000	5.92	Y	Y	Y	Y	Y	Y	Y	N	7
0349K00155000000	9.14	Y	Y	Y	N	N	Y		Y	5
0349P00053000000	5	Y	N	Y	N	N	Y	Y		4
0278F00068000000	8.3	Y	Y	Y	N	N	Y	Y	Y	6
0215B00350000000	8.2	Y	Y	N	N	N	N	Y	Y	4
0278R00235000000	5.3	Y	Y	Y	N	N	Y	Y	N	5
0278R00200000000	7.3	Y	Y	Y	N	N	Y	Y	Y	6
0216E00020000000	6.2	N	N	Y	N	N	Y	Y	N	3
0161G00125000000	7.99	Y	Y	N	N	N	N	Y	Y	4
0162K00115000000	8.4	Y	Y	N	N	N	N	Y	Y	4
0217N00175000000	12.6	Y	N	Y	Y	N	N	Y	N	4
0217J00070000000	7.8	Y	N	Y	Y	N	N	Y	N	4
0217K00225000000	6.72	N	N	Y	N	N	N	Y	Y	3
0164E00050000000	16.52	Y	N	N	Y	N	N	Y	Y	4
0219A00220000000	5.5	Y	N	Y	Y	N	N	Y	Y	5
0280D00255000000	11.2	Y	Y	Y	N	Y	Y	Y	N	6
0352E00120000000	15.2	Y	N	Y	Y	Y	N	Y	Y	6
0352M00085000000	6.79	Y	N	Y	N	Y	N	Y	N	4
0353P00079000000	6.27	Y	Y	N	N	N	N	N	N	2
0282C00280000000	9.47	N	N	Y	Y	N	N	N	Y	3

Policy Recommendations

The following table contains the ordinances and municipal planning code sections that were reviewed and a brief description of why the section was selected.

Ordinance and Code Review

Ordinance/Municipal Planning Code	Applicable Section	Steep Slope Language
Chapter 9 MPC – Grading and Excavation	§9-104 – Permits Required	Describes when grading permits are required for clearing based on slope.
Chapter 9 MPC – Grading and Excavation	§9-110.5. Standards for Excavation. Steep Slopes	The section outlines the township specifications for excavations that occur on steep slopes and landslide-prone areas.
Chapter 14 MPC – Timber Harvesting	§14-104 Timber Harvesting Permit Submission and Requirements & §14-109 Timber Harvesting Operation Regulations	Slopes greater than 25% must be indicated on timber harvesting maps; no clearing cutting can occur on > 25% slopes.
Chapter 22 – Subdivision and Land Development	All	Minimal mention of any land development restrictions based on slope.
Chapter 27 – Zoning	§27.202 Definitions; §27-1804	Steep slope areas are defined as environmentally sensitive areas
Ordinance No. 2430 Protection of Trees	All	No mention of steep slopes, however, protecting trees limits stormwater runoff.

Open Land Conservation Recommendations

Loweries Run Slopes to Marion Daulton Conservation Area

The following parcels are likely good candidates for further open land conservation: 428-M-38, 428-P-285, and 428-N-58. These three parcels are bordering or near the Lowries Run Slopes managed by the Allegheny Land Trust as well as an area identified on the USGS Topographic Map as the Marion Drive & Daulton Green Space. The Lowries Run Biodiversity area provides habitat for a Pennsylvania Department of Conservation and Natural Resources species of special concern. The Lowries Run Slopes have existing trails available for recreational use. Connecting existing green, or preserved lands, in an effort to improve landslide resiliency would be potential uses of the parcels in this area.

Co-operative Expansion of Ellen Hughes Park

Parcel 519-C-35 is located on the northwest border of Ross Township with Shaler Township. This parcel did not rank as a high priority for landslide preservation; however, the parcel is owned by Ross Township and is immediately adjacent to a parcel identified as Ellen Hughes Park. EAC recommends a site visit to identify the connectivity potential of the parcel to the existing park. EAC should reach out to the Ross Township Parks Department to determine if a similar investigation has previously occurred and open dialogue with the Parks Department.

Privately Held Lands

EAC recommends the preservation of lands that rank highly on our priority list. The remaining parcels are held by private individuals. If the lands were to come up for a sale, the township should, at that point, pursue the acquisition of properties. If not possible, the highly ranked parcels should be closely monitored for wise land-use practices that prevent excessive runoff and other factors that when combined with the landslide-prone nature of the soil, could result in a slide situation. Ross Township should be encouraged to assist private landowners with interventions and best-management practices when appropriate as there is a beneficial financial impact for the community at large.

Conclusions

Summary

This report identified and detailed possible preventative landslide interventions at the parcel level. The map developed for this report should be used for informational purposes only and should be used to empower the township and the residents to take a holistic view of preventing landslides as a community. This committee is not and does not recommend using the map for any other purposes at this time. Specific recommendations have been made for a few areas of special interest. There are further concrete steps that can be taken to prevent landslides outlined below.

Next Steps

1. EAC to investigate the open land conservation concept for the parcels near Lowries Run Slopes. Work with the Allegheny Land Trust to investigate the area. **IN PROGRESS**
2. Ross Planning Department and EAC to monitor other priority parcels as outlined in the Open Lands section. **IN PROGRESS**
3. Continue to update ordinances with best management practices (BMPs) as they change. **IN PROGRESS**

4. Develop and publish marketing collateral with recommendations for Best Practices on Private Parcels to empower homeowners.
5. Develop or expand existing programs that assist home and business owners manage stormwater runoff on-site. Programs should target neighborhoods in a priority order based on a risk/benefit analysis and equitable distribution of risk.
6. EAC should work with the Public Works Department to develop or expand best practices for landslide prevention.
7. Encourage developers to use cutting-edge BMPs through the planning process where applicable.

Bibliography

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Appendices

Appendix 1: Pennsylvania Land Trust Steep Slope Ordinance
Appendix 2: Ross Township Landslide Study Map
Appendix 3: Priority Ranking