



# Slow Moving Landslides 101

## Quesnel Fringe Area

## Quick Facts

Our region is home to a number of historical landslides. These are typically slow-moving slides, which move progressively over a period of months or years. While this shifting land movement generally does not pose immediate risk or danger to life, it can cause significant damage to buildings, roads and other infrastructure.

### Fast-moving vs. slow-moving landslides

A fast-moving landslide is often unpredictable and happens suddenly, resulting in a rapid and significant change in the landscape. Historical examples of this in our province include the Hope slide from over one hundred years ago, as well as the fatal North Vancouver landslide, which occurred in a residential area in 2005.

While slow-moving landslides also cause damage, they often occur over longer periods of time, rather than minutes. Slow-moving slides generally don't move all at once – one area may shift, while another area may have no activity at all. Movement can be complex and different areas can move at different rates. Certain zones of the slide may activate and continue to move, while others can be seemingly stable for decades.

### What can cause slow-moving landslides?

Slide activity is generally associated with the amount of water in the ground, as well as the natural movement and water flows of our rivers, and we know that climate change plays a factor. Changes to rain and snowfall patterns, spring melt, winter temperatures and wildfire effects all impact river and stream flows. When the ground is saturated with water, it can become more susceptible to movement.





# Slow Moving Landslides 101

## Quesnel Fringe Area

### What can be done to stop them?

The control and mitigation of slow-moving slides is a complex area of study. The characteristics of a particular slide will determine whether any steps can be taken to halt or slow down the slide activity. Often, there is very little, if anything, that can be done to stabilize the area and prevent further movement.

### What technology is used to detect slow-moving landslides?

To complete this analysis, geotechnical professionals used LiDAR technology to complete a change detection analysis. LiDAR provides accurate pictures of the earth's surface without any trees, plants or other vegetation. This technology allowed professionals to identify areas that have experienced appreciable land movement. Prior to the introduction of LiDAR in recent years, geotechnical professionals had to rely on aerial photography, combined with on-the-ground evidence of slide activity.

### What is the purpose of the latest LiDAR study?

The purpose of the study is to determine which landslides throughout the study area have undergone recorded movement in the stipulated period of time. From this, elected officials will be made aware of the situation as it exists today, and this may assist them in forming an approach to managing development on or adjacent to "slopes where the stability may be questionable".

The study is not predictive, meaning it cannot predict how much the slides will move in the future. Rather, it provides a "snapshot in time" for the movement within the stipulated time period.

### What if my home is near one of the questionable slope areas?

If you own property on or near one of the areas where the "slope stability may be questionable", or you are considering purchasing property in one of these areas, it is important that you educate yourself on the risks and on methods to avoid increasing the problem.





# Slow Moving Landslides 101

## Quesnel Fringe Area

- If you are considering a new development, upgrade, renovation, repair or other construction that involves excavation, placement of fill or structural work, consult with a qualified professional early in the process.
- Tree cutting, vegetation removal, ground disturbance and drainage work is not permitted within any of the known slide areas identified within the various Official Community Plans until an appropriate geotechnical assessment is completed by the landowner and a Development Permit is applied for and received from the CRD. These requirements have been in place for many years already to help reduce the impacts on slide areas.
- If you live on or near areas where the slope stability maybe questionable, it is important to know that even small actions, such as removing a tree, constructing a driveway, changing where your roof drainage goes, etc., could affect slope movement in these areas.
- Finally, if you are worried about existing or potential slope movement on your property, you should consult with a qualified professional.

### What management steps can I take in areas where the slope stability maybe questionable?

These are some responsibilities homeowners have, and steps they can take, if they live within these areas. Please note that this is not an exhaustive list:

- **Stormwater management:** Consider contacting a qualified professional to determine whether roof drainage to the storm sewer system or rain barrels would be advisable and permissible.
- **Irrigation:** Be aware that irrigating land can increase the potential for slope movement.
- **Reduce excavation and grading:** Be aware that both the excavation of slopes and the placement of fill can increase the potential for slope movement.
- **Reduce tree and vegetation clearing:** This damages natural vegetation and reduces stability.
- **Follow the CRD's bylaws and guidelines** for all development and vegetation removal and seek a professional geotechnical review.
- **Consult with professionals:** If you are worried about existing or potential slope movement on your property, you should consult with a qualified professional to assess the immediate and long-term risk, and determine whether anything can be done to stabilize the area, manage further movement and avoid increasing the problem.





# Slow Moving Landslides 101

## Quesnel Fringe Area

### How will I be kept informed about local updates?

We are ensuring that the study is publicly available, and all residents should review its contents. However, this type of mapping technology and analysis does not allow the authors of the study to identify which specific properties are and are not at risk. Rather, this study helps us understand the general areas where slope movement has occurred.

If you own property on or near one of the areas where the “slope stability may be questionable”, it is important to educate yourself on the risks and avoid increasing the problem.

Those who are interested in reading the study, fact sheets or accessing information about other updates can review all documents at [cariboord.ca/naturalhazards](http://cariboord.ca/naturalhazards). If you have further questions, please email [landstability@cariboord.ca](mailto:landstability@cariboord.ca) or contact our office at 250-392-3351 or 1-800-665-1636 and ask to speak to someone with regards to the slope stability study.

Please keep in mind, questions regarding movement or potential movement on your property can only be answered by a qualified professional.

## Information for Homeowners

### Am I in immediate danger?

In most instances, slow-moving slides do not pose an immediate life safety risk. Unlike fast-moving landslides, which can be catastrophic due to their speed and unpredictability, slow-moving slides often occur over months or years, rather than minutes. They can move at rates ranging from millimetres per year to metres per year, and can cause damage to buildings and infrastructure over a period of time.

However, this does not mean that there is “no risk” at all. Slow-moving slides can cause extensive property and building damage over time, and as such, the risk to life safety can also increase over time.



# Slow Moving Landslides 101

## Quesnel Fringe Area

If you own property on or near one of the areas where “slope stability may be questionable”, it is important that you educate yourself on the risks and avoid increasing the problem.

### **Is my home / property at risk?**

The study was conducted to gain a better understanding of the extent of recent slope movement within Quesnel and the surrounding fringe area. It contains several figures showing regions with “slopes where the stability may be questionable”. However, it is important to note that this type of mapping technology and analysis does not allow the authors of the study to identify which specific properties are and are not at risk.

If you own property on or near one of the areas where the “slope stability may be questionable”, it is important that you educate yourself on the risks and avoid increasing the problem.

Any specific questions regarding risk to your property should be directed to qualified professionals, who are able to assess the immediate or long-term risks and determine whether anything can be done to stabilize the area and manage further movement.

### **Will the Cariboo Regional District be contacting me directly?**

This type of mapping technology and analysis does not allow the authors of the study to identify the precise boundaries for the areas where the “slope stability may be questionable”. Rather, this study helps us understand the general areas where slope movement has occurred.

We are ensuring that the study is publicly available at: [cariboord.ca/naturalhazards](http://cariboord.ca/naturalhazards), and all residents should review its contents.

If you own property on or near one of the “slopes where the stability may be questionable” identified in the study, it is important that you educate yourself on the risks and on the methods to mitigate and avoid intensifying the issue.

250-392-3351 or  
1-800-665-1636

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# Slow Moving Landslides 101

## Quesnel Fringe Area

If you have a question about the study, please email [landstability@cariboord.ca](mailto:landstability@cariboord.ca). Please keep in mind, questions regarding movement or potential movement on your property can only be answered by a qualified professional.

### **What if my home is on or near one of the “slopes where the stability may be questionable”?**

If you own property on or near one of the areas where the “slope stability may be questionable”, or if you are considering purchasing property in one of those areas, it is important that you educate yourself on the risks and avoid increasing the problem.

- If you are considering a new development, upgrade, renovation, repair, or other construction that involves excavating, placement of fills or structural work, consult with a qualified professional early in the process.
- Tree cutting, vegetation removal, ground disturbance and drainage work is not permitted within any of the known slide areas identified within the various Official Community Plans, until an appropriate geotechnical assessment is completed by the landowner and a Development Permit is applied for and received from the CRD. These requirements have been in place for many years already to help reduce the impacts on slide areas.
- It is important to know that even small actions, such as removing a tree, constructing a driveway or changing where your roof drainage goes, etc., could affect the slope movement in these areas.
- Finally, if you are worried about existing or potential slope movement on your property, you should consult with a qualified professional.





# Slow Moving Landslides 101

## Quesnel Fringe Area

### What management steps can I take in an area where the slope stability maybe questionable?

There are some responsibilities homeowners have, and steps they can take, if they live within these areas. Please note that this is not an exhaustive list:

- **Irrigation:** Be aware that irrigating lands can increase the potential for slope movement.
- **Reduce excavation and grading:** Be aware that both the excavation of slopes and the placement of fill can increase the potential for slope movement.
- **Reduce tree and vegetation clearing:** This damages natural vegetation and reduces stability.
- **Follow the CRD's bylaws and guidelines** for all development and vegetation removal, and seek a professional geotechnical review.
- **Consult with qualified professionals:** If you are worried about existing or potential slope movement on your property, you should consult with a qualified professional to assess the immediate and long-term risk, and determine whether anything can be done to stabilize the area and manage further movement.

### Where can I see a map of the “slopes where the stability may be questionable”?

The entire study, including all maps showing the “slopes where the stability may be questionable”, is publicly available, and all residents should review its contents.

Note, however, that this type of mapping technology and analysis does not allow the authors of the study to identify the precise boundaries for the areas where the “slope stability may be questionable”. Rather, this study helps us understand the general areas where slope movement has occurred.

The study, fact sheets and updates can be found at [cariboord.ca/naturalhazards](http://cariboord.ca/naturalhazards).





# Slow Moving Landslides 101

## Quesnel Fringe Area

### **Will this affect the value of my property / BC home assessment?**

All questions regarding your property assessment should be directed to BC Assessment at: [bcassessment.ca](http://bcassessment.ca) or 1-866-825-8322. Alternatively, you may wish to contact a qualified appraiser.

### **Will this new information impact my home insurance?**

All questions regarding your insurance coverage must be directed to your own insurer.

### **Can I sell my house?**

If you are considering selling your property, you may be required to disclose information regarding slope movement on or near your property. It is recommended that you contact a lawyer regarding your legal obligations in this regard.

### **I am looking to buy a home in the area. Where can I find out more information about areas of questionable slope stability?**

Potential homebuyers should educate themselves about living in an area where the slope stability may be questionable. You can review the study, fact sheets, information, and updates at [cariboord.ca/naturalhazards](http://cariboord.ca/naturalhazards).

It is important to note that neither the LiDAR study nor any information provided in this Slow-moving Landslides 101 document should be relied upon by any person who may be contemplating purchasing a property in the study area or making a financial investment in a property in the study area. Individuals considering making a financial investment in a property located in the study area must conduct their own due diligence as to potential physical and economic landslide-related risks and seek the advice of qualified professionals before making any decision to purchase or invest.





# Slow Moving Landslides 101

## Quesnel Fringe Area

### Will I receive compensation for lost property values?

Compensation for loss of property values caused by slow-moving landslides falls outside of local governmental jurisdiction.

At this time, neither the provincial government nor the federal government has announced funding to compensate owners for any decrease in property values they may experience as a result of slow-moving slide activity on or near their property.

### Who will pay for mitigation costs?

The control and mitigation of slow-moving slides is a complex area of study. The characteristics of a particular slide will determine whether any steps can be taken to halt or slow down the slope movement. Often, there is very little, if anything, that can be done to stabilize the area and prevent further movement.

Local governments have no role to play in mitigating the slope movement described in the study area. At this time, neither the provincial government nor the federal government has announced funding for mitigation costs associated with the slow-moving slides in this area.

### How will I be kept informed about local updates?

We are ensuring that the study is publicly available, and all residents should review its contents. However, it is important to note that this type of mapping technology and analysis does not allow the authors of the study to identify which specific properties are and are not at risk. Rather, it helps us understand the general areas where slope movement has occurred. As a result, we are unable to identify and personally contact affected owners with updates.

If you own property on or near one of the “slopes where the stability may be questionable” identified in the study, it is important that you educate yourself on the risks and avoid increasing the problem. Those



# Slow Moving Landslides 101

## Quesnel Fringe Area

who are interested in reading the study, fact sheets or updates can review all documents at [cariboord.ca/naturalhazards](http://cariboord.ca/naturalhazards).

### **I have questions. Who can I speak to about this?**

We have set up a dedicated email address to address your questions. Please email [landstability@cariboord.ca](mailto:landstability@cariboord.ca) and we will respond as quickly as possible. If your matter is urgent, we'd be happy to answer any questions we can, or direct you to the appropriate agency. You can also call 250-392-3351 or 1-800-665-1636 and ask to speak with someone regarding the slope stability study for the Quesnel or Williams Lake fringe areas within CRD boundaries. If you live within city boundaries, please reach out to your municipality.

Please keep in mind, questions regarding movement or potential movement on your property can only be answered by a qualified professional.

## **Construction and Renovations**

### **I want to do a renovation on my property. What do I need to know?**

If you are considering a new development, upgrade, renovation or repair that involves excavation, placement of fill or structural work, consult with a qualified professional early in the process.

If you live on or near active or inactive slide areas it is important to know that even small actions such as constructing a driveway, changing where your roof drainage goes, etc. could affect how much or when a slide moves in the area.

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# Slow Moving Landslides 101

## Quesnel Fringe Area

### **Am I allowed to cut down trees on my property?**

Tree cutting, vegetation removal, ground disturbance and drainage work is not permitted within any of the slide areas identified within the various Official Community Plans until an appropriate geotechnical assessment is completed by the landowner and a Development Permit is applied for and received from the CRD. These requirements have been in place for many years already to help reduce the impacts on slide areas.

If you live on or near active or inactive slide areas it is important to know that even small actions such as removing a tree, constructing a driveway or changing where your roof drainage goes, etc. could affect how much or when a slide moves in the area.

### **When am I required to obtain a geotechnical report?**

Geotechnical reports are commonly required for any new development or building permit on lands that are located in what the applicable Official Community Plan identifies as a hazardous or environmentally sensitive area. However, be aware these reports generally assess the landslide risk to life and safety, and may not identify slow moving slide areas. It is important to discuss with your qualified professional precisely what is being assessed and reported on.

If you wish to obtain more information regarding slow-moving slides on or near your property, you should consult a qualified professional. Only qualified professionals are able to properly assess the immediate and long-term risk and determine whether anything can be done to stabilize and manage further slope movement.

### **Are you going to freeze all development in these areas?**

We care about the wellbeing of our communities and the safety of our citizens – and take these findings seriously. As a next step, we will be reviewing what policy and regulatory changes may be made regarding planning and development. Elected officials will use this data to help form their approach to managing future development.





# Slow Moving Landslides 101

## Quesnel Fringe Area

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Please keep in mind, questions regarding movement or potential movement on your property can only be answered by a qualified professional.

## About the Study

### What is the purpose of the study?

The study was conducted to gain a better understanding of the extent of slope movement within Quesnel and the surrounding fringe area. As a next step, we will be reviewing what policy and regulatory changes may be made involving planning and development. Elected officials will use this data to help form their approach to managing future development.

### What technology was used to assess the slope movement?

To complete this analysis, geotechnical professionals used LiDAR technology to undertake a change detection analysis within the stipulated timeframe. LiDAR provides accurate pictures of the earth's surface without any trees, plants or other vegetation. This technology allowed the professionals to identify areas that have experienced appreciable land movement during that timeframe. LiDAR is relatively new technology, and prior to this, geotechnical professionals had to rely on aerial photography, combined with on-the-ground evidence of slide activity.





# Slow Moving Landslides 101

## Quesnel Fringe Area

### What does this study tell us?

This study identifies:

- The approximate extent of where slope movement occurred within the stipulated timeframe, providing a “snapshot in time”, using LiDAR imagery.
- Areas where the slope stability may be questionable, even if slope movement did not occur within the stipulated time frame.

While the analysis shows that some areas have experienced greater movement than others, this type of mapping technology and analysis does not allow the authors of the study to predict with any certainty which specific properties are and are not at risk. Nor does the analysis show the extent of the problem – exactly how much the land has moved, how long it may have been happening or whether it has been accelerating. That would require further investigations, often on a property-by-property basis.

### What does the study not tell us?

This type of mapping technology and analysis does not allow the authors of the study to predict with any certainty which specific properties are and are not at risk. Nor does the study show the full extent of the problem – exactly how much the land has moved, how long it may have been happening, and whether it has been accelerating. That would require further investigations, often on a property-by-property basis.

In areas where a small movement may have occurred (i.e., less than 10 cm vertically), the LiDAR change detection analysis is unlikely to record any movement, as it is below the detectable limits.

Importantly, this study does not predict future slope movement, which can be influenced by a number of factors, including groundwater and climate change.





# Slow Moving Landslides 101

## Quesnel Fringe Area

### How many properties are affected?

The study highlighted movement in the following areas:

- The slopes around Baker Creek, and on the Baker Creek slide, the Baker Creek Pinnacles Road slide and the South Baker Creek slides;
- The Red Bluff and Plywood Hill slides;
- The Quesnel Hill slide complex and the Dragon Hill Road slide;
- The Garbage Dump slide; and
- The Plateau / Abbott Drive slides, the Ruric Springs subdivision and the Marsh Road Hill slide.

Some detectable movement was also noted on the Westply slide.

The analysis did not highlight any substantial changes within the West Quesnel slide area because the slope movement in this area may have been below the detectable limit for LiDAR change detection analysis over the time period.

However, this type of mapping technology and analysis does not allow the authors of the study to predict with any certainty which specific properties are and are not at risk. Nor does the study show the extent of the problem in any area – exactly how much the land has moved, how long it may have been happening or whether it has been accelerating. That would require further investigations, often on a property-by-property basis.

## Next Steps

### What is the Cariboo Regional District doing about this?

We care about the wellbeing of our communities and the safety of our citizens – and take these findings seriously. As a next step, we will be reviewing what policy and regulatory changes may be made involving





# Slow Moving Landslides 101

## Quesnel Fringe Area

planning and development. Elected officials will use this data to help form their approach to managing future development.

As we have seen with the increased number of wildfires throughout B.C., climate change is increasingly creating risks for all of us. And, just as we have learned to be fire-smart, we must also be landslide-smart.

This means:

- Educating community members about the realities of living in areas where the slope stability may be questionable.
- Educating property owners about the steps they can take to avoid increasing the problem.
- Working to develop policies involving future development in these areas.
- Raising awareness among all levels of government.

### What's happening next?

This study will form part of the CRD's approach to managing development (both existing and new) on or adjacent to "slopes where the stability may be questionable". The study is only one step in the process. In the coming months and years, we will be reviewing what policy and regulatory changes may be made involving planning and development. Elected officials will use this data to help form their approach to managing future development, including:

- Subdivision approvals;
- Building permit approvals;
- Development permit applications; and
- Rezoning approvals.





# Slow Moving Landslides 101

## Quesnel Fringe Area

### Can the slide be stopped, and can the damage be fixed?

The control and mitigation of slow-moving landslides is complex. The characteristics of a particular slide will determine whether any steps can be taken to halt or slow down the slide activity. Often, there is very little, if anything, that can be done to stabilize the area and prevent further movement.

If you live in or near one of the areas where the “slope stability may be questionable”, it is important to know that even small actions such as removing a tree, constructing a driveway, changing where your roof drainage goes, etc. could affect how much or when a slide moves in the area. Slide activity is generally associated with the amount of water in the ground, as well as the natural movement and water flows of our rivers, and we also know that climate change plays a factor.

If you are worried about existing or potential slide activity on your property, or if you wish to obtain specific information about what can be done to address the situation, you should consult with a qualified professional; only they are able to properly assess the immediate and long-term risk and determine whether anything can be done to stabilize the area and manage further movement.

### How can I find out more, ask questions or make recommendations?

We have set up a dedicated email address to address your questions. Please email [landstability@cariboord.ca](mailto:landstability@cariboord.ca) and we will respond as quickly as possible. If your matter is urgent, we'd be happy to answer any questions we can, or direct you to the appropriate agency. You can also call 250-392-3351 or 1-800-665-1636 and ask to speak with someone regarding the slope stability study for the Quesnel or Williams Lake fringe areas within CRD boundaries. If you live within city boundaries, please reach out to your municipality.

Please keep in mind, questions regarding movement or potential movement on your property can only be answered by a qualified professional.

