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## **Gypsum Karst: Human Initiation and Response, Woodville, NL, Canada**

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The community of Woodville, located in the Codroy Valley of southwest Newfoundland, Canada, is currently undergoing significant gypsum karst development in three distinct areas. Mapping has revealed more than 70 dolines, many of which have developed within the past 50 years, and which show a variety of differing stages of development. Several oval dolines have extended laterally to form uvalas, following the linear trends of gypsum beneath the surface. Doline development is directly related to structural geology and bedrock stratigraphy.

Suffusion dolines are the dominant landform features at Woodville, and thus development may not be immediately evident on the surface. Dolines in the study site range from barely perceptible depressions, to spectacular and rapidly expanding vertically-walled features with permanent water. Most are actively propagating and expanding. Properties adjacent to the doline walls are at medium-term risk of damage, and will eventually suffer collapse as dissolution continues.

The rate of doline development has accelerated substantially since 1970. Although precipitation has increased in the region by approximately 10% since 1950, the acceleration in the rates of karst development cannot be accounted for by climate change or variation. Human modifications to the landscape are significantly contributing to the situation. As the community grew inland and cleared land for farming and pasture, the dolines propagated. As forestry activities removed tree cover, small dolines have begun to form further inland

Attempts to infill the dolines have not been successful. Addition of refuse contain-

ing acids or other chemical compounds may act to accelerate gypsum dissolution, by changing the chemistry of the water in contact with the gypsum beds.

At Woodville, residents were allowed to build homes in areas of clear risk and are now coming to the realization of risk. Although human actions have accelerated the rate of dissolution, a significant problem is getting residents to acknowledge the situation. Many residents still believe that there is no problem in the community and that their home is not at risk. Some residents have reacted adversely to investigations, perceiving that identification of the hazard would mean a lowering of the property value and a possible loss of insurance coverage.

Residents who have built on these properties without prior knowledge of the geological hazards posed by the underlying bedrock cannot be held responsible. Large-scale remediation measures are not economically or logistically feasible, but a government-funded relocation program would provide alternate housing for the people most at risk. Many more families living in Woodville will have to come to terms with the unique situation that has developed in their community. Special consideration must be made when carrying out any sort of construction or land-clearing activities, especially in light of evidence that human activities are severely accelerating karst development.