Guide to Identifying High Water Marks

Preface

This is a guide for Civil Air Patrol Members to identify and report High Water Marks (HWM) using the Survey 123 CAP Incident Data Collection Tool. The material contained in this guide is taken from the USGS Identifying and Preserving High-Water Mark publication. A link to this document is in the references section of this guide and is recommended reading.

The first section of this guide will help you to identify the different types of HWM's. CAP's role in collecting HWM data if crucial to FEMA in degerming the extent of damage caused by a flood.

This guide works in conjunction with the CAP Incident Data Collection Tool,

Mail to : gis@cap.gov

Guide to Identifying High Water Marks

Section 1 – Types of HWM's

Mud Lines

When turbid water comes into contact with natural and man-made objects, the water can leave a film on the outside of nonporous surfaces called a "mud line". Mud lines on natural surfaces such as grasses, shrubs, and trees can form usable high-water marks, and the lines are typically easier to see when viewed from a distance, such as the desert shrubs shown in figure 1.



Figure 21. A rapid-water mud line of a different color than the existing bed sediment. Photograph by Jon Mason.

Mud lines on hard surfaces tend to leave better-quality high-water marks, especially when deposited by tranquil water. Excellent mud lines can form on stone, metal, plastic, and glass surfaces. Mud lines on structures may last for many weeks if undisturbed or may be washed away quickly during cleanup efforts. Mud lines on outside surfaces, including plants and structures, are susceptible to removal by subsequent rains.

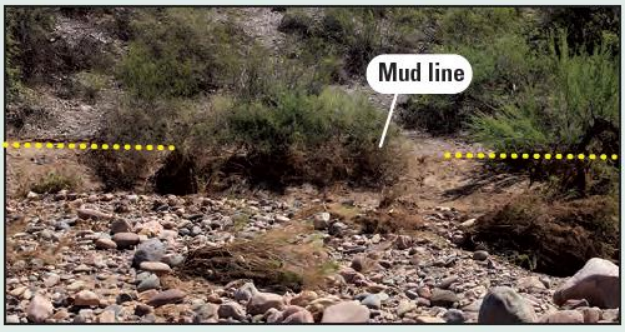


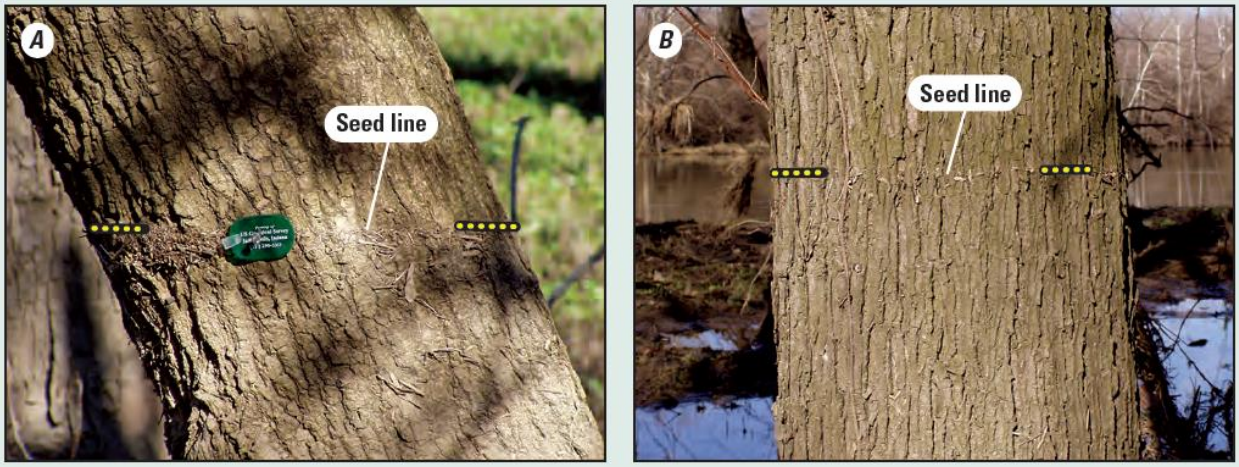
Figure 1. A mud line visible from a distance on desert shrubs. Sediment from the floodwaters has deposited onto the shrubs, turning them brown.

Seed Lines

Seed lines form when fine materials float on top of tranquil water and remain on objects after the water recedes. Seed lines can be left on tree trunks, bridge piers, buildings, and other objects in the flooded reach of a stream. Exposure to sun, wind, and rain can quickly remove seeds and small materials within hours or days; therefore, seed lines should be identified and marked with more permanent methods (described in a later section) soon after the flood event.



Figure 7. Seed lines on the surfaces of *A*, a recreational sign and *B*, a home exterior. Photographs by Walter Killion.





Debris Lines

Debris lines are trails of twigs, grasses, and other small debris left on sloping ground at the edge of a river where calmer water, as it receded, deposited the material (fig. 10). Generally, debris lines are not as reliable as seed lines because debris lines have a coarser texture and have a tendency to sag as the water recedes. However, debris lines sometimes form the only available high-water marks for a given reach, especially in reaches with less woody vegetation or other obstructions. Debris lines form primarily in tranquil overbank areas and flood plains; however, flooded streams with swift-moving main channels may still collect debris lines at the edges where velocities may be lower or eddies concentrate the floating debris. The best debris lines form in slack water areas where an obstruction, a backwater tributary, or a change in channel geometry created a tranquil pool. A new debris line forming in a small pool, immediately following the peak of a flood event, is shown in figure 11.



Figure 10. Debris lines formed on *A* and *B*, grassy overbanks; *C*, a roadway; and *D*, a grassy highway embankment. Photograph *C* by Michelle Kang; photograph *D* by R. Russell Lotspeich.



Figure 25. Photograph showing a line of debris collected along a chain-link fence. Photograph by Chad Ostheimer.



Ice Rings

When floods recede during freezing periods, ice sheets may form at the water surface. As the under-surface water recedes, suspended plates of ice, referred to as ice rings, may be left behind around cold objects such as fence posts or vegetation (fig. 13). If sunlight or increased temperatures have begun to melt the ice or if additional frozen precipitation has added thickness to the ice, the indicated water surface will be uncertain. More importantly, determining whether the freeze happened at the peak of the flood or at a lower water surface elevation during the recession is difficult. A somewhat unusual circumstance of hanging limbs that were originally frozen into surface ice and then released by the thawing river is shown in figure 14. Because their position at the time of initial freezing is unknown, establishing an accurate high-water mark from these ice-ring remnants alone would be difficult. As always, careful evaluation and verification with other marks are necessary.

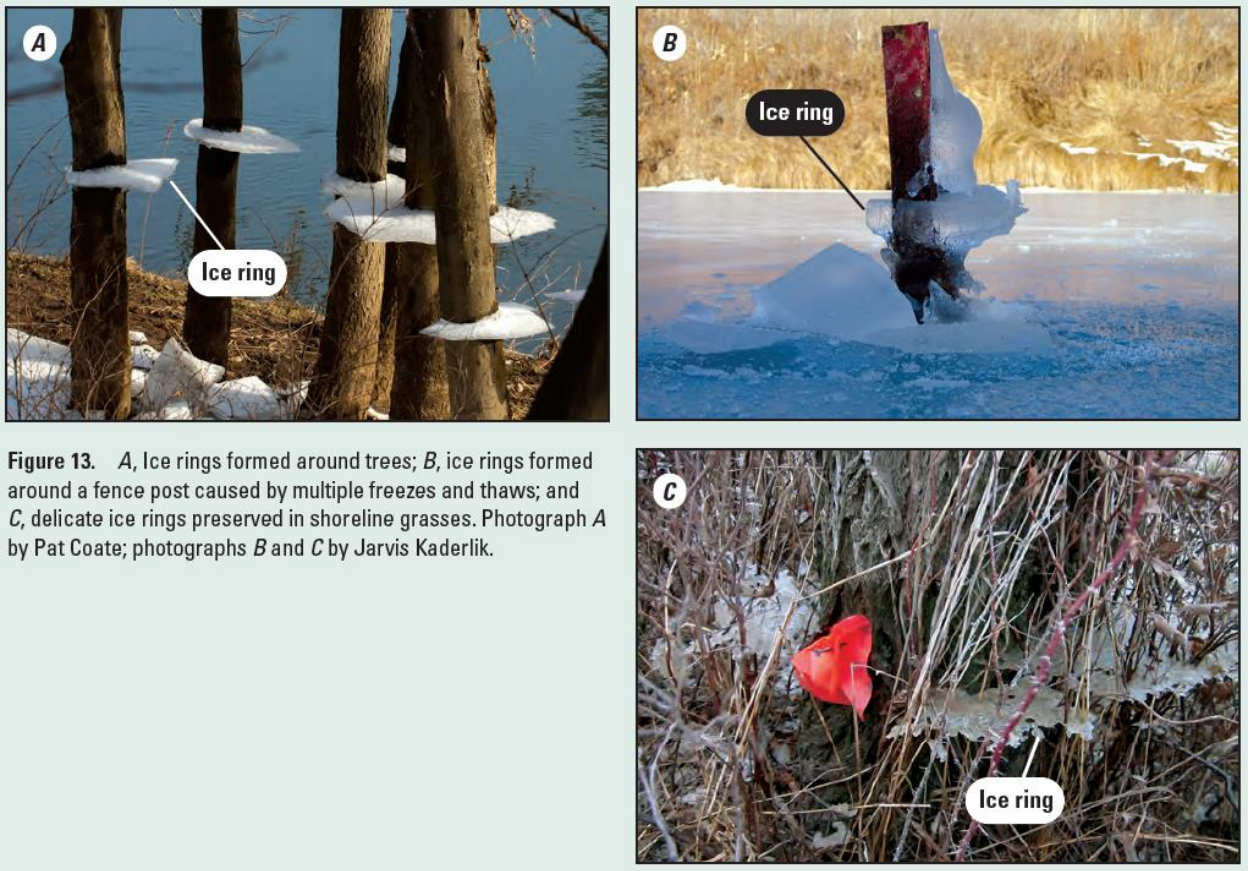


Figure 13. *A*, Ice rings formed around trees; *B*, ice rings formed around a fence post caused by multiple freezes and thaws; and *C*, delicate ice rings preserved in shoreline grasses. Photograph *A* by Pat Coate; photographs *B* and *C* by Jarvis Kaderlik.

Section 2 - Reporting HWM's

Safety first—Although many high-water marks are surveyed after dangerous floods have receded, floods and storms that create high-water marks may leave behind unstable structures, broken debris with sharp edges, damaged power lines, and unstable roads and footpaths.

Respond quickly—Most high-water marks are perishable and fragile and are likely to be disturbed, degraded, or destroyed by natural forces or cleanup efforts. The most important success factor when documenting high-water marks from recent events is to identify the marks before they change or disappear.

Look up—As floodwaters recede, secondary events may form multiple high-water marks below the highest mark. Sometimes, a lower, secondary mark is the first mark noticed, especially in coastal areas. Developing a habit of thoroughly checking above each high-water mark will improve the likelihood that the peak mark has been identified.

Stand back—A wider view may show patterns that were invisible up close, which is especially true with mud lines in low brush and foliage.

References

Identifying and Preserving High-Water Mark Data

https://pubs.usgs.gov/tm/03/a24/tm3a24.pdf

Civil Air Patrol Incident Data Collection Tool Explanation Document