To: Fluvial geomorphic consultants conducting VT Stream Geomorphic Assessments (Phase 2) and preparing River Corridor Plans

From: Vermont DEC Rivers Program

Date: May 2012

RE: **SGA Protocols on Rivers Affected by Major Flooding**

Tropical Storm Irene has had a major effect on the current geomorphology of many of Vermont's rivers. These rivers will continue to undergo physical adjustments as they respond to changes associated with both the flood magnitude and the flood recovery work conducted within the river corridor. We recognize that field characteristics normally assessed during SGA may now be unusually transient, and in many cases, it will be difficult to tease apart short-term and longer-term adjustments and, ultimately, geomorphic condition. Therefore, we are submitting the following cautions and considerations for groups who are conducting SGA (phase 2) on rivers with significant post-flood characteristics. We request your thoughtful, professional expertise to ensure that SGA data will be most useful to river corridor planning and mapping efforts and for river corridor management for stream equilibrium condition. We welcome your thoughts, suggestions, and interpretations.

1. **Checking In.** Once assessment is underway, work with your regional river scientist to report problems, ask questions, or make suggestions about capturing specific situations. We request you submit some reach data early for Rivers staff to look at to determine if other approaches are needed.
2. **Bankfull and Incision Ratios.** Following major flooding, bankfull features may be difficult or impossible to identify along some reaches. One to two-year flows may not meet the same elevation as features that were previously associated with bankfull. These "old" bankfull features may or may not still be present. "New" bankfull features may not yet be present, or at least, certainty about their associated discharge may be low.

   Please attempt to identify bankfull indicators when possible, following SGA Handbook protocols, by observing benches and scour lines (ideally observing water levels during spring flows). If there is not a good bankfull feature, and/or you are not sure what to use for bankfull to determine other RGA data, take more points along your cross-section to give more detail to the cross-section. This cross-section detail will help support judgments that may need to be made with uncertain data (e.g. if the VT Hydraulic Geometry Curves are used to determine what type of cross-sectional area/depth/etc. may be expected in that channel). Please specify what you used for bankfull features in your notes and cross-section worksheets.

An incision ratio will be calculated as usual but an alternate measure for channel enlargement should also be used when channel dimensions have been significantly altered and/or corroborating bankfull indicators are not present.

Note this method is NEW to SGA protocols:

The **channel enlargement measure (*E*)** is a comparison of the channel's cross sectional area from the current top of bank (A_{tob}) to the cross sectional area predicted by the Vermont regional hydraulic geometry curve (A_{curve}) as a percentage, using this equation:

$$E = A_{tob}/A_{curve} \times 100$$

An approximate value of 100% for *E* could be interpreted as a clue that the stream channel may have retained equilibrium capacity. A value of 300%, for example, could indicate channel enlargement. However, there are obvious problems with this method because of limitations of the regional hydraulic geometry curve (see Appendix J of SGA Handbook). Also, this measure alone will not directly indicate degree of incision or floodplain access. This method is simply another descriptor to help qualify the data.

The DMS will provide a space to enter any channel enlargement measures that are calculated.

3. **Dredged/braided areas.** At the time of assessment, some stream reaches may be significantly dredged with piled stream sediments or multiple channels associated with in-stream work. Segment out these areas if they are >500' long. If it is not possible to identify bankfull elevation, then take a descriptive cross section without identifying bankfull. Having these cross sections in the SGA database is still vital to understanding the geomorphic condition of the reach. Taking multiple cross sections in highly impacted reaches is encouraged. For areas <500', highlight those locations in your notes and comments; if you have time, cross-sections in these areas can be helpful, too, to demonstrate how much modification/impact has occurred as compared to the surrounding reach or segment that may have less impacts.
4. **Channel Dimensions.** For each cross section, note the following:
    - Were channel dimensions significantly changed by major flooding? (Yes/No/Unknown)
    - Were channel dimensions significantly changed by human alteration associated with flood recovery efforts (e.g., reshaping of banks by yellow machines)? (Yes/No/Unknown)

    Record your answers to these questions on cross-section field forms and in uploaded cross section spreadsheets. We are creating a place in the DMS to enter this information, as well as other information relating to major flood effects.
5. **"Highly Altered" Segments.** When bankfull elevation can't be identified and/or existing stream type is difficult to determine, the RGA condition may default to Poor for the segment. Sensitivity may also default to Extreme (discuss with your Regional River Scientist if you wish to assign Extreme sensitivity on a "highly altered" segment). Though a segment may default to poor/extreme conditions, complete as many questions in the RGA as possible to help characterize the type of adjustments that are most likely to be occurring and/or likely to occur in the segment.

6. **Phase 2 photos.** When taking photographs, be sure to include major features within the river corridor that tell the story of the flood's effects (e.g., berms, large bars, stockpiles of sediment, debris, damaged infrastructure, erosion). **Please include GPS coordinates for the location of each photograph.**
7. **Berms.** For new berms, please note if berm material appears to originate from channel-extracted material or from deposits pushed out of fields (e.g. farm clearing) or other notes of interest. There is a description field in FIT where these details can be recorded. This information will help document where/what/why/how a berm may have been created in that area and what options may be available for corridor planning projects.
8. **Woody debris.** Counts of woody debris pieces may be estimated in areas of heavily piled wood. Photos and comments of noteworthy debris that are significant for habitat, channel adjustment, or floodplain forests are helpful.
9. **Corridor Planning.** When preparing river corridor plans and identifying projects, always keep in mind the longer term goal of managing toward stream equilibrium. River Corridor Plans will be of particular interest to communities that have recently experienced major flooding. We encourage you to…
    - Be alert for areas where further remediation or monitoring efforts may still be needed and note recommendations that you think would be most critical to the river's long term stability.
    - Keep in mind that maintaining/improving floodplain access in key locations will be an important aspect of the shared goals of river corridor planning and flood resiliency. For example, RCP reports may benefit from maps which highlight existing floodplain access or opportunities for improved floodplain access.
    - Recommend and **prioritize** opportunities to improve crossing structures. Use information about recent structure losses and replacements when possible.
    - Strive to present project recommendations in a clear, usable format and place them in the context of allowing stream processes to move toward dynamic equilibrium.