

## **Summary of the Main Revisions in 6/5/14 Draft of the Connectivity Panel's Report**

The following points summarize the main revisions incorporated to address comments from the Panel. Other editorial changes have also been incorporated throughout the report.

### **Throughout the report**

- “Water quality” has been replaced in many places with “physical, chemical, and biological integrity of downstream waters.”
- The report has been revised to recommend that EPA replace the term “bidirectional waters and wetlands” with “waters and wetlands in floodplain settings.”
- The report has been revised to recommend that EPA replace the term “unidirectional waters and wetlands” with “waters and wetlands in non-floodplain settings.”
- The report has been revised to indicate that connectivity is a gradient determined as a function of the frequency, magnitude, and duration of physical, chemical, and biological processes and their downstream consequences.
- Other changes recommended by Panel members have been incorporated.

### **Letter to the Administrator**

- The letter has been revised to indicate that the SAB agrees with two of the three major conclusions in EPA's report and disagrees with the third. A short explanation is provided.
- The letter recommends that the interpretation of connectivity be revised to a gradient approach. The letter also notes that in certain systems, such as headwater streams and tributaries and floodplain wetlands, relatively low levels of connectivity can be ecologically significant in terms of impacts on downstream waters.
- The letter has been revised to indicate that the EPA Report should contain an expanded discussion of approaches to measuring connectivity.
- The letter mentions the importance of ground water systems.

### **Executive Summary**

- The Executive Summary has been revised to reflect revisions in the body of the Report and emphasize the key recommendations.

### **Section 3.1**

- Text has been added to emphasize the importance of addressing spatial and temporal scale.
- Text has been added to emphasize the importance of adopting watershed, riverscape, and groundwater basin perspectives to understand connectivity.
- The section has been revised to call for the addition of at least one case study where intermittent connectivity is important.
- The section has been revised to indicate that it would be useful for EPA to provide examples of approaches to assess or measure connectivity.
- The bullets listing the recommendations have been edited and combined. Some recommendations have been included in the text but not listed as separate bullets.

### **Section 3.2**

- New text has been added to expand the discussion of the importance of considering spatial and temporal scales in the conceptual framework. Additional references have been added and two new figures have been included (Relative spatial and temporal scale of hydrologic connectivity and interaction; and Relative likelihood X relative impact of global-scale phenomena).
- The discussion of defining connectivity and isolation has been expanded and additional references that were provided by Panel members have been added. The section includes a recommendation that the EPA Report contain figures for each water body type (i.e., streams, waters and wetlands in floodplain settings, and waters and wetlands in non-floodplain settings) that illustrate the conceptual approach to defining connectivity. Figure 3 in the Panel's report is suggested as an example that could be used by EPA to develop more specific figures for each water body type.
- A new subsection on measuring or otherwise quantifying connectivity has been added. Additional references and text have been included to provide insights from hydrologic systems, disturbance ecology and ground water/surface water modeling.
- The bullets listing the recommendations have been edited for clarity.

### **Section 3.3**

- Additional references have been incorporated.
- The discussion of temporal dynamics has been expanded.

- Sections 3.3.8 and 3.3.9 have been combined into a single subsection (connections to the broader riverine landscape) that recognizes the effect of riparian zones and landscape factors on headwater stream function and downstream waters.
- The bullets listing the recommendations have been edited for clarity.

### **Section 3.4**

- Section 3.4 indicates that there is strong scientific support for the conclusions and findings in Section 1.4.1 of EPA's report. The section also states that EPA should recognize that there is a gradient of connectivity that is a function of frequency, magnitude, and duration of physical chemical, and biological processes.
- Section 3.4 has been revised to recommend that: 1) different types of connectivity (hydrologic, biological) be added to table 4.1 of the EPA Report, and 2) the EPA report should explain that not all connectivity in the watershed is hydrologic and mention biological connectivity as an example of this.
- The Section has been revised to more clearly indicate that the case studies in the EPA's report should be presented earlier and that text boxes should be used.
- The bullets listing the recommendations have been edited for emphasis and clarity.

### **Section 3.5**

- Additional references on cumulative and aggregate effects have been included in the report.
- A paragraph on the implications of drought for connectivity has been added.
- The bullets listing the recommendations have been reordered and combined for emphasis and clarity.
- Some of the text on temporal variability in Section 3.6 has been moved into Section 3.5.

### **Section 3.6**

- The subsection on spatial and temporal scales has been revised to include suggested changes provided by the Panel.
- Additional literature citations on cumulative and aggregate effects have been added to the report.
- The discussion of temporal variation and the transient nature of some floodplains has been edited to move some material from Section 3.6 to Section 3.5.

- The text has been revised to indicate that the EPA Report should contain a discussion of the science related to floodplain areas.
- Text has been revised to mention the opportunity to link the discussion of the role of wetlands and waters in storing and transforming chemical constituents to the regulation and management of chemical constituents.
- Text has been included to indicate that the SAB encourages consistent use of terms and suggest that EPA provide clarification of the differences among terms in the definitions in the Report.
- References on channel migration zones has been added.
- Text has been added to indicate that the case studies in the EPA Report would benefit from more discussion of forested wetlands, including bottomland hardwoods.
- The discussion of human alterations has been revised to suggest inclusion of additional impairments such as dredging and channelization.
- The bullets listing the recommendations have been reordered and combined for emphasis and clarity.

### **Section 3.7**

- The subsection on spatial and temporal scales of connections among non-floodplain waters and wetlands has been expanded to include additional information.
- Additional references on the exchange of materials via biota, introduction of disease vectors, and the provisioning of habitat essential for biological integrity have been added to Section 3.7 and a new appendix containing additional literature citations on biological connectivity has been added to the report.
- New text has been added to section 3.7 to emphasize the importance of aggregate and cumulative impacts.
- Figure 3 (example illustration of the dimensions of connectivity arrayed as a gradient) and its caption have been edited to include minor changes suggested by panel members.
- The text has been revised to indicate that the EPA Report should recognize that all aquatic habitats have some degree of connection but such connections may not be relevant if they do not have important effects on the integrity of downstream waters. The revised text recommends that the Report assess connectivity in terms of downstream effects with an emphasis on frequency, magnitude, and duration of connections.

- The bullets listing the recommendations have been edited for emphasis and clarity.

### **Section 3.8**

- Edits suggested by Panel members have been incorporated.
- The Discussion of the key findings has been edited for clarity. The discussion of key finding c has been made shorter.