

Sediment Targets in the Boise River Tributaries

Hawk Stone

Idaho DEQ

Documents:

CH2MHILL

TECHNICAL MEMORANDUM

Selection of a Total Suspended Sediment (TSS) Target Concentration for the Lower Boise River TMDL

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Purpose

The purpose of this technical memorandum is to summarize the results, conclusions, and findings of published and unpublished studies pertaining to the effects of suspended sediment (SS) on selected species of fish and to select one or more appropriate target TSS concentration(s) to protect the existing and/or potential designated uses in the lower Boise River.

Literature Review

Background on Effects of Suspended Sediment

The effects of SS on fish vary with life stage (adult, juvenile, larvae, and eggs) and species (Sorensen et al. 1977; Waters 1995; Newcombe and Jensen 1996; Anderson et al. 1996; Sweeten 1998), as well as concentration of SS, duration of exposure, and particle size and angularity (Waters 1995; Anderson et al. 1996; Newcombe and Jensen 1996). Waters (1995) reported that salmonids have received the greatest attention regarding the effects of sediment on fish. This may be due to a number of reasons, including the great economic interest in the salmonids (Waters 1995) as well as their role as an indicator organism for cold water biota (e.g., Harvey 1989).

In a 1991 report, Newcombe and McDonald indicated that although the effects of SS on fish and aquatic life have been studied intensively, general principles characterizing environmental effects of suspended sediments had not been established. They noted that most published studies had only reported concentration; however, they stressed that severity of effects is also related to duration of exposure. In exploring the relationship between SS concentration and duration in influencing changes in fish habitat in Canada, Anderson et al. (1996) found duration of exposure played a more dominant role than concentration.

In addition to habitat effects, a variety of effects associated with SS and fish are published in the literature. In general, these include lethal and sublethal effects. Waters (1995) provided

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ports on fish re- equations that ration. These use of fishes ly, and the to excess quarantine The

were Newcom- the database plankton to fish. Third.

Newcombe and Jensen (1996)

- Meat-analysis: 80 studies
- How does sediment affect fish?
- 3 Questions
 - Which grouping of fish
 - Concentration of sediment
 - Duration of sediment
- 1 Answer = Severity of Effect on fish
- Use Matrix

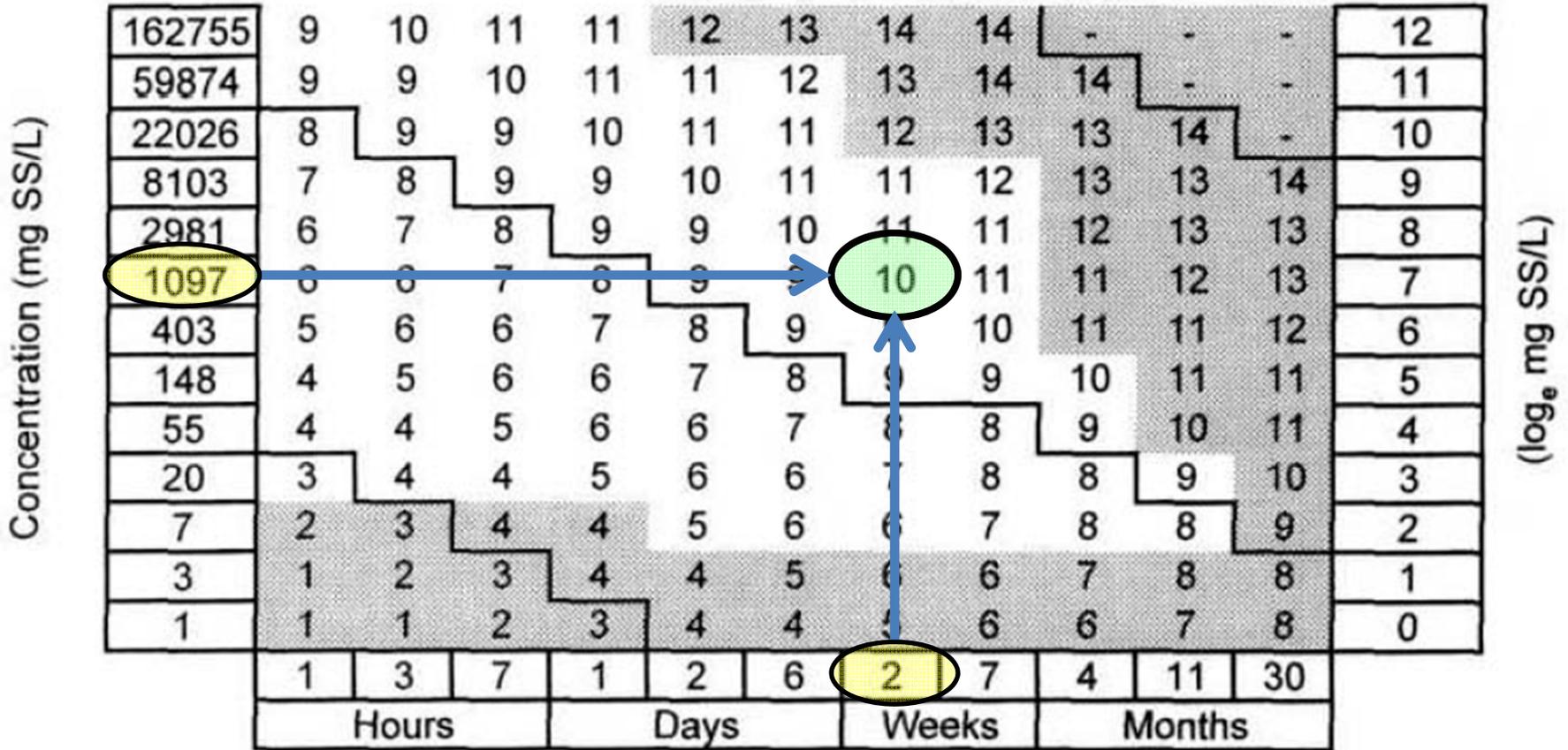
N&J EXAMPLE 1

Juvenile Salmonids

Duration of exposure to SS (\log_e hours)

0	1	2	3	4	5	6	7	8	9	10
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(B) Average severity-of-ill-effect scores (calculated)



N&J EXAMPLE 2

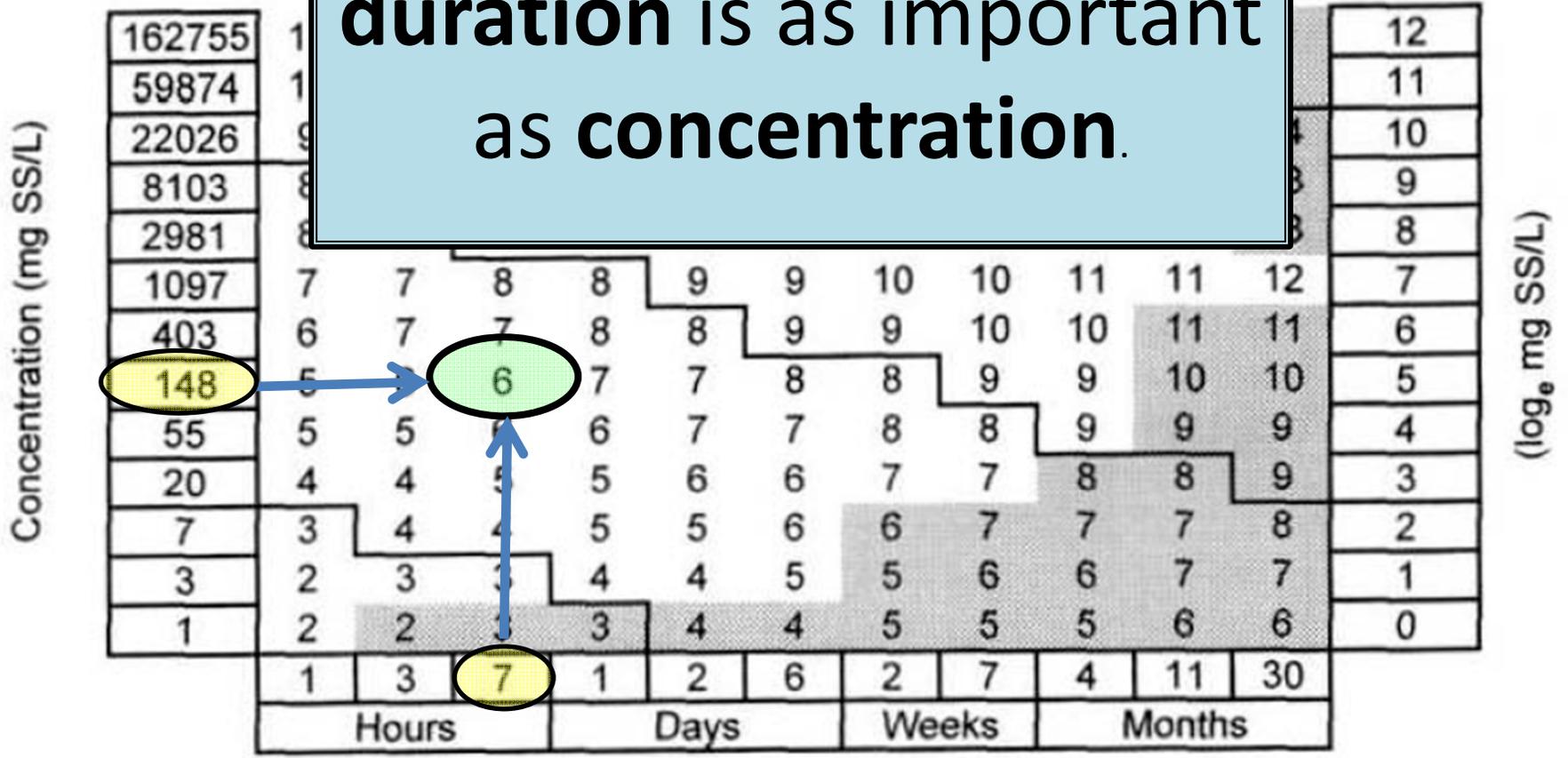
Adult Salmonids

Duration of exposure to SS (\log_e hours)

0	1	2	3	4	5	6	7	8	9	10
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(B) Average severity-of-ill-effect scores (calculated)

duration is as important as concentration.



Boise River TMDL

CH2MHill Technical Memorandum

Because of this situation, it is appropriate to select a target TSS concentration that would be protective over a *duration equal to the maximum probable length of time for which an elevated TSS concentration would be sustained*. This approach would rely on the seasonal variation in flow regimes and land use practices to avoid having to select a duration that continues

October 14; and low flow—October 15 to February 14. **However, in the absence of TSS-duration data**, and due to the TSS first-flush effect during the high-flow and irrigation-flow hydrologic seasons, *a protective, yet not overly conservative, duration would be 60 days*. This duration is **one-half of each of the three hydrologic seasons** and one-third of the agricultural

geometric means over the 60- and 14-day durations, respectively. **However, it is important to realize that sustaining these recommended TSS limits beyond the 60- and 14-day durations would not afford protection of the aquatic communities.** These

Boise River Mainstem Target

and because spawning of various species occurs throughout the river, the recommended TSS concentration limit for the protection of the lower Boise River fishery and aquatic community is 50 to 80 mg/L. The 50 mg/L target is intended to be protective against the ill effects attributable to a 60-day chronic TSS exposure, whereas the 80 mg/L target is to

50 mg/L for 60 days

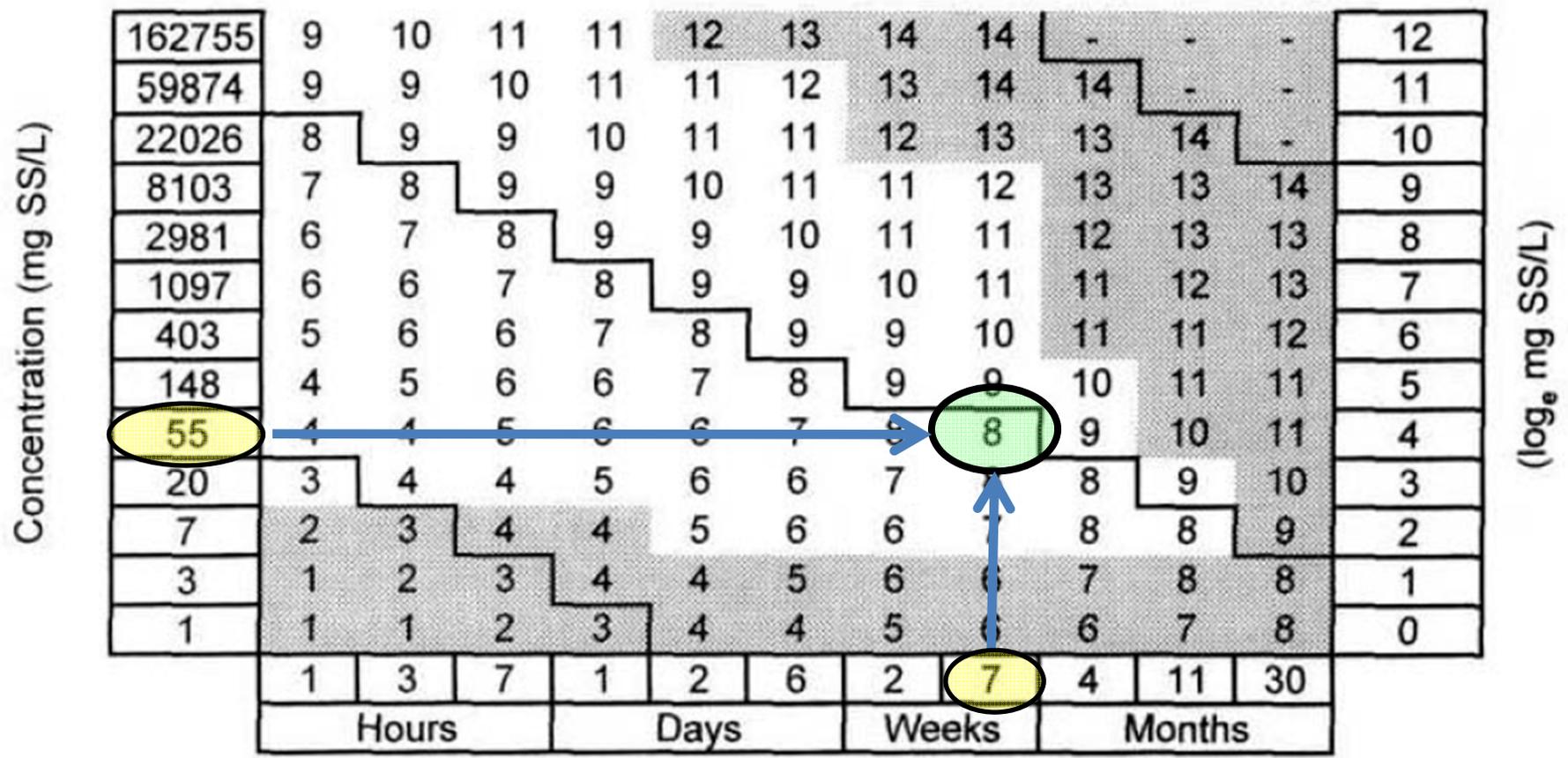
N&J Lower Boise River

Juvenile Salmonids

Duration of exposure to SS (\log_e hours)

0	1	2	3	4	5	6	7	8	9	10
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(B) Average severity-of-ill-effect scores (calculated)

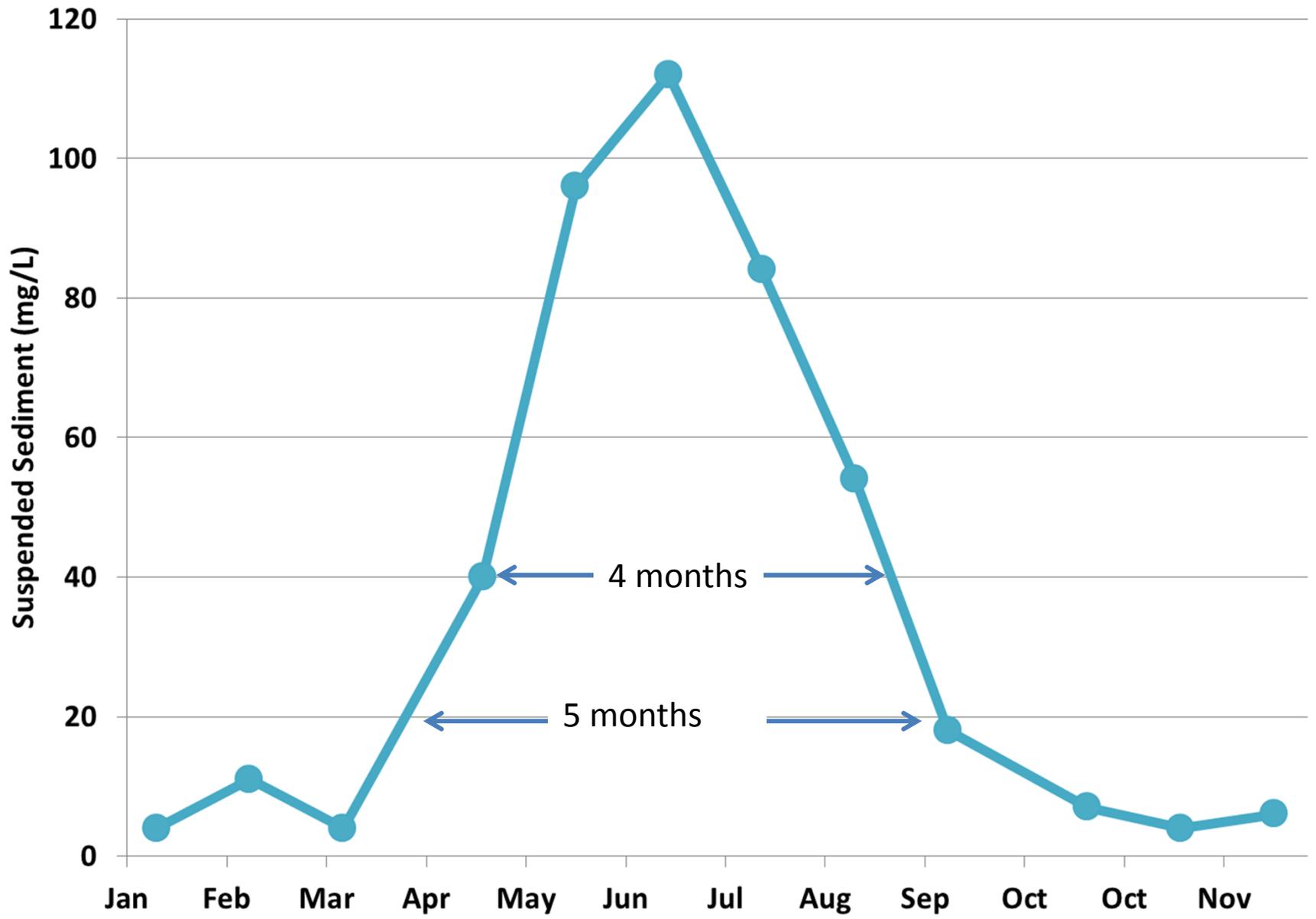


Tributary Sediment Targets

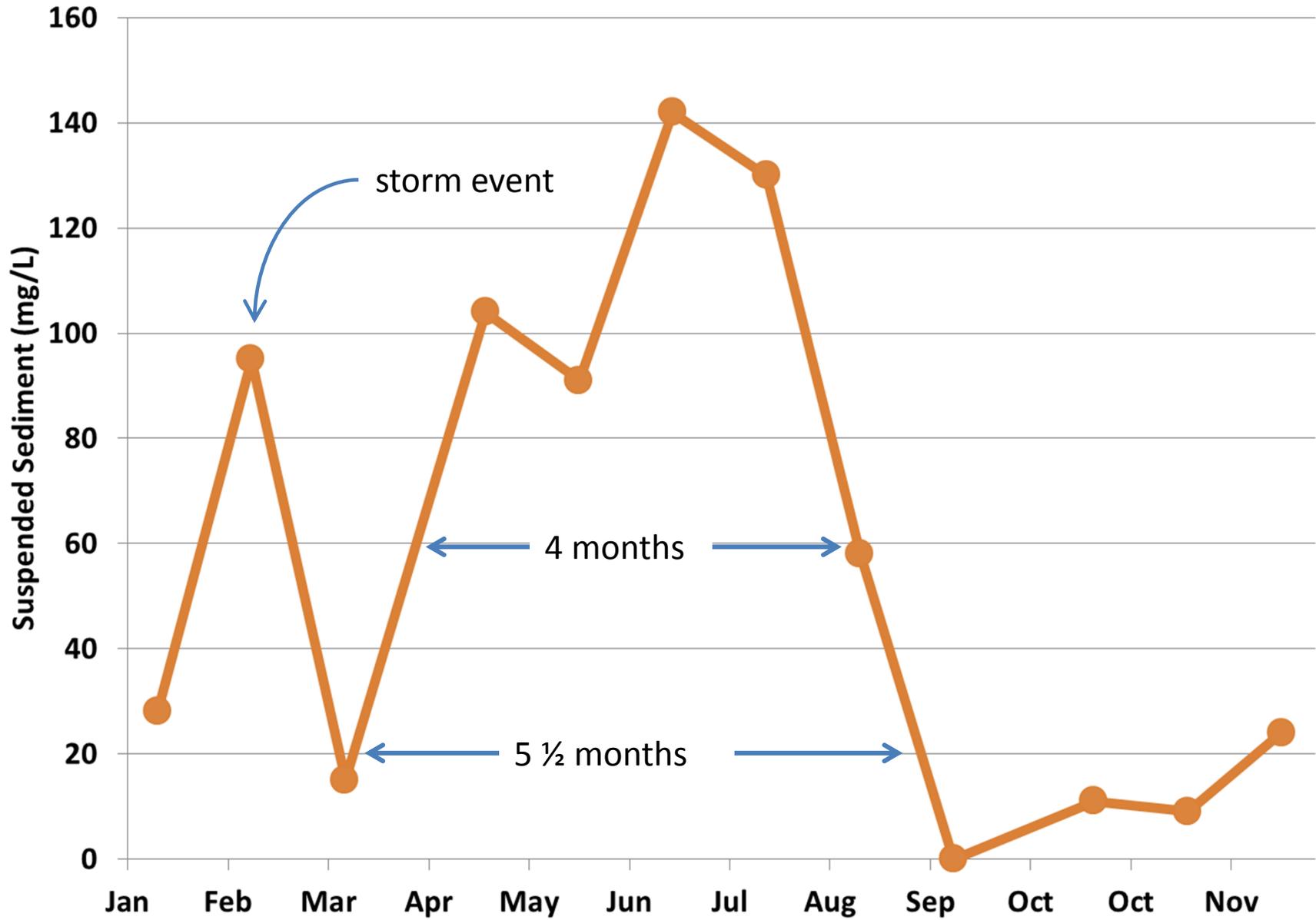
- Keep as much as possible from the Lower Boise River (mainstem) TMDL
 - Same framework (use Newcombe and Jensen)
 - Same fishery (juvenile salmonids)
 - Same level of protection (SEV8)
- BUT, sediment data show that we need a *different duration*

Because of this situation, it is appropriate to select a target TSS concentration that would be protective over a *duration equal to the maximum probable length of time for which an elevated TSS concentration would be sustained*. This approach would rely on the seasonal variation in flow regimes and land use practices to avoid having to select a duration that continues

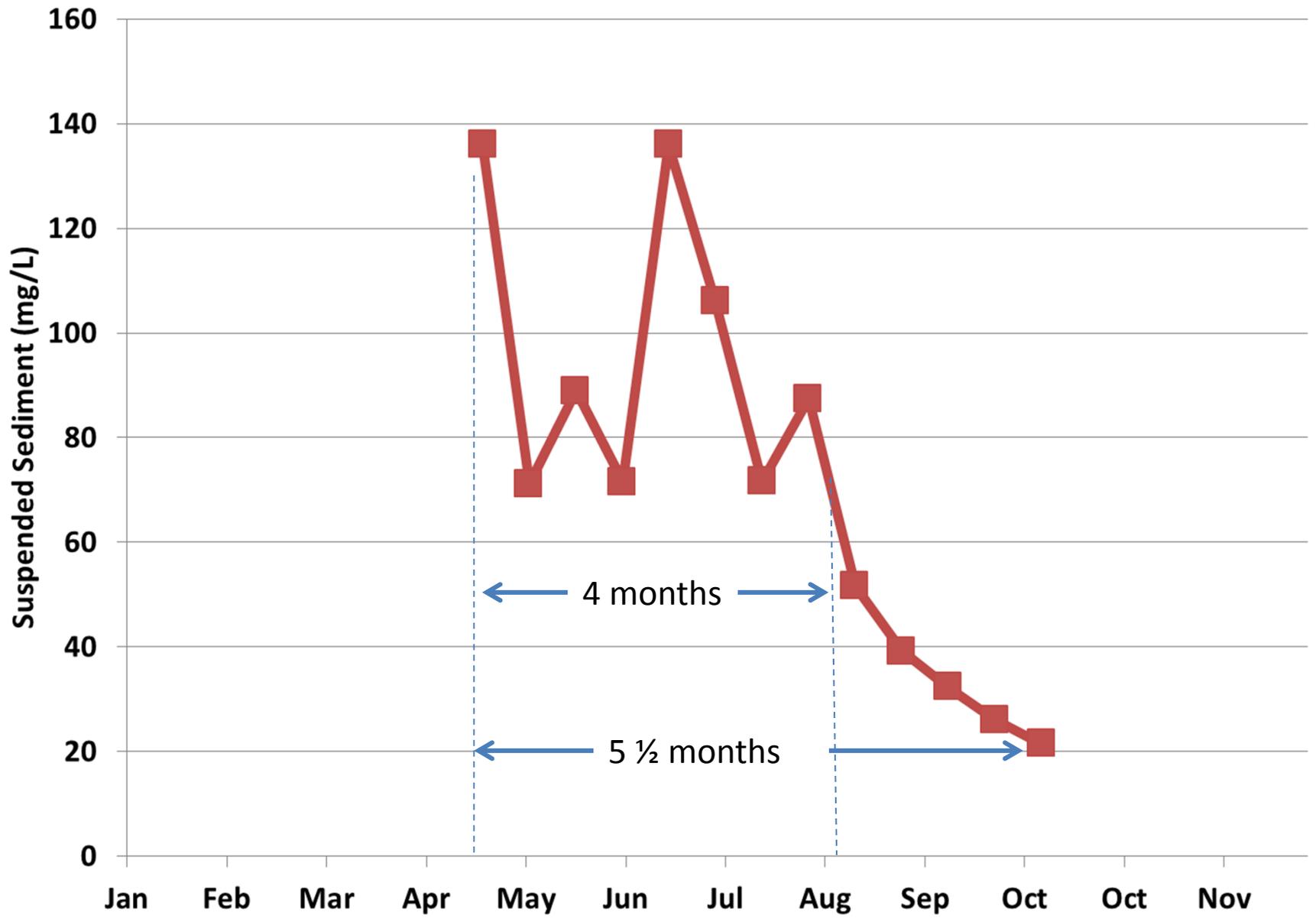
Ten Mile @ Mouth (2000 USGS)



Five Mile @ Mouth (2000 USGS)



Mason (2008 ISDA)



BRIBETARIUS

Proposed Target:

20 mg/L averaged over 4 months

Proposed Target 2:

403 mg/L for a maximum of 2 days

