

EXECUTIVE SUMMARY

The Belvidere Dam Fish Passage Committee is a group of local stakeholders working toward implementing fish passage at Belvidere Dam. With the support of a C2000 grant, the committee commissioned this study to develop enough information regarding design and performance of three defined fish passage alternatives, as well as the alternative to “do nothing”, to support discussion and decisions regarding which alternative should be pursued. This report presents the alternatives, evaluates the effects of each on water surface elevations, infrastructure, and environmental conditions, develops planning-level estimates of construction cost, and evaluates fish passage potential of each.

The four alternatives evaluated were:

1. **No Action** - leave the dam as it is. This alternative would have an estimated construction cost of \$0 but ongoing maintenance estimated as \$500,000 every 30 years plus debris removal. The No Action Alternative has the following characteristics:
 - An existing barrier to upstream passage of fishes would persist
 - The existing impoundment, park mill race and other features would continue unchanged
 - The dam would continue to represent a source of liability and require ongoing maintenance obligations from the IDNR or another public entity.
2. **Partial Dam Removal** - replace the timber and rock crib portion of the dam with three rock grade control structures that would each allow fish passage. Removal of the dam structure and construction of the grade controls would be relatively complicated, and the construction cost for this alternative was estimated to be \$2.5 million. Ongoing maintenance costs are likely to be lowest of all the alternatives. *Complete dam removal was evaluated*, but this would have endangered the integrity of three sanitary sewer crossings upstream. Rock grade control structures to be constructed immediately downstream of each crossing were deemed the most cost-effective measures to protect those crossings. The Partial Dam Removal Alternative has the following characteristics:
 - A full range of fish would be able to pass upstream and downstream of the dam during nearly all flow conditions.
 - Upstream water levels would be reduced during essentially all flow conditions. Flood levels through downtown Belvidere would be reduced by approximately nine inches for the 100-year event. During normal flows, water levels between the dam and Doty Park would be lowered by more than six feet, and for about a half mile upstream of Doty Park the level would be lowered by two feet. Water level conditions downstream of the dam site would not be affected.
 - Lowered water levels would limit motorized boating uses within the City of Belvidere.
 - Habitat in the impoundment would improve for native species but accumulated sediment in the impoundment may require additional stabilization.

- The existing abutments would remain in place
3. **Rock Ramp** - placing a pile of large rock across the front of the dam to create a wedge passable by all desired fish species. This alternative would have an estimated construction cost of \$1.8 million but expected annual maintenance costs lower than the No Action Alternative because of the reduced level of expenditures on the dam itself. The Rock Ramp Alternative has the following characteristics:
- A full range of fish would be able to pass upstream and downstream of the dam during nearly all flow conditions.
 - The existing impoundment, park mill race and other features would continue essentially unchanged. A 20-foot wide portion of the concrete cap will be removed to allow fish passage and concentrate low-flows.
 - Any changes to upstream water level conditions would be very small and downstream conditions would be unchanged
 - The ramp will require maintenance to clear debris, and it will provide an “attractive nuisance” to non-motorized boaters and others. It unlikely that it would be possible to design a ramp that would be completely safe for boaters or others to traverse, so this could be a source of liability.
4. **Fishway Bypass** - constructing a channel around the side of the dam with “nature-like” rock features that help fish swim up to the impoundment. This alternative would have an estimated construction cost of \$800,000 and estimated maintenance of \$500,000 every 30 years (for the dam) plus regular removal of debris from the fishway as well as the dam. The Fishway Bypass Alternative has the following characteristics:
- A full range of fish would be able to pass upstream and downstream of the dam during nearly all flow conditions. However, only a portion of the river will flow through the bypass so some fish may not be able to locate the passage
 - The existing dam, impoundment, park mill race and other features would continue unchanged
 - Water level conditions upstream and downstream would not be affected
 - The dam would continue to represent a source of liability and require ongoing maintenance obligations from the IDNR or another public entity.

These alternatives were compared using factors deemed by the committee as most relevant to this project. These factors consisted of fish passage, environmental impacts, infrastructure and flooding impacts, social/cultural, economics, recreation and public safety.

Based on these comparisons, the Rock Ramp Alternative was found to meet the project objectives somewhat better than the Partial Dam Removal Alternative, and significantly more than the Fishway Bypass and No Action Alternatives. The recommendation of this study is that the *Rock Ramp Alternative is the most appropriate means to provide fish passage at this site*, and it suggests that there are a number of factors that should be investigated in the design process that could either reduce the costs associated with the ramp or improve the benefits the community derives from the ramp.