Effect of Bridge Preservation on General Condition Ratings

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General Condition – WBPP Bridges

![Bar chart showing population distribution by GCR]
General Condition – Progression

![Population](chart1)

![GCR](chart2)
Simple Deterioration

Average Values

Years

GCR

0 10 20
Progression – Simple Deterioration

![Graph showing the progression of simple deterioration over years. The graph illustrates the decline in GCR with increasing years for both population and simple categories.]
GCR as Outcome

Population

Simple
Preservation is Difference

![Bar chart showing preservation over GCR values]
Preservation Fraction $\alpha$

$\alpha$

$(1-\alpha)$

Preserve

Simple

Population

GCR

Pct

Preservation Fraction $\alpha$
Preservation Fraction $\alpha$

$WBPP \alpha = 0.50$
$\alpha$, Bridge Owner

![Graph showing GCR over years for Local, State, and Federal ownership categories.](image-url)
$\alpha$, Bridge Material

![Graph showing the relationship between GCR and years for different bridge materials (Steel, Timber, RC, PS). The graph indicates differences in performance over time.]
$\alpha, \text{ Functional Class}$

Graph showing the relationship between GCR (Growth Curve Ratio) and years for different types of highways: Arterial, Interstate, and Local. The x-axis represents years, and the y-axis represents GCR. The graph indicates the depreciation rate of different types of highways over time.
$\alpha$, NHS

[Graph showing GCR against Years for NHS and non-NHS with a reference point $\alpha = 0.50$.]
## Projects

<table>
<thead>
<tr>
<th>General Condition</th>
<th>Inventory</th>
<th>Disposition, Annual</th>
<th>Addition, Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deck Area</td>
<td>Annual I/O</td>
<td>No Action</td>
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<tr>
<td>Good</td>
<td>267</td>
<td>16</td>
<td>16</td>
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<td>Fair</td>
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<tr>
<td>Poor</td>
<td>33</td>
<td>3</td>
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</tr>
</tbody>
</table>

*Deck Area, Million Sq Feet*
WBPP States

$\alpha = 0.06$

$\alpha = 0.67$
Owner

Local $\alpha = 0.44$

State $\alpha = 0.67$
Material

Timber $\alpha = 0.20$

RC $\alpha = 0.51$
Functional Class

Local $\alpha = 0.47$

Interstate $\alpha = 0.58$
\[ \alpha, \Delta \text{Service Life} \]

\[
\text{Simple Life} = \sum_{gcr} \mathbb{E}[t_{gcr}]
\]

\[
\text{Population Life} = \frac{\text{Population}}{\text{Annual Replacement}}
\]
$\alpha$, General Condition

$$GCR = \frac{\sum GCR_i \times Deck\ Area_i}{\sum Deck\ Area_i}$$
\( \alpha, \) CFR 490.4xx

**Pct Good vs \( \alpha \)**

![Graph showing Pct Good vs \( \alpha \)]

**Pct Poor vs \( \alpha \)**

![Graph showing Pct Poor vs \( \alpha \)]
α Targets, WBPP

Criteria:
Life ≥ 100 years
Poor Area ≤ 10%

<table>
<thead>
<tr>
<th>α</th>
<th>Life, years</th>
<th>% Poor Area</th>
<th>% Good Area</th>
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## Cost?

<table>
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<th>Addition, Annual</th>
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<td>Deck Area</td>
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<tr>
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<tr>
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</tbody>
</table>

- **Rehabilitation $\ ?**
- **Replace $**
Summary

• Condition is result of deterioration + preservation

• ‘Simple’ deterioration
  • Two segments of inventory
  • $\alpha$ preservation measure
  • Flow of projects

• Preservation effect on
  • Service life
  • General condition
  • Performance measures
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