

**Forecasting Rehabilitation Needs
for the
Illinois Interstate Highway System**



University of Illinois
and
Illinois Department of Transportation

Illinois Interstate Highway System



1,750 two-directional miles of
multilane pavement

10" JRCPC and 7-10" CRCP
Constructed between 1957 and 1980

300,000 to 7 million ESALs / year,
average 1.2 million (outer lane)

Wet-freeze climate, poor subgrades,
non-durable aggregates

Performance of Interstate Pavements



Mean life about equal to
20-year design life

Actual traffic 3 to 4 times more
than design traffic

More than 60 percent resurfaced
with 1.5" to 6" AC

Challenges Facing IDOT



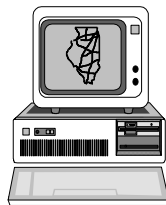
Predicting pavement conditions and
network health accurately

Prioritizing rehabilitation projects

Strategic planning for major corridors

Anticipating consequences of
inadequate rehabilitation funding

**Illinois Pavement
Feedback System (IPFS)
Database**

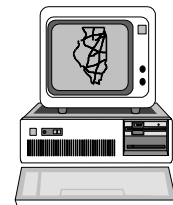


Design, construction, traffic, condition data

1,263 Interstate sections

IDOT Districts, central offices, and U of I
have on-line access

**ILLINET
Network Pavement
Rehabilitation
Management Program**



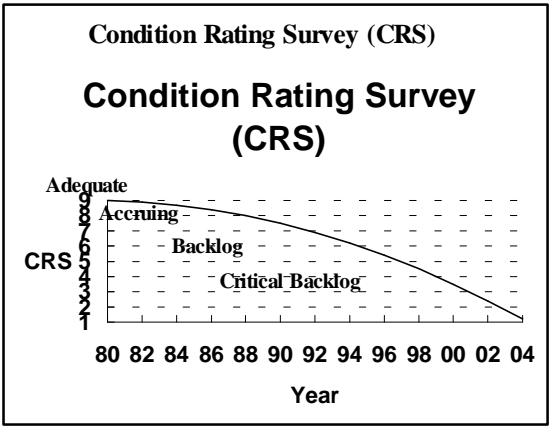
IPFS data

Performance prediction models

Project rehabilitation selection algorithms

Network rehabilitation programming algorithms

Accuracy of Condition Rating Survey (CRS) Predictions



CRS Prediction Models

Function of:

- Slab or overlay thickness
- Age since construction or rehabilitation
- ESALs since construction or rehabilitation

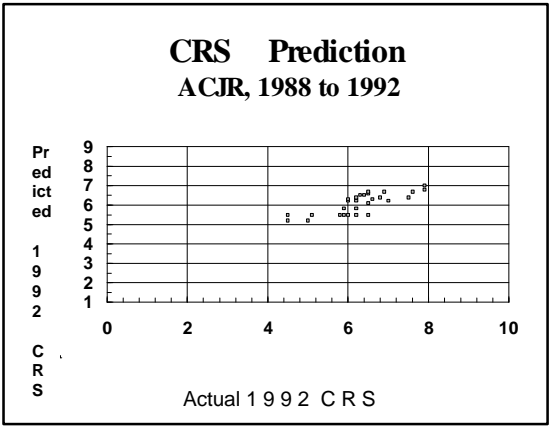
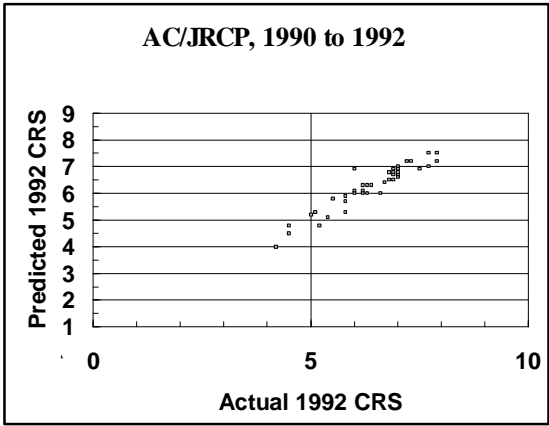
Pavement types:

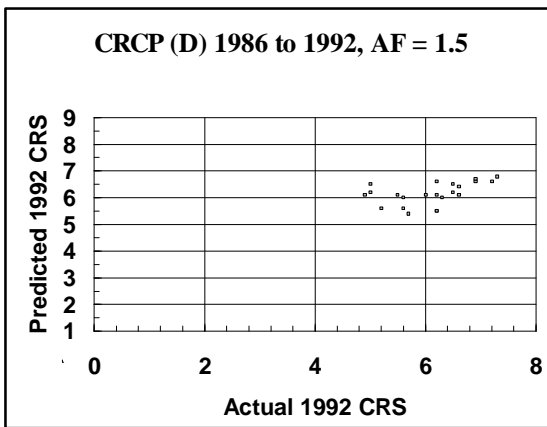
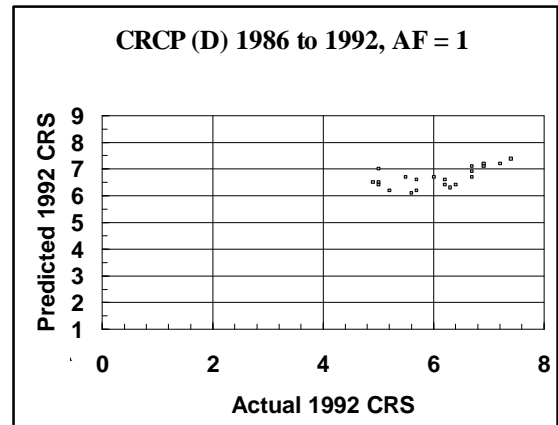
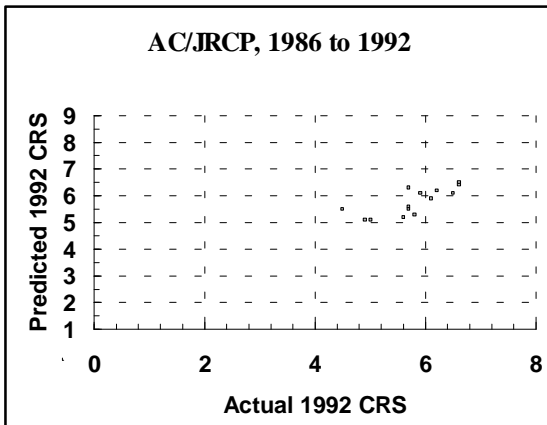
- Jointed reinforced PCC
- Continuously reinforced PCC
- AC-overlaid JRPC and CRCP

Accuracy of CRS Predictions

1990
 1988 → 1992
 1986

Good prediction for all types without D cracking
 JRPC, CRCP, AC/JRPC, AC/CRCP
 Adjustment factors needed for D cracking





D Cracking Adjustment Factors
Rate of CRS Loss

JRCP	1.2
AC / JRCP	1.2
AC / CRCP	1.2
CRCP	1.5

Can be varied in ILLINET for each District.

*Remaining Life
of
Interstate Routes
and
Corridors*

CRS Model Calibration
Vertical Shift of Prediction Curve

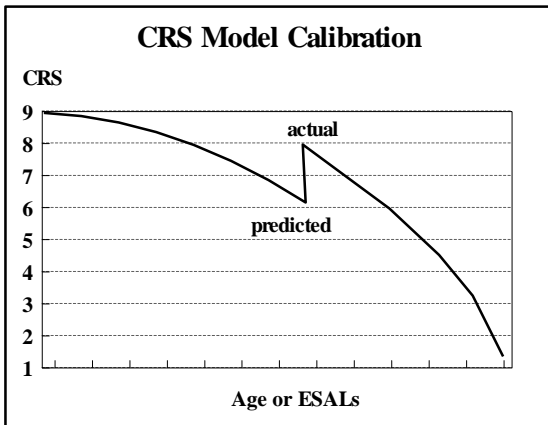
Curve represents mean predicted CRS

Actual CRS normally distributed about curve

CRS of any given section may differ from mean prediction

Shape of curve (rate of deterioration) assumed appropriate for each section

Age and ESAL data assumed accurate



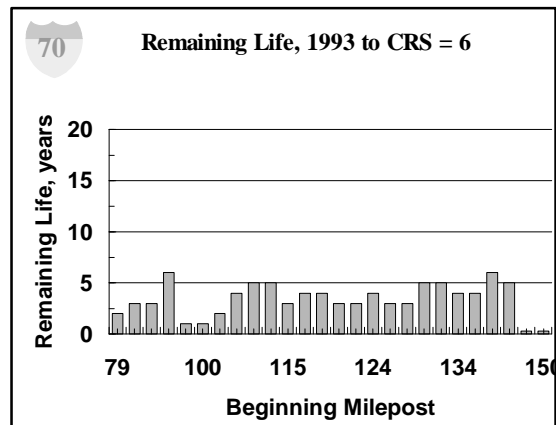
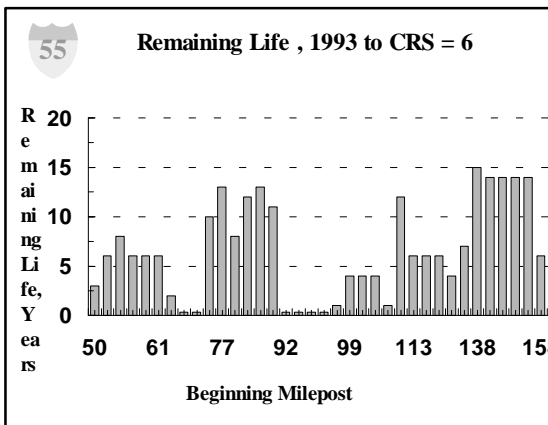
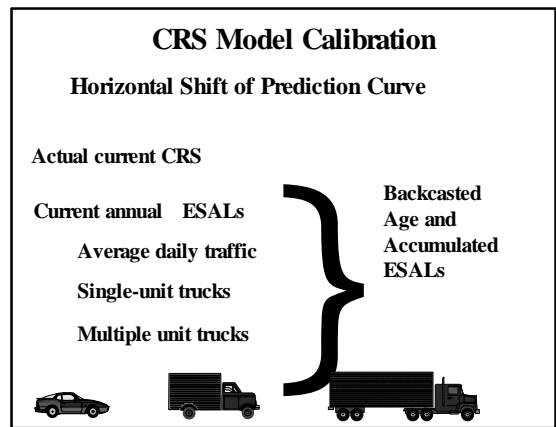
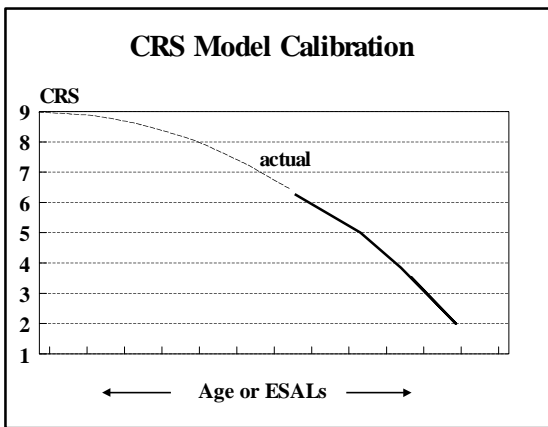
CRS Model Calibration

Horizontal Shift of Prediction Curve

Assumptions about prediction curve still apply, but:

- Age and especially ESALs not necessarily assumed accurate

Shape of curve (rate of deterioration) may not be appropriate for the given section



ILLINET
Rehabilitation NEEDS
vs
IDOT Multi-Year
Program

**Rehabilitation NEEDS Analysis
with ILLINET**

Rehabilitation needs each year for next ten years

No yearly budget constraint

User-set minimum CRS triggers rehabilitation

Purpose of NEEDS is to predict rehab timing

Any rehabilitation type and cost may be used

**IDOT's Proposed Highway
Improvement Program**

Proposed expenditures for Interstate highways,
state highways, and other facilities

Pavement rehabilitation, bridge rehabilitation
or replacement, major highway construction,
safety improvements

NEEDS vs IDOT Program

ILLINET NEEDS Analysis:

Sections and total mileage needing rehab
each year in next five years, starting
1991, '92, '93, '94

NEEDS run for each of nine Districts

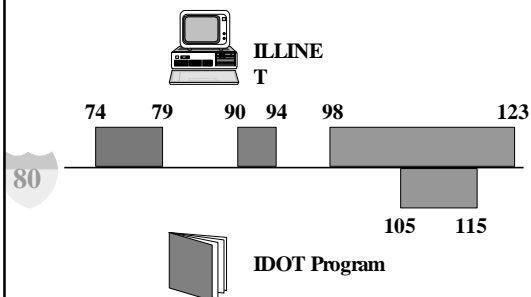
IDOT Program:

Programmed Interstate pavement
resurfacing and reconstruction

FY 91 - 95, 92 - 96, 93 - 97, 94 - 98

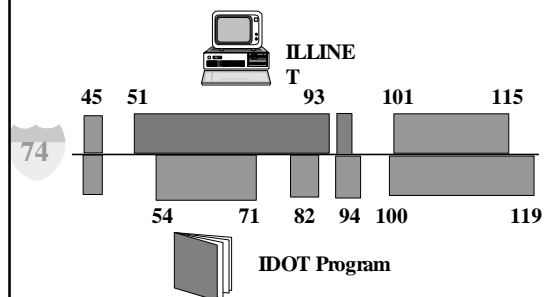
NEEDS vs IDOT Program

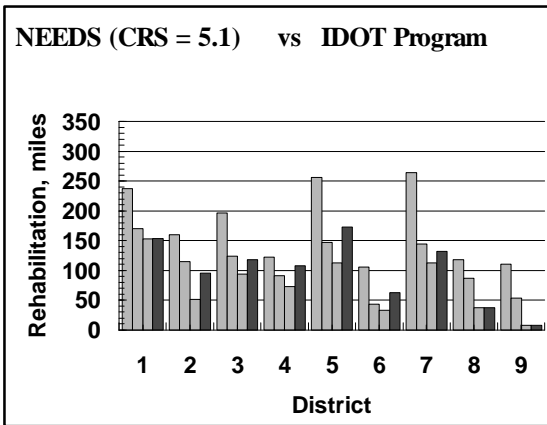
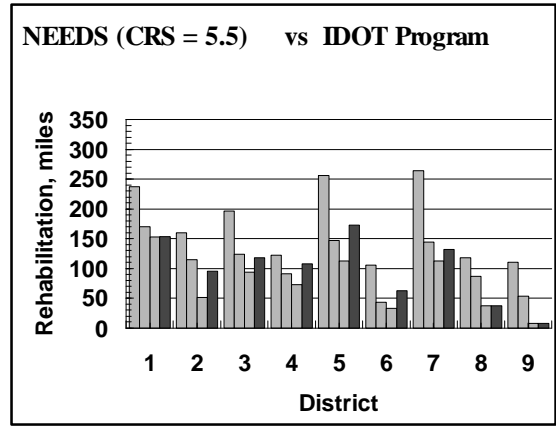
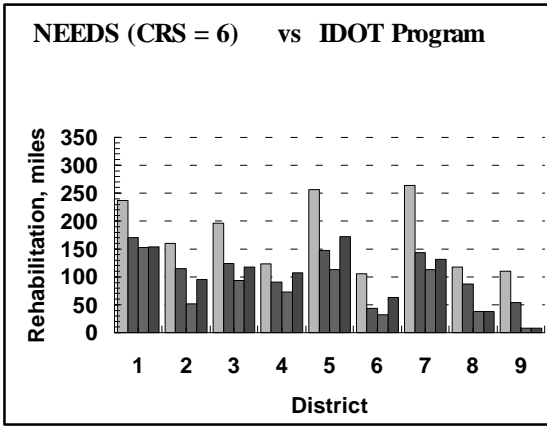
Minumum CRS = 6



NEEDS vs IDOT Program

Minumum CRS = 6





Conclusions

Accuracy of CRS Prediction Models

Pavement condition can be predicted for at least 6 years into future with acceptable accuracy.

More rapid deterioration of D-cracked pavements requires adjustment to CRS predictions.

Condition can be very difficult to predict below "adequate" level due to maintenance effects.

Conclusions

Remaining Life Analysis

Some routes show high variability in remaining life along length, likely to continue if managed in small sections.

Some routes are more uniform in remaining life: uniformly high or uniformly low.

Corridor management may be better strategic planning approach than uniform section management.

Conclusions

NEEDS vs IDOT Program

Comparison of long-range rehab needs and IDOT multi-year program was made using ILLINET.

IDOT program met only 60 percent of rehab needs below "acceptable" level.

Consequences of inadequate funding are:

- (1) increased maintenance costs,
- (2) growing backlog of rehab needs.