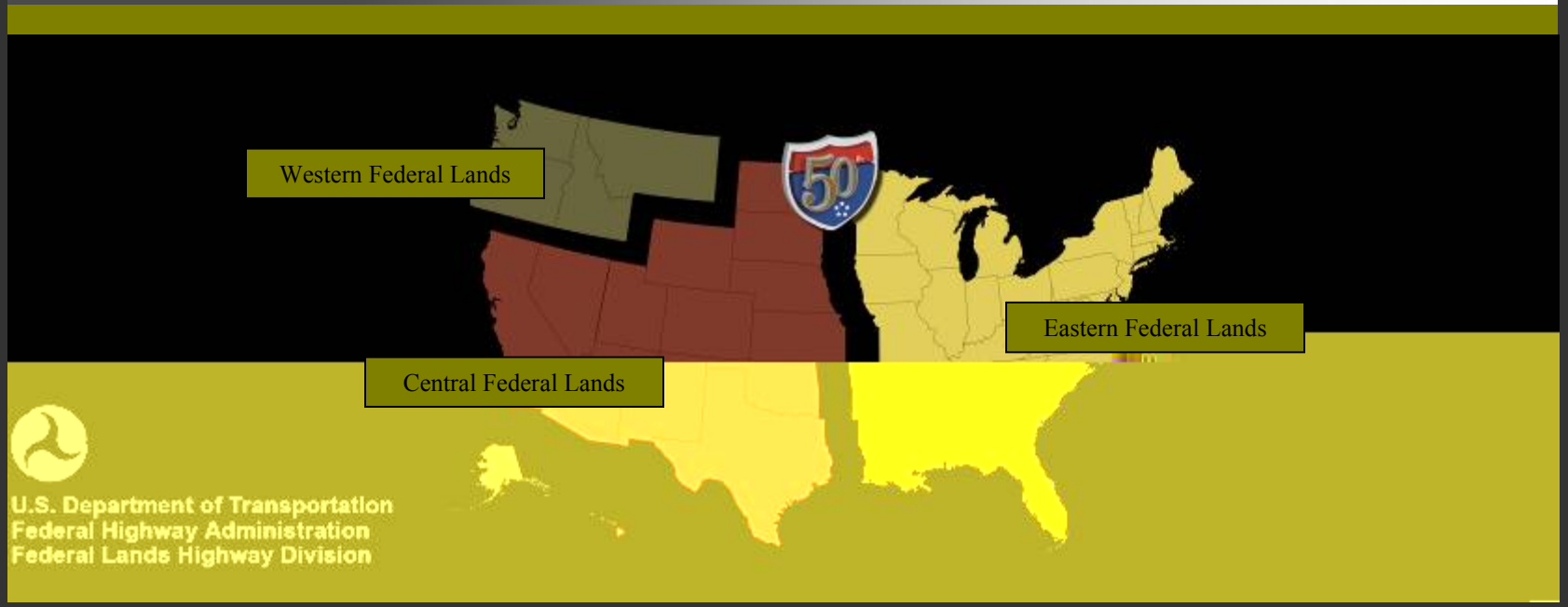
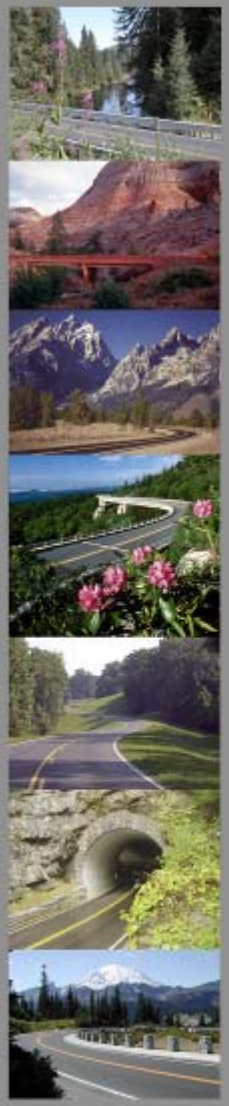
Cold In-Place Recycling in the Federal Lands Highway Program

Mike Voth, FLH-FHWA

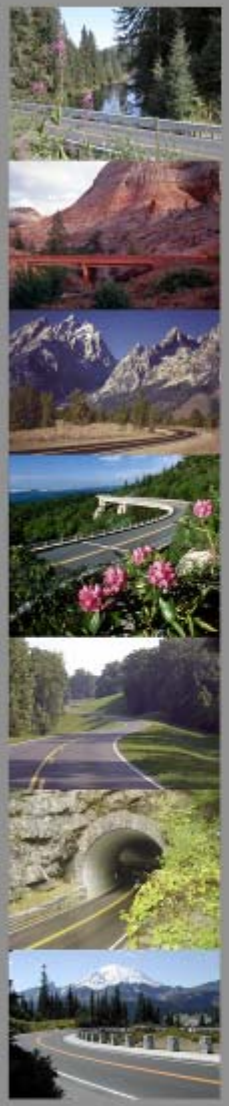


Western Region Recycling Conference, June 3-5, 2008



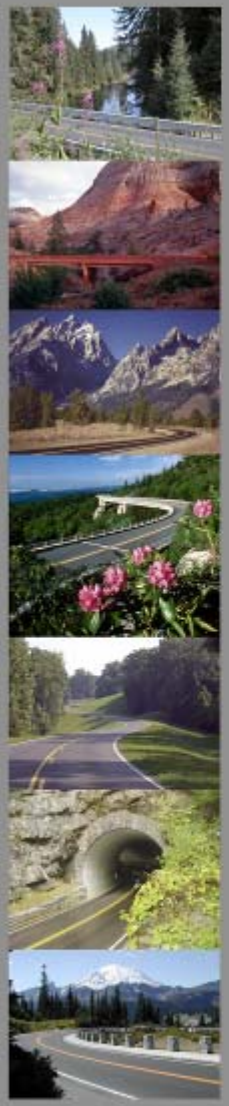
Topics

- Project Selection / Investigation
- Design
- Performance History



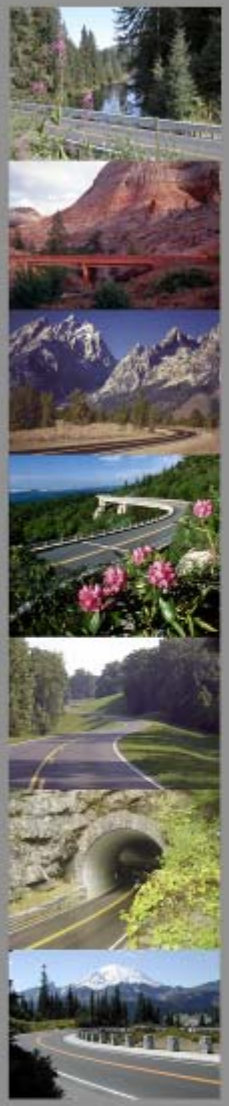
Recycling & Reclamation Methods Used

- Cold In-Place Recycling
- FDR pulverize
- FDR with cement
- FDR with foam
- FDR with emulsion



CIPR Project Selection

- Federal Lands has had good success (long-term performance) with CIPR
- CIPR has proven to be a cost effective, good performing, rehabilitation method
- Structural design completed and compared with other rehabilitation alternatives.



CIPR Project Selection

- Let field investigation guide decision
- FLHD management and decision-makers do NOT present any challenges to CIPR use.
- No cut-offs or pre-set requirements for CIPR use – it's an engineering decision

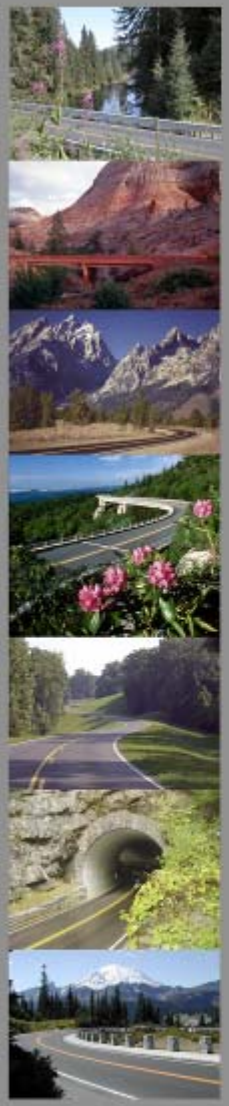
Field Investigation for CIPR

Reconnaissance	Sampling Frequency	Purpose
Pavement Distress Survey	Project wide	-Document suitability; isolate problem spots
Pavement Layer Depths, Uniformity, Quality	Every ¼-mile	Determine: -Feasibility -Recycling Depth
Subgrade soil	Minimum 1 per mile	-Structural design -Support for equipment

Field Investigation for CIPR

Reconnaissance	Sampling Frequency	Purpose
FWD Survey (not completed on all projects)	300 feet (maximum)	-Determine subgrade modulus -Delineate soft spots
Bulk Pavement Sampling*	As needed to represent differing project conditions	-Determine mix quality -Estimate application rates

*Completed on projects with marginal conditions and there is a concern about being able to obtain a quality product



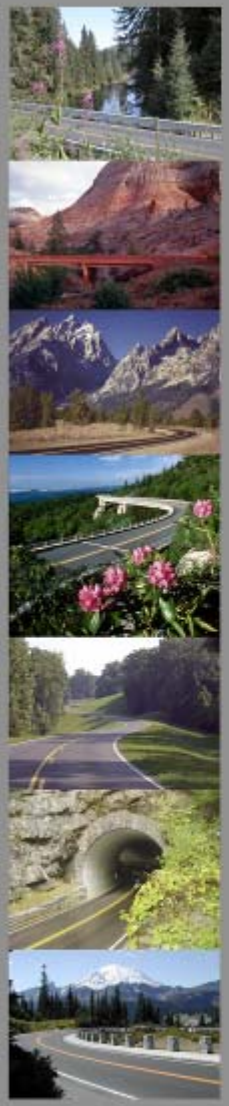
CIPR Project Selection

- Subgrade and base must have the ability to support the recycling train.
- Adequate Geometrics: minimal steep grades and sharp curves, minimal widening.
- Consider economy of scale -project size > 5 mi.


EIW
EAGLE IRON
WORKS

CIPR Project Selection- Example

PAVEMENT REHBILITATION ALTERNATIVES (long-term, structural improvements)				
Treatment Type / Method	**Life Expectancy**	**Pros**	**Cons**	**Cost/Mile ($1000s)**
▪8” Full-depth reclamation (FDR) – stabilized ▪2” HACP	20 – 30 years	▪Stabilization reduces risk for pumping (and potential for subexcavation overrun) ▪Reuses/recycles materials ▪Efficient/smaller “carbon footprint” ▪Favorable life-cycle costs ▪Minimal dust	▪Contractor availability / mobilization ▪Slight grade raise ▪More intensive inspection during construction	$600 k
▪4” Cold in-place recycling (CIPR) ▪3” HACP	20 – 30 years	▪History of long-term performance ▪Reuses/recycles materials ▪Efficient/smaller “carbon footprint” ▪Favorable life-cycle costs ▪No dust	▪Contractor availability / mobilization ▪Treating some base materials ▪Not suitable for pullouts & parking areas ▪Grade raise ▪Subgrade/base may not have sufficient strength to support CIPR train	$600 k
▪Mill 4” of existing material	15 – 20	▪Zero grade raise ▪Conventional construction	▪No in-place recycling ▪Requires 3 separate operations (mill,	



Why complete a design?

- Fairly compare rehabilitation alternatives & additives
- Programmatic approach is not practical when you work in all 50 states
- Justify chosen alternative client-agency

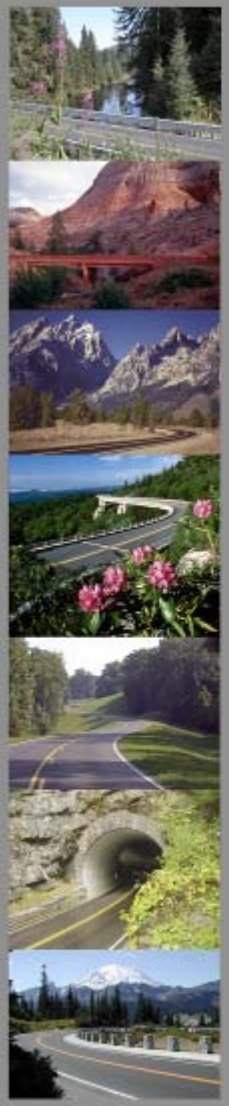
FLHD Structural Guidelines

FDR Method	Minimum Thickness of Riding Surface	Typical Structural Coefficient
Mechanical	2” HMA	0.10 – 0.12
Bituminous	Surface Treatment or Structural HMA	0.20 – 0.28
Cement	Surface Treatment or Structural HMA	0.15 – 0.20

FLHD Structural Guidelines

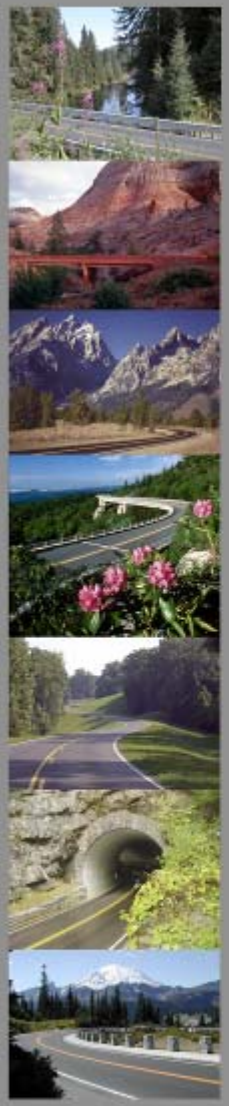
	Minimum Thickness of Riding Surface	Typical Structural Coefficient
CIPR	Surface Treatment or Structural HMA	0.28

See Chapter 11 in the FLH Project Development and Design Manual for further details. Web link: www.wfl.fhwa.dot.gov/design/manual/



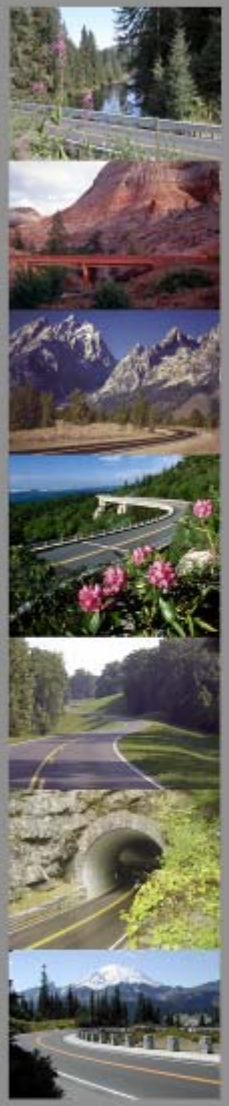
Mix Design

- FLH performs a mix design and provides initial application (AASHTO Task Force 38) - Hveem
- Future: Use SGC?



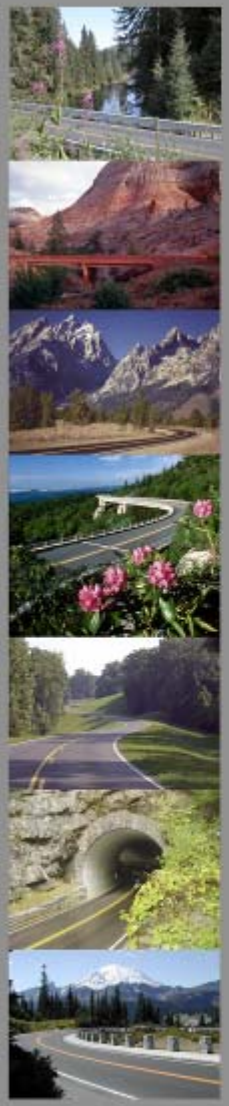
Performance

- Performance has exceeded expectations
- Nearly all of FLHD's CIPR projects are still in-service
- A couple case studies follow…



FLHD's first CIPR Project

- Location: Rocky Mountain N.P.
- Year: 1982
- Typical Structural Section
  - 4 inches CIPR
  - 2 inches HMA
- CIPR Contractor: Valentine Surfacing



FLHD's first CIPR Project

- Recycling agent: Rejuvenator (Reclamite)
- Application Rate: 0.9 to 1.2 percent
- Cost Effectiveness
  - About 40% savings from the alternative to place a 1.5-inch leveling course
- Elevation: 9,500 to 12,000 feet

Rocky Mountain N.P. CIPR - 1982

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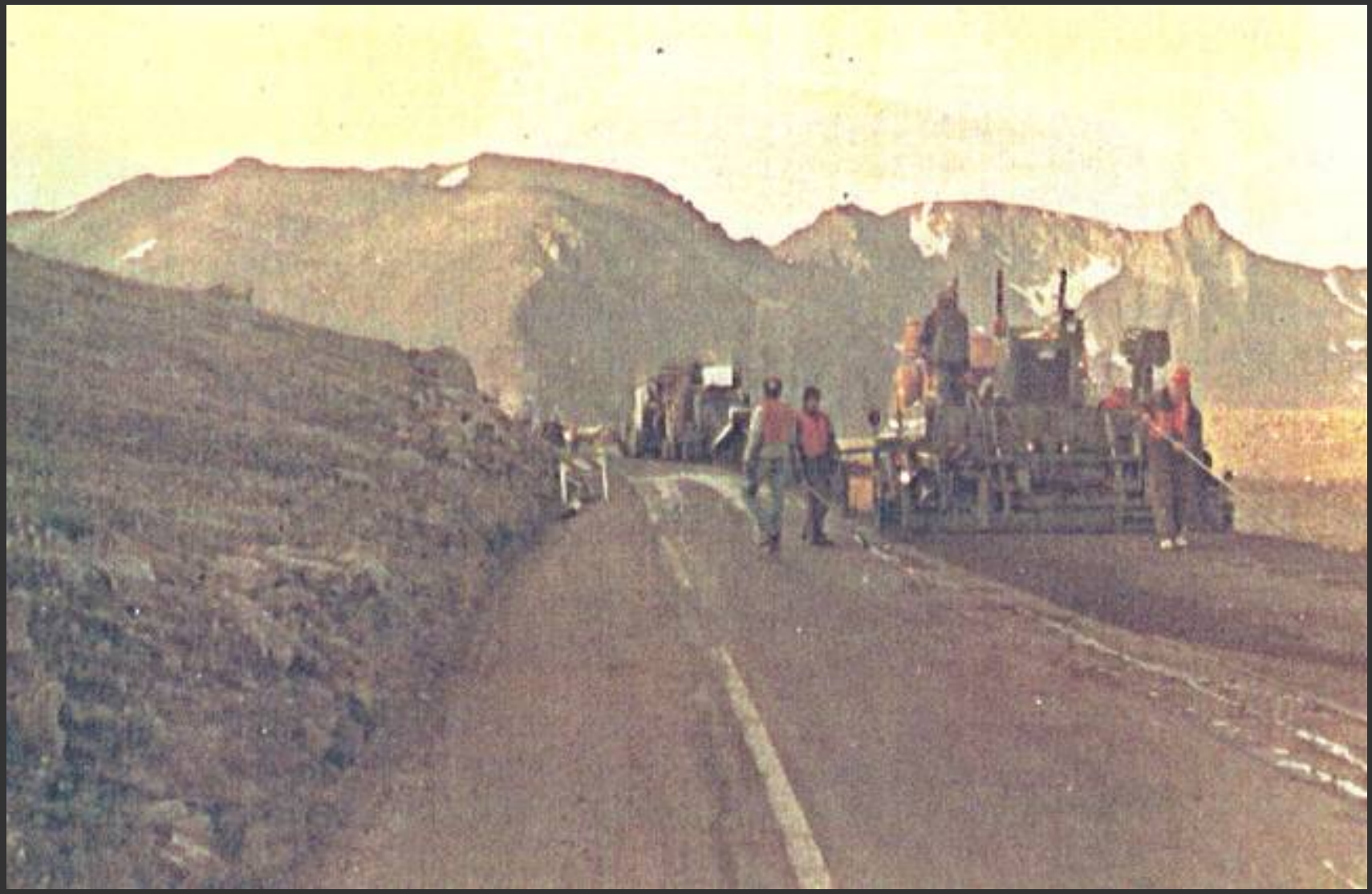
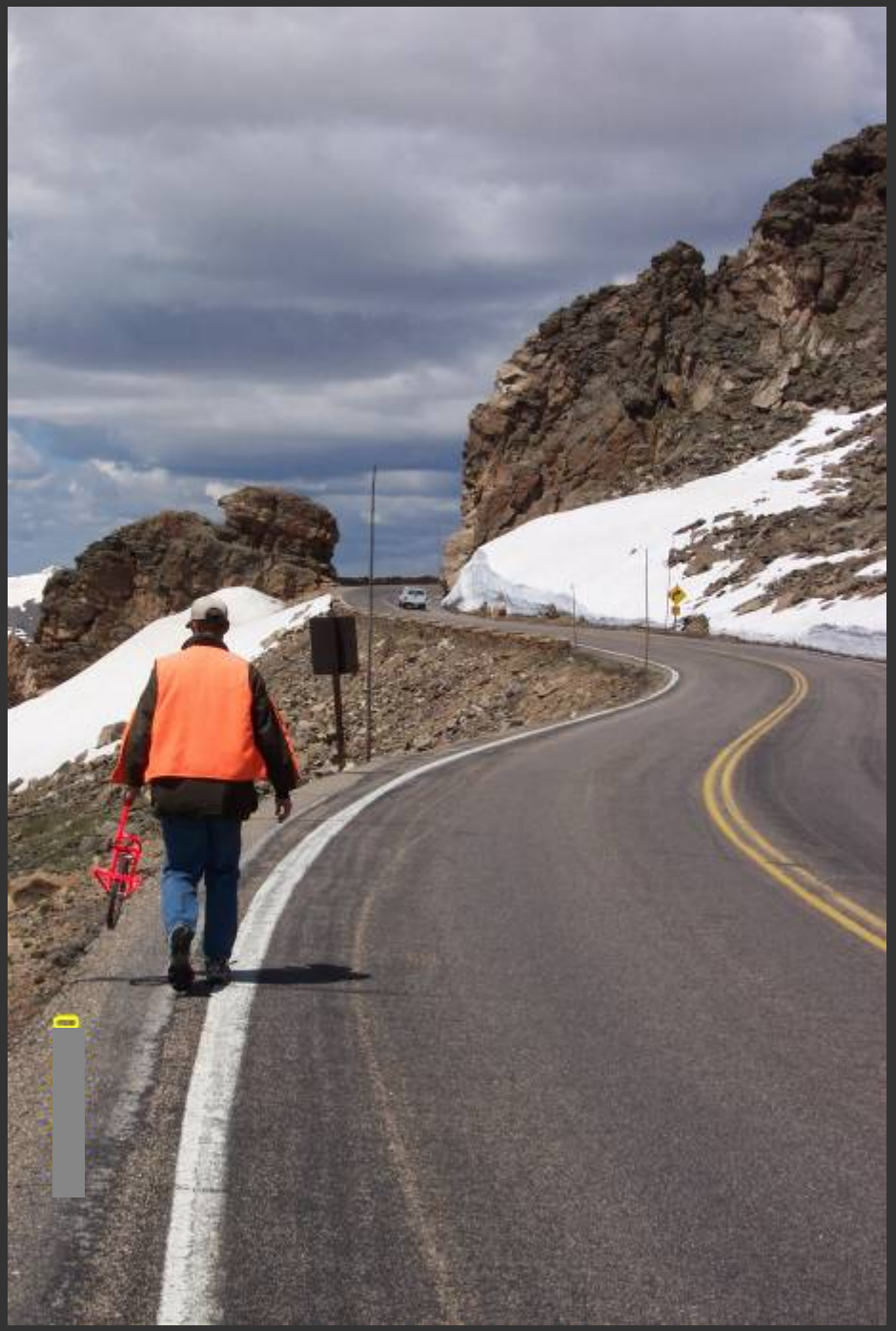
Rocky Mountain N.P. CIPR - 1982



Rocky Mountain N.P. project today.

After 26 years!



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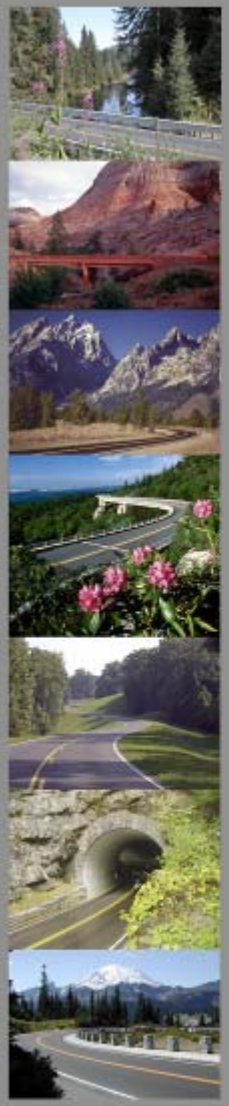
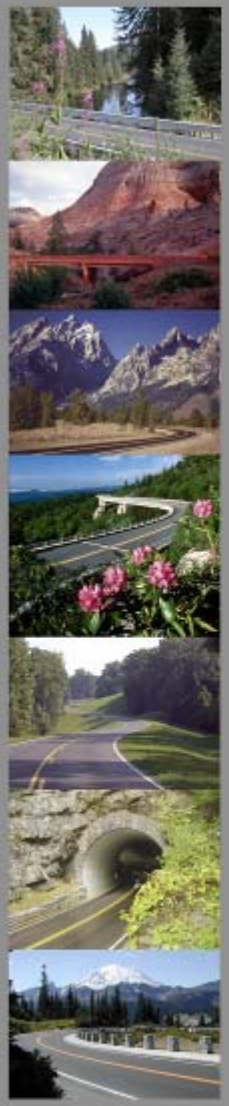
Rocky Mountain N.P. Project - TODAY



First CIPR project in California

- Location: Ice House Road (Eldorado National Forest)
- Year: 1988
- Typical Structural Section
  - 4-5 inches CIPR
  - 2 inches HMA
- CIPR Contractor: Valentine Surfacing



First CIPR project in California

- Recycling agent: HFMS-2
- Project length: 13 miles
- Traffic: 1000 vpd (1988) with heavy logging trucks

First CIPR project in California

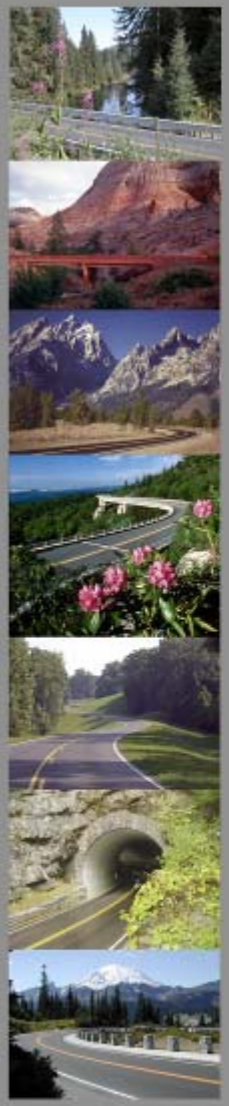
20 year &

counting!

First CIPR project in California

First CIPR project in California

After 20 years of performance…



Performance

- Out of the 25 to 30 CIPR projects completed by Federal Lands, only one of these projects is no longer in service (the first CIPR project completed).

Twin Lakes Rd - California

15 years and counting

HFMS-2s

Grand Canyon – Center Rd

15 years and counting

HFE-300s

Mendocino Pass - California

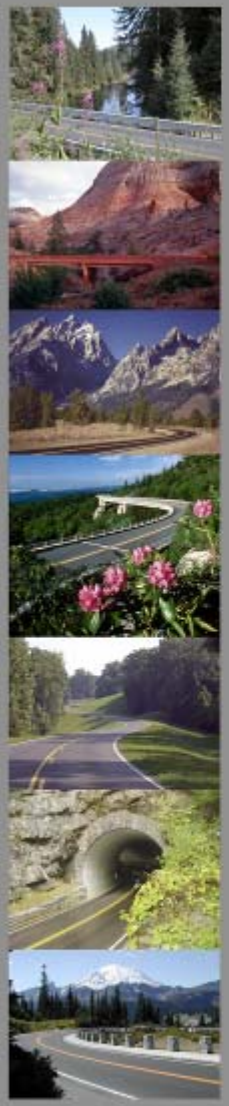
12 years and counting

HFMS-2s

Colorado State Hwy 145 (Dolores to Rico)

10 years and counting

HFMS-2sP



Questions?