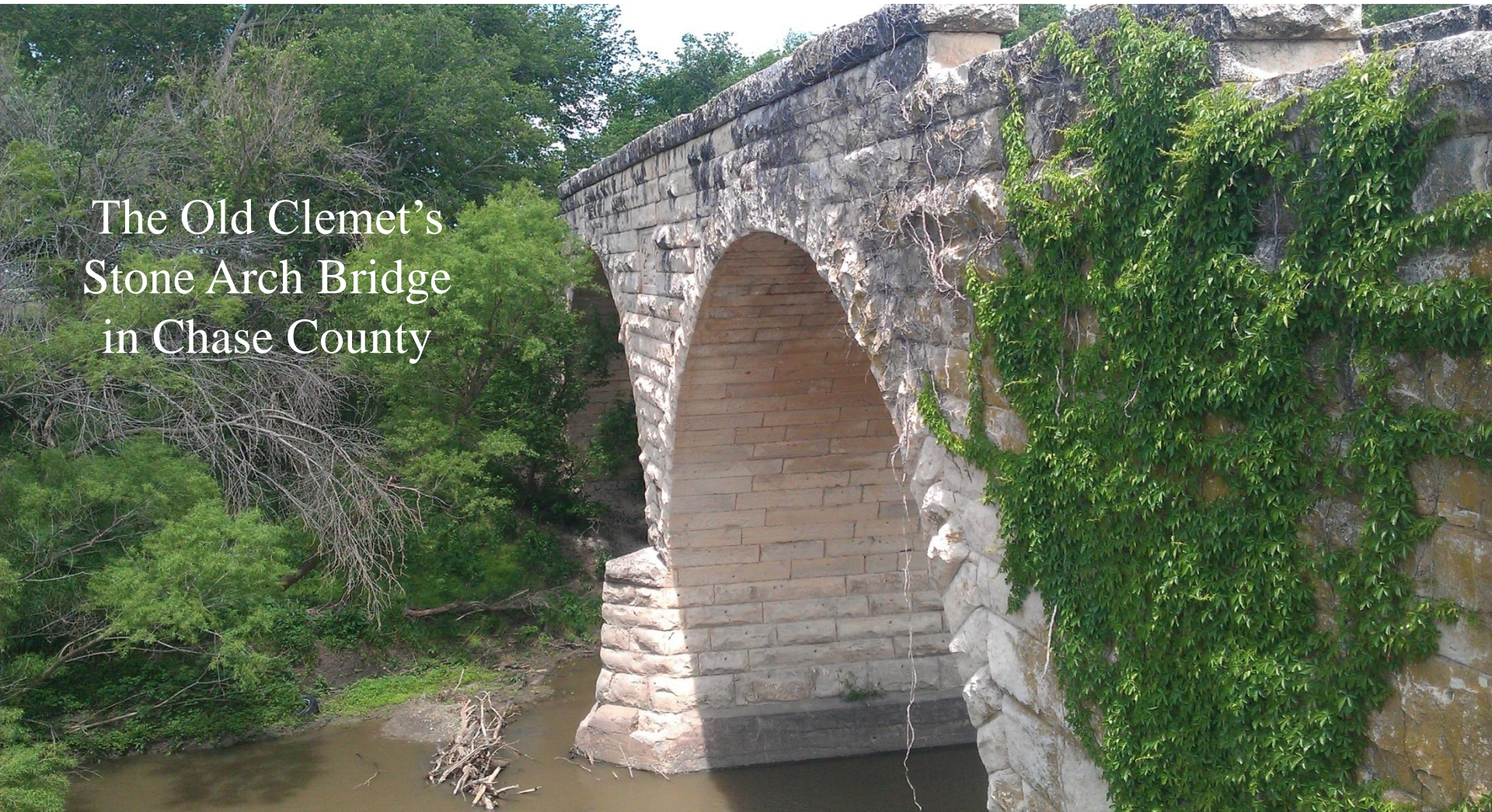


Welcome Kansas Emergency Management Association

The Old Clemet's
Stone Arch Bridge
in Chase County



Introduction to Debris Management 101



Components of a Debris Management Plan

- ❑ **Established debris management structure**
- ❑ **Good assessment of the situation and assumptions**
- ❑ **Well-defined debris collection plan**
- ❑ **Identification of debris management sites**
- ❑ **Procedures for contracted services**
- ❑ **Process for demolition and debris removal from private property**
- ❑ **Process for disseminating information**
- ❑ **Safety**

Common Disaster Types

Wildfires

Tornadoes

Ice Storms

Earthquakes

Floods

Act of Terrorism

Disaster Debris Types

Construction and Demolition

Household Hazardous Waste

Meta

Vegetative

Silt and Sediment

Personal Property

Vegetation



Soil/Mud



Sandbags



Construction and Demolition



Personal Property Structures



Personal Property

Mobile Homes



Personal Property

Household Hazardous Waste



Metals



White Goods



Mixed Debris



Vehicles



Animal Carcass





Critical Debris Issues

- Estimated quantities and types of debris
- How it will be:
 - Collected
 - Stored
 - Reduced
 - Disposed



Critical Debris Issues

- Identification of responsible agencies
- Capabilities of in-house resources
- Identification of work to be contracted
- Identification of applicable environmental and historic laws
- Requirements for FEMA funding

Debris Quantity Forecasting and Estimating





Forecasting vs. Estimating

Debris Forecasting

- Pre-disaster plan development

Debris Estimating

- Post-disaster plan implementation



Debris Forecasting Techniques

- Historical Analysis
- Community-based risk analysis
- Computer-based prediction analysis

Forecasting

Community-Based Risk Analysis

- Use maps to indicate areas of similar land use
 - Urban, industrial, rural, mixed
- Develop a representative sample of debris quantities of each area
- Project debris quantity estimate for each area

Forecasting

Computer-Based Prediction Analysis

- Types of models
 - USACE
 - Private industry

Debris Forecasting

USACE Model – Manual

- Formula: $Q = C(H)(V)(B)(S)$
 - Q = Volume of debris in cubic yards
 - C = Storm category factor
 - H = Number of households
 - V = Vegetative characteristic
 - B = Commercial/business/industrial use multiplier
 - S = Precipitation multiplier



Debris Estimating Techniques

- Ground measurement
- Aerial photography
- GIS
- Combination of techniques

Estimating Roadside Debris Piles



Mixed Debris

C&D Debris



Debris Estimating Formulas

- One-story building:

$$\frac{L' \times W' \times H'}{27} = \text{___} \text{CY} \times .33 = \text{___} \text{CY}$$

- Mobile homes:

$$\frac{L' \times W' \times H'}{27} = \text{CY}$$

- Debris piles:

$$\frac{L' \times W' \times H'}{27} = \text{___} \text{CY}$$

Debris Estimating Table

Vegetative Cover Multiplier (Yard Waste)

<u>Typical House</u>	<u>None</u>	<u>Light (1.1)</u>	<u>Medium (1.3)</u>	<u>Heavy (1.5)</u>
1000 SF.	200 cy	220 cy	260 cy	300 cy
1200 SF.	240 cy	264 cy	312 cy	360 cy
1400 SF.	280 cy	308 cy	364 cy	420 cy
1600 SF.	320 cy	352 cy	416 cy	480 cy
1800 SF	360 cy	396 cy	468 cy	540 cy
2000 SF	400 cy	440 cy	520 cy	600 cy
2200 SF	440 cy	484 cy	572 cy	660 cy
2400 SF	480 cy	528 cy	624 cy	720 cy
2600 SF	520 cy	572 cy	676 cy	780 cy

Formula for one story structure: $\frac{\text{square feet} \times 8 \text{ feet}}{27} \times .20 \times \text{VCM} = \text{cy}$

This chart and calculations are inclusive of the structure and contents

Debris Forecasting

USACE Flood Debris Model

- Used to calculate debris quantity from a flood event only when the structure is not destroyed.
- Formula: Square footage x .02 = cubic yards of debris
- 2400 sq. ft. x .02 = 48 cubic yards

Mobile Home Park Debris Estimating

Typical single
wide = 290
cubic yards

Typical double
wide = 415
cubic yards



Approximate Conversions

Construction and Demolition (C&D)

- CY of C&D debris to tons—divide by 2
- Tons of C&D to CY—multiply by 2

Woody Debris

- CY of hardwoods to tons—divide by 4
- Tons of hardwoods to CY—multiply by 4
- Tons of softwoods to CY—multiply by 6

Estimating Using Aerial Photography



Tornado Damage

Debris Management Site



Improper Site Layout



Tools for Assessing Eligibility

- ❑ *Public Assistance Guide FEMA 325*
- ❑ *Public Assistance Policy Digest*
- ❑ *Debris Management Guide*
- ❑ FEMA Policies and Appeals
- ❑ Debris Eligibility Reference Table

Debris Removal Eligibility

Curbside Debris Pickup

- ❑ Be disaster-related debris
- ❑ Be separated from garbage
- ❑ **Be kept in distinct piles**
- ❑ Monitor pickup activities
- ❑ Keep public informed



Reasonable Cost

FEMA definition:

- A cost that is both fair and equitable for the type of work being performed (OMB A-87)



Eligible Costs

- ❑ Force Account Labor
- ❑ Equipment
- ❑ Materials & Supplies
- ❑ Mutual Aid
- ❑ Contracted Services
- ❑ Project Management
- ❑ Monitoring
- ❑ Volunteers (Offset Federal Cost Share)



Debris Operations

Prioritizing Activities

Initial Response–Debris Clearance

- Clearance of debris that hinders immediate life-saving actions and poses an immediate threat to public health and safety

Recovery–Debris Removal

- Removing and disposing of debris that hinders the orderly recovery of the community and poses less immediate threats to health and safety

Debris Operations

Operational Considerations

- ❑ Separate debris by type
- ❑ Segregate recyclable materials
- ❑ Segregate household hazardous waste
- ❑ Place debris on right-of-way
- ❑ Keep fire hydrants and valves cleared of debris piles
- ❑ Report locations of illegal dumping

Evaluation Criteria – Size

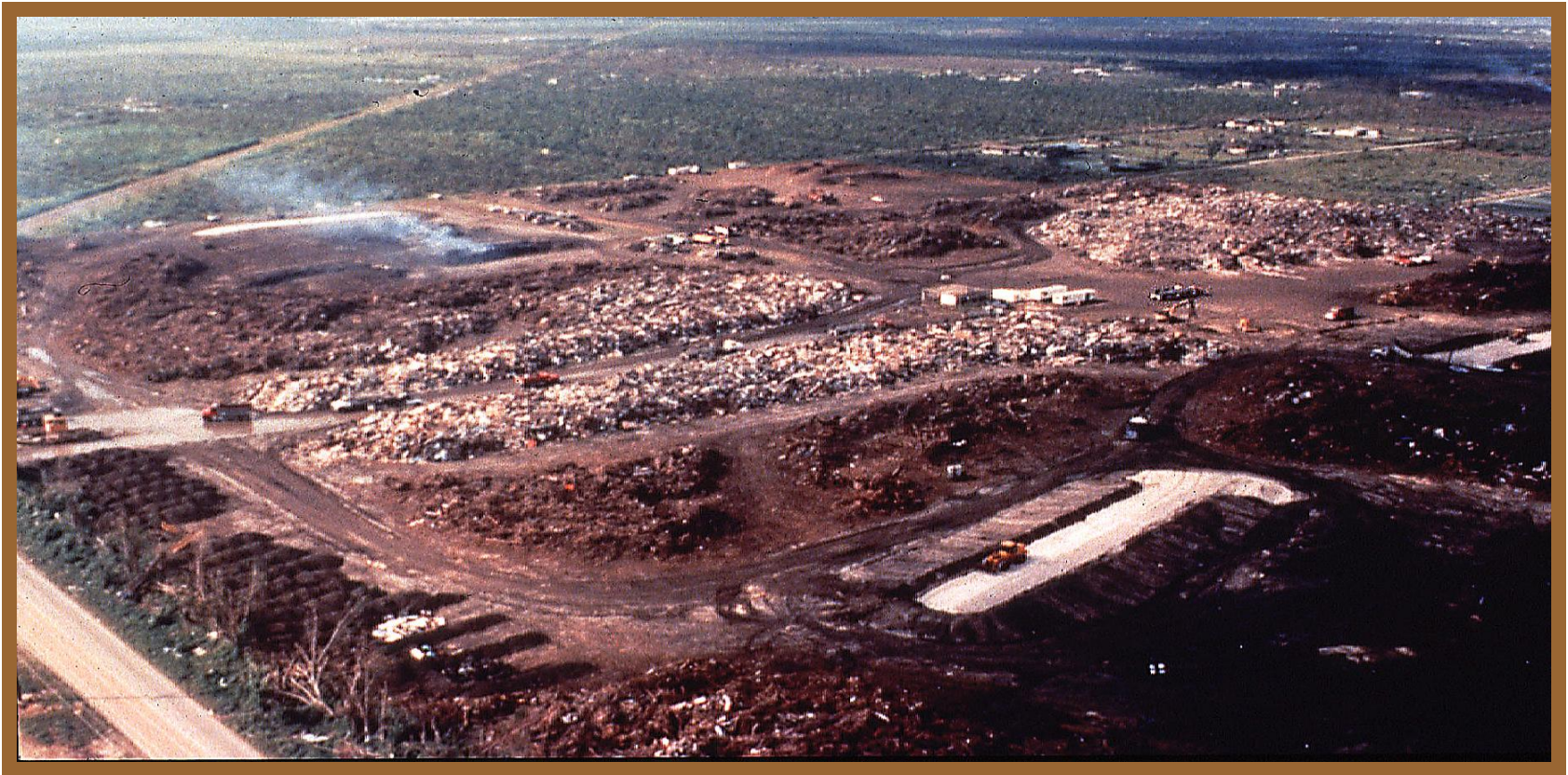
- Dependent on:
 - Expected volume of debris to be collected
 - Planned volume reduction methods
 - Volume recycling rate
- Anticipate between 50-200 acres



Evaluation Criteria – Baseline Data Checklist

- Environmental Baseline Study
 - Document existing conditions
 - Assess potential impacts of use
 - Establish a monitoring program and closure criteria
 - Coordinate with appropriate State and local agencies

Debris Management Site



Proper Site Layout

Debris Removal Operations



Debris Management Site



Improper Site Operation



Environmental Monitoring

- Groundwater
- Surface Water
- Air Quality
- Ash
- Soil



Debris Management Site

Volume Reduction

Primary methods:

- Burning
- Chipping and Grinding

Grinding and Chipping Equipment



Volume Reduction – Vegetative Grinding and Chipping

- ❑ Reduces volume by a ratio of 4 to 1
- ❑ Preferred method for reduction of vegetative debris
- ❑ Allows better ease of site management



Developing the Plan

“Planning is worthless; however the planning process is priceless.”

General Dwight D. Eisenhower
June 4, 1944