1 01:27:58:25 01:28:02:07 Annenberg Media
2 01:28:02:09 01:28:06:09 §
3 01:28:06:11 01:28:09:08 CAPTIONING MADE POSSIBLE BY
SOUTHERN CALIFORNIA CONSORTIUM
4 01:28:50:18 01:28:52:02 *A CLOSE LOOK*
5 01:28:52:04 01:28:54:07 *AT THE EARTH'S INTRICATE*
SYSTEM OF RUNNING WATER
6 01:28:54:09 01:28:56:20 *IS A CLOSE LOOK*
AT THE EVOLUTION
7 01:28:56:22 01:28:58:04 *OF EARTH'S LANDSCAPE.*
8 01:28:58:06 01:28:59:19 *AS THEY CONTINUE*
9 01:28:59:21 01:29:01:19 *TO SHAPE THE LAND*
AROUND US,
10 01:29:01:21 01:29:03:18 *RIVERS AND STREAMS*
LEAVE BEHIND EVIDENCE
11 01:29:03:20 01:29:05:02 *OF THEIR ENDURING POWER.*
12 01:29:07:05 01:29:09:15 *UNLIKE EARTHQUAKES*
AND VOLCANOES,
13 01:29:09:17 01:29:11:17 *WHICH CAN CAUSE*
SUDDEN CHANGE,
14 01:29:11:19 01:29:13:15 *RUNNING WATER*
WORKS SLOWLY,
15 01:29:13:17 01:29:14:23 *ALMOST IMPERCEPTIBLY,*
16 01:29:14:25 01:29:16:27 *IN SHAPING*
EARTH'S LANDSCAPE.
17 01:29:26:06 01:29:28:19 WE USUALLY THINK
OF THE GRAND CANYON
18 01:29:28:21 01:29:30:05 IN TERMS OF ITS ROCKS
19 01:29:30:07 01:29:32:19 AND THE FASCINATING
STORY THAT THEY CONTAIN,
20 01:29:32:21 01:29:35:19 ONE THAT SPANS ALMOST
HALF OF EARTH HISTORY.
21 01:29:35:21 01:29:38:19 BUT THERE'S MORE
TO THE GRAND CANYON
THAN ROCKS.
22 01:29:38:21 01:29:40:05 THE CANYON ITSELF
23 01:29:40:07 01:29:41:29 IS A GEOLOGICALLY
ACTIVE FEATURE,
24 01:29:42:01 01:29:44:11 A CHANGING
AND EVOLVING LAND FORM
25 01:29:44:13 01:29:47:13 THAT'S A MONUMENT
TO THE POWER
OF RUNNING WATER.
26 01:29:47:15 01:29:50:04 THE COLORADO RIVER
CARVED THIS
ENORMOUS VALLEY
27 01:29:50:06 01:29:52:09 OVER THE LAST
NINE MILLION YEARS.
28 01:29:52:11 01:29:54:01 IN FACT,
THE RIVER CARRIES
29 01:29:54:03 01:29:56:15 ABOUT HALF A MILLION
TONS OF SEDIMENT
30 01:29:56:17 01:29:59:02 PAST ANY POINT
IN THE CANYON
EVERY DAY.
31 01:29:59:04 01:30:00:18 NO WONDER

THIS GREAT RIVER
32 01:30:00:20 01:30:03:18 HAS BEEN DESCRIBED AS
TOO THIN TO WALK ON,
33 01:30:03:20 01:30:05:11 BUT TOO THICK TO DRINK.
34 01:30:05:13 01:30:07:03 RIVERS LIKE
THE COLORADO,
35 01:30:07:05 01:30:08:20 ARE POWERFUL
GEOLOGIC AGENTS
36 01:30:08:22 01:30:12:13 THAT DISRUPT
AND RESHAPE THE SURFACE
OF CONTINENTS.
37 01:30:12:15 01:30:13:28 THE ENERGY
OF RUNNING WATER
38 01:30:14:00 01:30:15:28 IN A RIVER CHANNEL
IS TRANSFORMED
39 01:30:16:00 01:30:19:03 INTO PROCESSES
THAT ERODE ROCK
AND SEDIMENT
40 01:30:19:05 01:30:21:03 FROM THE BOTTOM
OF THE CHANNEL
41 01:30:21:05 01:30:22:17 AND CARRY IT
DOWNSTREAM.
42 01:30:22:19 01:30:24:17 AS THE RIVER
DEEPENS ITS CHANNEL,
43 01:30:24:19 01:30:27:17 THE SIDES
OF THE VALLEY STEEPEN
AND GROW UNSTABLE.
44 01:30:27:19 01:30:30:01 EVENTUALLY MASS
WASTING PROCESSES
ARE TRIGGERED,
45 01:30:30:03 01:30:32:02 CAUSING THESE SLOPES
TO FAIL.
46 01:30:32:04 01:30:35:02 THIS DELIVERS EVEN MORE
SEDIMENT TO THE RIVER
47 01:30:35:04 01:30:38:10 AND WIDENS
THE RIVER VALLEY
EVEN FURTHER.
48 01:30:38:12 01:30:41:10 IN ORDER TO UNDERSTAND
THE INFLUENCE
OF RUNNING WATER
49 01:30:41:12 01:30:42:25 ON THE EARTH'S SURFACE,
50 01:30:42:27 01:30:45:10 WE'RE GOING TO LOOK
AT A VARIETY OF RIVERS
51 01:30:45:12 01:30:47:02 AND ALSO AT DIFFERENT
LAND FORMS
52 01:30:47:04 01:30:48:26 IN VARIOUS STAGES
OF THEIR DEVELOPMENT.
53 01:30:48:28 01:30:51:17 IN DOING SO,
WE'LL EXPLORE
THE CONNECTIONS BETWEEN
54 01:30:51:19 01:30:53:03 THE GEOLOGIC PROCESS
OF RUNNING WATER
55 01:30:53:05 01:30:56:01 AND THE EVOLUTION
OF THE SURFACE
OF THE EARTH.
56 01:30:57:17 01:30:59:00 *THE CONNECTION BETWEEN*

			A RIVER
57	01:30:59:02	01:31:00:22	*AND ITS DEEP, WIDE VALLEY*
58	01:31:00:24	01:31:02:22	*IS NOT AN OBVIOUS ONE.*
59	01:31:04:00	01:31:05:23	*AT ONE TIME,*
			VALLEYS WERE THOUGHT
60	01:31:05:25	01:31:07:05	*TO HAVE FORMED*
			INDEPENDENTLY
61	01:31:07:07	01:31:09:11	*OF THE RIVERS WHICH*
			FLOW THROUGH THEM.
62	01:31:09:13	01:31:12:00	*TODAY GEOLOGISTS*
			ARE WELL AWARE
63	01:31:12:02	01:31:13:21	*THAT VALLEYS*
			USUALLY FORM
64	01:31:13:23	01:31:16:05	*BY THE DOWN-CUTTING*
			OF RUNNING WATER
65	01:31:16:07	01:31:19:15	*COMBINED WITH THE MASS*
			WASTING OF SLOPES.
66	01:31:19:17	01:31:21:29	*AS A RIVER CUTS*
			ITS CHANNEL DEEPER,
67	01:31:22:01	01:31:23:15	*IT CARRIES AWAY SEDIMENT*
68	01:31:23:17	01:31:26:02	*FED TO IT*
			FROM SURROUNDING HILLSIDES.
69	01:31:27:20	01:31:29:18	THERE ARE LIMITS
			TO HOW DEEPLY
70	01:31:29:20	01:31:31:19	A STREAM
			CAN ERODE ITS VALLEY.
71	01:31:31:21	01:31:33:05	THOSE LIMITS COME
			OF SEVERAL KINDS,
72	01:31:33:07	01:31:35:05	GENERALLY REFERRED
			TO AS BASE LEVEL.
73	01:31:35:07	01:31:39:04	THE ULTIMATE BASE LEVEL,
			OR GRAND BASE LEVEL,
			IS SEA LEVEL.
74	01:31:39:06	01:31:40:19	STREAM DON'T DEGRADE
			THEIR VALLEYS
75	01:31:40:21	01:31:42:19	BELOW THE LEVEL
			OF THE SEA.
76	01:31:42:21	01:31:45:19	WE DON'T FIND
			GREAT CANYONS ARCING
			DOWN TO THE OCEAN
77	01:31:45:21	01:31:48:20	FILLED BY WATER WHICH
			FLOWS IN FROM THE SEA.
78	01:31:48:22	01:31:51:05	THE STREAM, AS IT
			APPROACHES SEA LEVEL,
79	01:31:51:07	01:31:54:05	LOSES VELOCITY
			AND THEREFORE LOSES
			ABILITY TO ERODE.
80	01:31:55:23	01:31:58:08	*MODERN CONCEPTS*
			OF LANDSCAPE EVOLUTION
81	01:31:58:10	01:32:01:02	*BEGAN WITH AN AMERICAN*
			GEOMORPHOLOGIST,
82	01:32:01:04	01:32:03:18	*WILLIAM MORRIS DAVIS.*
83	01:32:03:20	01:32:05:14	*HE BELIEVED THAT*
			RIVERS AND STREAMS
84	01:32:05:16	01:32:08:12	*GRADUALLY WEAR DOWN*
			RUGGED MOUNTAIN SLOPES

85 01:32:08:14 01:32:10:08 *TO FORM PLAINS.*

86 01:32:10:10 01:32:12:29 *HE CLASSIFIED LANDSCAPES BY THEIR MATURITY*

87 01:32:13:01 01:32:14:16 *AND USED THE TERMS*

88 01:32:14:18 01:32:16:17 *"YOUTHFUL", "MATURE", AND "OLD AGE"*

89 01:32:16:19 01:32:19:09 *TO CATEGORIZE THEIR STAGES OF DEVELOPMENT.*

90 01:32:21:22 01:32:23:09 DAVIS' WORK,

91 01:32:23:11 01:32:25:28 DONE MOSTLY IN THE APPALACHIAN MOUNTAINS,

92 01:32:26:00 01:32:27:14 CONCEIVED OF LANDSCAPES

93 01:32:27:16 01:32:30:13 AS GOING THROUGH A DISTINCT SERIES OF STAGES

94 01:32:30:15 01:32:32:28 THAT BEGAN WITH AN UPLIFT OF THE AREA,

95 01:32:33:00 01:32:34:27 SUPPLYING STREAMS WITH POTENTIAL ENERGY

96 01:32:34:29 01:32:36:24 WHICH THEY COULD THEN USE

97 01:32:36:26 01:32:38:10 TO CARVE THEIR VALLEYS.

98 01:32:38:12 01:32:41:05 DURING THE EARLIEST STAGES AFTER UPLIFT,

99 01:32:41:07 01:32:43:17 STREAMS PREDOMINATELY CUT DOWNWARD,

100 01:32:43:19 01:32:45:01 INCISING THEIR VALLEYS,

101 01:32:45:03 01:32:47:28 AND CREATING A STEEP-SIDED LANDSCAPE.

102 01:32:48:00 01:32:51:23 DAVIS REFERRED TO THIS AS "YOUTH."

103 01:32:51:25 01:32:53:09 AS THIS PROCESS CONTINUES,

104 01:32:53:11 01:32:57:03 THE STREAMS GRADUALLY EXPEND SOME OF THEIR ENERGY

105 01:32:57:05 01:32:58:18 CARVING FROM SIDE TO SIDE,

106 01:32:58:20 01:33:01:07 WANDERING BACK AND FORTH ACROSS THE VALLEYS.

107 01:33:01:09 01:33:04:01 THE VALLEYS THEN CEASE TO BE V-SHAPED,

108 01:33:04:03 01:33:06:14 BECOME SOMEWHAT MORE FLAT-FLOORED,

109 01:33:06:16 01:33:08:29 AND EVENTUALLY ALL OF THE ORIGINAL UPLAND SURFACE

110 01:33:09:01 01:33:11:27 IS CONSUMED BY EROSION FROM TRIBUTARIES,

111 01:33:11:29 01:33:13:27 SO THAT ALL OF THE LANDSCAPE

112 01:33:13:29 01:33:15:11 IS NOW IN HILL SLOPE.

113 01:33:15:13 01:33:17:26 THIS IS WHAT DAVIS

CONSIDERED TO BE
114 01:33:17:28 01:33:19:08 THE STAGE OF MATURITY.
115 01:33:19:10 01:33:21:26 AND FINALLY,
AS THE STREAM
WORKS DOWN,
116 01:33:21:28 01:33:23:11 IT REACHES NEAR
BASE LEVEL,
117 01:33:23:13 01:33:26:12 OR THE LIMIT TO WHICH
IT CAN ERODE DOWNWARD
118 01:33:26:14 01:33:28:27 AND THEN
DOES VERY LITTLE
VERTICAL EROSION,
119 01:33:28:29 01:33:30:27 EXPENDING ALMOST ALL
OF ITS ENERGY
120 01:33:30:29 01:33:32:11 ERODING
FROM SIDE TO SIDE.
121 01:33:32:13 01:33:33:27 AND AS IT DOES SO,
122 01:33:33:29 01:33:36:11 THESE VALLEY
BOTTOMS BECOME
MORE AND MORE BROAD,
123 01:33:36:13 01:33:39:11 THE TRIBUTARY STREAMS
ERODE THEIR SLOPES,
124 01:33:39:13 01:33:41:25 EVENTUALLY
CREATING FLOOD PLAINS
OF THEIR OWN,
125 01:33:41:27 01:33:45:13 AND, FINALLY, VIRTUALLY
ALL OF THE MATERIAL
THAT WAS UPLIFTED
126 01:33:45:15 01:33:47:28 IS DESTROYED AND BROUGHT
TO AN EQUAL LEVEL,
127 01:33:48:00 01:33:50:15 WHICH DAVIS REFERRED
TO AS A PENEPLAIN,
128 01:33:50:17 01:33:53:00 AS THE ULTIMATE STAGE
IN THE CYCLE OF EROSION
129 01:33:53:02 01:33:55:13 WHICH HE THOUGHT
ENDED IN "OLD AGE."
130 01:33:55:15 01:33:58:16 *IN ORDER*
TO MAKE HIS MODEL
131 01:33:58:18 01:34:01:08 *EASIER FOR GEOLOGISTS*
TO APPLY,
132 01:34:01:10 01:34:03:20 *DAVIS DESCRIBED*
UPLIFT AND EROSION
133 01:34:03:22 01:34:06:20 *AS EVENTS OCCURRING*
SEPARATELY IN TIME.
134 01:34:06:22 01:34:08:05 *BUT HE KNEW, IN FACT,*
135 01:34:08:07 01:34:10:11 *THESE PROCESSES*
OCCUR SIMULTANEOUSLY.
136 01:34:11:26 01:34:14:19 *LANDSCAPES FORM BY*
A CONTINUOUS INTERPLAY
137 01:34:14:21 01:34:17:08 *OF TECTONIC ACTIVITY*
AND EROSION.
138 01:34:17:10 01:34:18:23 *OTHER CRUCIAL ELEMENTS*
139 01:34:18:25 01:34:21:24 *ALSO INFLUENCE*
THE SHAPE OF THE LAND,
140 01:34:21:26 01:34:25:09 *INCLUDING ROCK TYPE,*
ROCK STRUCTURE, AND CLIMATE.

141 01:34:27:03 01:34:28:16 *SOLID ROCK,*
FOR EXAMPLE,
142 01:34:28:18 01:34:31:00 *CAN HOLD UP*
A MUCH STEEPER CLIFF
143 01:34:31:02 01:34:33:05 *THAN SAND OR CLAY.*
144 01:34:33:07 01:34:35:25 *AND WHEN STRUCTURES,*
SUCH AS FOLDS OR FAULTS,
145 01:34:35:27 01:34:37:18 *APPEAR*
AT THE EARTH'S SURFACE,
146 01:34:37:20 01:34:39:16 *SHAPES ADJUST*
ACCORDINGLY.
147 01:34:41:13 01:34:43:11 *THE SLOPE*
OF THE GRAND CANYON
148 01:34:43:13 01:34:46:03 *IS A RESULT OF MANY*
OF THESE FACTORS.
149 01:34:46:05 01:34:48:23 *THE ROCKS ARE LAYERED*
SEDIMENTARY STRATA
150 01:34:48:25 01:34:51:29 *WITH CONTRASTING*
RESISTANCE TO WEATHERING.
151 01:34:52:01 01:34:53:16 *THIS NATURALLY RESULTS*
152 01:34:53:18 01:34:55:12 *IN SLOPES*
WITH DIFFERING STEEPNESS
153 01:34:55:14 01:34:56:29 *AND RATES OF EROSION.*
154 01:34:58:03 01:34:59:29 *IN ADDITION,*
THE ARID CLIMATE
155 01:35:00:03 01:35:01:27 *AND RELATIVE LACK*
OF VEGETATION
156 01:35:01:29 01:35:04:06 *CONTRIBUTE TO THE SHARP,*
ANGULAR FEATURES
157 01:35:04:08 01:35:05:28 *OF THE CANYON WALLS.*
158 01:35:08:05 01:35:10:19 *ULTIMATELY, ROCK TYPE*
AND ROCK STRUCTURE
159 01:35:10:21 01:35:13:10 *ALSO AFFECT RIVER*
DRAINAGE PATTERNS.
160 01:35:13:12 01:35:15:17 *BY STUDYING DIFFERENT*
STREAM PATTERNS,
161 01:35:15:19 01:35:17:29 *GEOLOGISTS CAN INFER*
A GREAT DEAL
162 01:35:18:01 01:35:21:22 *ABOUT THE NATURE*
OF THE UNDERLYING ROCK.
163 01:35:21:24 01:35:23:07 IF WE HAVE
HOMOGENEOUS ROCKS
164 01:35:23:09 01:35:25:07 OR FLAT-LYING
SEDIMENTARY ROCKS,
165 01:35:25:09 01:35:28:00 STREAMS TYPICALLY
FORM WHAT'S CALLED
A DENDRITIC PATTERN
166 01:35:28:02 01:35:31:01 THAT LOOKS MUCH LIKE
THE BRANCHING OF A TREE.
167 01:35:31:03 01:35:32:16 WHERE THE ROCKS
AREN'T HOMOGENEOUS
168 01:35:32:18 01:35:35:00 OR THERE ARE
DEFINITE STRUCTURES
IN THE ROCKS,
169 01:35:35:02 01:35:36:12 OTHER PATTERNS OCCUR.
170 01:35:36:14 01:35:37:27 FOR EXAMPLE,

IF WE HAVE
171 01:35:37:29 01:35:39:29 INTERSECTING FRACTURES
OR FAULTS,
172 01:35:40:01 01:35:41:14 STREAMS COMMONLY FOLLOW
173 01:35:41:16 01:35:43:08 THOSE
INTERSECTING PATTERNS.
174 01:35:43:10 01:35:44:23 THEY MAKE SHARP BENDS
175 01:35:44:25 01:35:46:23 AT ACUTE,
OR EVEN RIGHT ANGLES,
176 01:35:46:25 01:35:49:15 FORMING A DIFFERENT
KIND OF STREAM PATTERN.
177 01:35:49:17 01:35:51:06 WHERE WE HAVE
ALTERNATING LAYERS
178 01:35:51:08 01:35:52:28 OF STRONG
AND WEAK ROCKS,
179 01:35:53:00 01:35:56:11 THE STREAMS
MORE USUALLY BRANCH OUT
AS A TRELLIS PATTERN,
180 01:35:56:13 01:36:00:05 REFLECTING
THE WEAKER VALLEY ROCKS
181 01:36:00:07 01:36:02:16 AND THE STRONGER
HILL-FORMING ROCKS.
182 01:36:04:23 01:36:06:19 *THE DRAINAGE PATTERNS*
OF STREAMS
183 01:36:06:21 01:36:08:20 *EXPAND AND GROW*
MORE INTRICATE
184 01:36:08:22 01:36:10:22 *AS THE LAND ERODES AWAY.*
185 01:36:12:13 01:36:16:05 *EVEN AFTER STREAMS AND RIVERS*
WEAR A LANDSCAPE FLAT,
186 01:36:16:07 01:36:17:20 *IT'S POSSIBLE*
FOR EROSION
187 01:36:17:22 01:36:19:03 *TO BECOME*
ACTIVE AGAIN
188 01:36:19:05 01:36:21:00 *IF THE LANDSCAPE*
IS UPLIFTED
189 01:36:21:02 01:36:24:12 *OR IF THE REGIONAL*
BASE LEVEL DROPS.
190 01:36:24:14 01:36:27:19 *GEOLOGISTS CALL THIS*
RENEWAL OF STREAM EROSION
191 01:36:27:21 01:36:29:14 *"REJUVENATION."*
192 01:36:29:16 01:36:32:16 *AND IT PRODUCES CERTAIN*
CHARACTERISTIC LAND FORMS
193 01:36:32:18 01:36:36:13 *SUCH AS STREAM TERRACES.*
194 01:36:36:15 01:36:39:05 STREAM TERRACES
ARE FOUND FREQUENTLY
195 01:36:39:07 01:36:42:28 IN AREAS
OF VERY WIDE VALLEYS
196 01:36:43:00 01:36:45:14 WHERE ONE OF SEVERAL
THINGS HAS HAPPENED.
197 01:36:45:16 01:36:48:16 ONE COMMON WAY IN WHICH
TERRACES FORM
198 01:36:48:18 01:36:50:24 IS BECAUSE
OF REJUVENATION,
199 01:36:50:26 01:36:53:22 WHERE THERE HAS BEEN
UPLIFTING OF THE AREA
200 01:36:53:24 01:36:56:21 OR A DOWN-DROPPING

OF THE BASE LEVEL,
201 01:36:56:23 01:37:00:06 SO THAT
A STREAM WHICH WAS
FORMERLY MEANDERING
202 01:37:00:08 01:37:03:21 WITH BIG,
WIDE SWEEPING TURNS,
WITH A WIDE FLOOD PLAIN,
203 01:37:03:23 01:37:05:22 CUTS INTO ITS
OWN FLOOD PLAIN,
204 01:37:05:24 01:37:07:07 LEAVING THE FLOOD PLAIN
205 01:37:07:09 01:37:09:22 ELEVATED ON EITHER SIDE
OF THE RIVER
206 01:37:09:24 01:37:11:06 AS A TERRACE.
207 01:37:11:08 01:37:13:21 IT IS NO LONGER
AN ACTIVE FLOOD PLAIN,
208 01:37:13:23 01:37:16:18 BUT AN ELEVATED SURFACE
ABOVE THE RIVER.
209 01:37:17:23 01:37:19:18 *BUT TERRACES*
CAN ALSO INDICATE
210 01:37:19:20 01:37:21:18 *OTHER TYPES*
OF REGIONAL CHANGE.
211 01:37:21:20 01:37:24:18 *FOR EXAMPLE,*
IF THE CLIMATE GROWS DRIER,
212 01:37:24:20 01:37:28:04 *A RIVER*
WILL SHRINK IN SIZE.
213 01:37:28:06 01:37:30:03 *RATHER THAN*
CARRYING AWAY SEDIMENT
214 01:37:30:05 01:37:31:19 *FROM SURROUNDING SLOPES,*
215 01:37:31:21 01:37:33:05 *THE SHRINKING STREAM*
216 01:37:33:07 01:37:36:04 *WILL EAT INTO ITS OWN*
SEDIMENTARY DEPOSITS
217 01:37:36:06 01:37:38:02 *CREATED IN WETTER TIMES.*
218 01:37:38:04 01:37:40:00 *GRADUALLY TERRACES FORM.*
219 01:37:41:20 01:37:44:19 *ANOTHER LAND FORM*
THAT CAN BE PRODUCED
220 01:37:44:21 01:37:47:03 *AS A RESULT OF REJUVENATION*
AND UPLIFT
221 01:37:47:05 01:37:48:19 *IS AN INCISED MEANDER.*
222 01:37:48:21 01:37:51:17 *THE KEY FACTOR DISTINGUISHING*
INCISED MEANDERS
223 01:37:51:19 01:37:53:02 *FROM NORMAL MEANDERS*
224 01:37:53:04 01:37:56:18 *IS THAT THEY ARE CUT*
WELL BELOW THE LEVEL
225 01:37:56:20 01:37:58:22 *OF A RIVER'S*
FORMER FLOOD PLAIN.
226 01:38:01:06 01:38:04:04 *INCISED MEANDERS RESULT*
FROM DOWN-CUTTING
227 01:38:04:06 01:38:05:18 *ALONG THE THALWEG--*
228 01:38:05:20 01:38:08:18 *OR DEEPEST PART*
OF A RIVER'S CHANNEL.
229 01:38:08:20 01:38:10:18 *THE DOWN-CUTTING*
IS SO RAPID
230 01:38:10:20 01:38:13:03 *THE RIVER MAINTAINS*
A MEANDERING PATTERN
231 01:38:13:05 01:38:15:17 *WHILE DEEPENING*
ITS VALLEY.

232 01:38:17:05 01:38:19:19 *RIVER VALLEYS FORM*
A SIGNIFICANT PART
233 01:38:19:21 01:38:21:04 *OF EARTH'S LANDSCAPE,*
234 01:38:21:06 01:38:23:18 *BUT THEY AREN'T*
THE ONLY LAND FORM
235 01:38:23:20 01:38:25:02 *CREATED BY RUNNING WATER.*
236 01:38:26:20 01:38:29:18 *ALL STREAMS AND RIVERS*
COME TO AN END.
237 01:38:29:20 01:38:32:03 *MOST ULTIMATELY*
FLOW INTO THE OCEAN
238 01:38:32:05 01:38:34:13 *OR ANOTHER LARGE*
BODY OF WATER,
239 01:38:34:15 01:38:35:27 *SUCH AS A LAKE.*
240 01:38:37:07 01:38:39:18 *DUE TO THE SUDDEN LOSS*
IN VELOCITY
241 01:38:39:20 01:38:41:18 *AT THE MOUTH*
OF A RIVER,
242 01:38:41:20 01:38:44:02 *MOST OF ITS SEDIMENT*
IS DEPOSITED,
243 01:38:44:04 01:38:45:18 *FORMING A DELTA.*
244 01:38:45:20 01:38:49:05 DELTAS, OF COURSE,
FORM AT THE MOUTH
OF THE RIVER
245 01:38:49:07 01:38:52:04 WHERE THEY ENT
A LARGE LAKE
OR THE OCEAN.
246 01:38:52:06 01:38:55:03 THE GRADIENT
OR THE SLOPE
OF THE RIVER
247 01:38:55:05 01:38:56:17 IS VERY GENTLE.
248 01:38:56:19 01:38:59:16 WHEN IT HITS THE WATER,
THERE'S NO GRADIENT.
249 01:38:59:18 01:39:02:16 CONSEQUENTLY, THE SEDIMENT
BEGINS TO SETTLE OUT
IMMEDIATELY.
250 01:39:02:18 01:39:05:18 IN SO DOING,
IT DAMS ITS CHANNEL.
251 01:39:05:20 01:39:07:03 THE RIVER
TENDS TO BRANCH
252 01:39:07:05 01:39:09:02 INTO A SERIES
OF DISTRIBUTARIES.
253 01:39:09:04 01:39:10:17 FROM TIME TO TIME,
254 01:39:10:19 01:39:13:16 CERTAIN BRANCHES LOAD UP
WITH MORE SEDIMENT
THAN OTHERS,
255 01:39:13:18 01:39:16:17 SO THE MAIN FLOW
OF THE RIVER MAY SHIFT
256 01:39:16:19 01:39:18:01 FROM ONE LOCALITY
TO ANOTHER
257 01:39:18:03 01:39:20:13 OVER A LONG PERIOD
OF TIME.
258 01:39:22:03 01:39:24:02 *DISTRIBUTARIES PLAY*
A VITAL ROLE
259 01:39:24:04 01:39:26:18 *IN BUILDING AND ENLARGING*
A DELTA,
260 01:39:26:20 01:39:28:03 *INTERMITTENTLY SUPPLYING*

NEW SEDIMENT

261 01:39:28:05 01:39:31:16 *TO ALL PARTS*
OF THE DELTA'S SHORE.

262 01:39:31:18 01:39:33:15 *THE MISSISSIPPI RIVER*
HAS BUILT

263 01:39:33:17 01:39:36:15 *ONE OF THE LARGEST DELTAS*
IN THE WORLD.

264 01:39:36:17 01:39:39:00 *NEARLY 40,000*
SQUARE KILOMETERS OF LAND

265 01:39:39:02 01:39:42:01 *HAVE BEEN ADDED*
TO THE STATE OF LOUISIANA

266 01:39:42:03 01:39:44:00 *DUE TO THE ASTONISHING*
POWER

267 01:39:44:02 01:39:45:16 *OF THE MISSISSIPPI RIVER*

268 01:39:45:18 01:39:47:25 *AND ITS ENORMOUS*
AMOUNT OF SEDIMENT.

269 01:39:47:27 01:39:50:25 *ONE MILLION TONS*
OF SILT, SAND, AND CLAY

270 01:39:50:27 01:39:54:00 *ARE ADDED TO THE*
MISSISSIPPI DELTA EACH DAY,

271 01:39:54:02 01:39:56:07 *GIVING THE RIVER*
ITS NICKNAME--

272 01:39:56:09 01:39:59:00 *THE BIG MUDDY.*

273 01:39:59:02 01:40:02:00 *THE MISSISSIPPI COULD NOT*
HAVE CREATED THIS MUCH LAND

274 01:40:02:02 01:40:04:15 *IF IT HAD STAYED*
IN ONE CHANNEL.

275 01:40:04:17 01:40:06:29 *THE SOUTHERN PART*
OF THE RIVER

276 01:40:07:01 01:40:08:29 *HAS CHANGED COURSE*
MANY TIMES

277 01:40:09:01 01:40:11:28 *OVER AN AREA*
SOME 300 KILOMETERS WIDE.

278 01:40:12:00 01:40:13:28 *THE KEY TO THESE CHANGES*

279 01:40:14:00 01:40:15:28 *IS THE RIVER'S*
NATURAL TENDENCY

280 01:40:16:00 01:40:18:14 *TO FOLLOW THE PATH*
OF LEAST RESISTANCE,

281 01:40:18:16 01:40:20:00 *WHICH IS ALMOST ALWAYS*

282 01:40:20:02 01:40:22:14 *THE SHORTEST ROUTE*
TO THE SEA.

283 01:40:22:16 01:40:24:29 *THE MISSISSIPPI FOLLOWS*
A SINGLE CHANNEL

284 01:40:25:01 01:40:27:28 *UNTIL GRADUALLY ITS CHANNEL*
FILLS WITH SEDIMENT.

285 01:40:28:00 01:40:30:09 *AT THAT POINT,*

286 01:40:30:11 01:40:32:13 *THE RIVER EASILY*
OVERTOPS ITS BANKS

287 01:40:32:15 01:40:34:23 *DURING PERIODS*
OF HIGH DISCHARGE.

288 01:40:36:16 01:40:39:14 *WHEN THAT HAPPENS,*
IT IS FREE TO FIND

289 01:40:39:16 01:40:41:29 *A MORE DIRECT ROUTE*
TO THE GULF,

290 01:40:42:01 01:40:43:14 *UNTIL, OF COURSE,*

291 01:40:43:16 01:40:45:13 *THE LENGTHY CYCLE*

BEGINS AGAIN.

292 01:40:47:26 01:40:50:09 *THIS CYCLICAL SHIFTING*
OF THE MISSISSIPPI

293 01:40:50:11 01:40:52:24 *HAS RESULTED*
IN AN ONGOING BATTLE

294 01:40:52:26 01:40:55:27 *TO CONTROL THE FORCES*
OF NATURE.

295 01:40:55:29 01:40:58:12 *ALONG MOST*
OF ITS LOWER COURSE,

296 01:40:58:14 01:40:59:27 *LEVEES HAVE BEEN BUILT*

297 01:40:59:29 01:41:03:20 *TO CONFINE THE RIVER*
TO ITS PRESENT CHANNEL.

298 01:41:03:22 01:41:07:12 *CITIES AND PORTS HAVE*
GROWN ALONG THE MISSISSIPPI,

299 01:41:07:14 01:41:09:13 *AND IT HAS GRADUALLY BECOME*

300 01:41:09:15 01:41:12:17 *ONE OF THE WORLD'S MOST*
IMPORTANT ECONOMIC WATERWAYS.

301 01:41:14:22 01:41:17:19 *IF THE MISSISSIPPI WERE*
ALLOWED TO CHANGE COURSE

302 01:41:17:21 01:41:19:05 *FROM ITS MODERN CHANNEL,*

303 01:41:19:07 01:41:21:19 *MAJOR PORTS*
BUILT ALONG ITS SHORES

304 01:41:21:21 01:41:23:04 *WOULD BE LEFT DRY.*

305 01:41:23:06 01:41:24:21 *ELSEWHERE, FARMS AND TOWNS*

306 01:41:24:23 01:41:27:13 *IN THE PATH*
OF THE NEW RIVERBED

307 01:41:27:15 01:41:28:27 *COULD BE WASHED AWAY.*

308 01:41:30:14 01:41:32:27 *SO THE U.S. ARMY*
CORPS OF ENGINEERS

309 01:41:32:29 01:41:35:27 *HAS ENGAGED A TEAM*
OF SCIENTISTS AND ENGINEERS

310 01:41:35:29 01:41:38:23 *TO HOLD THE RIVER*
TO ITS PRESENT CHANNEL.

311 01:41:41:03 01:41:45:00 HOW LONG THE CORPS
CAN KEEP THE RIVER
WHERE IT IS

312 01:41:45:02 01:41:47:17 IS REALLY JUST
A MATTER OF MONEY.

313 01:41:47:19 01:41:49:17 ONE OF THE THINGS
ABOUT ENGINEERING

314 01:41:49:19 01:41:52:16 IS THAT THAT YOU CAN DO
ALMOST ANYTHING,

315 01:41:52:18 01:41:54:01 GIVEN THE MONEY.

316 01:41:54:03 01:41:57:00 WE CAN BASICALLY
KEEP THE RIVER
WHERE IT IS.

317 01:41:57:02 01:42:00:13 WE MAY HAVE
CONTROL STRUCTURES
UP AND DOWN THE RIVER,

318 01:42:00:15 01:42:03:14 BECAUSE THE RIVER WILL TRY
TO CHANGE COURSE

319 01:42:03:16 01:42:07:15 TO FIND
THE SHORTEST DISTANCE
TO THE GULF OF MEXICO.

320 01:42:07:17 01:42:11:00 IT MAY BE
NOT THIS FLOOD,

BUT MAYBE THE NEXT
321 01:42:11:02 01:42:13:00 WHERE A LEVEE
MIGHT BREAK
322 01:42:13:02 01:42:15:29 OR ELSE A STRUCTURE
MIGHT BE FLANKED
323 01:42:16:01 01:42:17:14 OR SOMETHING LIKE THAT,
324 01:42:17:16 01:42:21:09 WHERE THE RIVER
WILL TRY TO CHANGE
ITS COURSE AGAIN.
325 01:42:21:11 01:42:25:24 BUT THE CORPS REALIZED
IT COULD NOT REALLY
LET THIS HAPPEN.
326 01:42:25:26 01:42:28:23 THE ECONOMIES
OF BATON ROUGE
AND NEW ORLEANS
327 01:42:28:25 01:42:31:15 DEPEND ON THE RIVER
328 01:42:31:17 01:42:34:00 FOR ITS FRESH WATER,
FOR ITS COMMERCE,
329 01:42:34:02 01:42:35:09 ITS TRANSPORTATION.
330 01:42:35:11 01:42:38:09 INDUSTRIES ALL
UP AND DOWN THE RIVER
331 01:42:38:11 01:42:41:09 USE THE FRESH WATER
IN THEIR PROCESSING.
332 01:42:42:11 01:42:43:25 *IN ITS CONTINUING SEARCH*
333 01:42:43:27 01:42:46:10 *FOR THE SHORTEST ROUTE*
TO THE SEA,
334 01:42:46:12 01:42:48:24 *THE MISSISSIPPI*
HAS FOUND A COMRADE.
335 01:42:48:26 01:42:51:11 *AT ONE TIME A MERE TRICKLE*
336 01:42:51:13 01:42:52:25 *COMPARED*
TO THE MISSISSIPPI,
337 01:42:52:27 01:42:55:24 *THE ATCHAFALAYA IS NOW*
A MIGHTY PREDATOR,
338 01:42:55:26 01:42:57:24 *THE MISSISSIPPI--*
A WILLING PREY.
339 01:42:57:26 01:42:59:28 *THE FIGHT TO CONTROL*
THE MISSISSIPPI
340 01:43:00:01 01:43:03:23 *HAS ESCALATED*
FROM A BATTLE INTO A WAR.
341 01:43:03:25 01:43:07:13 *APPROXIMATELY 150 MILES*
NORTH OF NEW ORLEANS,
342 01:43:07:15 01:43:10:14 *THESE TWO RIVERS HAVE COME*
PERILOUSLY CLOSE TOGETHER,
343 01:43:10:16 01:43:14:09 *LINKED BY AN ABANDONED*
LOOP OF THE MISSISSIPPI
344 01:43:14:11 01:43:16:08 *CALLED OLD RIVER.*
345 01:43:16:10 01:43:18:07 *THE ATCHAFALAYA OFFERS*
THE MISSISSIPPI
346 01:43:18:09 01:43:22:06 *A ROUTE TO THE GULF*
THAT IS 175 MILES SHORTER
347 01:43:22:08 01:43:24:05 *THAN ITS PRESENT COURSE.*
348 01:43:26:07 01:43:27:22 THE CORPS OF ENGINEERS
REALIZED
349 01:43:27:24 01:43:29:07 THERE WAS
A POTENTIAL PROBLEM
350 01:43:29:09 01:43:31:06 WITH THE ATCHAFALAYA

CAPTURING THE MISSISSIPPI

351 01:43:31:08 01:43:32:22 BACK IN THE 1950s.

352 01:43:32:24 01:43:35:06 A GENTLEMAN
BY THE NAME OF FISK,

353 01:43:35:08 01:43:36:21 WHO WAS A GEOLOGIST,

354 01:43:36:23 01:43:39:21 DID A REPORT
FOR THE CORPS OF ENGINEERS

355 01:43:39:23 01:43:41:06 AND THE MISSISSIPPI
RIVER COMMISSION

356 01:43:41:08 01:43:44:20 IN WHICH HE STUDIED
OLD DELTA SYSTEMS
OF THE MISSISSIPPI

357 01:43:44:22 01:43:46:22 AND OLD DIVERSIONS
OF THE MISSISSIPPI

358 01:43:46:24 01:43:49:21 AND COMPARED THOSE
TO WHAT WAS HAPPENING

359 01:43:49:23 01:43:52:06 ON THE ATCHAFALAYA
AND THE MISSISSIPPI.

360 01:43:52:08 01:43:54:08 AND HE THEORIZED THAT

361 01:43:54:10 01:43:57:21 THE ATCHAFALAYA
AND THE MISSISSIPPI

362 01:43:57:23 01:44:00:20 WERE IN
AN INTERMEDIATE
STAGE OF CAPTURE

363 01:44:00:22 01:44:03:22 AND THAT, IF
SOMETHING WAS NOT DONE

364 01:44:03:24 01:44:06:21 BY ABOUT THE 1970s,
ABOUT 1975,

365 01:44:06:23 01:44:09:20 WE WOULD REACH
A CRITICAL STAGE
OF CAPTURE

366 01:44:09:22 01:44:11:06 IN WHICH THE MISSISSIPPI

367 01:44:11:08 01:44:14:06 WOULD NO LONGER
BE ABLE TO CARRY
ANY MORE FLOW

368 01:44:14:08 01:44:16:22 BECAUSE IT WAS
FILLED WITH SEDIMENT,

369 01:44:16:24 01:44:19:22 AND THE FLOWS
WOULD GO DOWN
THE ATCHAFALAYA.

370 01:44:19:24 01:44:21:22 HE SAID THAT THIS
WOULD HAPPEN

371 01:44:21:24 01:44:23:27 WHEN ABOUT 40%
OF THE FLOW

372 01:44:23:29 01:44:26:29 WAS GOING DOWN
THE ATCHAFALAYA
FROM THE MISSISSIPPI.

373 01:44:27:01 01:44:31:10 *IN 1954, AS A RESULT*
OF THE ARMY CORPS REPORT,

374 01:44:31:12 01:44:33:11 *THE UNITED STATES CONGRESS*
AUTHORIZED

375 01:44:33:13 01:44:35:28 *THE OLD RIVER*
CONTROL PROJECT.

376 01:44:37:09 01:44:39:05 *ESSENTIALLY, THIS FUNDED*
THE CONSTRUCTION

377 01:44:39:07 01:44:43:03 *OF A SERIES OF CONTROL*

STRUCTURES AND CHANNELS

378 01:44:43:05 01:44:46:03 *ALL SITUATED*
IN THE OLD RIVER AREA.

379 01:44:46:05 01:44:47:18 *UNDER THE PLAN,*

380 01:44:47:20 01:44:50:03 *THE FLOW OF WATER*
AND SEDIMENT

381 01:44:50:05 01:44:52:17 *BETWEEN THE MISSISSIPPI*
AND THE ATCHAFALAYA

382 01:44:52:19 01:44:55:15 *WAS TO REMAIN AT ITS*
THEN CURRENT RATE,

383 01:44:55:17 01:44:57:05 *A 70/30 SPLIT.*

384 01:44:57:07 01:44:59:05 *30% OF THE COMBINED*
DISCHARGE

385 01:44:59:07 01:45:01:20 *OF THE MISSISSIPPI*
AND RED RIVERS

386 01:45:01:22 01:45:04:05 *WAS TO FLOW*
INTO THE ATCHAFALAYA,

387 01:45:04:07 01:45:05:20 *WHILE THE REMAINING 70%*

388 01:45:05:22 01:45:08:23 *WOULD BE KEPT WITHIN*
THE MISSISSIPPI ITSELF.

389 01:45:08:25 01:45:13:04 *FIRST THE OLD RIVER CHANNEL*
WAS DAMNED.

390 01:45:13:06 01:45:16:04 *THIS MEANT THAT THE ONLY*
NATURAL CONNECTION

391 01:45:16:06 01:45:19:04 *BETWEEN THE ATCHAFALAYA*
AND MISSISSIPPI WAS CLOSED.

392 01:45:19:06 01:45:22:04 *SINCE THE CORPS DIDN'T WANT*
TO DISRUPT BOAT TRAFFIC

393 01:45:22:06 01:45:23:19 *BETWEEN THE TWO RIVERS,*

394 01:45:23:21 01:45:26:20 *A NAVIGATIONAL LOCK*
WAS BUILT ON OLD RIVER

395 01:45:26:22 01:45:29:04 *AT A COST OF $15 MILLION.*

396 01:45:33:06 01:45:36:04 *TO ENFORCE THE MANDATED*
70/30 FLOW RATE,

397 01:45:36:06 01:45:39:04 *CONSTRUCTION BEGAN*
ON TWO CONTROL STRUCTURES

398 01:45:39:06 01:45:42:19 *AT A COMBINED COST*
OF $15 MILLION.

399 01:45:42:21 01:45:45:19 *THESE STRUCTURES WERE*
COMPLETED AND OPERATIONAL

400 01:45:45:21 01:45:47:03 *BY 1963.*

401 01:45:50:20 01:45:54:16 *THE LOW SILL STRUCTURE*
IS 566 FEET WIDE

402 01:45:54:18 01:45:56:03 *AND HAS 11 GATES*

403 01:45:56:05 01:45:59:16 *WHICH ALLOW THE CORPS*
TO CONTROL THE FLOW RATE.

404 01:46:02:12 01:46:05:26 *THE LOW SILL SITS ON*
A MAN-MADE OUTFLOW CHANNEL

405 01:46:05:28 01:46:08:18 *CONNECTING THE MISSISSIPPI*
TO THE ATCHAFALAYA.

406 01:46:10:05 01:46:11:20 *ON THE FLOOD PLAIN*

407 01:46:11:22 01:46:14:05 *NEXT TO THE LOW SILL*
STRUCTURE

408 01:46:14:07 01:46:15:20 *SITS AN EMERGENCY*
FACILITY--

409 01:46:15:22 01:46:17:05 *THE OVERBANK STRUCTURE,*

410 01:46:17:07 01:46:21:03 *BUILT TO ASSIST THE LOW SILL DURING MAJOR FLOODS.*
411 01:46:23:19 01:46:26:01 *WELL OVER A HALF-MILE LONG,*
412 01:46:26:03 01:46:27:17 *IT HAS 73 GATES.*
413 01:46:27:19 01:46:31:17 *FOR A TIME, THIS ELABORATE AND COSTLY SYSTEM*
414 01:46:31:19 01:46:35:02 *MANAGED TO KEEP THE MISSISSIPPI IN PLACE,*
415 01:46:35:04 01:46:37:03 *BUT IN 1973,*
416 01:46:37:05 01:46:40:02 *10 YEARS AFTER THE SYSTEM WENT ON-LINE,*
417 01:46:40:04 01:46:44:02 *THE CORPS' EFFORTS WERE TESTED TO THEIR LIMITS.*
418 01:46:44:04 01:46:48:01 WELL, 1973
WE HAD A FLOOD
THAT HAPPENED TO BE
419 01:46:48:03 01:46:51:03 THE SECOND
GREATEST FLOOD
MAN HAS OBSERVED
420 01:46:51:05 01:46:53:17 SINCE HE KEPT RECORDS
ON THE MISSISSIPPI,
421 01:46:53:19 01:46:56:01 THE GREATEST BEING
THE 1927 FLOOD
422 01:46:56:03 01:46:58:15 WHICH RESULTED IN
THE MISSISSIPPI RIVER
423 01:46:58:17 01:46:59:28 AND TRIBUTARY SYSTEM
424 01:47:00:02 01:47:03:15 AND ALL
THE STRUCTURES
THAT YOU SEE TODAY.
425 01:47:03:17 01:47:06:15 WE HAD TO OPEN UP
SEVERAL STRUCTURES
426 01:47:06:17 01:47:09:01 BETWEEN OLD RIVER
AND NEW ORLEANS
427 01:47:09:03 01:47:10:16 TO ALLEVIATE
FLOOD WATERS
428 01:47:10:18 01:47:12:16 BETWEEN HERE
AND NEW ORLEANS
429 01:47:12:18 01:47:15:15 SO THAT NEW ORLEANS
WOULDN'T GO UNDER WATER.
430 01:47:15:17 01:47:19:15 WHAT HAPPENED IS
THAT THE RIVER DECIDED
431 01:47:19:17 01:47:21:29 THAT IT BASICALLY
WANTED TO CONTINUE
432 01:47:22:01 01:47:23:15 GOING DOWN
THE ATCHAFALAYA.
433 01:47:23:17 01:47:25:16 THE THALWEG
OF THE MISSISSIPPI
434 01:47:25:18 01:47:28:16 MOVED ALMOST
RIGHT INTO THE ENTRANCE
435 01:47:28:18 01:47:30:16 TO THE LOW SILL
STRUCTURE
436 01:47:30:18 01:47:33:15 AND BASICALLY
TOOK OUT A WING WALL.
437 01:47:33:17 01:47:35:14 THE FORCES
WERE THAT POWERFUL.
438 01:47:35:16 01:47:38:00 IT ALSO UNDERMINED

439 01:47:38:02 01:47:40:14 THE FOUNDATION
OF THE LOW SILL
STRUCTURE.
440 01:47:40:16 01:47:43:16 THE WATER,
IN ADDITION TO
GOING AROUND IT,
441 01:47:43:18 01:47:45:16 DID GO UNDERNEATH
THE STRUCTURE.
442 01:47:45:18 01:47:50:00 IT WAS ONLY BECAUSE
THE STRUCTURE'S
PILE FOUND IT,
443 01:47:50:02 01:47:53:14 AND THAT THE PILES WERE
VERY, VERY DEEP,
444 01:47:53:16 01:47:55:15 THAT THE STRUCTURE
REMAINED STANDING.
445 01:47:55:17 01:47:58:14 WE BASICALLY
JUST HAD TO
OPEN THE GATES
446 01:47:58:16 01:48:00:16 AND LET THE RIVER GO
447 01:48:00:18 01:48:03:11 BECAUSE THEY WERE
SO AFRAID TO LOSE
THE STRUCTURE.
448 01:48:03:13 01:48:05:15 *ALTHOUGH EMERGENCY*
REPAIR WORK
449 01:48:05:17 01:48:07:29 *TO STRENGTHEN*
THE LOW SILL STRUCTURE
450 01:48:08:01 01:48:09:15 *BEGAN IMMEDIATELY,*
451 01:48:09:17 01:48:13:18 *IT WAS OBVIOUS THAT*
MORE CONTROL WAS NEEDED.
452 01:48:13:20 01:48:18:16 *AT AN ADDITIONAL COST*
OF ALMOST $300 MILLION,
453 01:48:18:18 01:48:21:00 *THE ARMY CORPS PROCEEDED*
WITH THE CONSTRUCTION
454 01:48:21:02 01:48:22:15 *OF ANOTHER*
CONTROL STRUCTURE
455 01:48:22:17 01:48:24:14 *AND ACCOMPANYING CHANNEL.*
456 01:48:27:02 01:48:30:14 WE LEARNED THAT WE WOULD
BASICALLY NOT BE ABLE
457 01:48:30:16 01:48:32:01 TO CONTROL THE FLOWS
458 01:48:32:03 01:48:34:16 UNLESS WE DID CONSTRUCT
ANOTHER STRUCTURE.
459 01:48:34:18 01:48:37:03 THE LOW SILL
WAS JUST TOO DAMAGED.
460 01:48:37:05 01:48:38:15 THE CORPS
WAS AUTHORIZED
461 01:48:38:17 01:48:40:02 IN THE LATE SEVENTIES
462 01:48:40:04 01:48:42:14 TO BUILD
THE AUXILIARY STRUCTURE.
463 01:48:42:16 01:48:45:01 THE AUXILIARY STRUCTURE,
464 01:48:45:03 01:48:49:00 WHICH WAS COMPLETED
IN 1986,
465 01:48:49:02 01:48:51:15 BASICALLY IS
WHAT ITS NAME SAYS--
466 01:48:51:17 01:48:53:00 IT'S AN AUXILIARY.
467 01:48:53:02 01:48:55:28 IT SERVES TO COMPLEMENT
THE LOW SILL STRUCTURE,

468 01:48:56:00 01:48:59:28 ALLOWS US
TO GET BETTER CONTROL
OF THE FLOWS
469 01:49:00:00 01:49:03:28 SO THAT IN THE EVENT
WE HAVE A 1973 FLOOD,
470 01:49:04:00 01:49:06:29 WHICH WAS
JUST A TREMENDOUS
AMOUNT OF WATER,
471 01:49:07:01 01:49:08:29 THAT WE WOULDN'T
GET OURSELVES
472 01:49:09:01 01:49:10:28 IN THE SITUATION
THAT WE DID
473 01:49:11:00 01:49:13:13 WHERE WE
ALMOST LOST THE RIVER.
474 01:49:14:29 01:49:17:12 *THE 1973 FLOOD*
DEMONSTRATED
475 01:49:17:14 01:49:20:13 *HOW SUDDENLY THE RIVER'S*
CONDITIONS COULD CHANGE.
476 01:49:20:15 01:49:23:29 *THE CORPS REALIZED IT HAD*
TO MORE CLOSELY MONITOR
477 01:49:24:01 01:49:25:24 *THE 70/30 RATIO OF FLOW*
478 01:49:25:26 01:49:28:28 *BETWEEN THE MISSISSIPPI*
AND THE ATCHAFALAYA.
479 01:49:30:15 01:49:33:12 *UNTIL 1973,*
THE CORPS ONLY LOOKED
480 01:49:33:14 01:49:35:28 *AT THE THE AVERAGE*
ANNUAL FLOW.
481 01:49:36:00 01:49:37:29 *AS A RESULT OF THE FLOOD,*
482 01:49:38:01 01:49:40:14 *THE FLOW RATE*
IS CURRENTLY MONITORED
483 01:49:40:16 01:49:42:12 *EACH AND EVERY DAY.*
484 01:49:42:14 01:49:44:28 *IT IS THE NEW ORLEANS*
DISTRICT OFFICE
485 01:49:45:00 01:49:47:13 *OF THE ARMY CORPS*
OF ENGINEERS
486 01:49:47:15 01:49:49:12 *WHICH OVERSEES*
THE DAILY OPERATION
487 01:49:49:14 01:49:51:10 *OF THE CONTROL STRUCTURES.*
488 01:49:51:12 01:49:53:26 *THE FLOW DATA*
FROM THE STRUCTURES
489 01:49:53:28 01:49:55:15 *IS REVIEWED HERE,*
490 01:49:55:17 01:49:58:13 *AND RIVER CONDITIONS*
ARE CLOSELY MONITORED.
491 01:49:58:15 01:49:59:27 *BASED ON THESE DATA,*
492 01:49:59:29 01:50:02:26 *MAJOR DECISIONS ARE MADE*
ABOUT WHICH GATES
493 01:50:02:28 01:50:05:11 *ARE TO BE OPENED*
OR CLOSED.
494 01:50:09:13 01:50:12:10 *A SMALL DEVICE IS LOWERED*
INTO THE WATER
495 01:50:12:12 01:50:14:10 *TO MEASURE VELOCITY.*
496 01:50:14:12 01:50:17:12 *THESE MEASUREMENTS*
ARE MADE ALONG THE RIVER
497 01:50:17:14 01:50:19:12 *TO CALCULATE DISCHARGE.*
498 01:50:19:14 01:50:23:11 *USING THIS INFORMATION,*
FLOW PREDICTIONS ARE MADE,

499 01:50:23:13 01:50:27:16 *AND THE GATES ARE RAISED*
OR LOWERED ACCORDINGLY.
500 01:50:27:18 01:50:30:10 *BUT THE AMOUNT*
OF WATER FLOW
501 01:50:30:12 01:50:33:12 *IS NOT THE ONLY FACTOR*
TO BE CONSIDERED
502 01:50:33:14 01:50:35:19 *IN KEEPING THE MISSISSIPPI*
IN PLACE.
503 01:50:35:21 01:50:37:11 *ALTHOUGH THE ATCHAFALAYA*
504 01:50:37:13 01:50:39:11 *TAKES WATER*
FROM THE MISSISSIPPI,
505 01:50:39:13 01:50:42:10 *IT LEAVES MOST OF*
THE SEDIMENT BEHIND.
506 01:50:42:12 01:50:43:23 *IN RESPONSE,*
507 01:50:43:25 01:50:45:27 *THE ATCHAFALAYA*
SCOURS ITS OWN CHANNEL,
508 01:50:45:29 01:50:47:26 *ACQUIRING*
ENOUGH NEW SEDIMENT
509 01:50:47:28 01:50:50:11 *TO RESTORE*
ITS EQUILIBRIUM.
510 01:50:53:28 01:50:55:24 *THE EFFECT*
OF THE SCOURING
511 01:50:55:26 01:50:58:09 *ALSO DEEPENS*
THE ATCHAFALAYA'S BED,
512 01:50:58:11 01:51:00:08 *PROVIDING*
AN EVEN STEEPER ROUTE
513 01:51:00:10 01:51:02:00 *FOR THE MISSISSIPPI.*
514 01:51:04:19 01:51:06:10 *THE EFFECT*
ON THE MISSISSIPPI
515 01:51:06:12 01:51:08:25 *OF THE BED LOAD*
REMAINING BEHIND
516 01:51:08:27 01:51:11:24 *IS A BUILDUP OF SEDIMENT*
IN ITS CHANNEL.
517 01:51:11:26 01:51:14:23 *SO, SEDIMENT FLOW,*
ESPECIALLY BED LOAD,
518 01:51:14:25 01:51:18:02 *AS WELL AS WATER FLOW,*
MUST BE KEPT IN CHECK.
519 01:51:20:25 01:51:22:12 *WITH THIS IN MIND,*
520 01:51:22:14 01:51:25:24 *THE AUXILIARY STRUCTURE*
WAS STRATEGICALLY PLACED.
521 01:51:25:26 01:51:27:10 ONE OF THE GOALS
522 01:51:27:12 01:51:30:09 OF PLACING
THE AUXILIARY STRUCTURE
WHERE IT IS
523 01:51:30:11 01:51:32:00 IS TO INCREASE
THE SEDIMENTS
524 01:51:32:02 01:51:35:02 BEING DIVERTED
FROM THE MISSISSIPPI
TO THE ATCHAFALAYA.
525 01:51:35:04 01:51:37:23 ONE OF THE LESSONS
THAT WE LEARNED
526 01:51:37:25 01:51:39:25 WAS THAT
WE WEREN'T DIVERTING
527 01:51:39:27 01:51:41:25 THE SAME PROPORTION
OF SEDIMENTS
528 01:51:41:27 01:51:44:10 THROUGH THE

LOW SILL STRUCTURE
529 01:51:44:12 01:51:45:24 AS WE WERE WATER.
530 01:51:45:26 01:51:47:08 THE MISSISSIPPI RIVER
531 01:51:47:10 01:51:49:24 WAS CONTINUING
TO SHOW EVIDENCE
532 01:51:49:26 01:51:51:24 THAT IT WANTED
TO FILL UP,
533 01:51:51:26 01:51:54:22 AND THE ATCHAFALAYA WAS
CONTINUING TO SCOUR.
534 01:51:54:24 01:51:57:07 WE FELT IF WE
INCREASED THE SEDIMENTS
535 01:51:57:09 01:51:59:08 BEING DIVERTED HERE
AT OLD RIVER,
536 01:51:59:10 01:52:01:23 WE WOULD ACTUALLY
TRY TO STABILIZE
537 01:52:01:25 01:52:04:08 THE MISSISSIPPI RIVER
AND THE ATCHAFALAYA
RIVER,
538 01:52:04:10 01:52:07:07 AT LEAST SLOW THE TREND
IN THE ATCHAFALAYA.
539 01:52:07:09 01:52:09:07 SO WE LOCATED
THE AUXILIARY STRUCTURE
540 01:52:09:09 01:52:11:07 ON THE INSIDE OF A BEND
541 01:52:11:09 01:52:13:07 WHERE THERE'S
ACTUALLY MORE SEDIMENTS.
542 01:52:13:09 01:52:15:23 WE ANGLED IT SO WE'D
GET THE SEDIMENTS
543 01:52:15:25 01:52:17:22 MOVING ALONG
THE RIVER BOTTOM.
544 01:52:17:24 01:52:19:09 THESE SEDIMENTS WOULD GO
545 01:52:19:11 01:52:22:07 INTO THE INFLOW CHANNEL
OF THE AUXILIARY
STRUCTURE,
546 01:52:22:09 01:52:23:22 THROUGH THE STRUCTURE,
547 01:52:23:24 01:52:26:06 AND ON DOWN
TO THE ATCHAFALAYA.
548 01:52:28:09 01:52:31:23 *LIFE AROUND OLD RIVER*
IS GENERALLY PEACEFUL NOW.
549 01:52:33:27 01:52:36:08 *EVEN MORE IMPORTANT,*
550 01:52:36:10 01:52:40:14 *THE WORLD BELOW OLD RIVER*
CARRIES ON NORMALLY.
551 01:52:40:16 01:52:45:06 *MANY HERE ARE UNAWARE OF*
THEIR UPSTREAM FORTRESS.
552 01:52:45:08 01:52:49:07 *IT WOULD TAKE*
AN EXTRAORDINARY
AMOUNT OF WATER
553 01:52:49:09 01:52:50:23 *TO TEST THESE STRUCTURES*
554 01:52:50:25 01:52:54:00 *AND THE WILL OF THE*
ARMY CORPS OF ENGINEERS,
555 01:52:54:02 01:52:57:20 *BUT RIVERS ARE CAPABLE*
OF EXTRAORDINARY THINGS.
556 01:52:59:29 01:53:01:26 OUR ABILITY
TO CONTROL NATURE,
557 01:53:01:28 01:53:04:26 PARTICULARLY OUR ABILITY
TO CONTROL RIVERS IS LIMITED.
558 01:53:04:28 01:53:07:26 WE MAY BE SUCCESSFUL

FOR A SHORT PERIOD
OF TIME--

559 01:53:07:28 01:53:11:13 A YEAR, 5 YEARS, 10,
MAYBE EVEN 25 YEARS,

560 01:53:11:15 01:53:14:05 BUT THERE'S ALWAYS
A LARGER FLOOD OUT THERE.

561 01:53:14:07 01:53:17:05 THERE'S ALWAYS
A BIGGER WINDSTORM
OR HIGHER WAVES

562 01:53:17:07 01:53:19:20 THAN THE ONES
WE'VE ENCOUNTERED BEFORE.

563 01:53:19:22 01:53:22:05 WHEN WE PLACE OURSELVES
AND OUR LIVES

564 01:53:22:07 01:53:24:04 IN THE PATHS
OF THESE PROCESSES,

565 01:53:24:06 01:53:27:22 WE CAN EXPECT TO SEE
THE ADVERSE EFFECTS.

566 01:53:27:24 01:53:30:05 *SINCE ITS BEGINNINGS,*

567 01:53:30:07 01:53:33:17 *CIVILIZATION HAS FLOCKED*
TO THE RIVERSIDE,

568 01:53:33:19 01:53:36:19 *AND THERE HAS ALWAYS*
BEEN A PRICE TO PAY

569 01:53:36:21 01:53:38:01 *AS A RESULT.*

570 01:53:38:03 01:53:40:29 *BUT EVEN WITH*
THEIR POWER TO DESTROY,

571 01:53:41:01 01:53:42:21 *RIVERS HAVE GIVEN BACK.*

572 01:53:42:23 01:53:46:20 *THEY HAVE CRADLED THE LIFE*
IN AND AROUND THEIR BANKS

573 01:53:46:22 01:53:50:05 *AND CARVED OUT LANDSCAPES*
WHICH ARE LEGACIES

574 01:53:50:07 01:53:52:04 *TO THEIR POWER AND MIGHT.*

575 01:53:53:19 01:53:55:18 *TODAY AS ALWAYS,*

576 01:53:55:20 01:53:58:19 *RUNNING WATER IS ONE OF THE*
MOST SIGNIFICANT SCULPTORS

577 01:53:58:21 01:54:00:19 *OF EARTH'S TERRAIN.*

578 01:54:00:21 01:54:02:18 *ITS EFFECTS*
ARE VIRTUALLY EVERYWHERE,

579 01:54:02:20 01:54:05:18 *EVEN IN PLACES WHICH*
APPEAR TO BE DOMINATED

580 01:54:05:20 01:54:07:18 *BY OTHER GEOLOGIC FORCES.*

581 01:54:07:20 01:54:11:03 *INDEED, THE LAND FORMS*
RUNNING WATER CREATES

582 01:54:11:05 01:54:12:18 *AND LEAVES BEHIND*

583 01:54:12:20 01:54:16:11 *ARE AN ENDURING TESTAMENT*
TO ITS POWER.

584 01:54:16:13 01:54:18:19 THE SEQUENCE OF EVENTS
THAT TAKES PLACE

585 01:54:18:21 01:54:20:19 IN THE EVOLUTION
OF LANDSCAPES

586 01:54:20:21 01:54:22:04 IS NOT COMPLETELY
UNDERSTOOD.

587 01:54:22:06 01:54:25:18 THIS IS BECAUSE
THE PROCESSES THAT
SHAPE THE LAND'S SURFACE

588 01:54:25:20 01:54:28:18 OPERATE VERY SLOWLY
ON A HUMAN TIME SCALE.

589 01:54:28:20 01:54:32:19 BUT THERE'S NO DOUBT
THAT RUNNING WATER
PLAYS A SIGNIFICANT ROLE.
590 01:54:32:21 01:54:35:19 LAND FORMS THAT HAVE BEEN
SHAPED BY RUNNING WATER
591 01:54:35:21 01:54:38:18 ARE FOUND IN NEARLY EVERY
TERRESTRIAL ENVIRONMENT
ON EARTH.
592 01:54:38:20 01:54:40:18 THEY'RE EVEN ABUNDANT
IN DESERTS,
593 01:54:40:20 01:54:43:03 WHERE SUDDEN RAINSTORMS
AND FLASH FLOODS
594 01:54:43:05 01:54:46:17 CAN PRODUCE MORE
GEOMORPHIC CHANGE
IN A FEW HOURS
595 01:54:46:19 01:54:48:13 THAN YEARS
OF DESERT WINDS.
596 01:54:48:15 01:54:52:03 BUT THERE WOULD BE
NO RUNNING WATER
WITHOUT SLOPES.
597 01:54:52:05 01:54:55:02 LAND SLOPES ARE BOTH
CREATED AND MAINTAINED
598 01:54:55:04 01:54:56:17 BY TECTONIC ACTIVITY.
599 01:54:56:19 01:54:59:16 INDEED, THE SHAPE OF MUCH
OF THE EARTH'S SURFACE
600 01:54:59:18 01:55:02:16 IS THE RESULT OF
A CONSTANT COMPETITION
601 01:55:02:18 01:55:04:01 BETWEEN TECTONIC FORCES
602 01:55:04:03 01:55:06:16 AND THE DESTRUCTIVE EFFECTS
OF RUNNING WATER.
603 01:55:06:18 01:55:09:16 NOWHERE IS THIS DUEL BETWEEN
TECTONISM AND RUNNING WATER
604 01:55:09:18 01:55:11:02 EASIER TO APPRECIATE
605 01:55:11:04 01:55:13:02 THAN HERE
AT THE GRAND CANYON,
606 01:55:13:04 01:55:16:01 WHERE THE COLORADO RIVER
CONTINUES TO SUSTAIN
THE EVOLUTION
607 01:55:16:03 01:55:18:01 OF ONE OF
THE MOST BEAUTIFUL
608 01:55:18:03 01:55:20:17 AND DISTINCTIVE
LANDSCAPES ON EARTH.
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