A scenic view of a pond with a wooden dock, trees, and ducks. The water is calm, reflecting the surrounding greenery. A wooden dock extends into the water on the left. Several trees with green leaves are visible in the background. A duck is swimming in the water on the right, and another is on the grassy bank. The overall scene is peaceful and natural.

Irrigated Lands:
Determining
Reductions for Non-Irrigated
Inclusions

Contor
ESHMC Meeting
August 2008

GOAL FOR MODELING

- Correct representation of irrigated lands for all stress periods
 - location
 - geometry
 - size

GOAL FOR MODELING

- Correct representation of irrigated lands for all stress periods
 - location ✓
 - geometry
 - size
 - correct size ✓
 - *consistency* in size ✓

ESPAM1.1

- Three data sources were available
 - 1980 LANDSAT classification (IDWR/USGS for RASA)
 - 1992 classification of 86-92 photos (IDWR/BOR)
 - 2000 LANDSAT classification (IDWR)
- Actual differences confounded by differences in methods
- We used 1992 data set for all periods

A serene landscape featuring a calm pond in the foreground, a wooden dock extending into the water, and a lush green shoreline with several trees. The scene is reflected in the water, creating a peaceful and natural atmosphere.

ESPAM2 Proposal

- Use all the data sets
- Use "reduction for non-irrigated inclusions" to normalize to common acreage basis

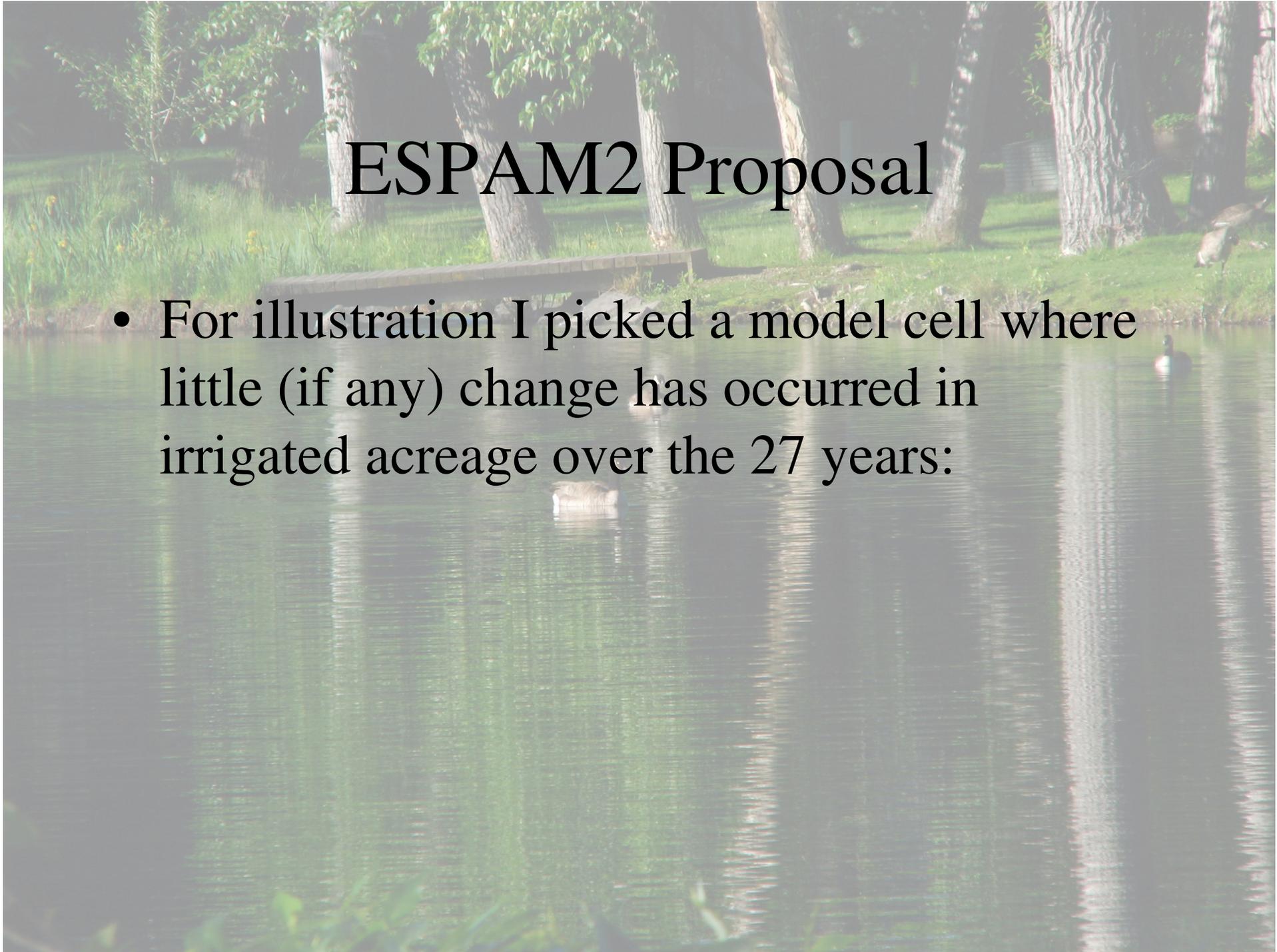
A serene landscape featuring a calm pond in the foreground, a wooden dock extending into the water, and a lush green shoreline with several trees. The scene is peaceful and natural.

ESPAM2 Proposal

- Use all the data sets
 - three mentioned previously
 - 1986 LANDSAT/NDVI pixels to be constructed by IDWR
 - 1996 LANDSAT/NDVI pixels to be constructed by IDWR
 - 2006 USDA CLU polygons scored "irr/non-irr" using 2006 LANDSAT/NDVI pixels. Under construction by IDWR.

ESPAM2 Proposal

- For illustration I picked a model cell where little (if any) change has occurred in irrigated acreage over the 27 years:





ew1

Base_87_cells.shp

Doqq_postreview.shp

Irr_92_for_compare.shp

Samplelocations.shp

Irr_2006

- 0
- 1
- No Data

Irr2000_all_idtm83.shp

Theme7.shp

Theme6.shp

Irr_92.shp

Naip06_clark_idwr.sid

2004_clark_usda.sid

2001_n44w1124_spot.tif

98_44112a3ne_usgs.bil

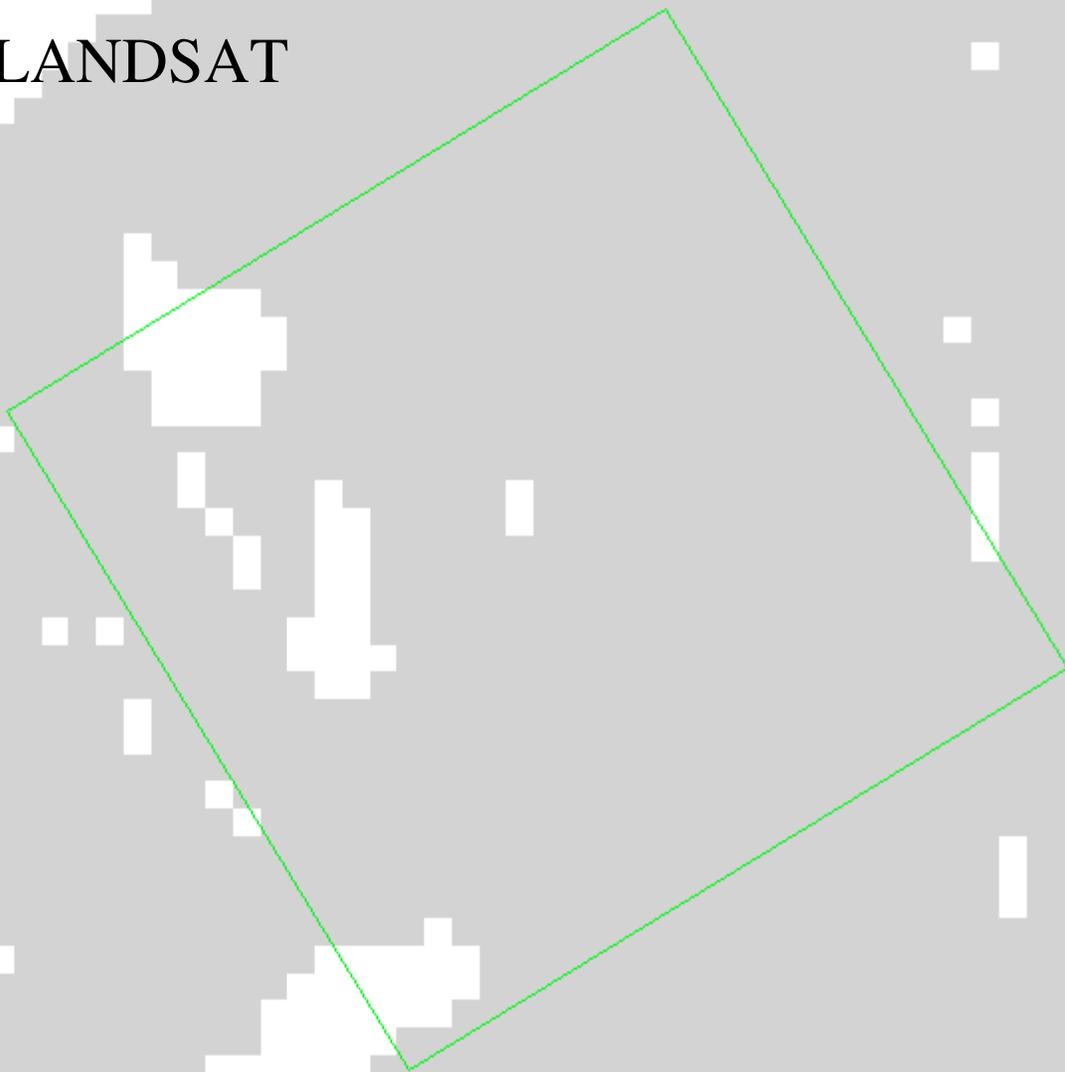
92_44112a2nw_usgs.bil

Basin31.sid

Irr80_rasa.shp

80-155-178.tif

1980 LANDSAT



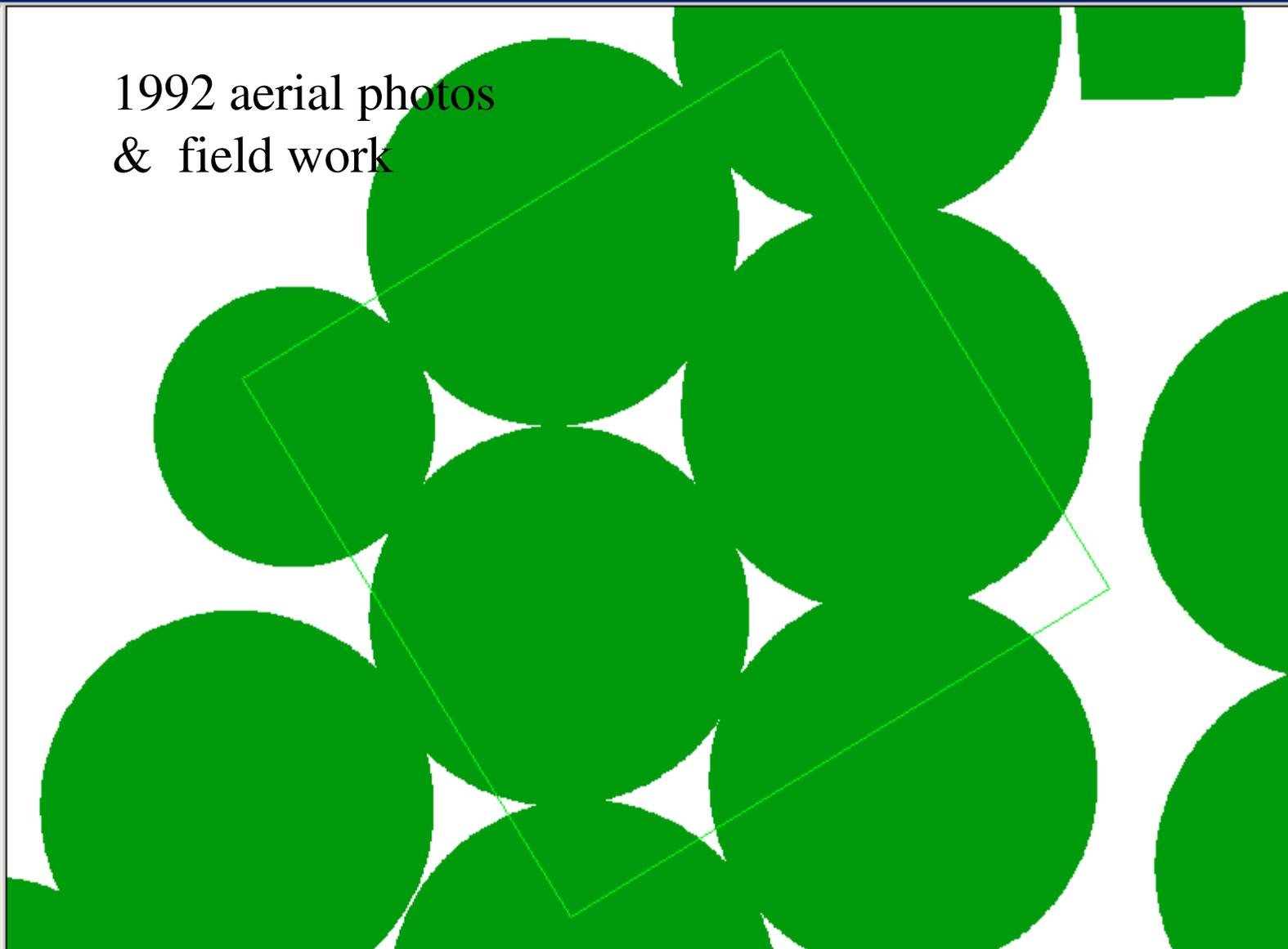


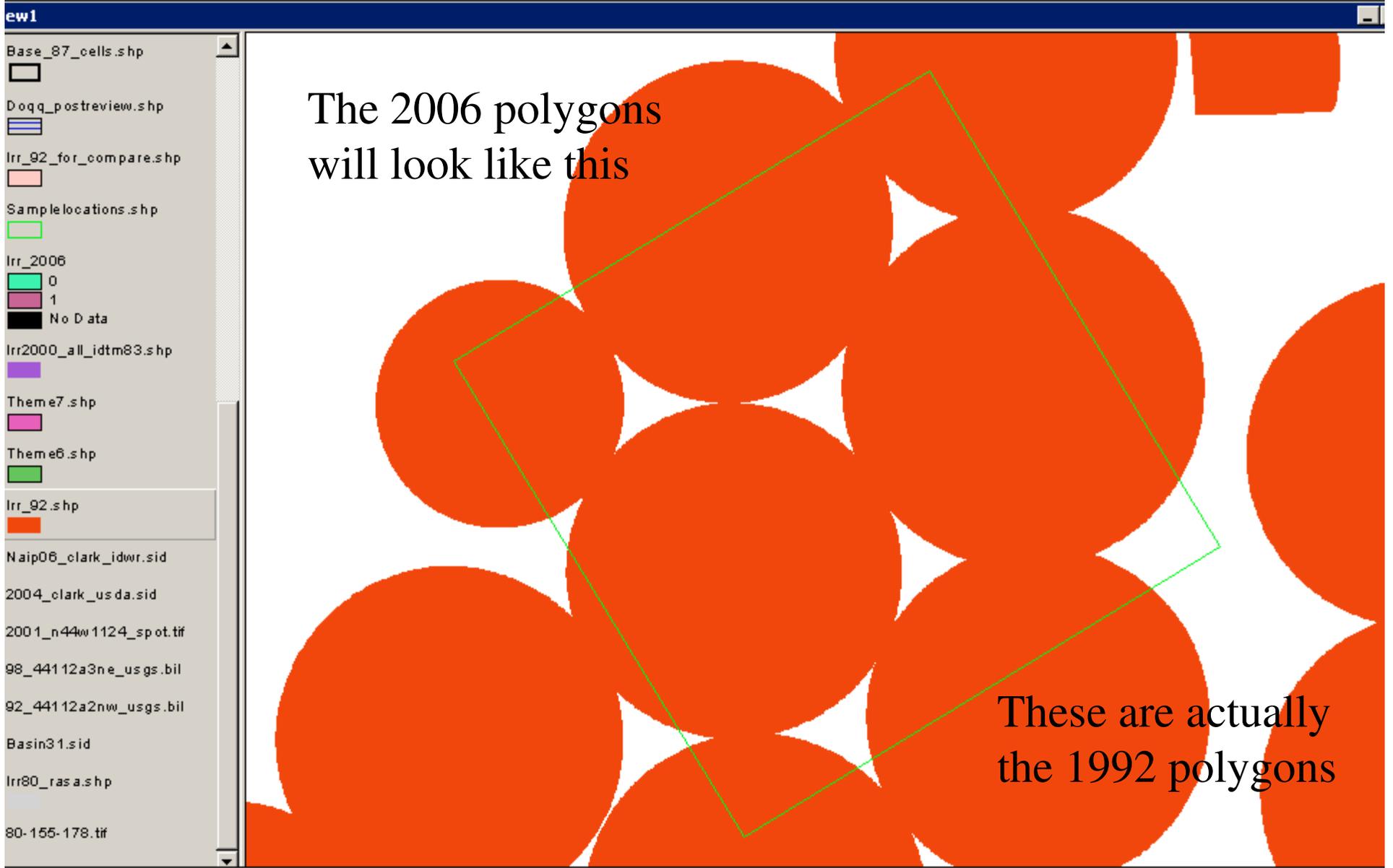


ew1

- Base_87_cells.shp
- Doqq_postreview.shp
- Irr_92_for_compare.shp
- Samplelocations.shp
- Irr_2006
 - 0
 - 1
 - No Data
- Irr2000_all_idtm83.shp
- Theme7.shp
- Theme6.shp
- Irr_92.shp
- Naip06_clark_idwr.sid
- 2004_clark_usda.sid
- 2001_n44w1124_spot.tif
- 98_44112a3ne_usgs.bil
- 92_44112a2nw_usgs.bil
- Basin31.sid
- Irr80_rasa.shp
- 80-155-178.tif

1992 aerial photos
& field work



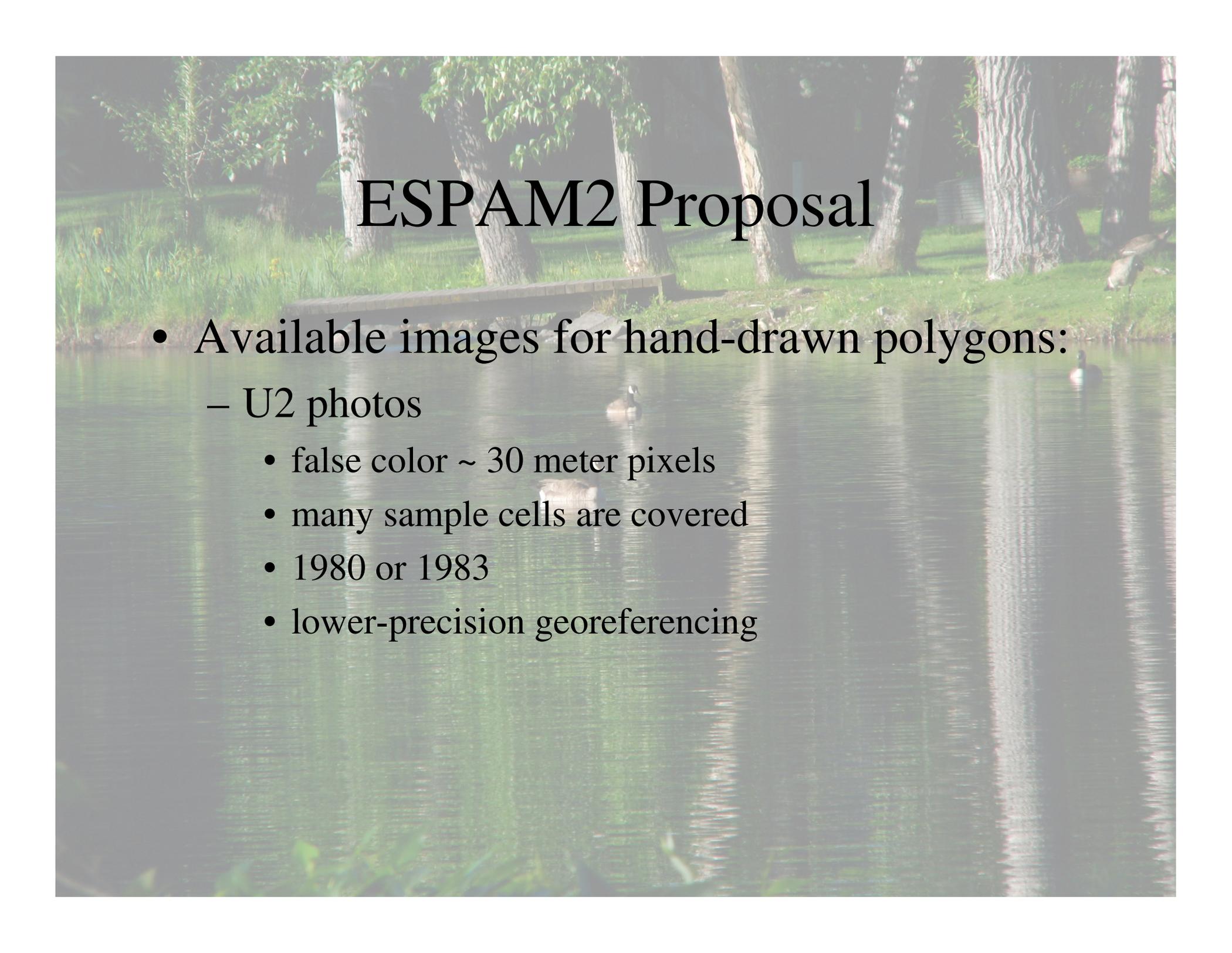


ESPAM2 Proposal

- Use "reduction for non-irrigated inclusions" to normalize to common acreage basis
 - statistical sample of cells
 - $(\text{Ratio}) = (\text{actual acres}) / (\text{data-set acres})$
 - $\text{RED} = (1 - \text{Ratio})$

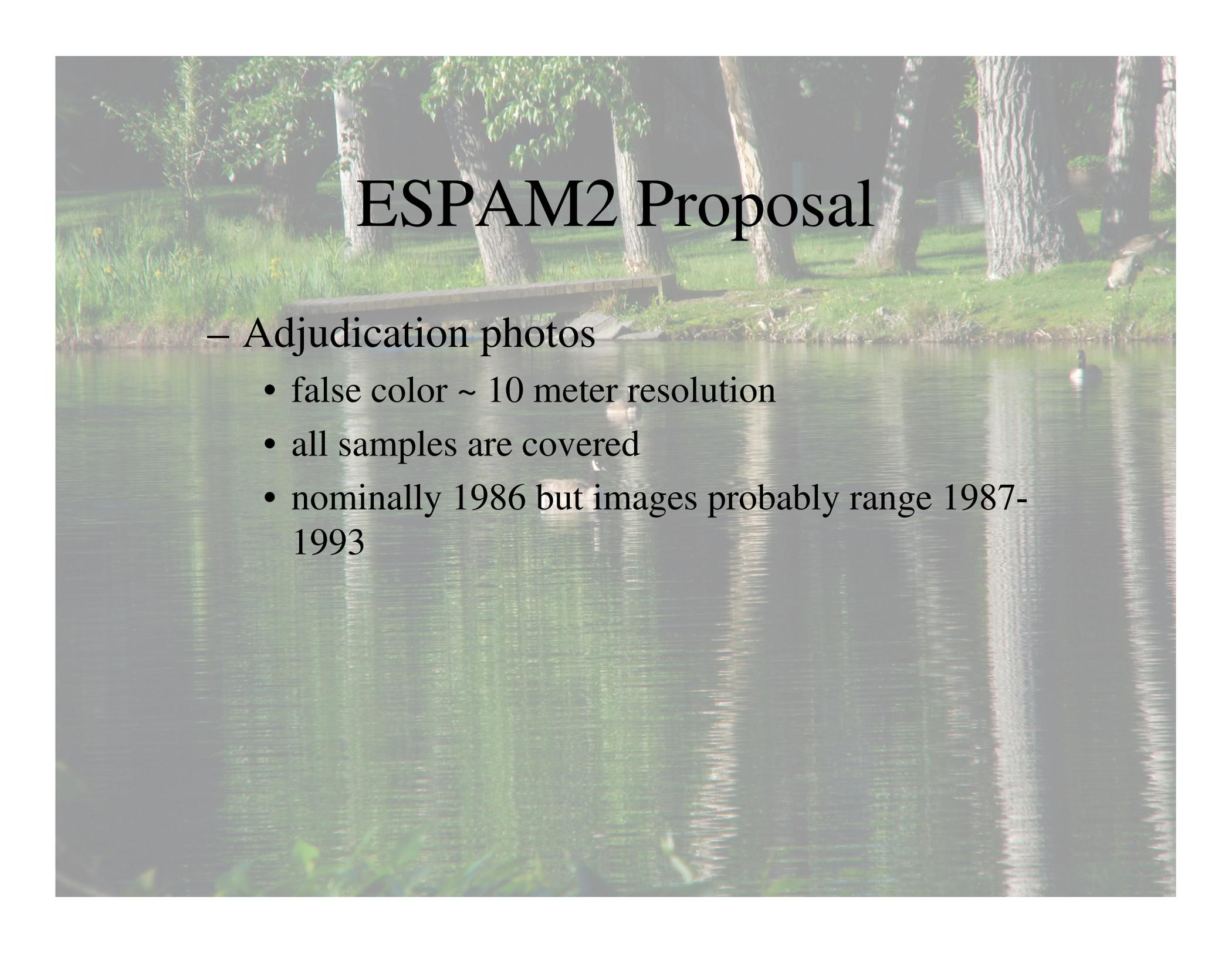
ESPAM2 Proposal

- If we *knew* actual acres we wouldn't need to do this exercise
- We propose using hand-drawn polygons from aerial imagery as a proxy for actual acres
 - (actual acres) ~ (hand-drawn acres)



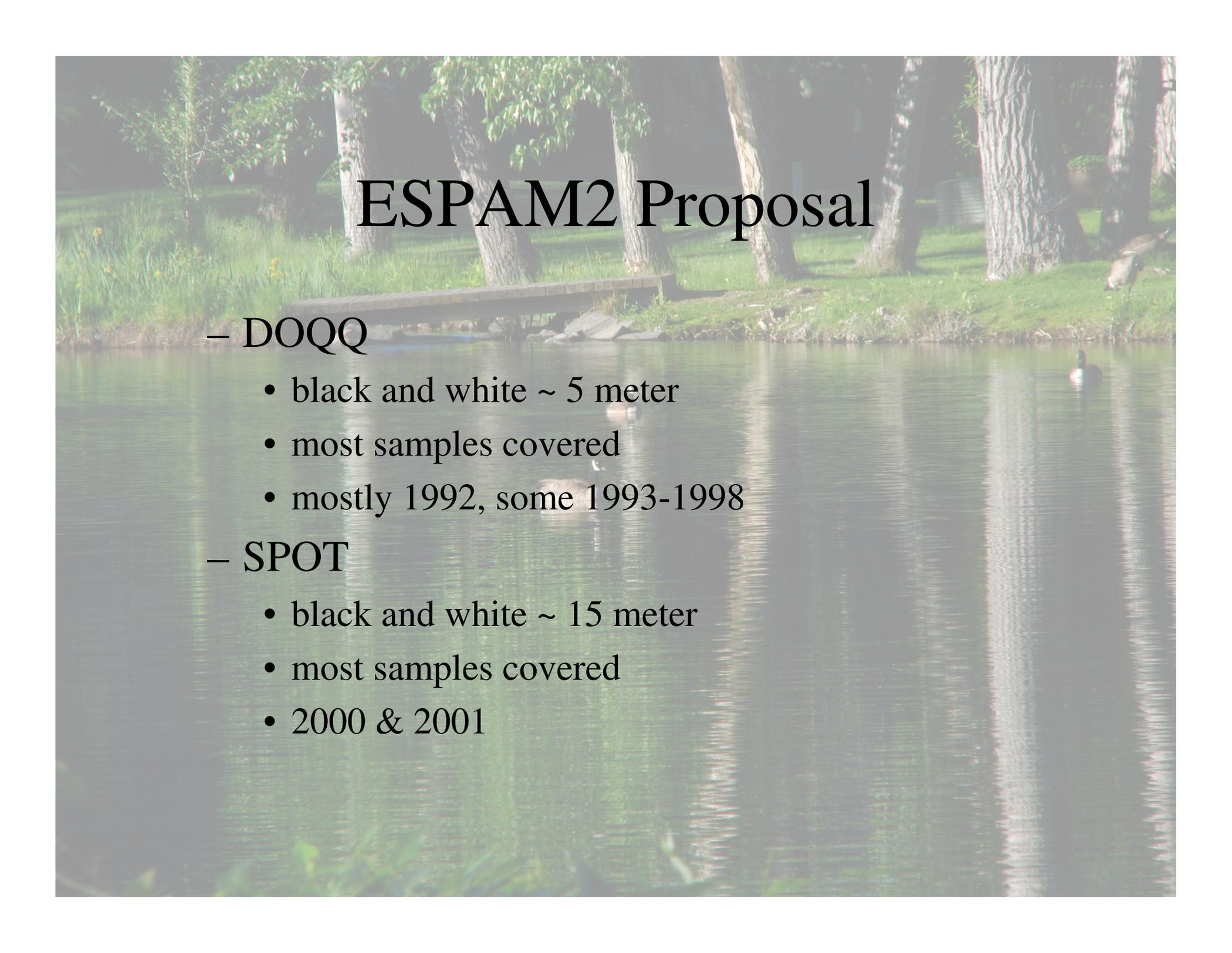
ESPAM2 Proposal

- Available images for hand-drawn polygons:
 - U2 photos
 - false color ~ 30 meter pixels
 - many sample cells are covered
 - 1980 or 1983
 - lower-precision georeferencing

A serene landscape photograph of a pond. In the foreground, the water is calm, reflecting the surrounding greenery. A wooden dock extends from the left side into the water. The background is filled with lush green trees and grass. A few ducks are visible in the water and on the grassy bank. The overall scene is peaceful and natural.

ESPAM2 Proposal

- Adjudication photos
 - false color ~ 10 meter resolution
 - all samples are covered
 - nominally 1986 but images probably range 1987-1993

A serene lake scene with a wooden dock extending into the water. The background is filled with lush green trees and grass. The water is calm, reflecting the surrounding greenery. A few ducks are visible in the water and on the grassy bank.

ESPAM2 Proposal

– DOQQ

- black and white ~ 5 meter
- most samples covered
- mostly 1992, some 1993-1998

– SPOT

- black and white ~ 15 meter
- most samples covered
- 2000 & 2001

A serene landscape photograph of a pond. In the foreground, the water is calm, reflecting the surrounding greenery. A wooden dock extends from the left side into the water. Several ducks are visible: one is on the grassy bank to the right, and two are swimming in the water. The background is filled with lush green trees and foliage, creating a peaceful natural setting.

ESPAM2 Proposal

– NAIP2004

- true color, 1 meter
- all samples covered
- 2004

– NAIP2006

- true color, 2 meter
- all samples covered
- 2006

A serene landscape featuring a calm pond in the foreground. The water reflects the surrounding greenery and trees. In the middle ground, a wooden dock extends into the water. The background is filled with lush green trees and grass. The overall scene is peaceful and natural.

ESPAM2 Proposal

– Gritty details

- image years don't match up perfectly with irrigated-lands data-set years

Year**Images****Irrigated Lands Data**

1980	U2 - some	RASA (omits Big Lost, Oakely, RexBench)
1981		
1982		
1983	U2 - few	
1984		
1985		
1986		NDVI (soon)
1987	AJ - all	
1988		
1989		
1990		
1991		
1992	DOQQ - many	Aerial Photo-based
1993	DOQQ - few	
1994		
1995		
1996		NDVI (eventually)
1997		
1998	DOQQ - few	
1999		
2000		LANDSAT
2001	SPOT - many	
2002		
2003		
2004	NAIP - all	
2005		
2006	NAIP - all	IDWR (soon)
2007		
2008		

ESPAM2 Proposal

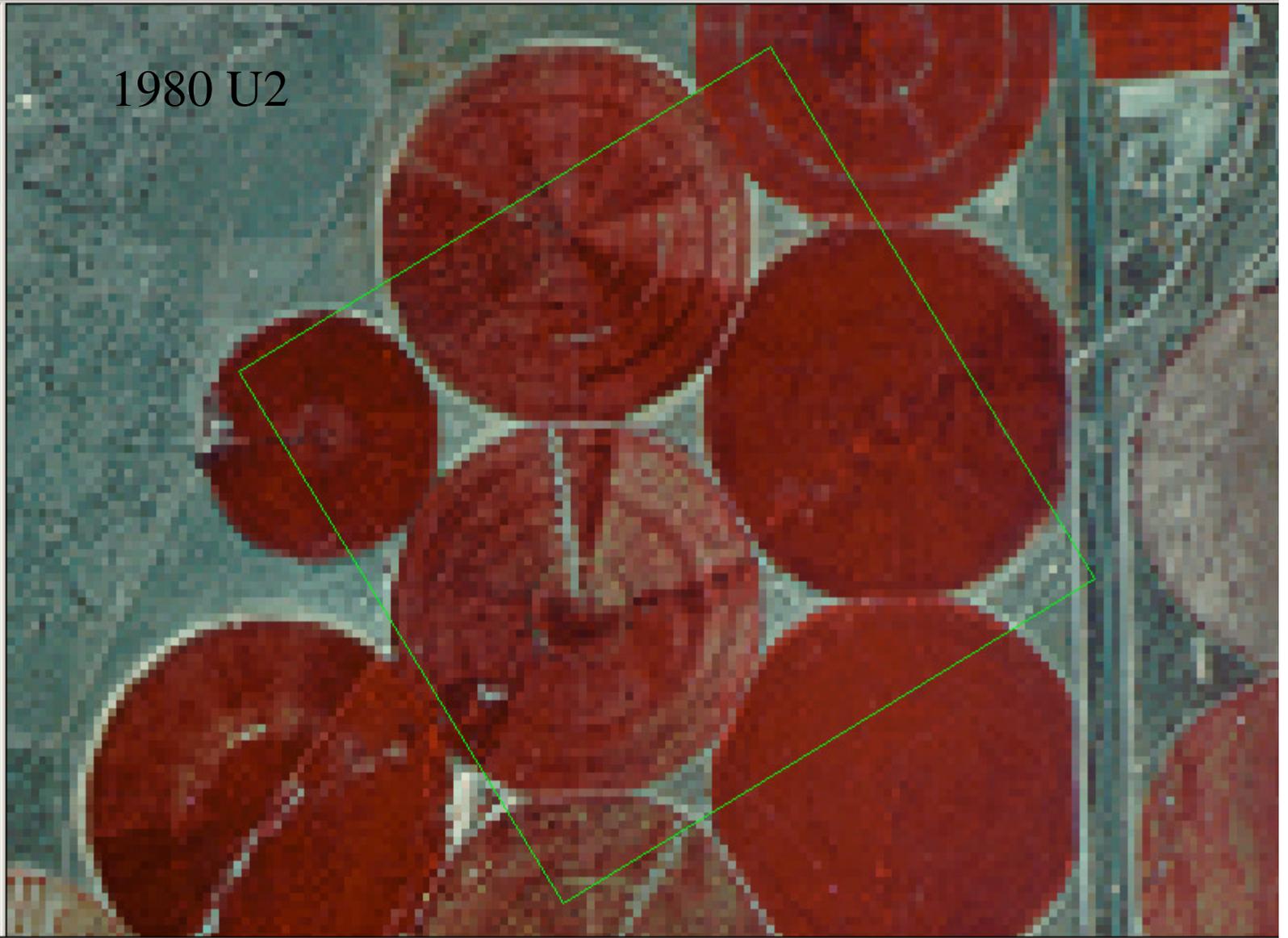
- Images vary in quality & characteristics (samples follow):





ew1

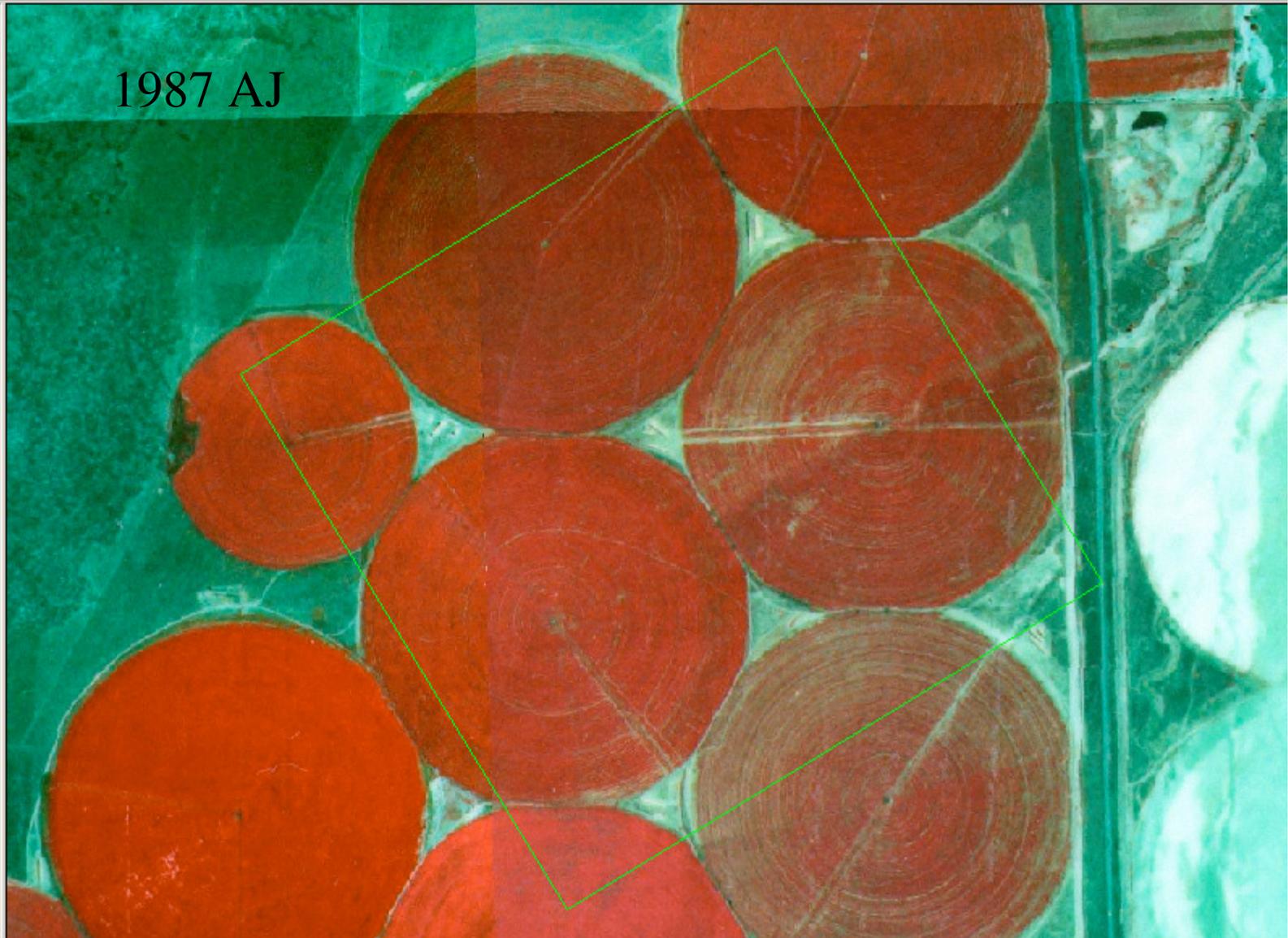
- Doqq_utm.shp
- Base_87_utm.shp
- Spot_utm.shp
- Spot_cells.shp
- Samplec_utm.shp
- Naip06_cells.shp
- Naip04_cells.shp
- Doqq_cells.shp
- U2_cells.shp
- Base_87_cells.shp
- Samplelocations.shp
- Naip06_clark_idwr.sid
- 2004_clark_usda.sid
- 2001_n44w1124_spot.tif
- 98_44112a3ne_usgs.bil
- 92_44112a2nw_usgs.bil
- Basin31.sid
- 80-155-178.tif





ew1

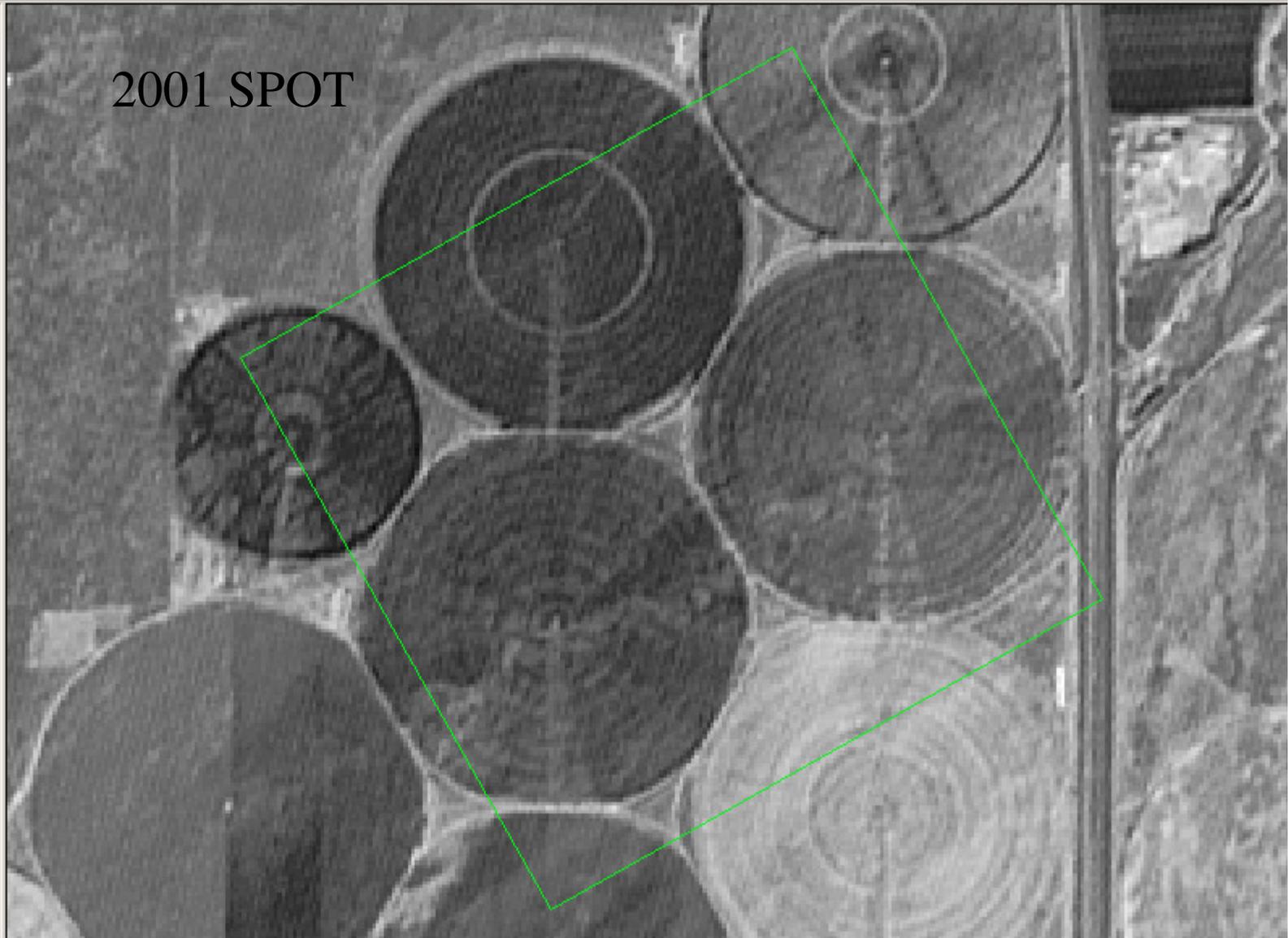
- Doqq_utm.shp
- Base_87_utm.shp
- Spot_utm.shp
- Spot_cells.shp
- Samplec_utm.shp
- Naip06_cells.shp
- Naip04_cells.shp
- Doqq_cells.shp
- U2_cells.shp
- Base_87_cells.shp
- Samplelocations.shp
- Naip06_clark_idwr.sid
- 2004_clark_usda.sid
- 2001_n44w1124_spot.tif
- 98_44112a3ne_usgs.bil
- 92_44112a2nw_usgs.bil
- Basin31.sid
- 80-155-178.tif





ew1

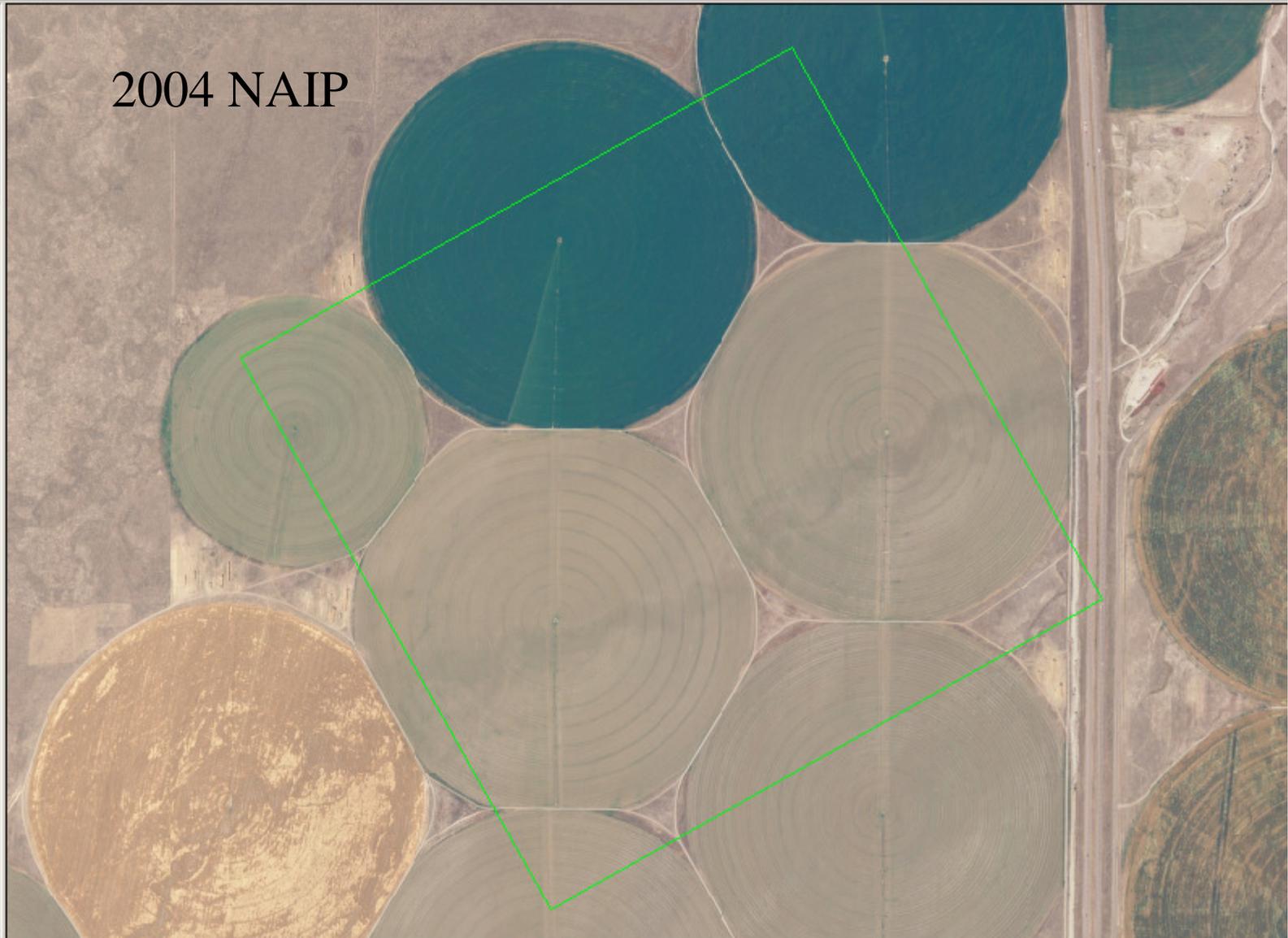
- Doqq_utm.shp ■
- Base_87_utm.shp ■
- Spot_utm.shp ■
- U2_cells.shp ■
- Spot_cells.shp ■
- Samplec_utm.shp ■
- Naip06_cells.shp ■
- Naip04_cells.shp ■
- Doqq_cells.shp ■
- Base_87_cells.shp ■
- Samplelocations.shp ■
- Naip06_clark_idwr.sid
- 2004_clark_us da.sid
- 2001_n44w1124_spot.tif
- 98_44112a3ne_usgs.bil
- 92_44112a2nw_usgs.bil
- Basin31.sid
- 80-155-178.tif





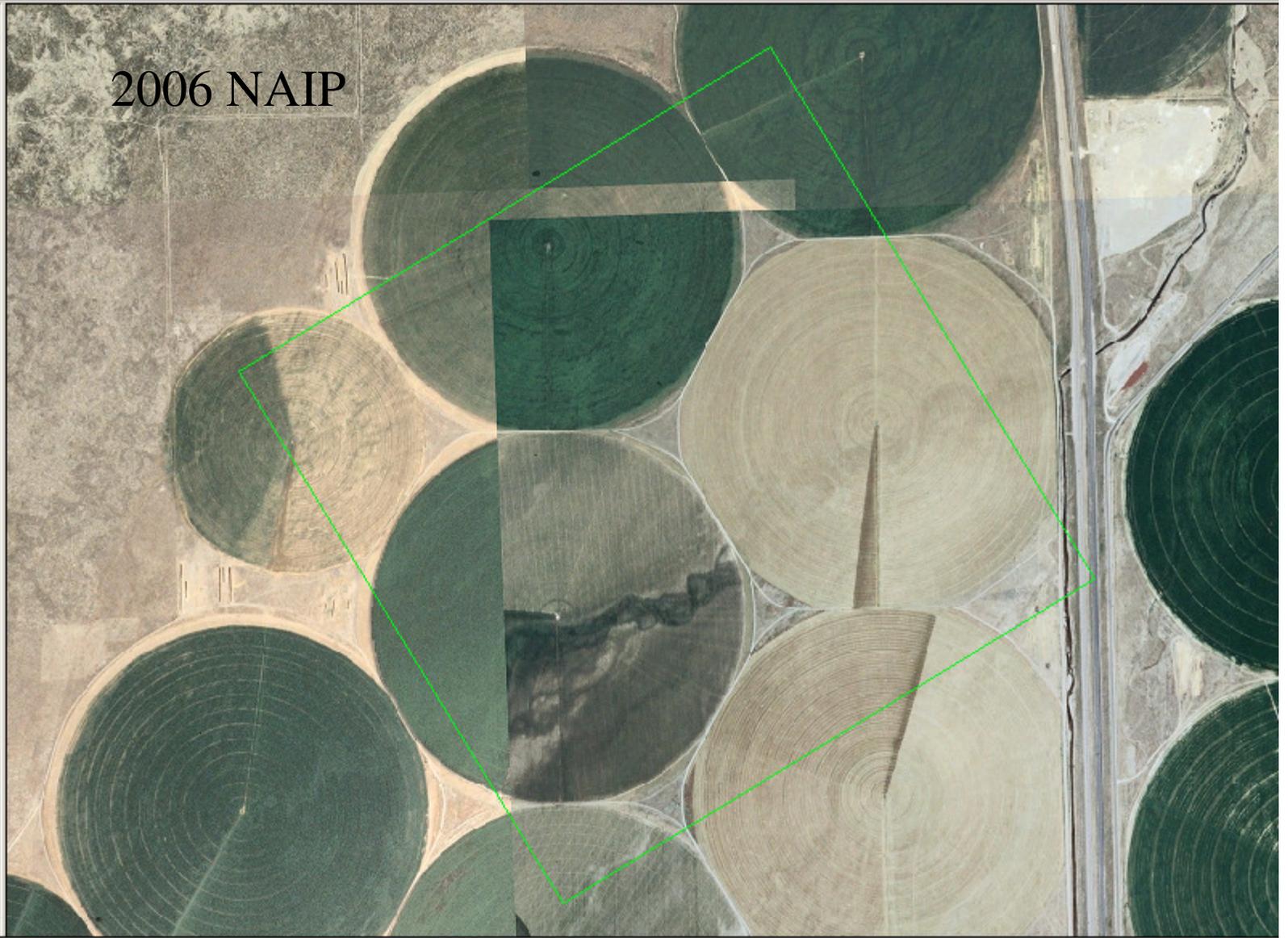
ew1

- Doqq_utm.shp ■
- Base_87_utm.shp ■
- Spot_utm.shp ■
- U2_cells.shp ■
- Spot_cells.shp ■
- Sampleloc_utm.shp ■
- Naip06_cells.shp ■
- Naip04_cells.shp ■
- Doqq_cells.shp ■
- Base_87_cells.shp ■
- Samplelocations.shp ■
- Naip06_clark_idwr.sid
- 2004_clark_us da.sid
- 2001_n44w1124_spot.tif
- 98_44112a3ne_usgs.bil
- 92_44112a2nw_usgs.bil
- Basin31.sid
- 80-155-178.tif





- ew1
- Doq_index.shp
- U2_utm.shp
- Naip06_utm.shp
- Naip04_utm.shp
- Doqq_utm.shp
- Base_87_utm.shp
- Spot_utm.shp
- U2_cells.shp
- Spot_cells.shp
- Samplec_utm.shp
- Naip06_cells.shp
- Naip04_cells.shp
- Doqq_cells.shp
- Base_87_cells.shp
- Samplelocations.shp
- Naip06_clark_idwr.sid
- 2004_clark_usda.sid



Goal of hand-drawn polygons

- Get acreage approximately right
 - any systematic error in drawing will be compensated in calculation of ET adjustment factors
 - random errors will self cancel

A serene landscape featuring a calm pond in the foreground, a wooden dock extending into the water, and a line of trees with green foliage in the background. The scene is peaceful and natural.

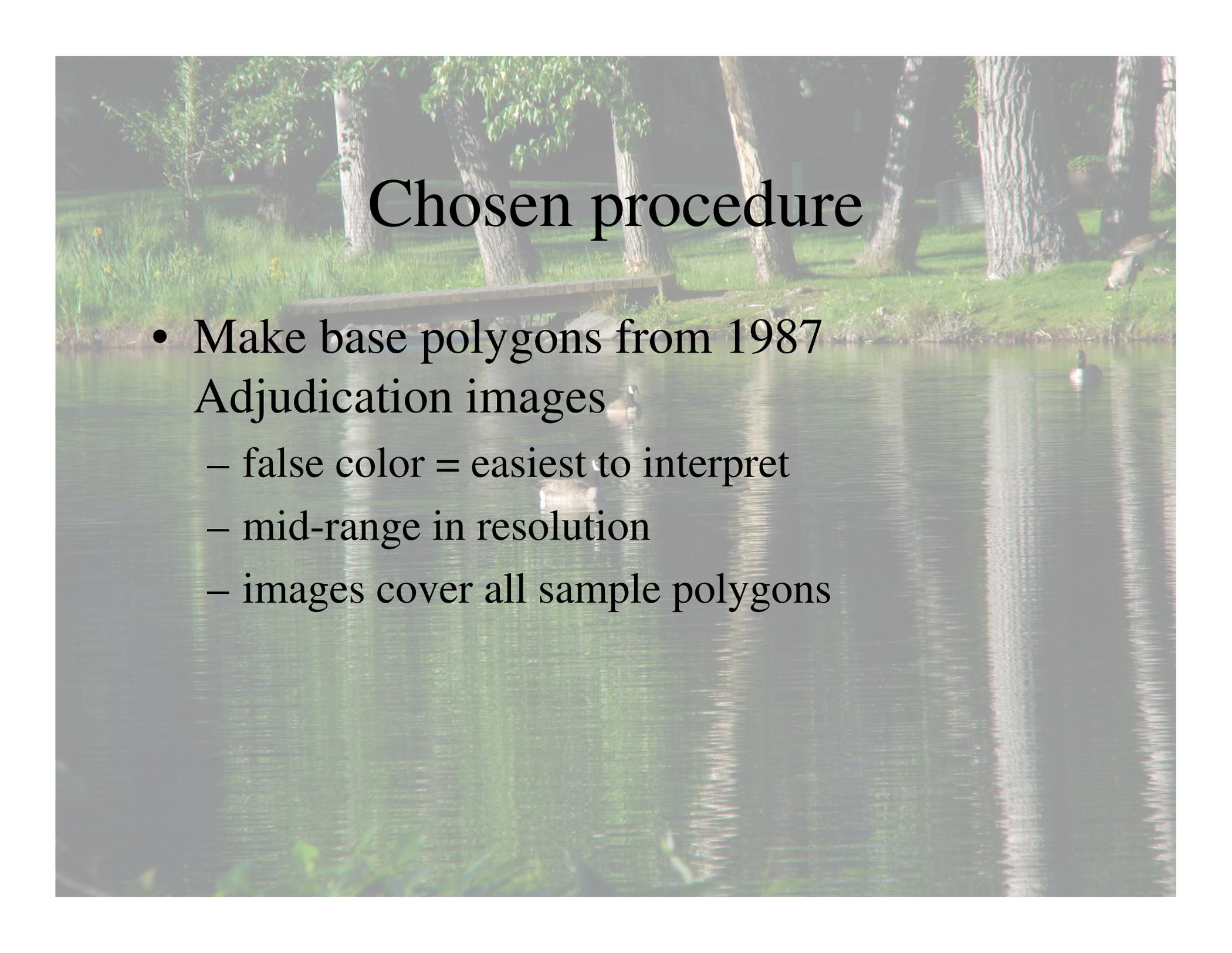
Goal of hand-drawn polygons

- **BE CONSISTENT IMAGE-TO-IMAGE**
 - if parcel didn't change, acres shouldn't
 - if parcel did change, acres should
 - "100 acres" should mean the same on the ground in hand-drawn polygons for all images
 - ET adjustment **can't** compensate for image-to-image errors because we won't have enough METRIC years to cover all image years

A serene landscape featuring a calm pond in the foreground. The water reflects the surrounding greenery and trees. In the middle ground, a wooden dock extends into the water. Several ducks are visible: one is swimming in the pond, another is on the grassy bank to the right, and a third is partially visible on the far right. The background is filled with lush green trees and foliage, creating a peaceful, natural setting.

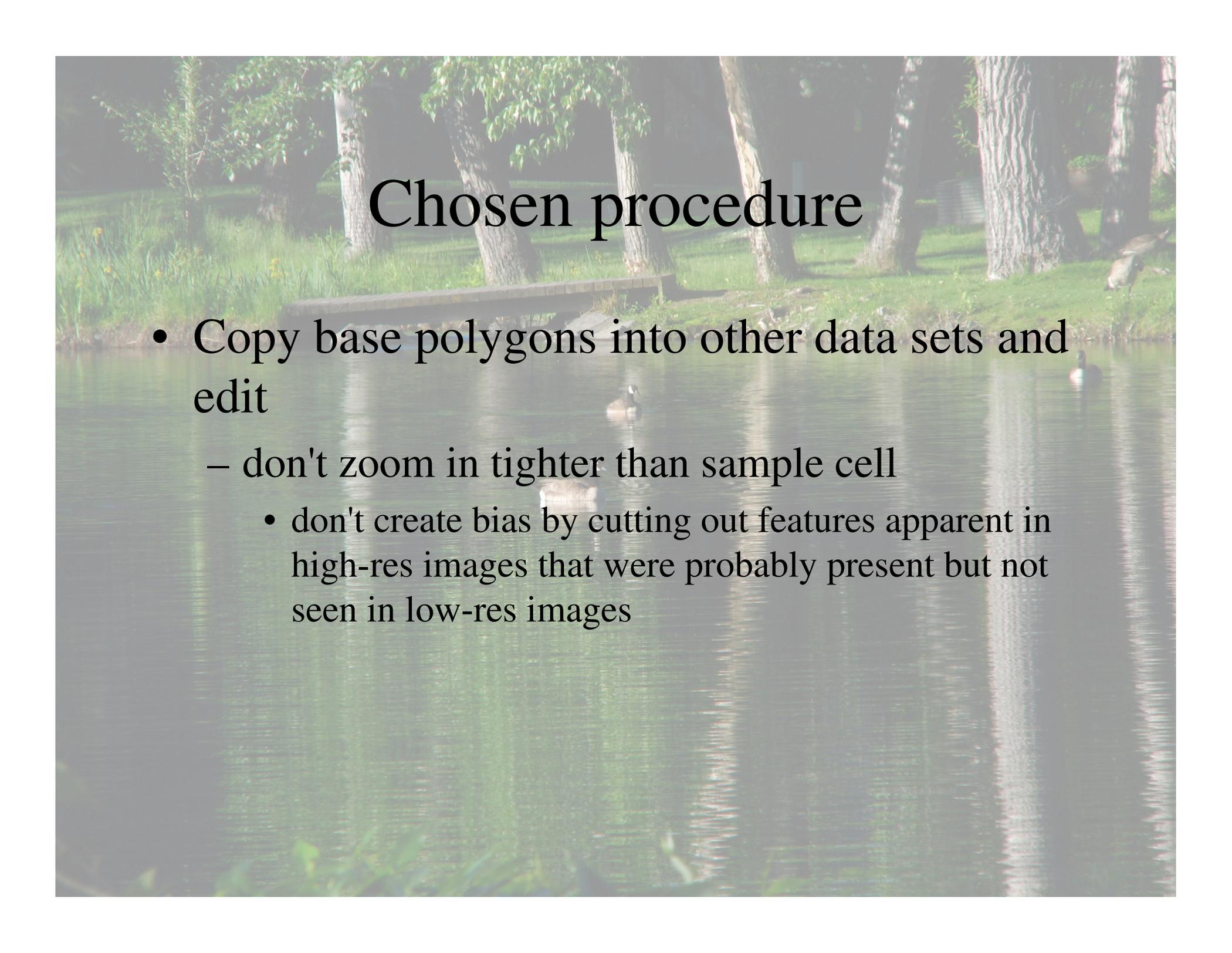
Issues to worry about

- resolution
 - inclusions
 - boundary geometry
- color interpretation
 - are inclusions irrigated or not

A serene landscape photograph of a pond. In the foreground, a wooden dock extends into the water. The water is calm, reflecting the surrounding greenery and trees. Several ducks are visible in the pond. The background is filled with lush green trees and grass. The overall scene is peaceful and natural.

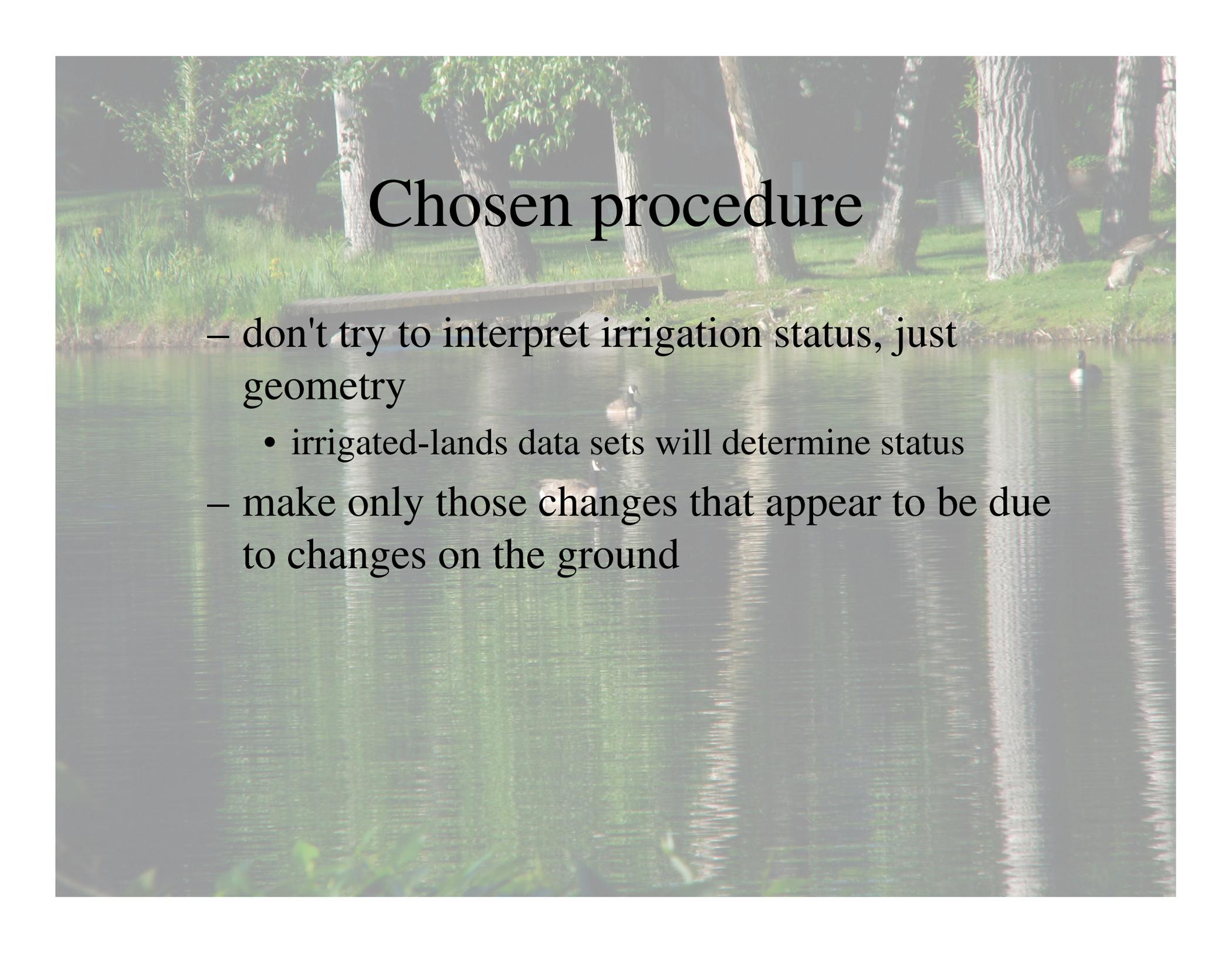
Chosen procedure

- Make base polygons from 1987 Adjudication images
 - false color = easiest to interpret
 - mid-range in resolution
 - images cover all sample polygons

A serene landscape featuring a calm pond in the foreground, a wooden dock extending into the water, and a lush green shoreline with several trees. The scene is captured in a soft, slightly desaturated light, creating a peaceful atmosphere. The text 'Chosen procedure' is overlaid on the upper portion of the image.

Chosen procedure

- Copy base polygons into other data sets and edit
 - don't zoom in tighter than sample cell
 - don't create bias by cutting out features apparent in high-res images that were probably present but not seen in low-res images

A serene landscape featuring a calm pond in the foreground, a wooden dock extending into the water, and a lush green background with several trees and a grassy area. The scene is peaceful and natural.

Chosen procedure

- don't try to interpret irrigation status, just geometry
 - irrigated-lands data sets will determine status
- make only those changes that appear to be due to changes on the ground

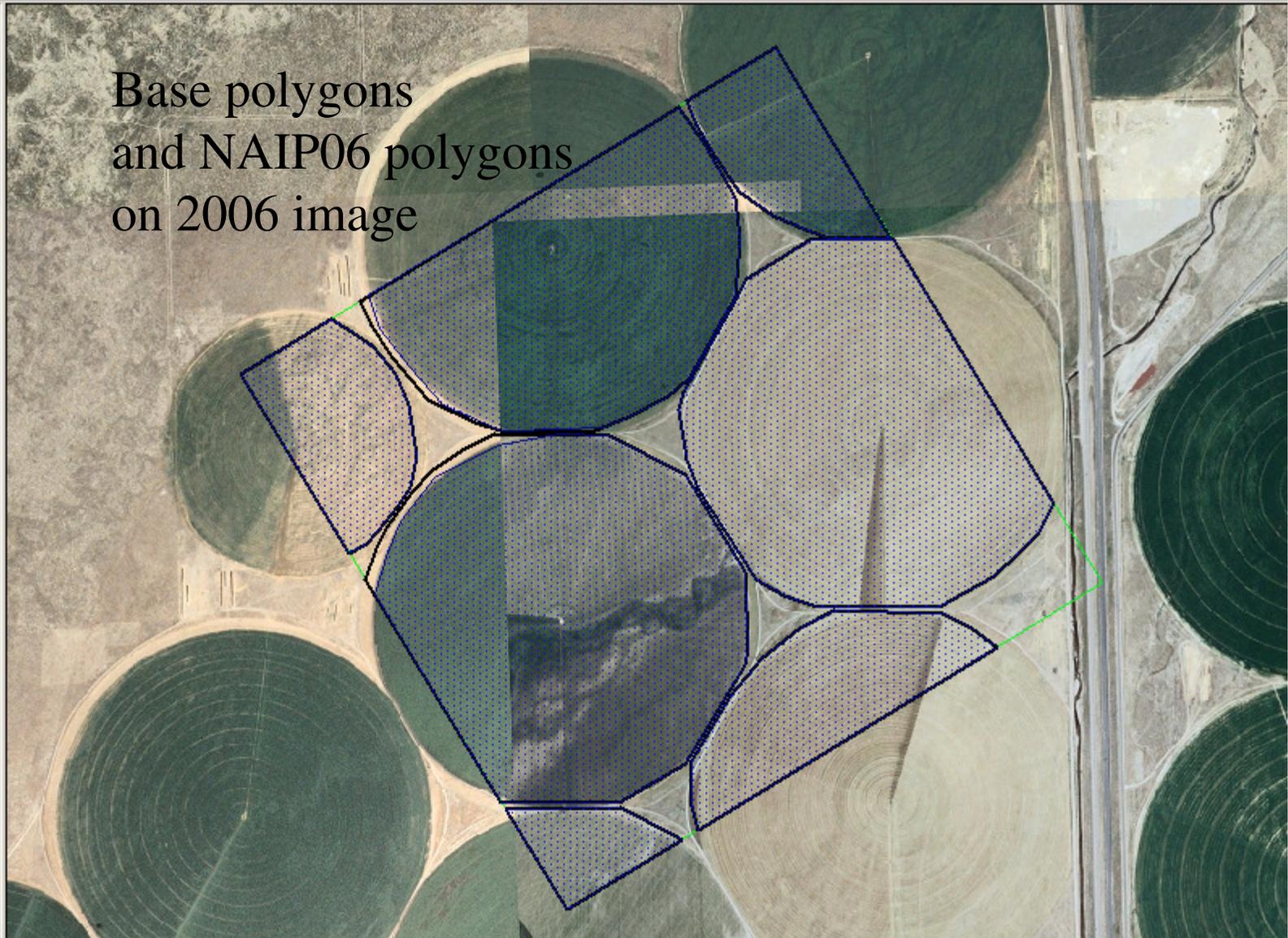
Illustrations & discussion

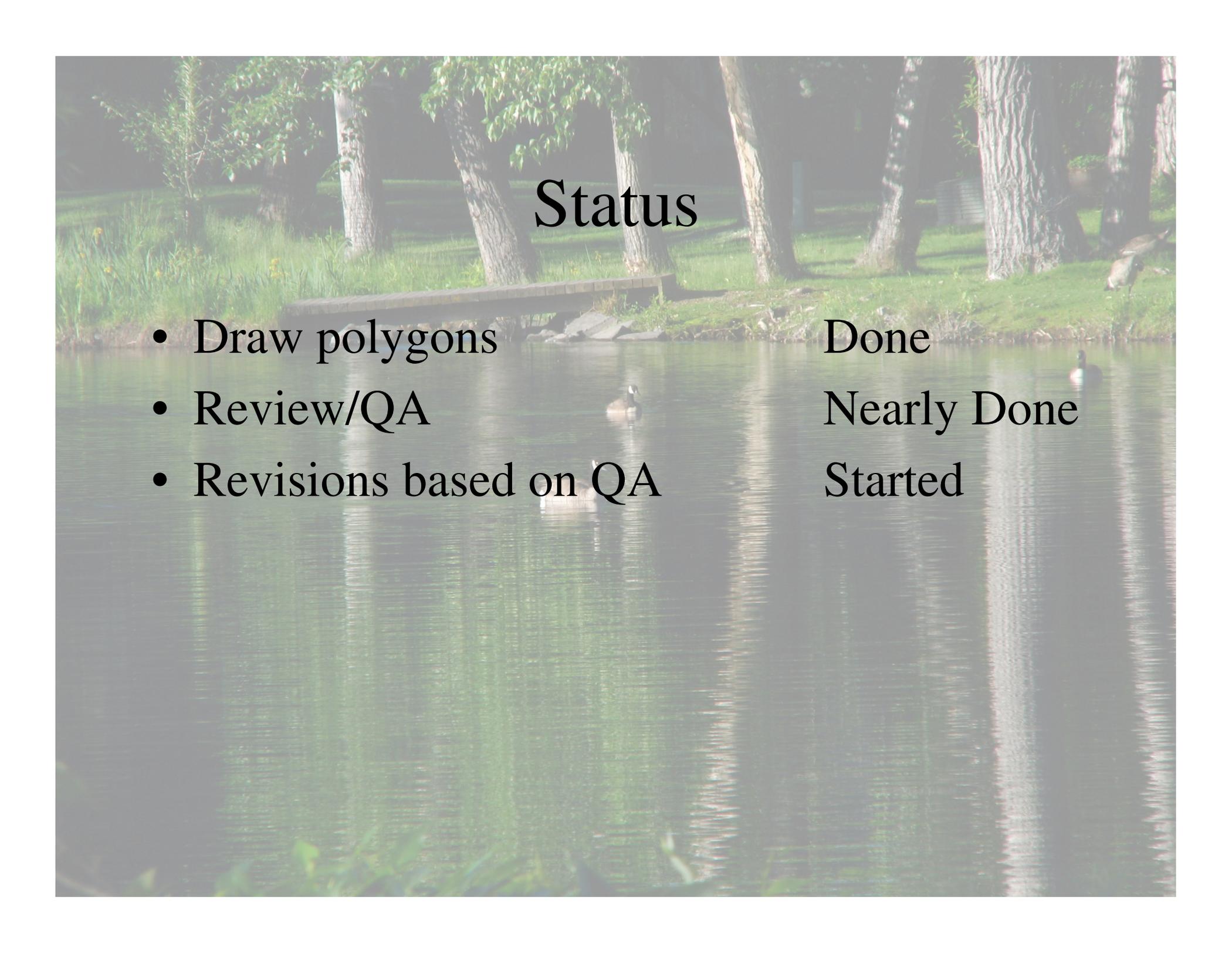




ew1

- Doqq_utm.shp
- Spot_utm.shp
- Base_87_utm.shp
- Spot_cells.shp
- Samplec_utm.shp
- Naip06_cells.shp
- Naip04_cells.shp
- Doqq_cells.shp
- U2_cells.shp
- Base_87_cells.shp
- Samplelocations.shp
- Naip06_clark_idwr.sid
- 2004_clark_usda.sid
- 2001_n44w1124_spot.tif
- 98_44112a3ne_usgs.bil
- 92_44112a2nw_usgs.bil
- Basin31.sid
- 80-155-178.tif



A serene lake scene with a wooden dock, trees, and ducks. The water is calm, reflecting the surrounding greenery and sky. Several ducks are visible in the water and on the grassy bank. The overall atmosphere is peaceful and natural.

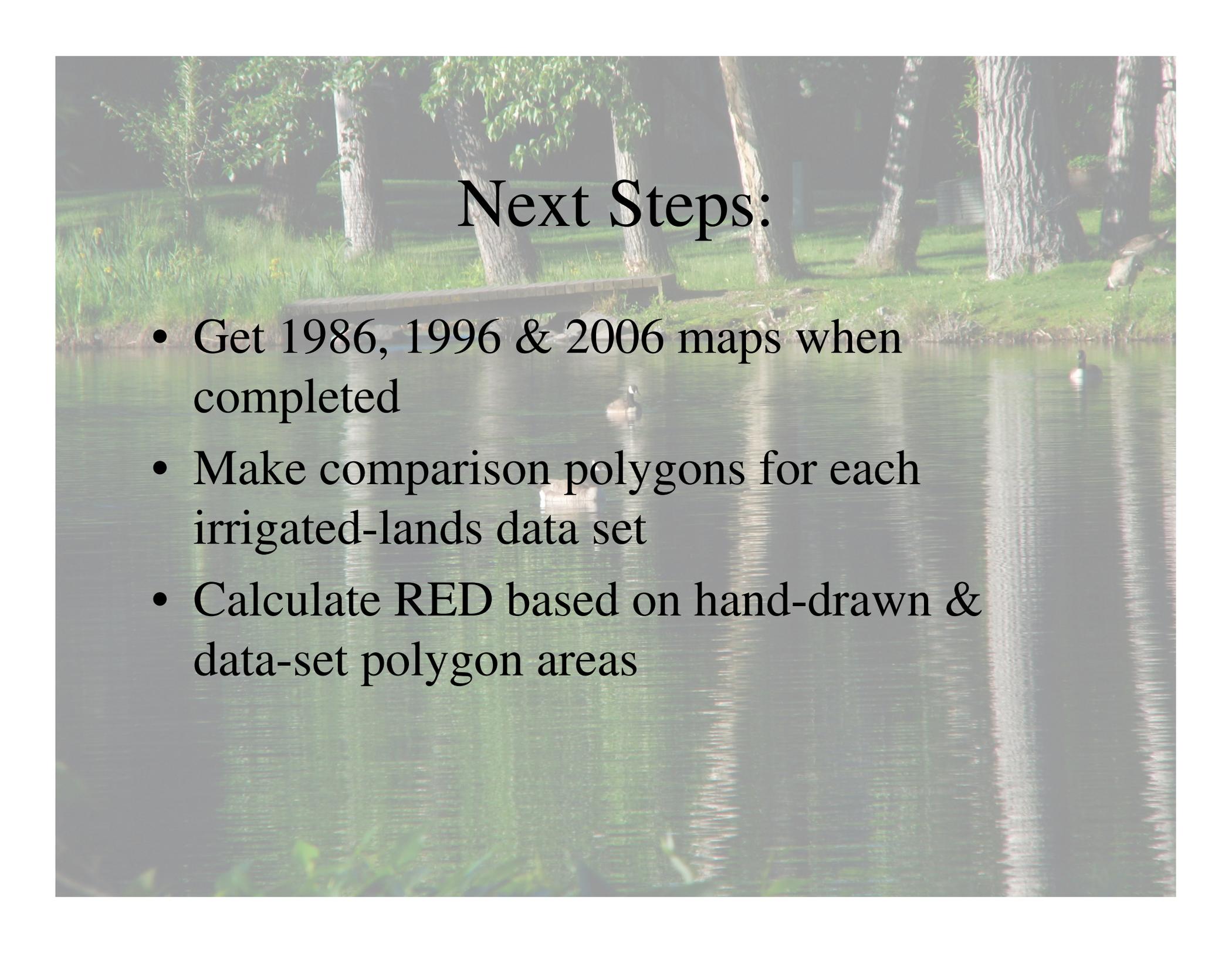
Status

- Draw polygons
- Review/QA
- Revisions based on QA

Done

Nearly Done

Started

A serene landscape featuring a calm pond in the foreground. The water reflects the surrounding greenery and trees. In the middle ground, a wooden dock extends into the water. The background is filled with lush green trees and grass, creating a peaceful natural setting.

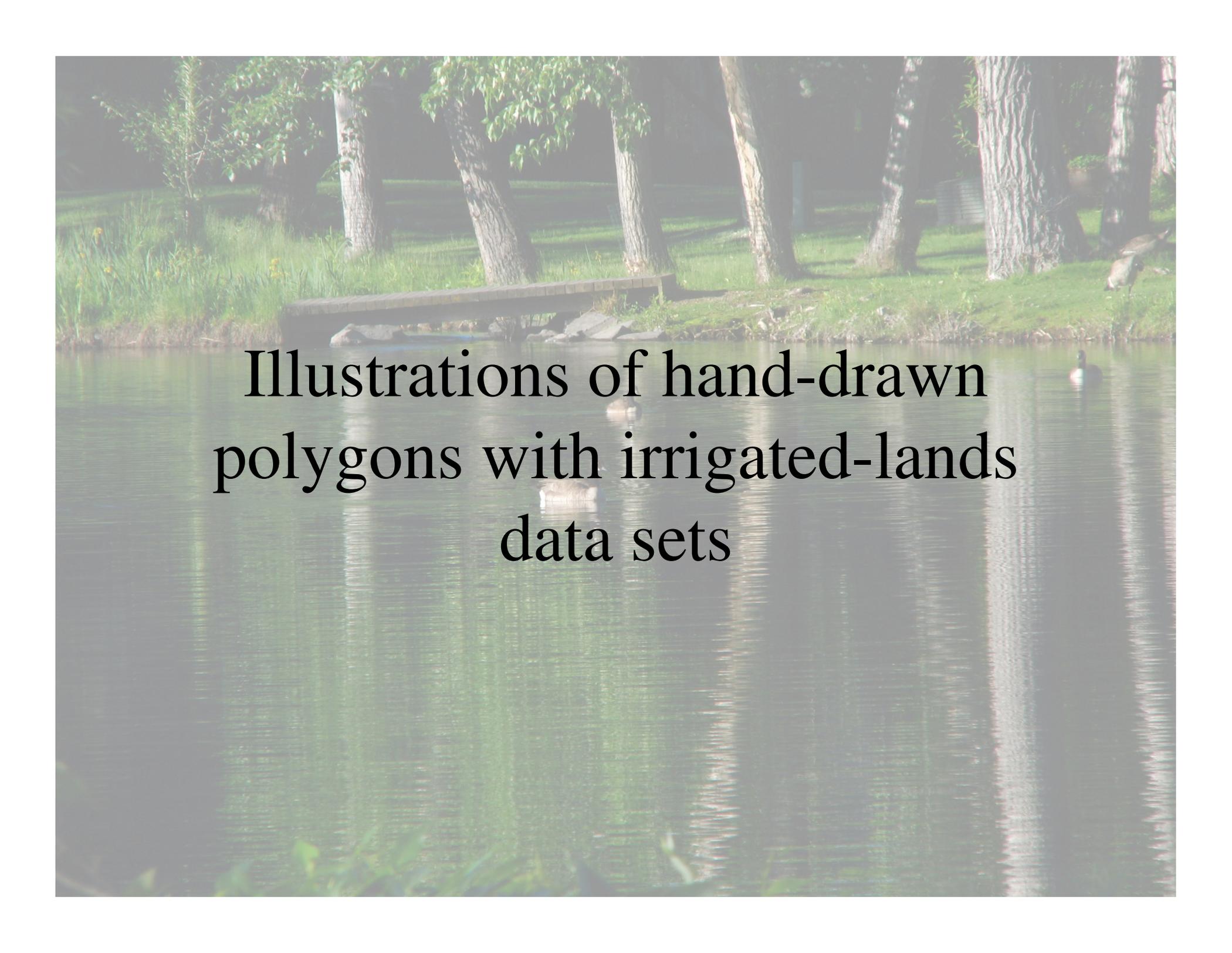
Next Steps:

- Get 1986, 1996 & 2006 maps when completed
- Make comparison polygons for each irrigated-lands data set
- Calculate RED based on hand-drawn & data-set polygon areas

A serene landscape featuring a calm pond in the foreground. The water reflects the surrounding greenery and trees. In the middle ground, a wooden dock extends into the water, supported by rocks. The background is filled with lush green trees and grass, creating a peaceful natural setting.

Next Steps:

- RED same for sprinkler & gravity
 - inadequate ability to distinguish furrow irrigation from handlines in aerial photos

A photograph of a peaceful pond scene. In the foreground, the water is calm, reflecting the surrounding greenery. A wooden dock extends from the left bank into the water. The background is filled with lush green trees and grass. A few ducks are visible in the water and on the grass. The overall atmosphere is quiet and natural.

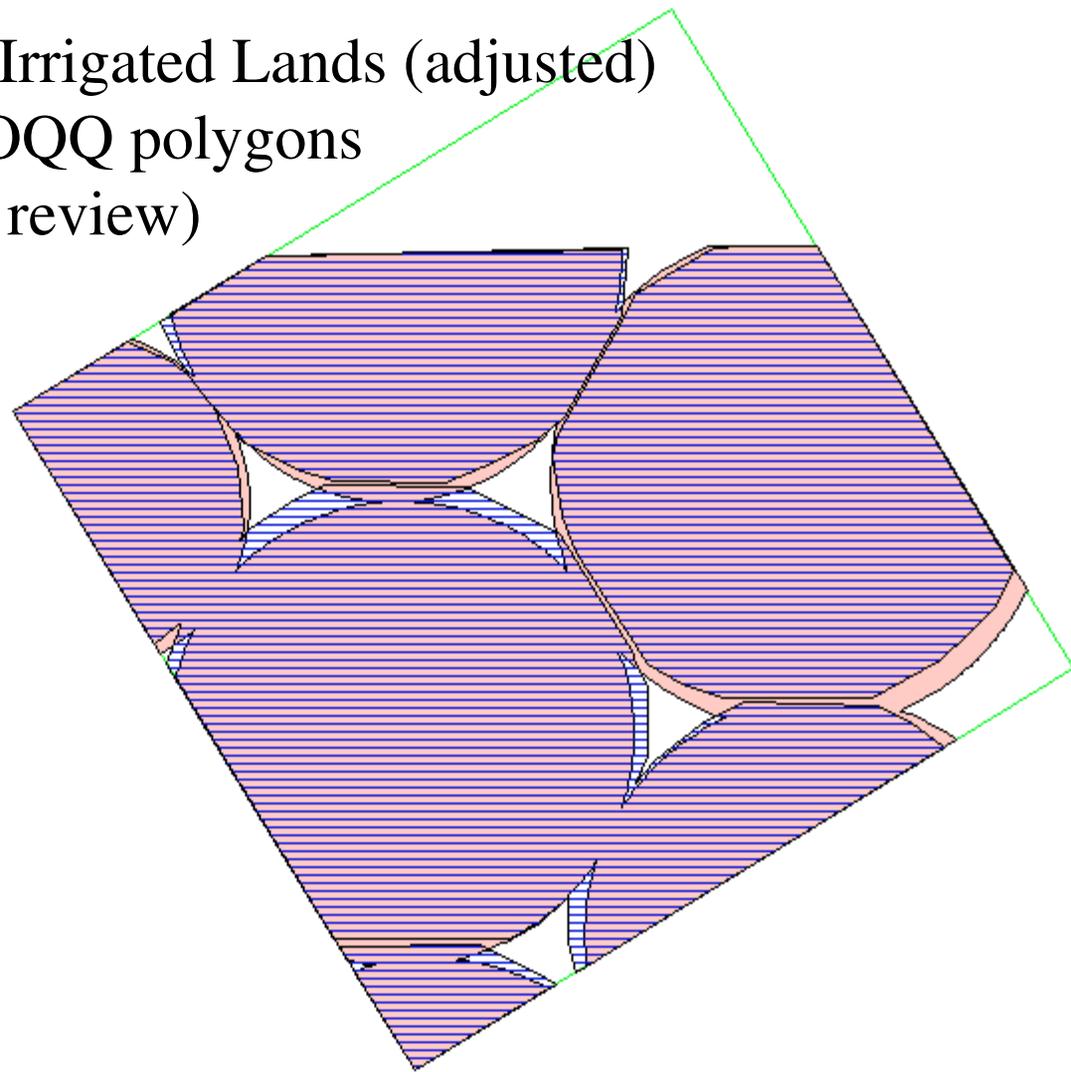
Illustrations of hand-drawn
polygons with irrigated-lands
data sets



ew1

- Spot_utm.shp
- Base_87_utm.shp
- Spot_cells.shp
- Samploc_utm.shp
- Naip06_cells.shp
- Doqq_cells.shp
- Naip04_cells.shp
- U2_cells.shp
- Base_87_cells.shp
- Doqq_postreview.shp
- Irr_92_for_compare.shp
- Samplelocations.shp
- Theme7.shp
- Theme6.shp
- Irr_92.shp
- Naip06_clark_idwr.sid

1992 Irrigated Lands (adjusted)
an DOQQ polygons
(after review)





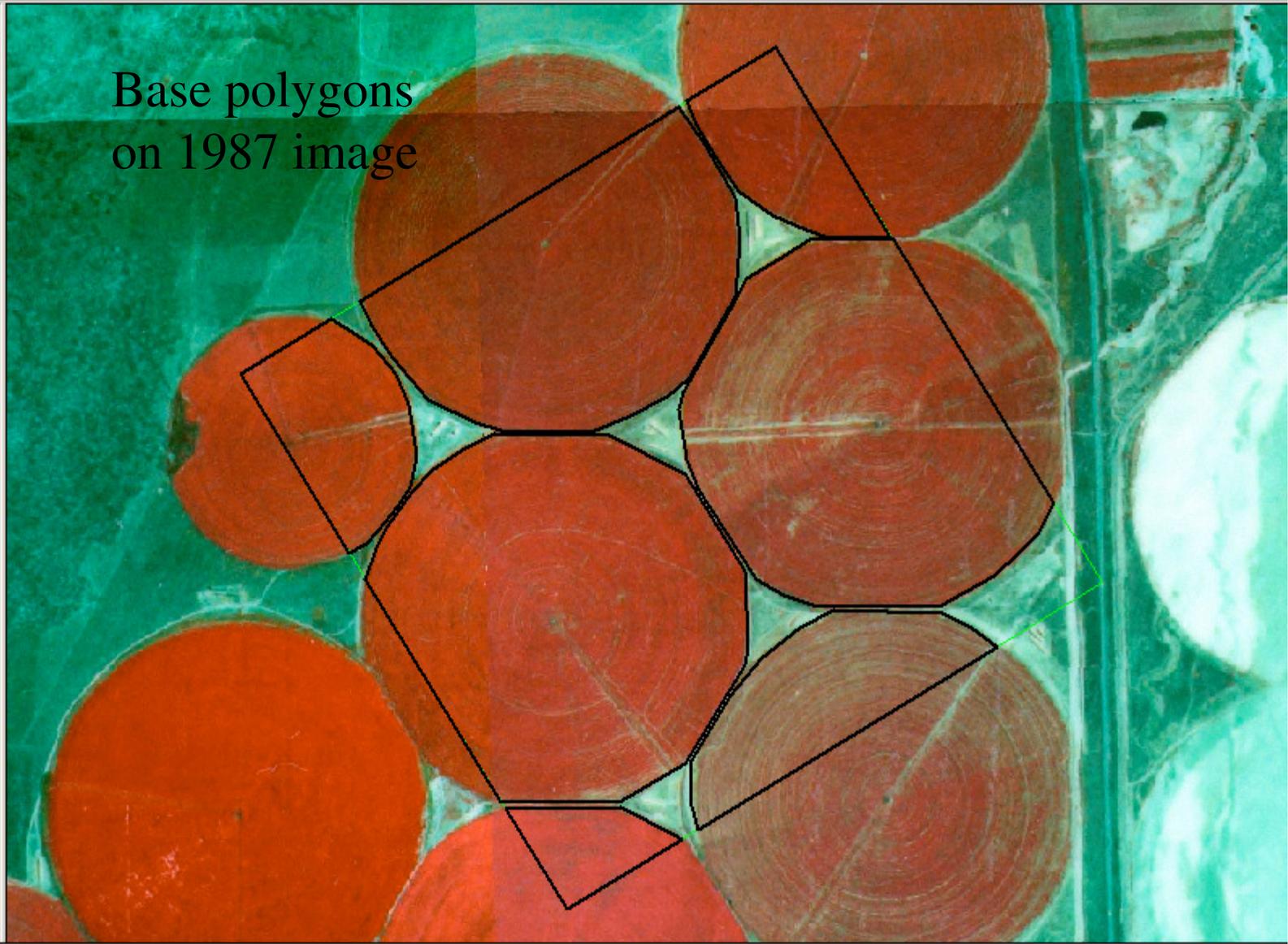


ISETTA



ew1

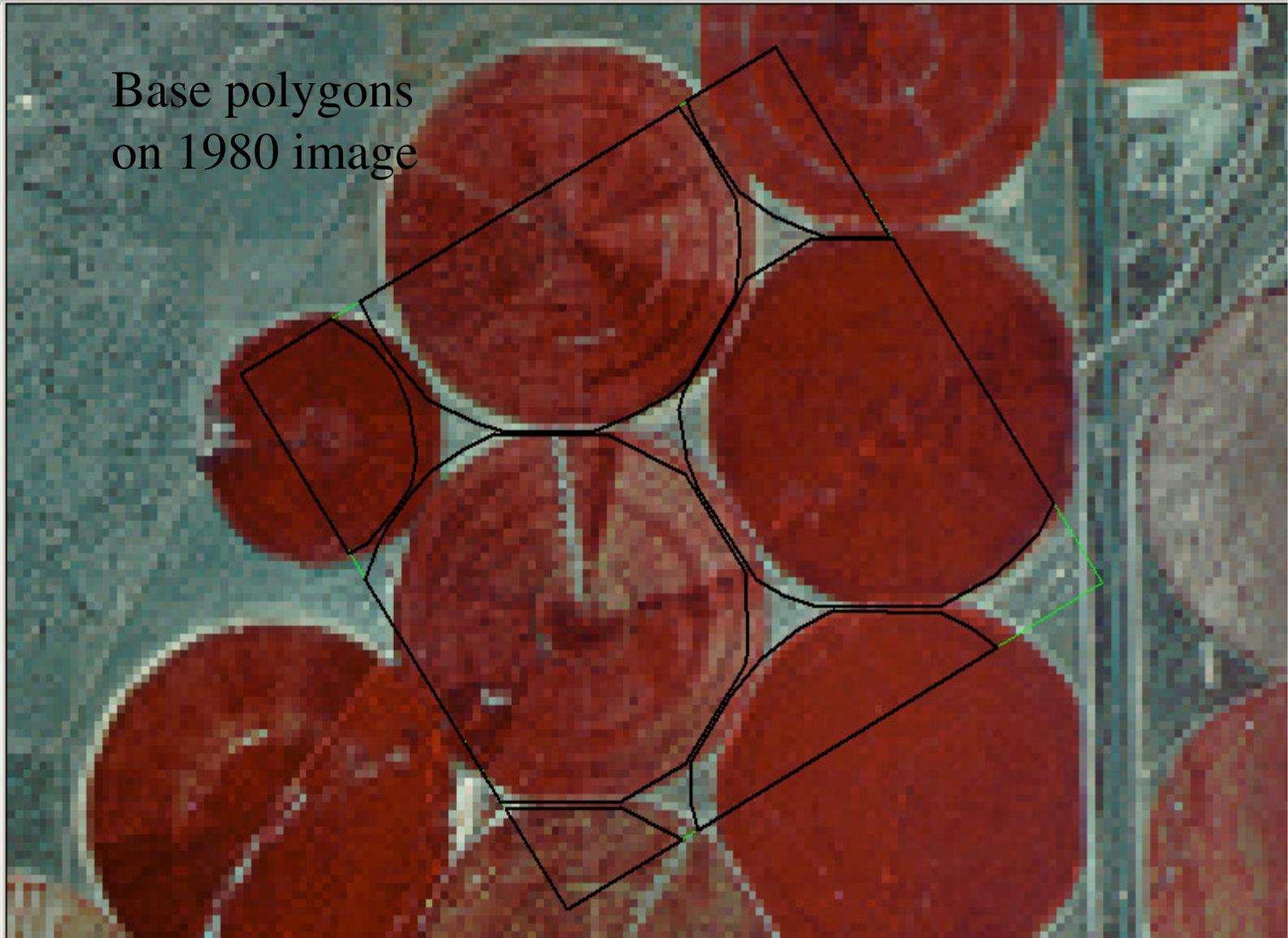
- Doqq_utm.shp 
- Base_87_utm.shp 
- Spot_utm.shp 
- Spot_cells.shp 
- Sample_c_utm.shp 
- Naip06_cells.shp 
- Naip04_cells.shp 
- Doqq_cells.shp 
- U2_cells.shp 
- Base_87_cells.shp 
- Samplelocations.shp 
- Naip06_clark_idwr.sid
- 2004_clark_usda.sid
- 2001_n44w1124_spot.tif
- 98_44112a3ne_usgs.bil
- 92_44112a2nw_usgs.bil
- Basin31.sid
- 80-155-178.tif





ew1

- Doqq_utm.shp
- Base_87_utm.shp
- Spot_utm.shp
- Spot_cells.shp
- Sampleloc_utm.shp
- Naip06_cells.shp
- Naip04_cells.shp
- Doqq_cells.shp
- U2_cells.shp
- Base_87_cells.shp
- Samplelocations.shp
- Naip06_clark_idwr.sid
- 2004_clark_usda.sid
- 2001_n44w1124_spot.tif
- 98_44112a3ne_usgs.bil
- 92_44112a2nw_usgs.bil
- Basin31.sid
- 80-155-178.tif



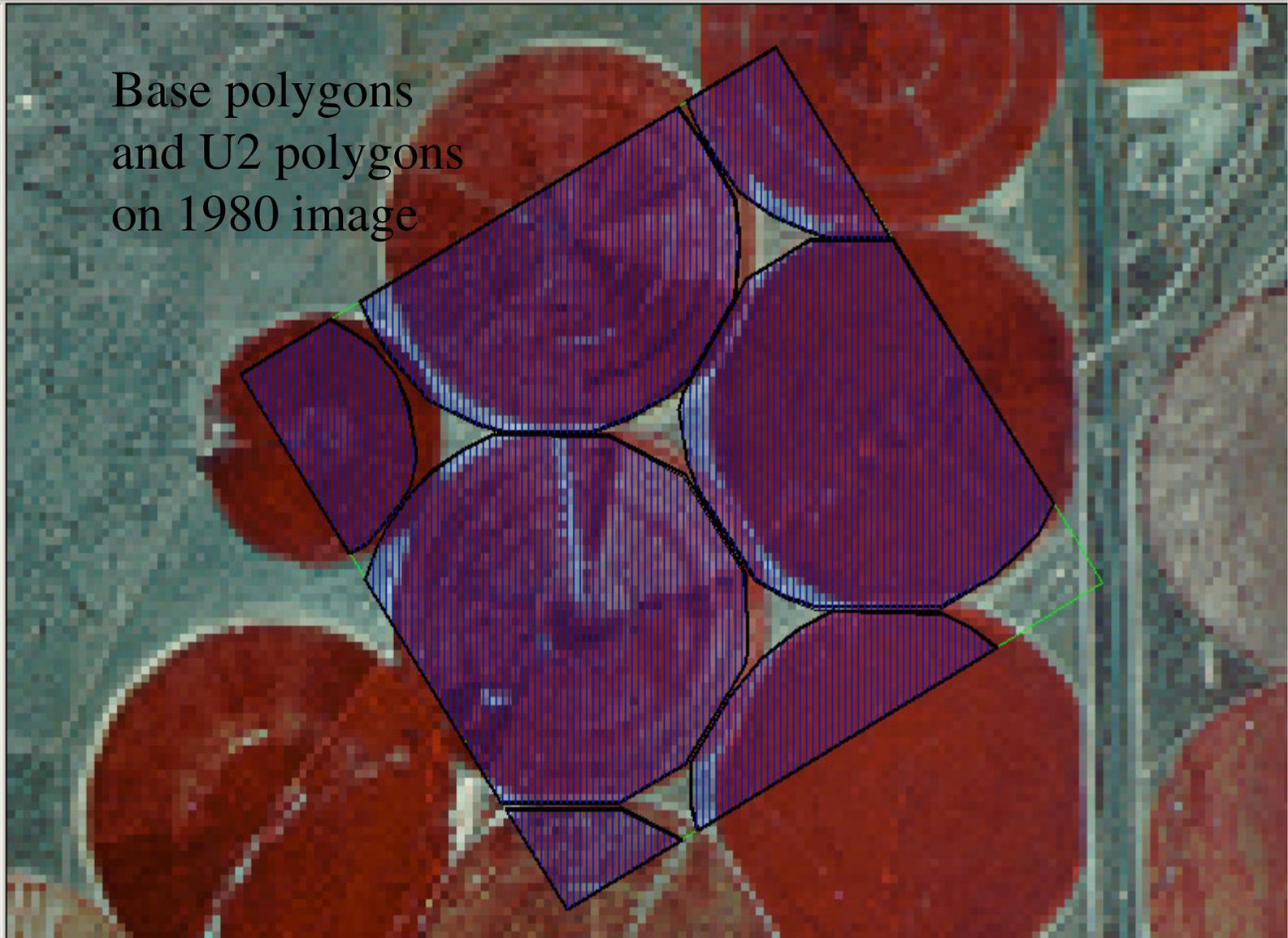
Base polygons
on 1980 image



ew1

- Doqq_utm.shp
- Base_87_utm.shp
- Spot_utm.shp
- Spot_cells.shp
- Sampleloc_utm.shp
- Naip06_cells.shp
- Naip04_cells.shp
- Doqq_cells.shp
- U2_cells.shp
- Base_87_cells.shp
- Samplelocations.shp
- Naip06_clark_idwr.sid
- 2004_clark_usda.sid
- 2001_n44w1124_spot.tif
- 98_44112a3ne_usgs.bil
- 92_44112a2nw_usgs.bil
- Basin31.sid
- 80-155-178.tif

Base polygons
and U2 polygons
on 1980 image

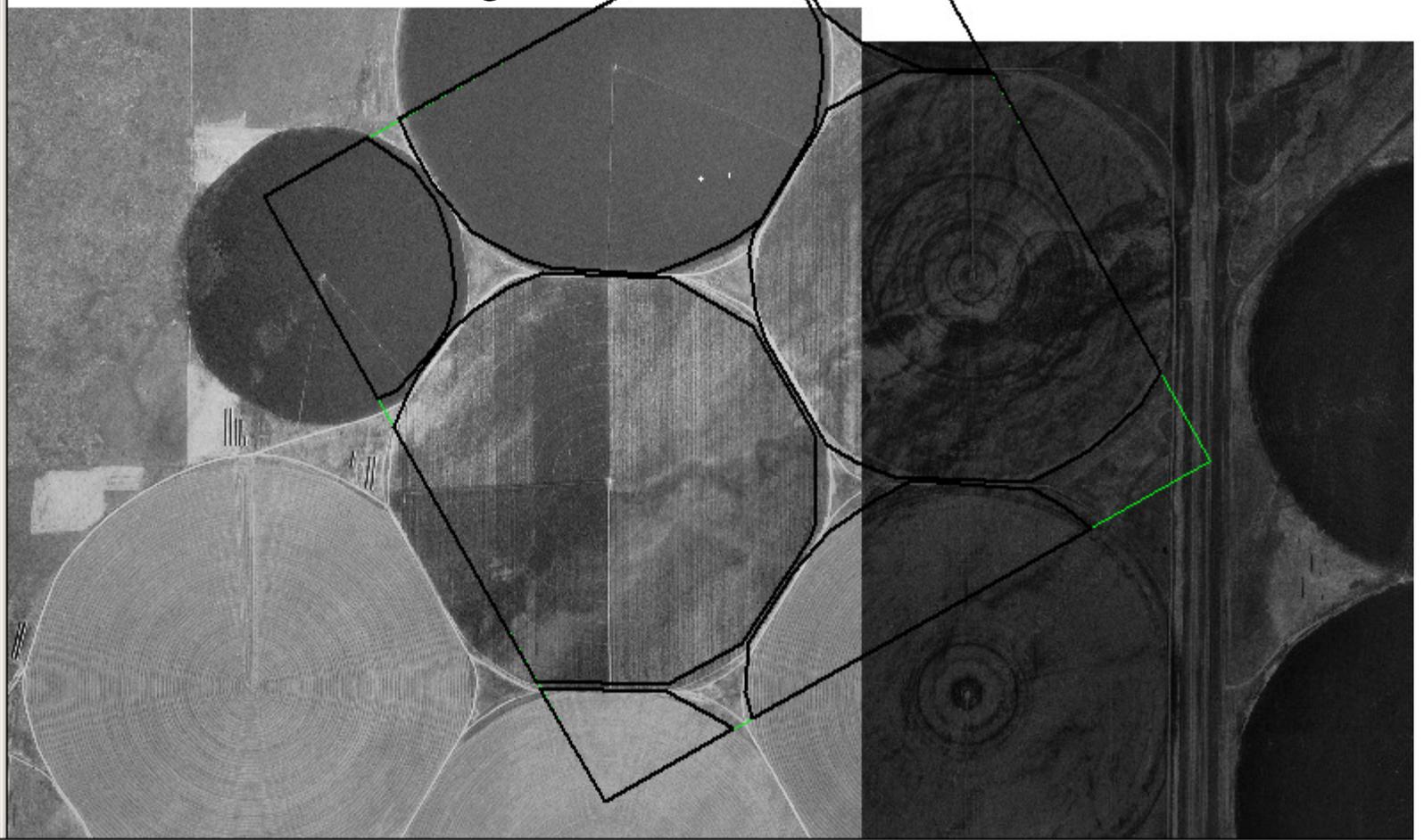




ew1

- Doqq_utm.shp
- Base_87_utm.shp
- Spot_utm.shp
- Spot_cells.shp
- Samplec_utm.shp
- Naip06_cells.shp
- Naip04_cells.shp
- Doqq_cells.shp
- U2_cells.shp
- Base_87_cells.shp
- Samplelocations.shp
- Naip06_clark_idwr.sid
- 2004_clark_usda.sid
- 2001_n44w1124_spot.tif
- 98_44112a3ne_usgs.bil
- 92_44112a2nw_usgs.bil
- Basin31.sid
- 80-155-178.tif

Base polygons
on 1992/98 image



- ew1
- Doqq_utm.shp
- Base_87_utm.shp
- Spot_utm.shp
- Spot_cells.shp
- Samplec_utm.shp
- Naip06_cells.shp
- Naip04_cells.shp
- Doqq_cells.shp
- U2_cells.shp
- Base_87_cells.shp
- Samplelocations.shp
- Naip06_clark_idwr.sid
- 2004_clark_usda.sid
- 2001_n44w1124_spot.tif
- 98_44112a3ne_usgs.bil
- 92_44112a2nw_usgs.bil
- Basin31.sid
- 80-155-178.tif

Base polygons and DOQQ polygons on 1992/98 image

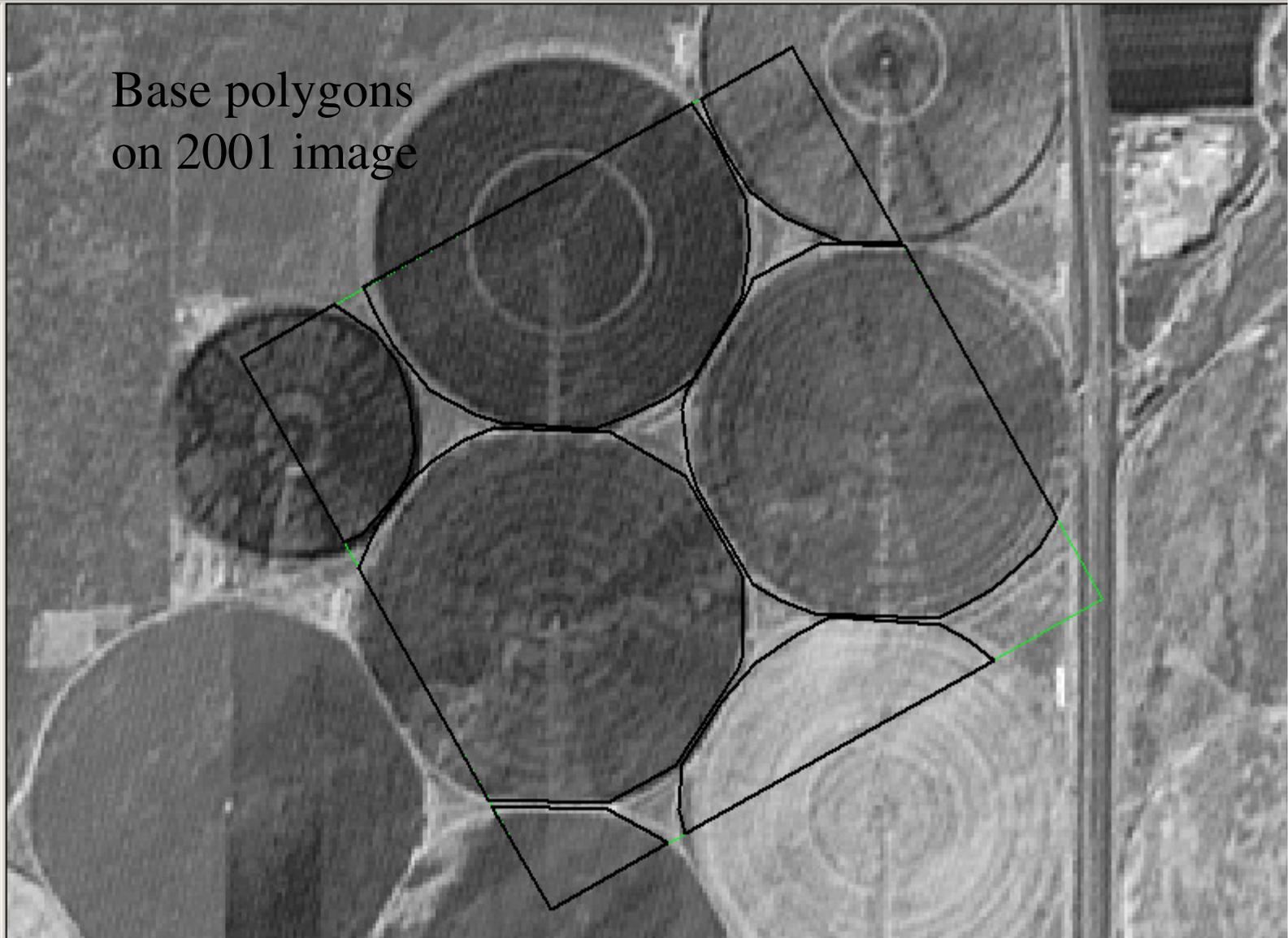
Reviewer's Notes: remove polygons that are out of image

Reviewer's Notes: add these pivots



ew1

- Doqq_utm.shp
- Base_87_utm.shp
- Spot_utm.shp
- Spot_cells.shp
- Samplec_utm.shp
- Naip06_cells.shp
- Naip04_cells.shp
- Doqq_cells.shp
- U2_cells.shp
- Base_87_cells.shp
- Samplelocations.shp
- Naip06_clark_idwr.sid
- 2004_clark_usda.sid
- 2001_n44w1124_spot.tif
- 98_44112a3ne_usgs.bil
- 92_44112a2nw_usgs.bil
- Basin31.sid
- 80-155-178.tif

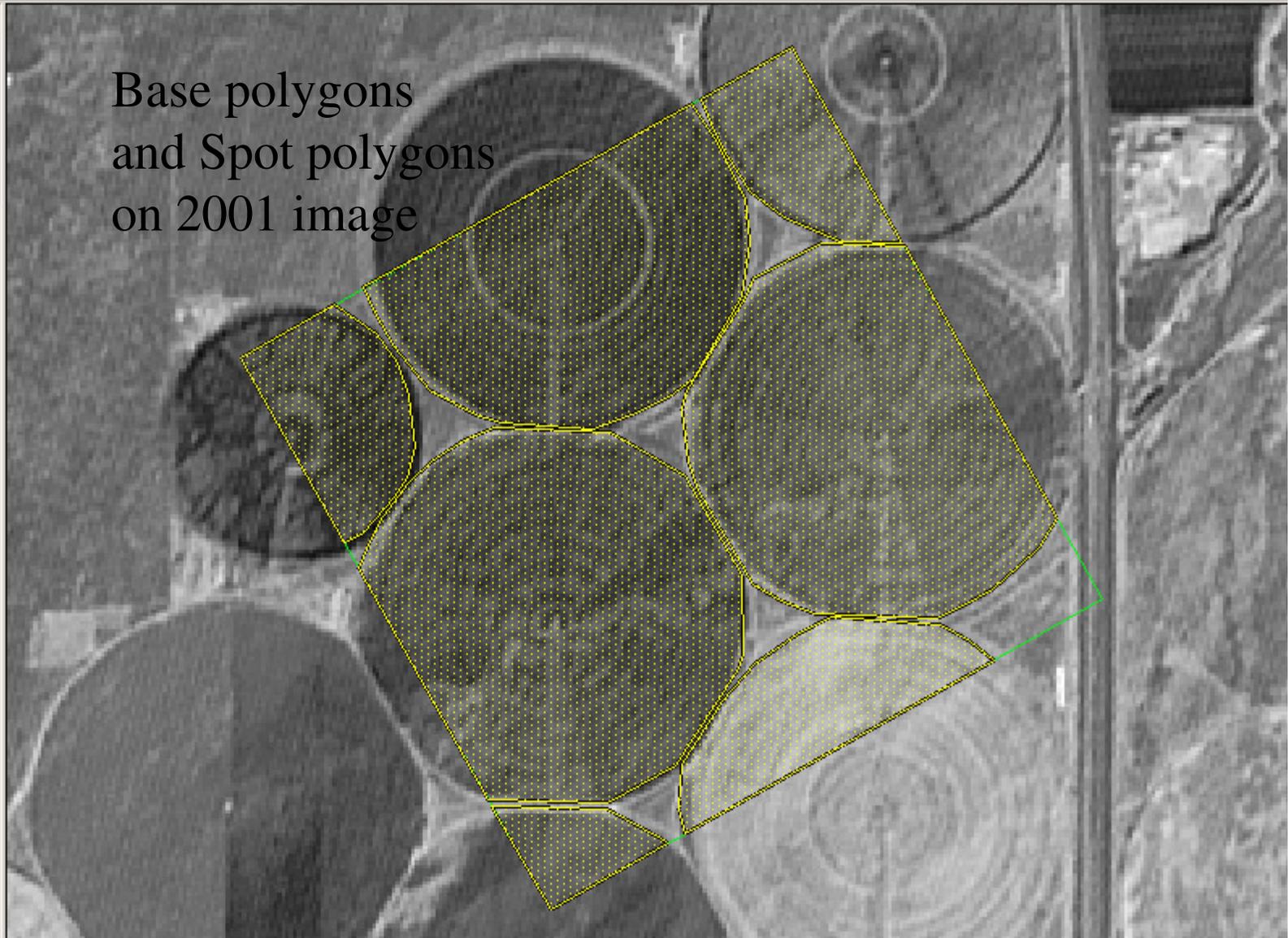


Base polygons
on 2001 image



ew1

- Doqq_utm.shp
- Spot_utm.shp
- Base_87_utm.shp
- Spot_cells.shp
- Samplec_utm.shp
- Naip06_cells.shp
- Naip04_cells.shp
- Doqq_cells.shp
- U2_cells.shp
- Base_87_cells.shp
- Samplelocations.shp
- Naip06_clark_idwr.sid
- 2004_clark_usda.sid
- 2001_n44w1124_spot.tif
- 98_44112a3ne_usgs.bil
- 92_44112a2nw_usgs.bil
- Basin31.sid
- 80-155-178.tif

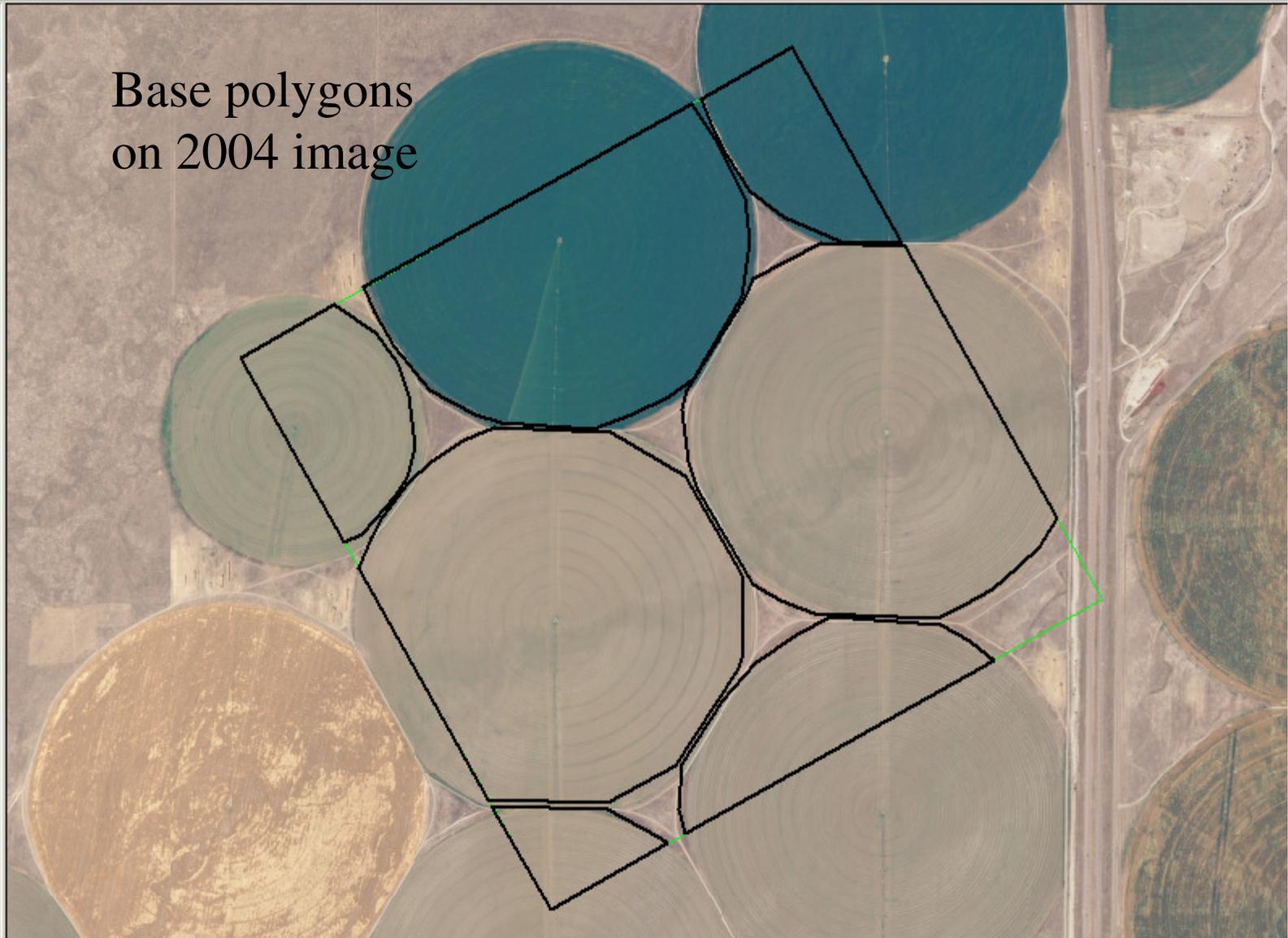


Base polygons
and Spot polygons
on 2001 image



ew1

- Doqq_utm.shp
- Spot_utm.shp
- Base_87_utm.shp
- Spot_cells.shp
- Samplec_utm.shp
- Naip06_cells.shp
- Naip04_cells.shp
- Doqq_cells.shp
- U2_cells.shp
- Base_87_cells.shp
- Samplelocations.shp
- Naip06_clark_idwr.sid
- 2004_clark_usda.sid
- 2001_n44w1124_spot.tif
- 98_44112a3ne_usgs.bil
- 92_44112a2nw_usgs.bil
- Basin31.sid
- 80-155-178.tif



Base polygons
on 2004 image



ew1

- Doq_index.shp
- U2_utm.shp
- Naip06_utm.shp
- Naip04_utm.shp
- Doqq_utm.shp
- Spot_utm.shp
- Base_87_utm.shp
- Spot_cells.shp
- Sampleloc_utm.shp
- Naip06_cells.shp
- Naip04_cells.shp
- Doqq_cells.shp
- U2_cells.shp
- Base_87_cells.shp
- Samplelocations.shp
- Naip06_clark_idwr.sid

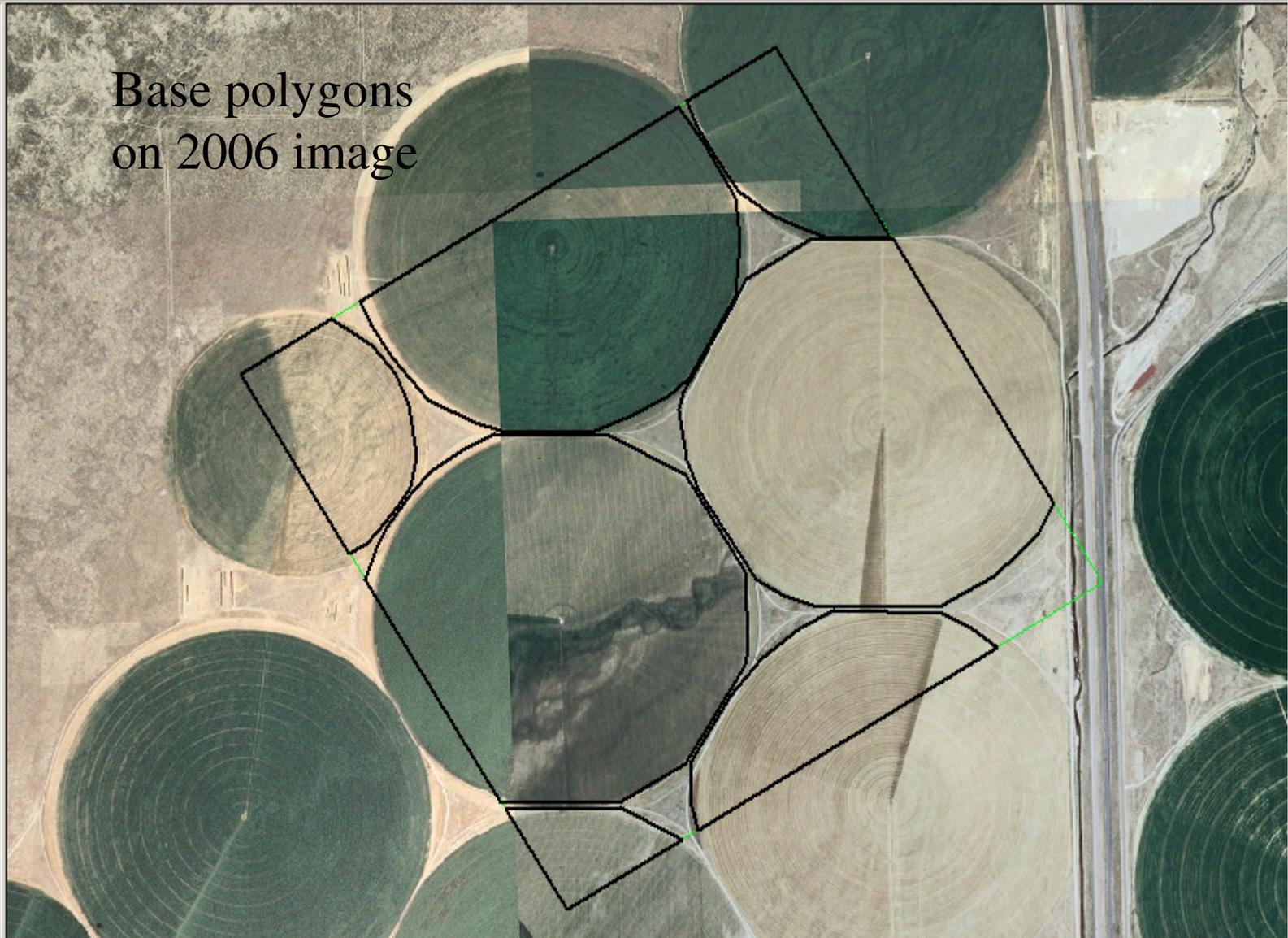


Base polygons
and NAIP04 polygons
on 2004 image



ew1

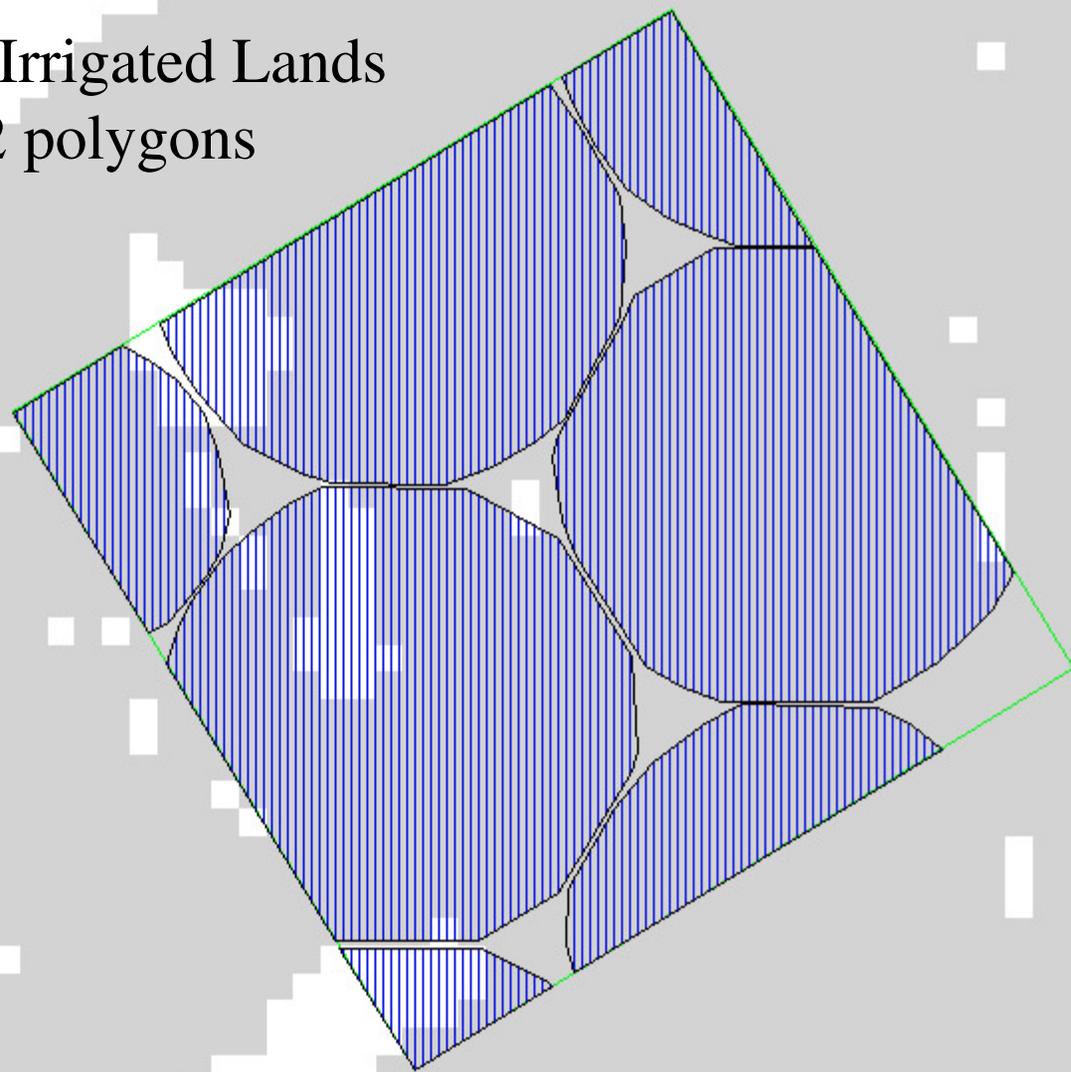
- Doqq_utm.shp
- Spot_utm.shp
- Base_87_utm.shp
- Spot_cells.shp
- Samplec_utm.shp
- Naip06_cells.shp
- Naip04_cells.shp
- Doqq_cells.shp
- U2_cells.shp
- Base_87_cells.shp
- Samplelocations.shp
- Naip06_clark_idwr.sid
- 2004_clark_usda.sid
- 2001_n44w1124_spot.tif
- 98_44112a3ne_usgs.bil
- 92_44112a2nw_usgs.bil
- Basin31.sid
- 80-155-178.tif





- ew1
- Spot_utm.shp
- Base_87_utm.shp
- Spot_cells.shp
- Samploc_utm.shp
- Naip06_cells.shp
- Doqq_cells.shp
- Naip04_cells.shp
- U2_cells.shp
- Base_87_cells.shp
- Samplelocations.shp
- Naip06_clark_idwr.sid
- 2004_clark_us da.sid
- 2001_n44w1124_spot.tif
- 98_44112a3ne_usgs.bil
- 92_44112a2nw_usgs.bil
- Basin31.sid
- Irr80_rasa.shp
- 80-155-178.tif

1980 Irrigated Lands
an U2 polygons

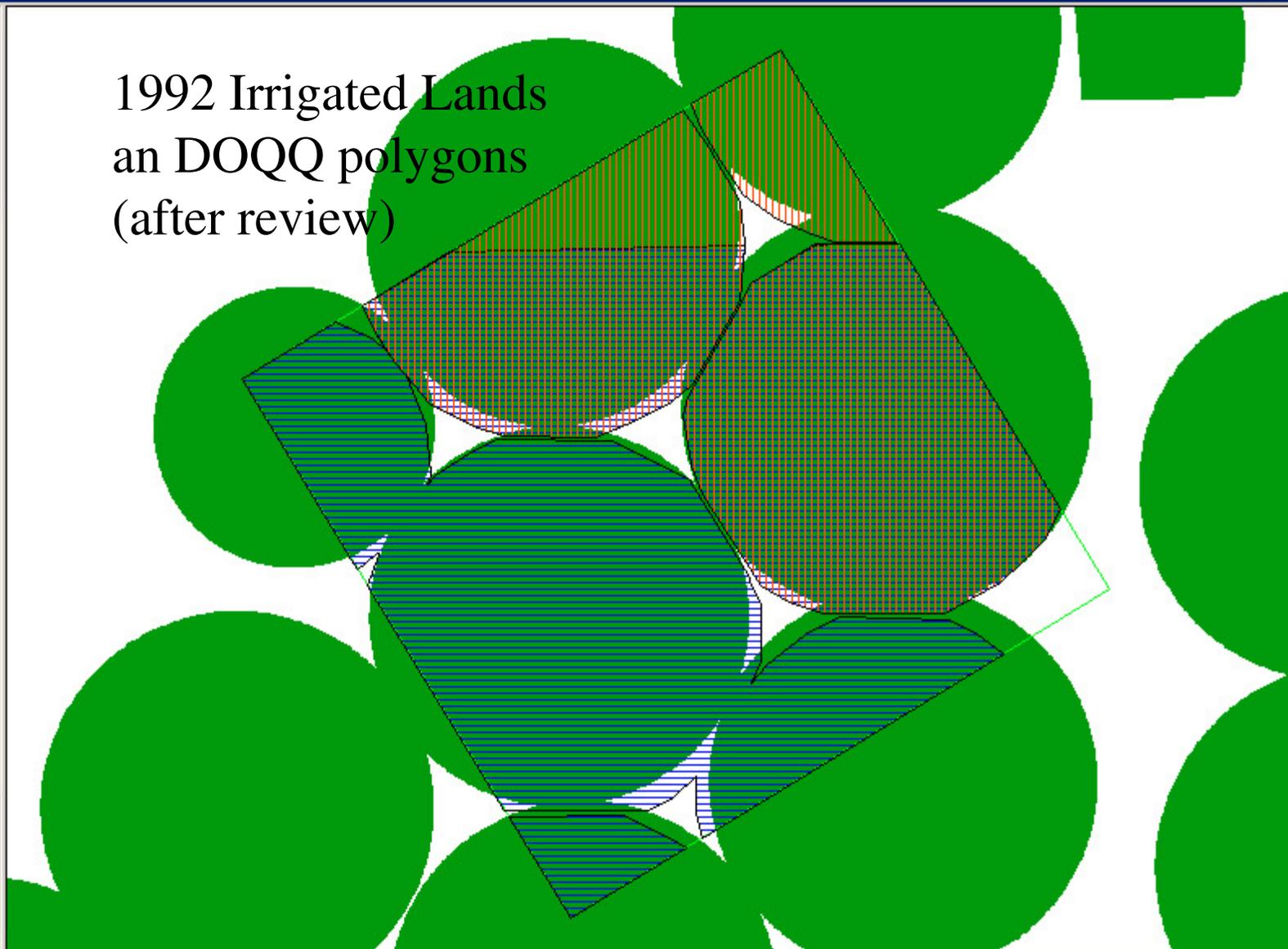




ew1

- Doqq_utm.shp
- Spot_utm.shp
- Base_87_utm.shp
- Spot_cells.shp
- Samplec_utm.shp
- Naip06_cells.shp
- Doqq_cells.shp
- Naip04_cells.shp
- U2_cells.shp
- Base_87_cells.shp
- Doqq_postreview.shp
- Samplelocations.shp
- Theme6.shp
- Irr_92.shp
- Naip06_clark_idwr.sid
- 2004_clark_usda.sid
- 2001_n44w1124_spot.tif

1992 Irrigated Lands
an DOQQ polygons
(after review)

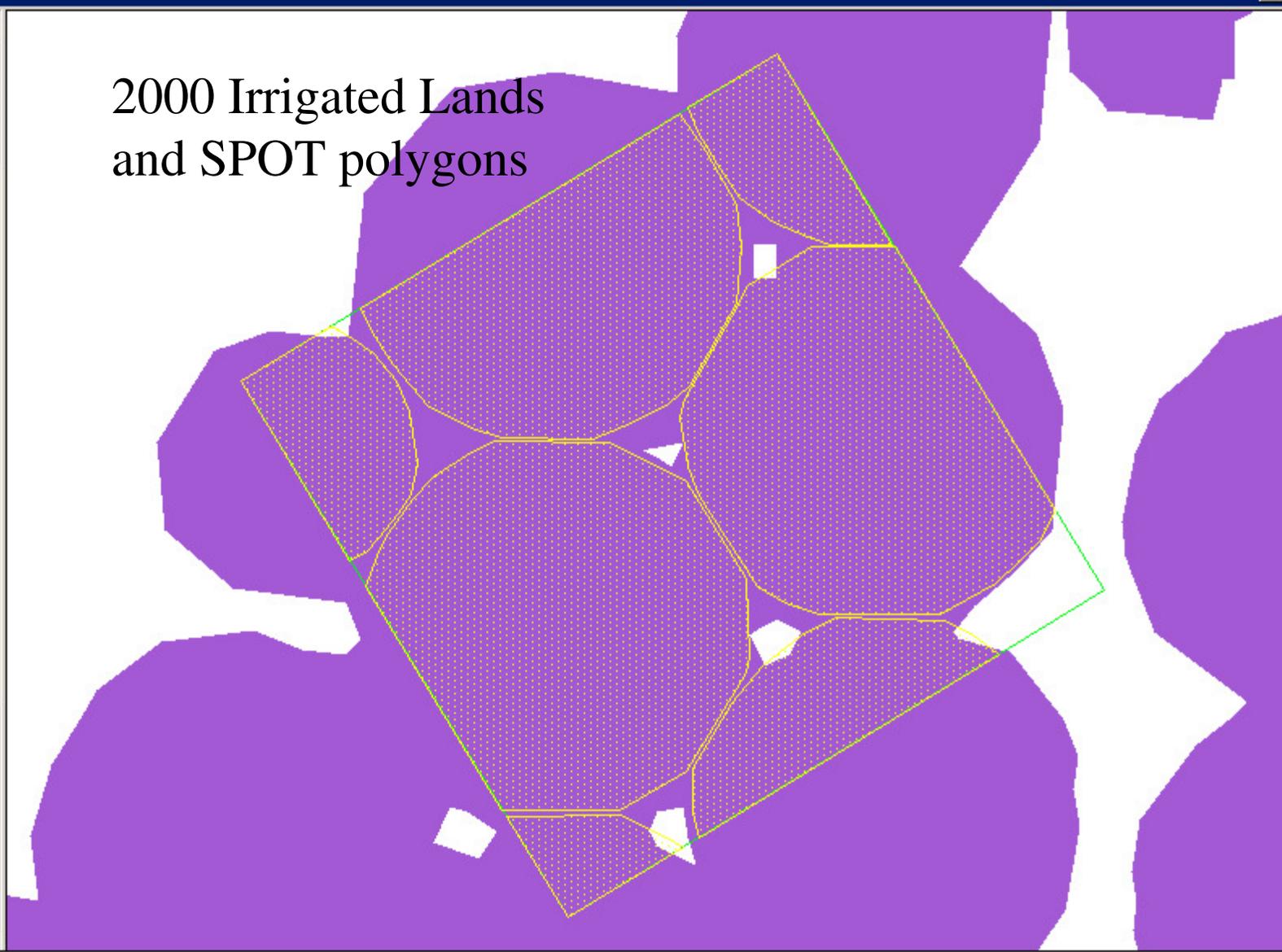




ew1

- Doqq_utm.shp
- Spot_utm.shp
- Base_87_utm.shp
- Spot_cells.shp
- Samploc_utm.shp
- Naip06_cells.shp
- Doqq_cells.shp
- Naip04_cells.shp
- U2_cells.shp
- Base_87_cells.shp
- Doqq_postreview.shp
- Irr_92_for_compare.shp
- Samplelocations.shp
- Irr2000_all_idtm83.shp
- Theme7.shp
- Theme6.shp

2000 Irrigated Lands and SPOT polygons



- ew1
- Sampleloc_utm.shp
- Naip06_cells.shp
- Doqq_cells.shp
- Naip04_cells.shp
- U2_cells.shp
- Base_87_cells.shp
- Doqq_postreview.shp
- Irr_92_for_compare.shp
- Samplelocations.shp
- Irr_2006
 - 0
 - 1
 - No Data
- Irr2000_all_idtm83.shp
- Theme7.shp
- Theme6.shp
- Irr_92.shp
- Naip06_clark_idwr.sid

