Three Parameters Plus, Inc. Employee of the Year Steve Reidsma completes yet another jurisdictional field plot near the "G" Valley.

This was Steve's fourth field season on the project.

Pebble Project Wetlands Study

2007 Agency Update

THREE PARAMETERS+
Natural Resource Consulting

Major Study Components

Delineation

Based on Criteria and Indicators Found in the 1987 Corps Wetland Delineation Manual & 2006 Interim, and very soon – the 2007 Regional Supplement for the Alaska Region.

Classify Wetlands and Assess Their Functions

Magee Rapid Procedure for Assessing Wetland Functional Capacity (HGM Based)

Consider Wetland Values

Incorporate Subsistence, Recreation, Cultural Resource, and Other Values into the Functional Assessment Evaluation

Identify & Evaluate Potential Compensatory Mitigation Projects

Prepare Compensatory Mitigation Plan

Per June 10, 2004 Final Alaska District Compensatory Mitigation Guidelines (or subsequent guidance)

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Natural Resource Consulting

Status Report by Study Component

THREE PARAMETERS+
Natural Resource Consulting

- Field Data Collection ←
- Data QC/ Validation
- Line Drawing
- Polygon Coding
- Field Review

Delineation

Wetlands and Other Waters of the U.S.

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Natural Resource Consulting

Both the 1987 and 2006 Delineation Methods Were Again Applied Concurrently at Pebble During the 2007 Field Season

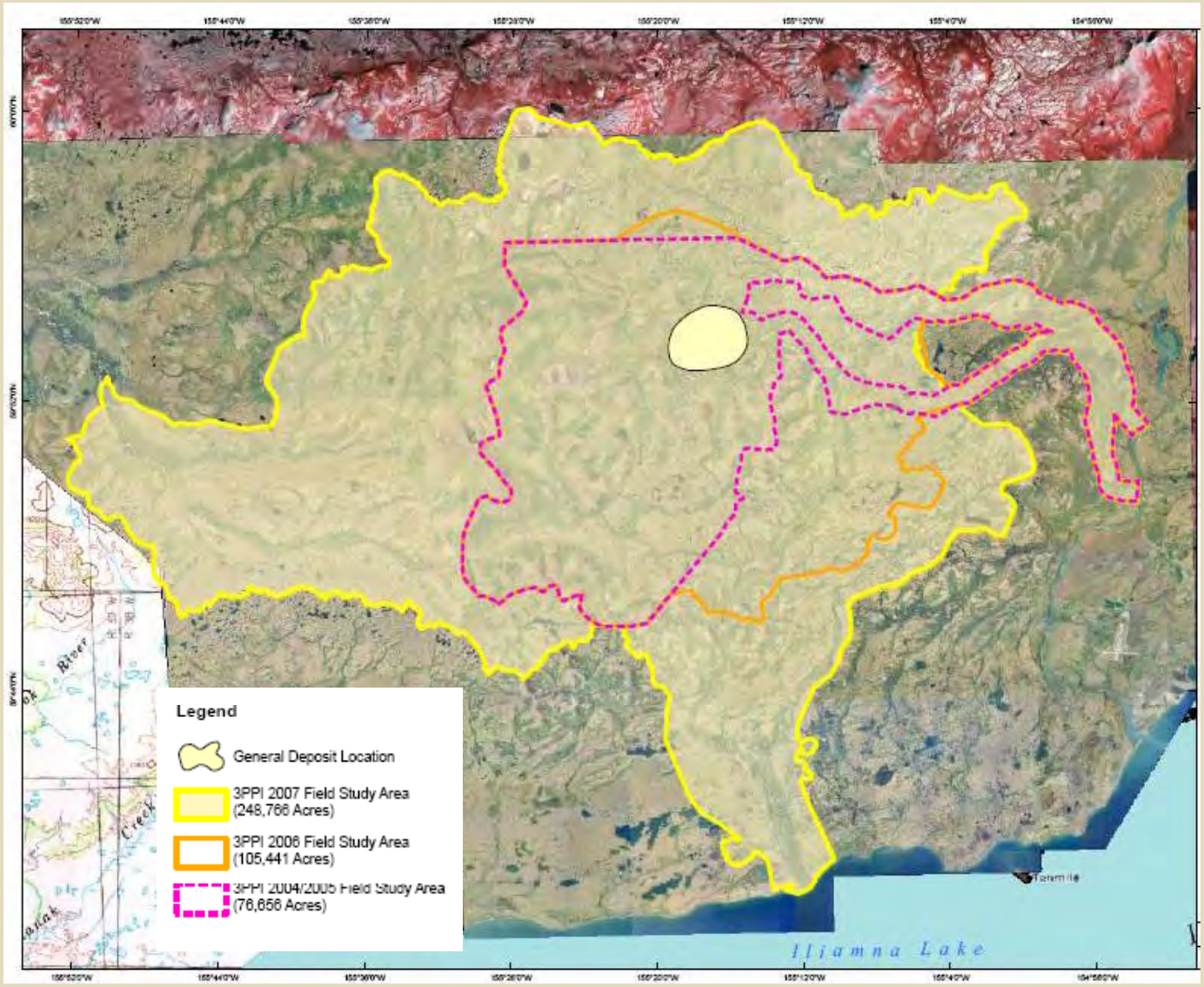
We're still loosing a lot of hair and sleep trying to reconcile the two methods and get all the data needed. If that wasn't enough of a challenge…

Greg Everetts, Ottertail Environmental, working in the Wiggly Lake Area

THREE PARAMETERS+
Natural Resource Consulting

Three Parameters +

Natural Resource Consulting



In early 2007, the Wetlands Study Area doubled in size over that of our 2006 Study Area -- more than <u>four times</u> the size of our original 2004 Study Area (a mere 66,000 acres…).

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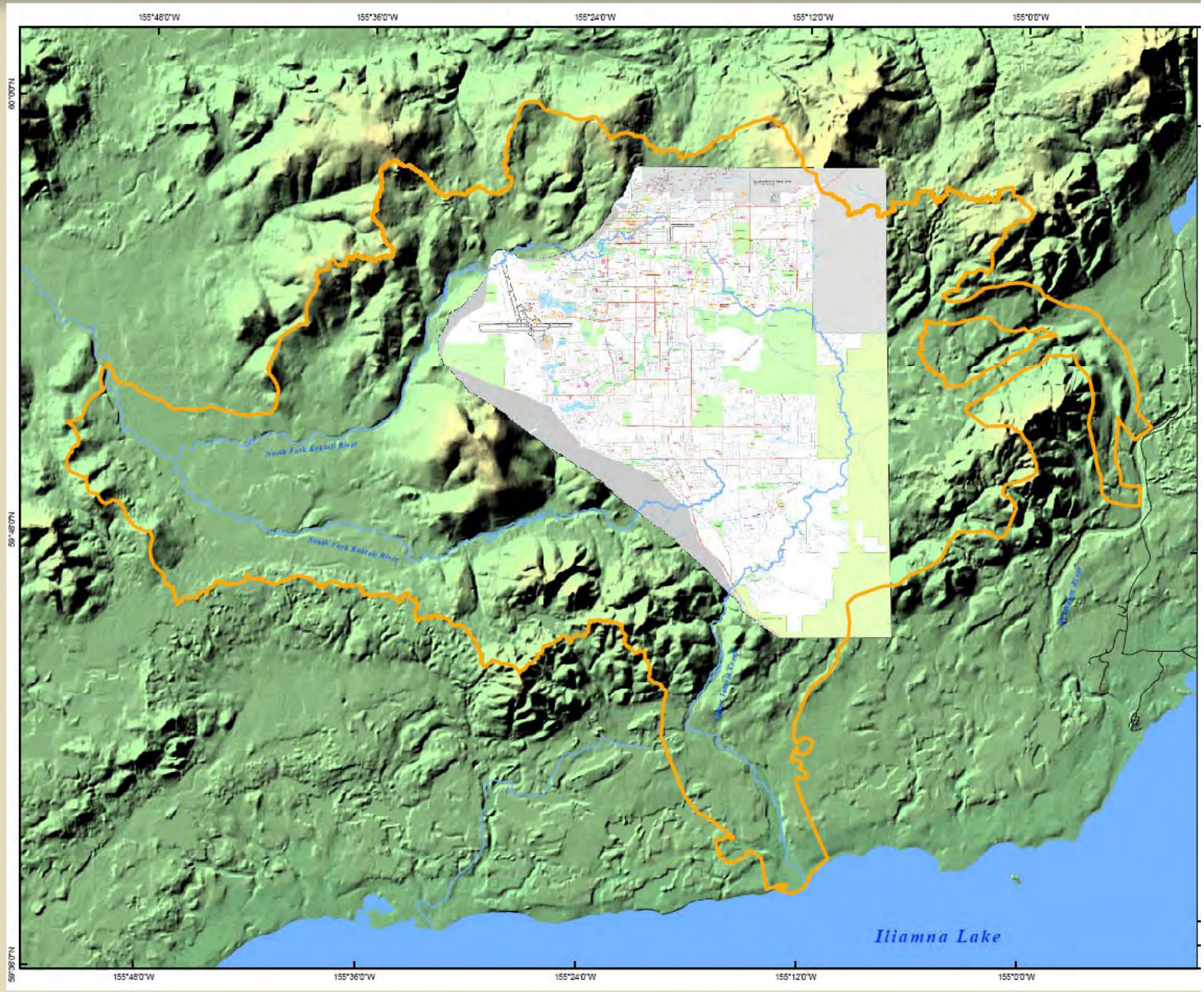
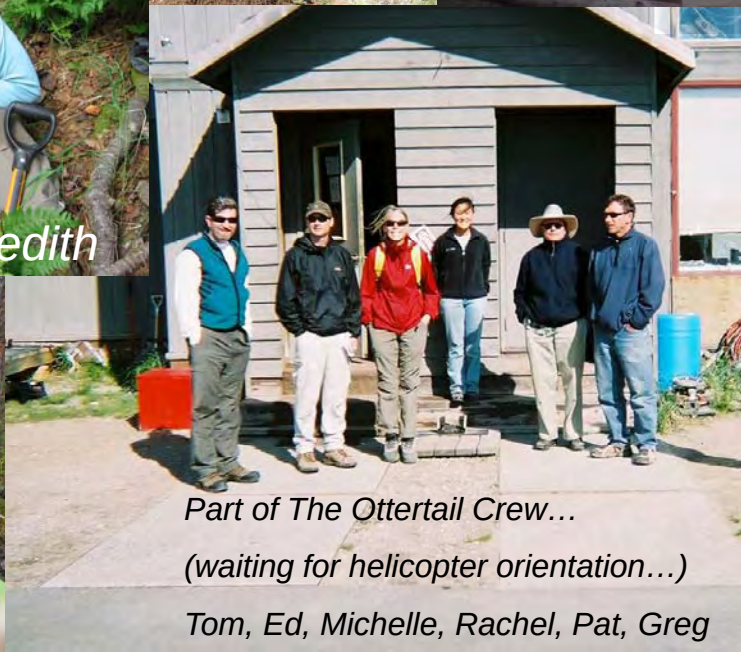
Natural Resource Consulting

To put this in perspective for you – here's the Anchorage Bowl superimposed over our 2007 Wetlands Study Area Boundary.



So, it was time to call for reinforcements



Part of The Ottertail Crew…

(waiting for helicopter orientation…)

Tom, Ed, Michelle, Rachel, Pat, Greg

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Pebble Wetland Boot Camp

Shrubs, Shrubs, Always More Shrubs!

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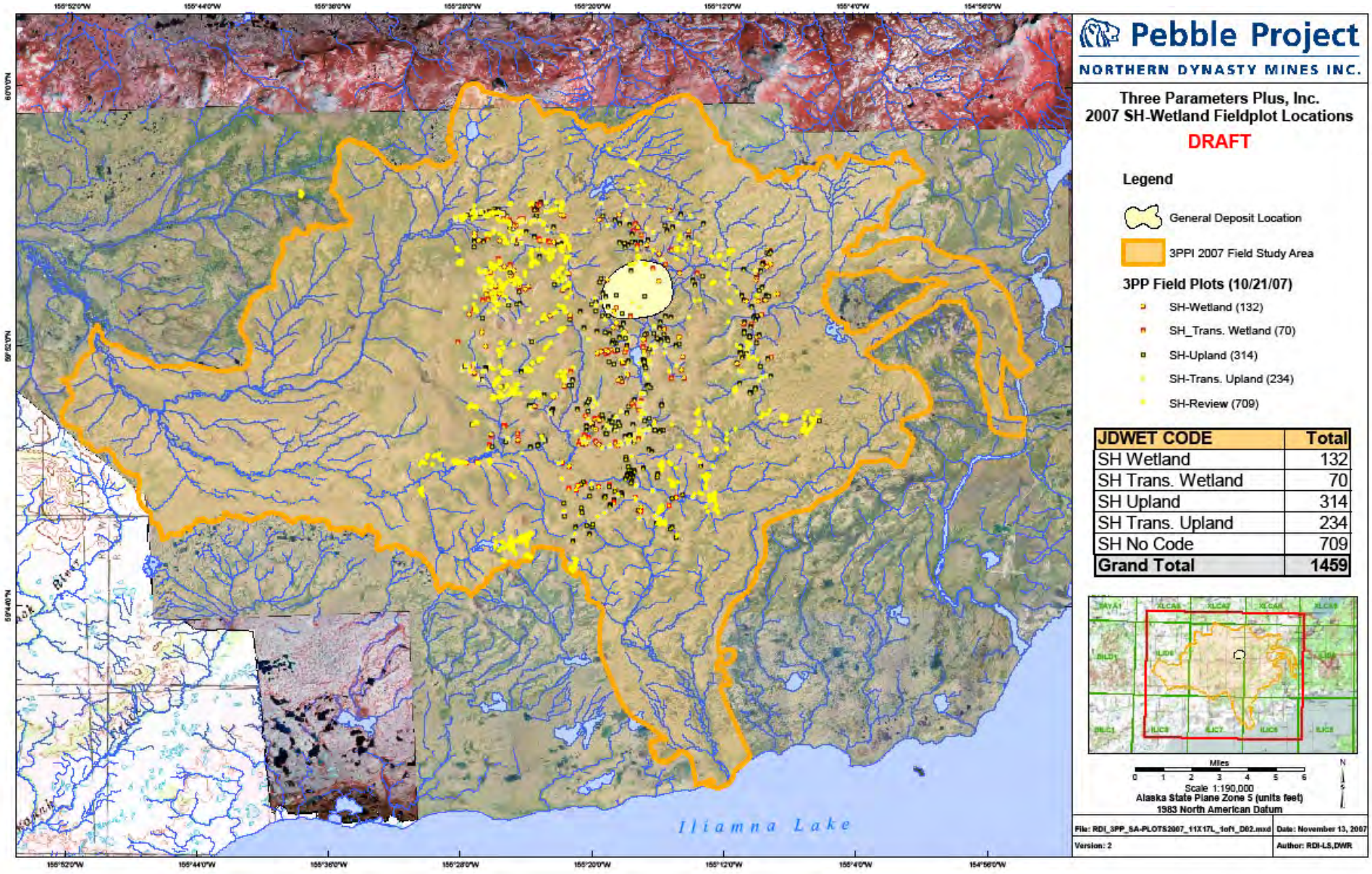
Natural Resource Consulting



Keep Digging!

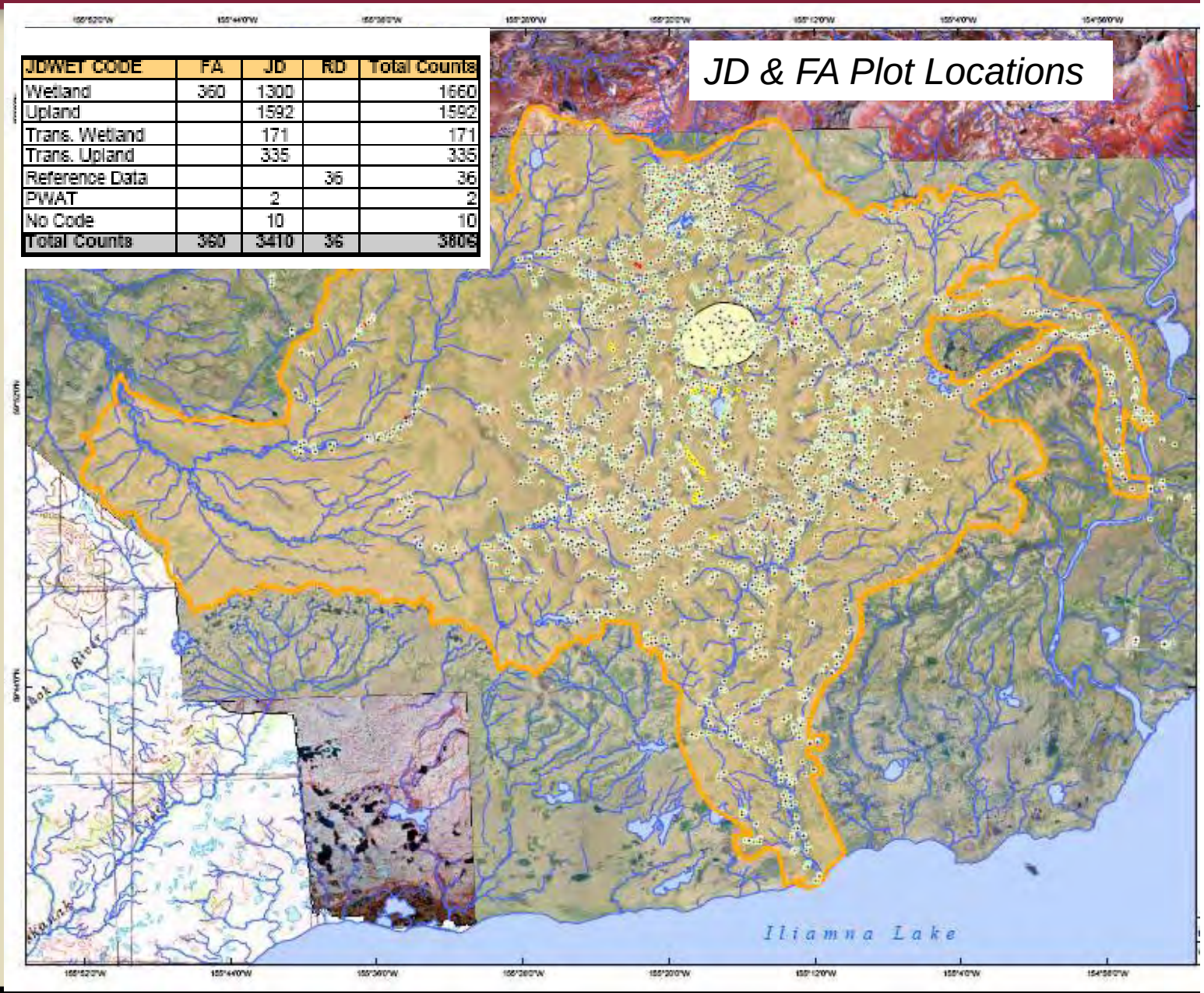
Three Parameters +

Natural Resource Consulting

In addition to the 1,459 rapid shrub height assessments, mine site crews have also completed 3,806 full jurisdictional determinations or stand alone functional assessments.

This brings the number of holes dug and photographed to over 5,000.

JDWET CODE	FA	JD	RD	Total Counts
Wetland	360	1300		1660
Upland		1592		1592
Trans. Wetland		171		171
Trans. Upland		335		335
Reference Data			36	36
PWAT		2		2
No Code		10		10
Total Counts	360	3410	36	3806

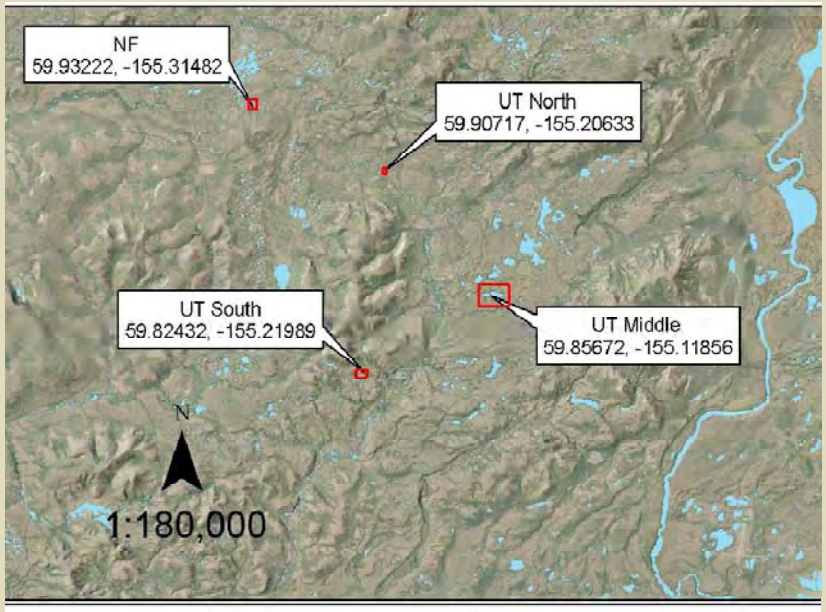


Three Parameters +

Natural Resource Consulting

And you can't go far at Pebble without finding some water…

Or Somebody talking about it…

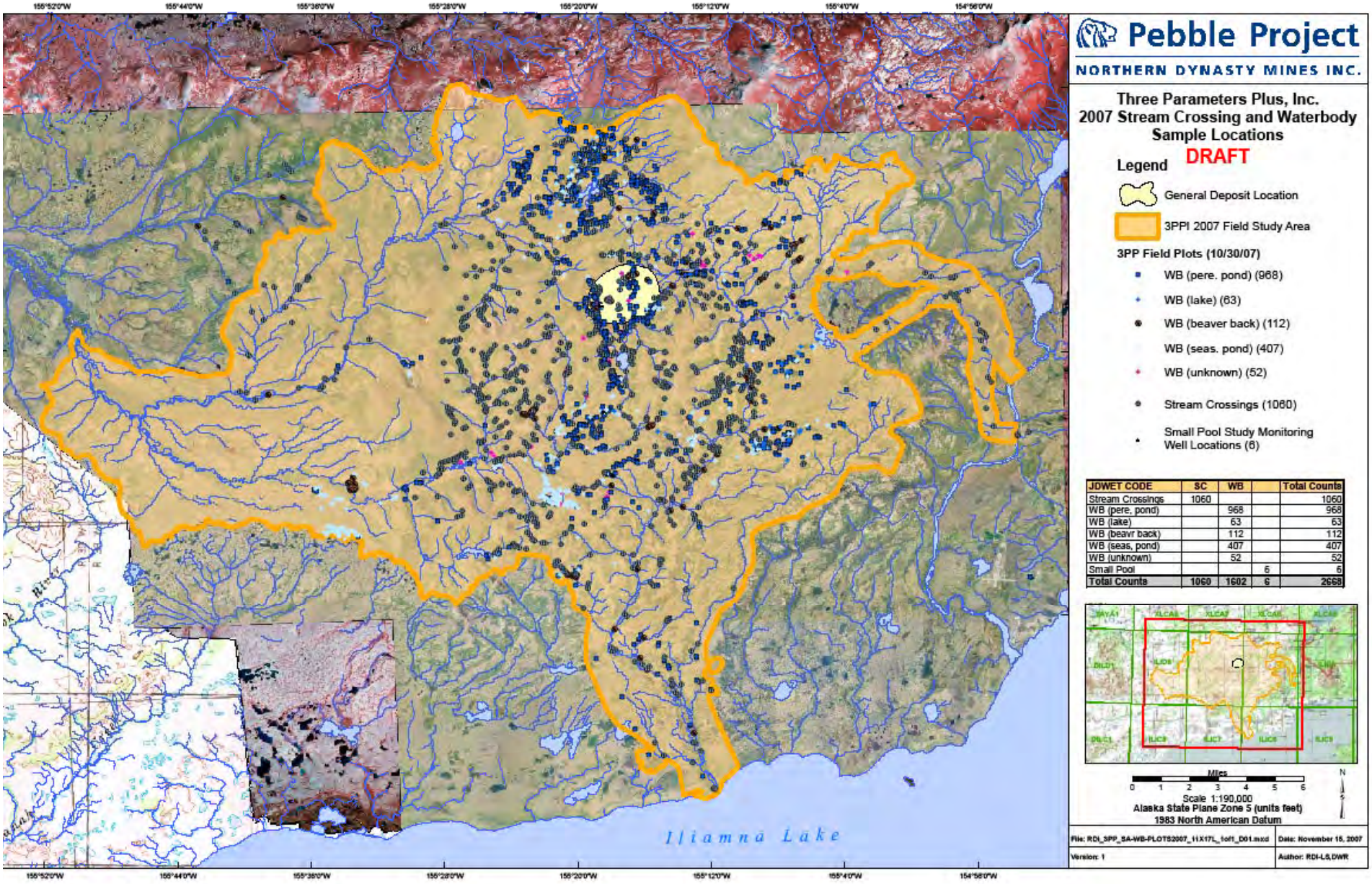


Dr. Mark Rains explains the focus of the Small Pools Study to a regional citizen's advisory group on a tour last August while Karyn Noyes looks on…

Our hypothesis is that pool electrical conductivity is controlled by water-rock interaction. If pool electrical conductivity is controlled by evaporation, then all conservative dissolved constituents (e.g., Na, K, Mg, Ca, Si, and Cl) should concentrate proportionally. If pool electrical conductivity is controlled by water-rock interaction, then conservative dissolved constituents commonly found in regional sediments (e.g., Na, K, Mg, Ca, and Si but not Cl) should concentrate preferentially. In order to evaluate this hypothesis, we will sample ~90 pools in each of the three basins and collect and analyze water samples according to the objectives listed above.

Three Parameters +

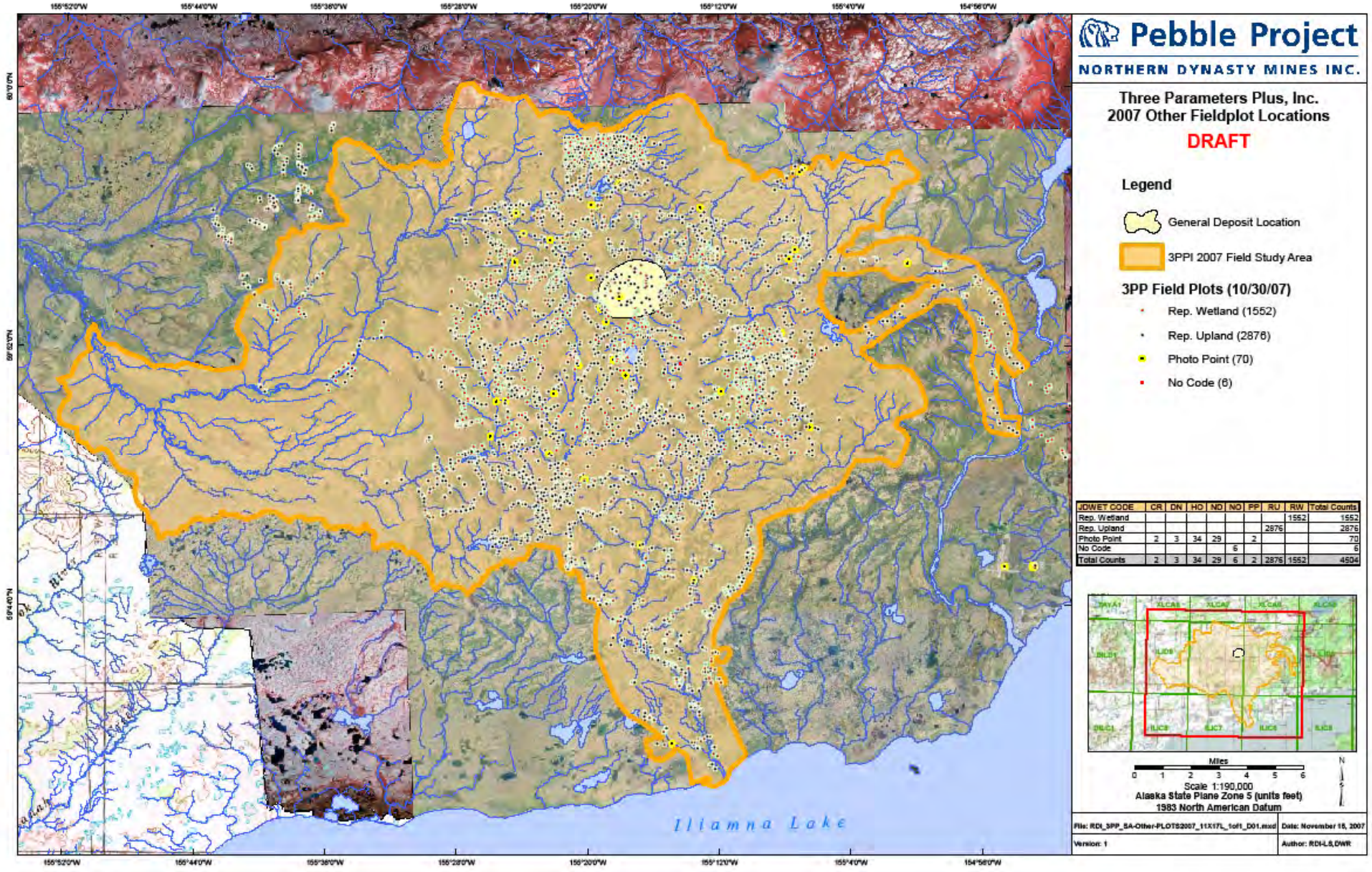
Natural Resource Consulting



JDWET CODE	SC	WB		Total Counts
Stream Crossings	1060			1060
WB (pere. pond)		968		968
WB (lake)		63		63
WB (beavr back)		112		112
WB (seas. pond)		407		407
WB (unknown)		52		52
Small Pool			6	6
Total Counts	1060	1602	6	2668

Three Parameters +

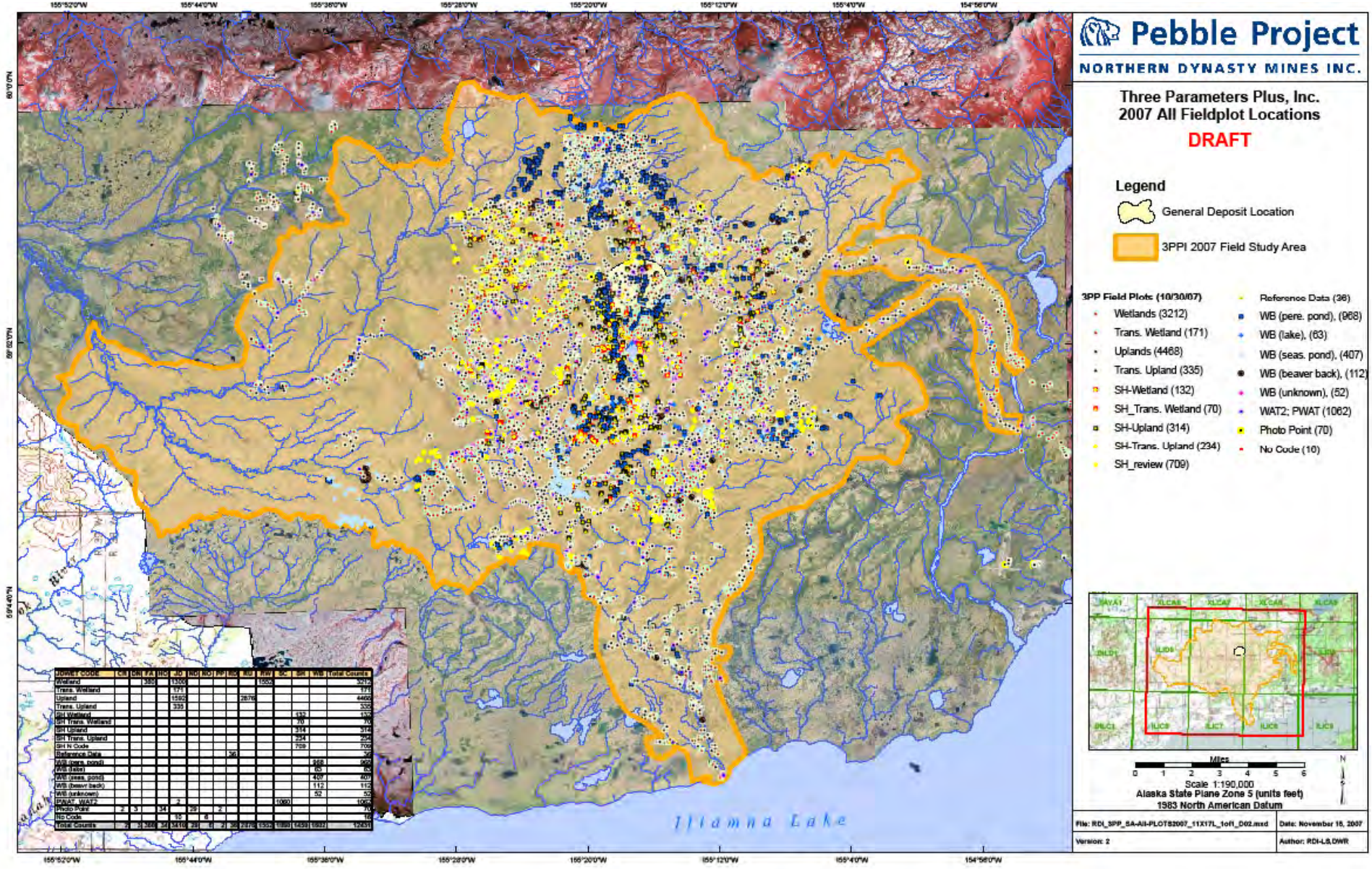
Natural Resource Consulting



JDWET CODE	CR	DN	HO	ND	NO	PP	RU	RW	Total Counts
Rep. Wetland								1552	1552
Rep. Upland							2876		2876
Photo Point	2	3	34	29		2			70
No Code					6				6
Total Counts	2	3	34	29	6	2	2876	1552	4504

Three Parameters +

Natural Resource Consulting





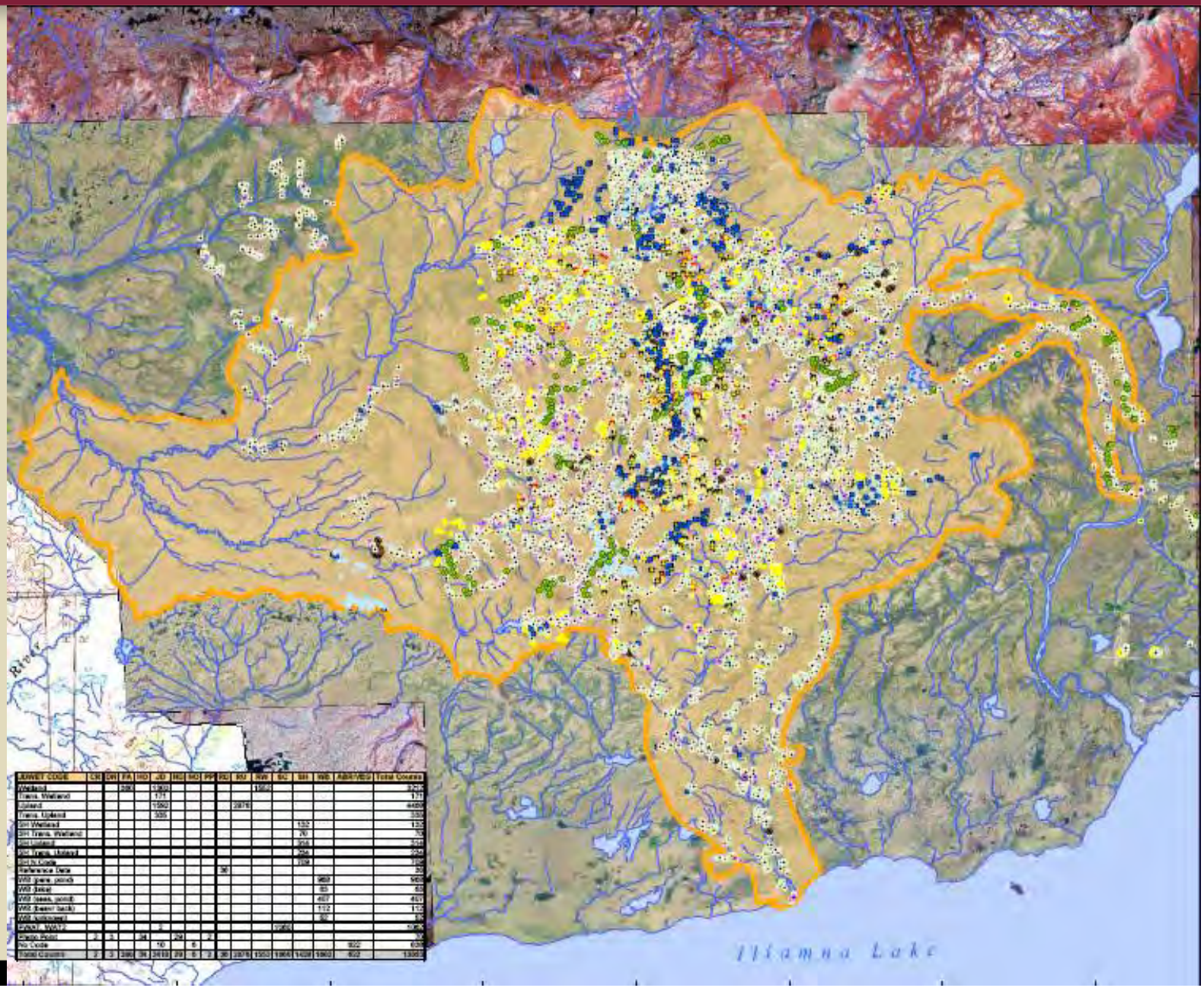
Year	Jurisdictional Determinations	Shrub Height Rapid JDs	Functional Assessments	HGM Reference Data Point	Stream Crossing Photos	Waterbody Evaluations	Representative Upland Photos	Representative Wetland Photos	Habitat Observations	Dens	Photo Points	New Disturbance	Cultural Resources	NO CODE	Totals
2004															
Number of Plots	1182	0	0	0	307	39	420	313	14	3	0	2	1	245	2526
Number of Crew Field Days	188	0	0	0	126	25	132	136	14	3	0	2	1	28	655
Average Plots/Crew Field Day	6.287	0	0	0	2.436	1.56	3.181	2.301	1	1	0	1	1	8.75	3.856
Number of Pictures	3512	0	0	0	886	78	856	634	28	6	0	4	2	418	6424
2005															
Number of Plots	317	630	350	36	165	291	450	122	12	0	0	2	0	354	2729
Number of Crew Field Days	101	58	90	9	62	66	109	60	11	0	0	2	0	78	646
Average Plots/Crew Field Day	3.138	10.862	3.888	4	2.661	4.409	4.128	2.033	1.09	0	0	1	0	4.538	4.224
Number of Pictures	975	1876	1047	73	491	575	907	248	22	0	0	4	0	880	7098
2006															
Number of Plots	524	125	0	0	196	312	510	422	0	0	1	16	1	0	2107
Number of Crew Field Days	145	11	0	0	58	62	77	74	0	0	1	5	1	0	434
Average Plots/Crew Field Day	3.613	11.363	0	0	3.379	5.032	6.623	5.702	0	0	1	3.2	1	0	4.854
Number of Pictures	1562	367	0	0	580	619	1016	834	0	0	2	32	2	0	5014
2007															
Number of Plots	1355	698	3	0	387	955	1459	664	8	0	1	9	0	6	5545
Number of Crew Field Days	352	170	3	0	117	99	142	117	7	0	1	1	0	3	1012
Average Plots/Crew Field Day	3.849	4.105	1	0	3.307	9.646	10.274	5.675	1.142	0	1	9	0	2	5.479
Number of Pictures	4031	2079	9	0	1156	1899	2918	1329	14	0	2	18	0	11	13466
Summarize (2004 - 2007)															
Total Number of Plots	3378	1453	353	36	1055	1597	2839	1521	34	3	2	29	2	605	12907
Total Number of Crew Field Days	786	239	93	9	363	252	460	387	32	3	2	10	2	109	2747
Total Average Plots/Crew Field Day	4.297	6.079	3.795	4	2.906	6.337	6.171	3.93	1.062	1	1	2.9	1	5.55	4.698
Total Number of Pictures	10080	4322	1056	73	3113	3171	5697	3045	64	6	4	58	4	1309	32002



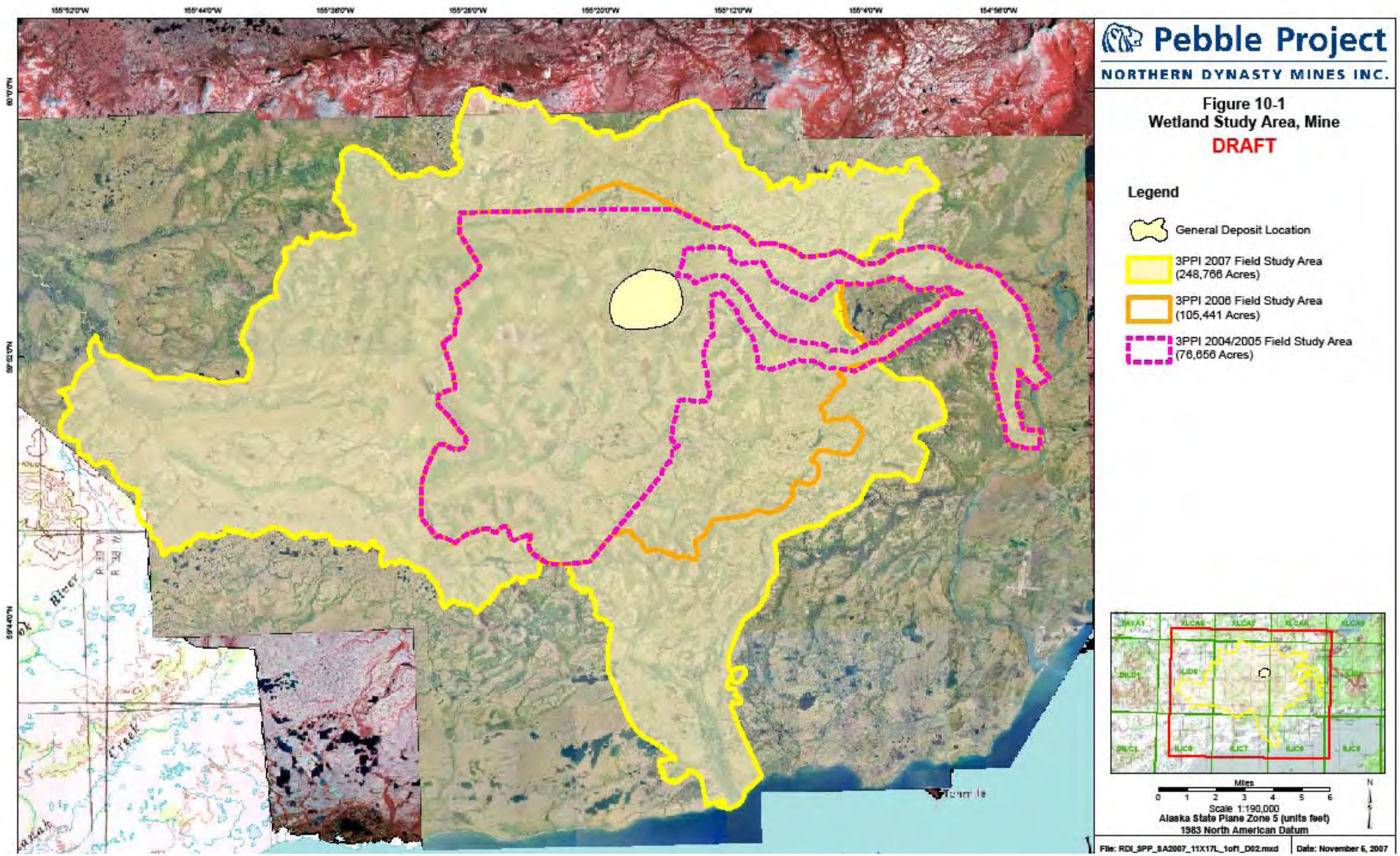
Three Parameters +

Natural Resource Consulting

This winter, our mappers will also have access to ABR's habitat and vegetation data (shown in green) which increases the site specific observations by another 622 vegetation plots.



Plot Density By Study Area Boundary



Field Data Collection

Data Validation

Line Drawing ←

Polygon Coding ←

Field Review

Delineation

Wetlands and Other Waters of the U.S.

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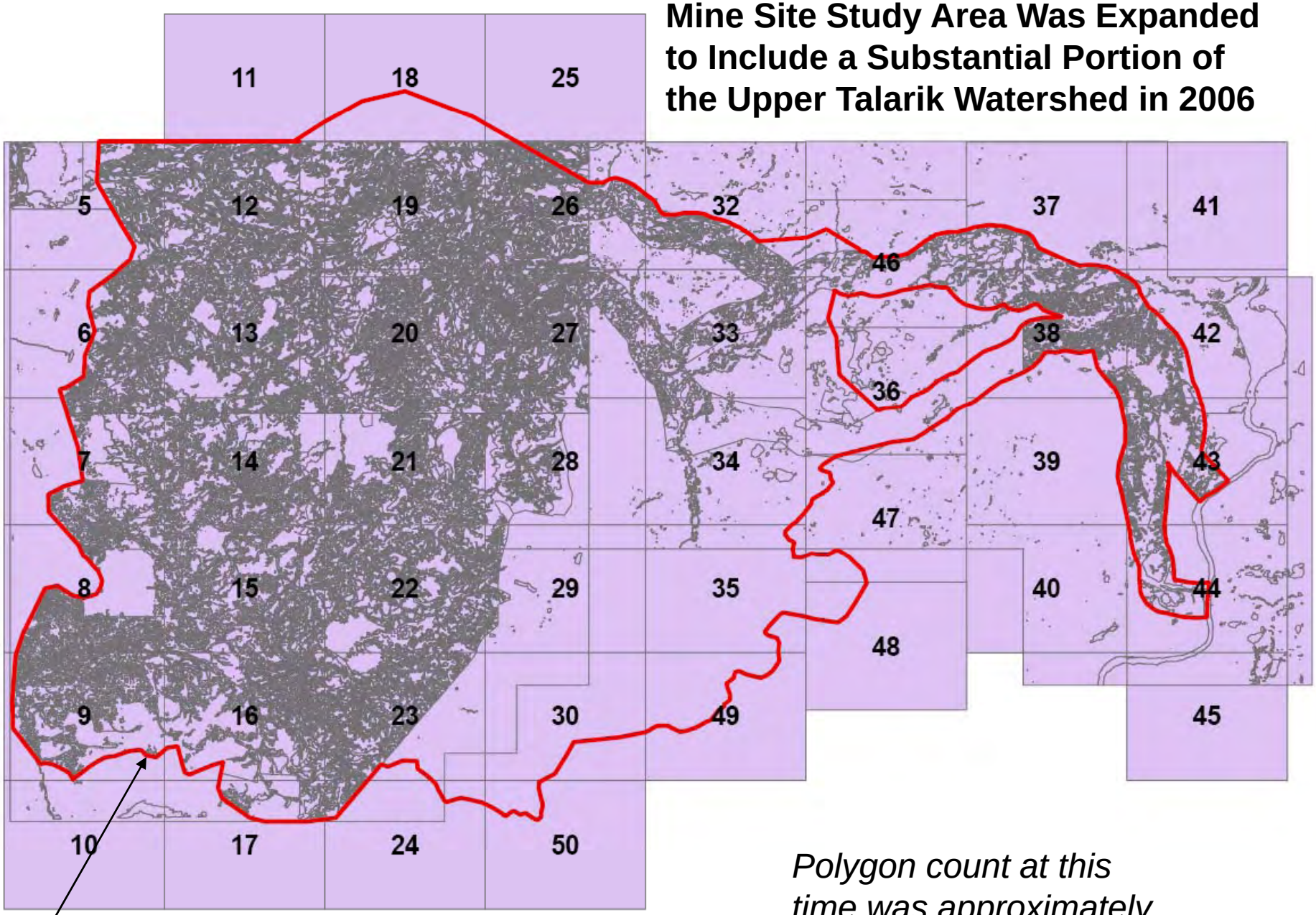
Natural Resource Consulting

Mine Site Study Area Was Expanded to Include a Substantial Portion of the Upper Talarik Watershed in 2006

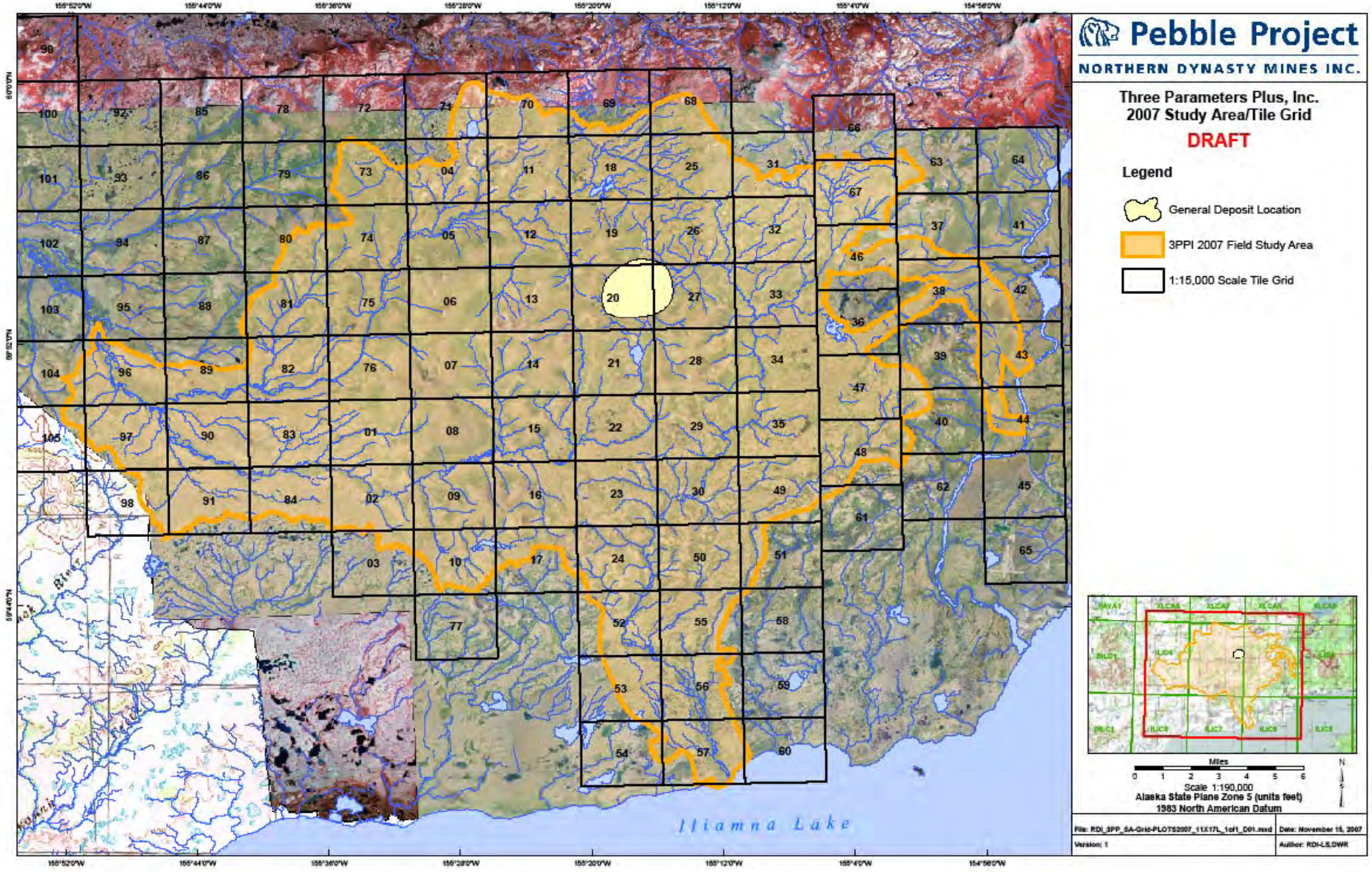


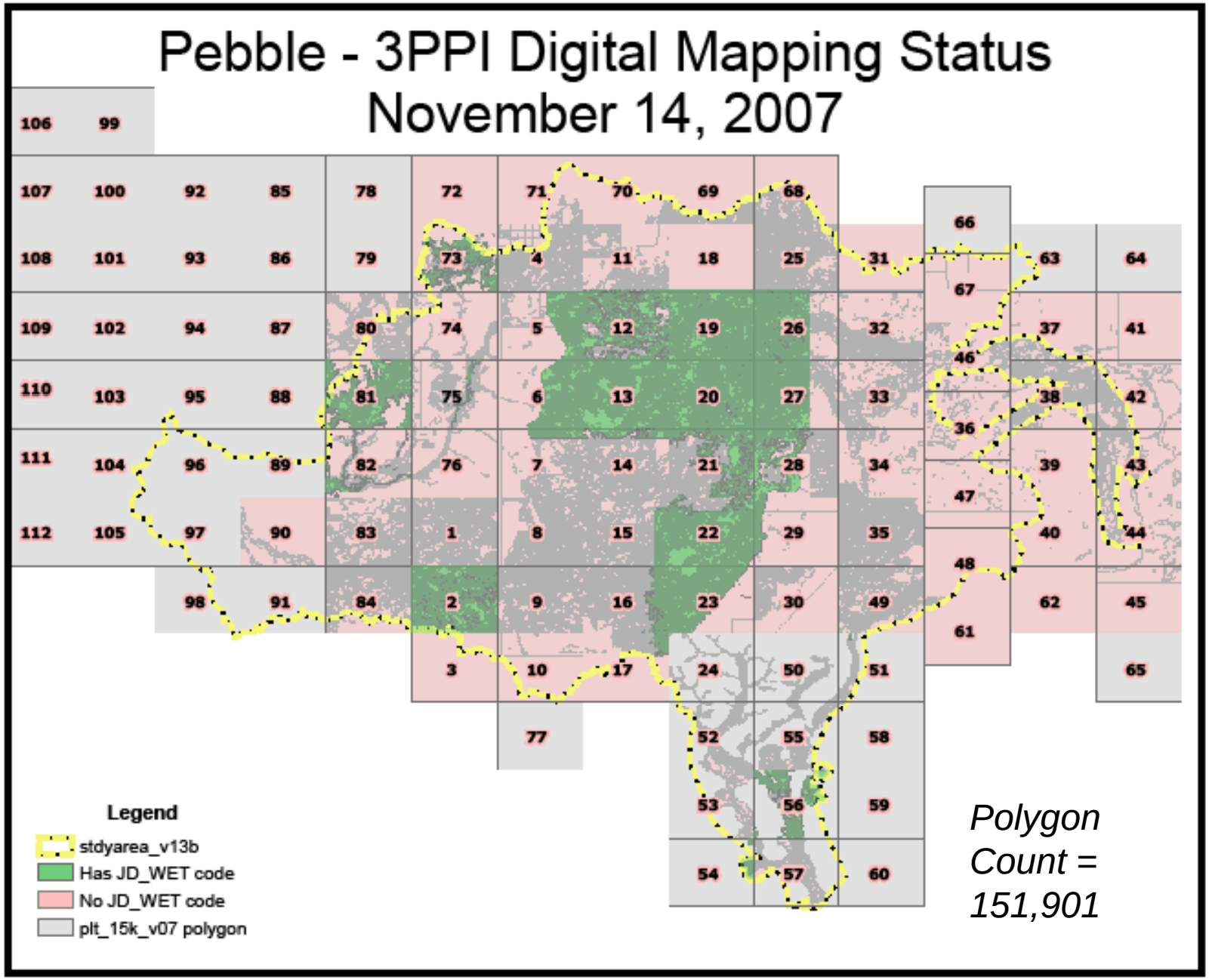
Red Study Area Boundary
= 104,069 Acres

Polygon count at this time was approximately 70,000

Three Parameters +

Natural Resource Consulting

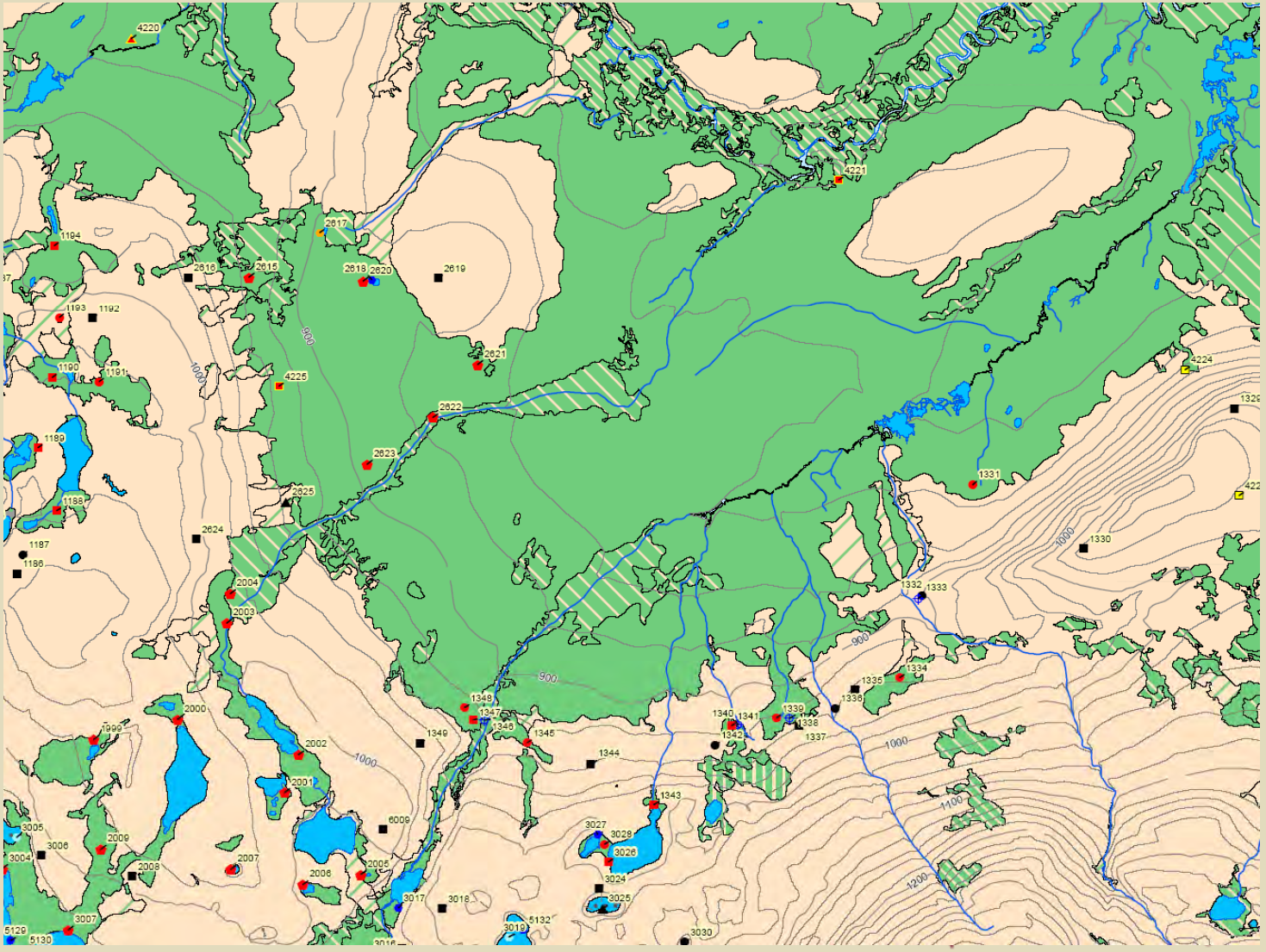



Pebble - 3PPI Digital Mapping Status
November 14, 2007
106 99
107 100 92 85 78 72 71 70 69 68
108 101 93 86 79 73 4 11 18 25 31 66 63 64
109 102 94 87 80 74 5 12 19 26 32 67 37 41
110 103 95 88 81 75 6 13 20 27 33 46 38 42
111 104 96 89 82 76 7 14 21 28 34 36 39 43
112 105 97 90 83 1 8 15 22 29 35 47 40 44
98 91 84 2 9 16 23 30 49 48 62 45
3 10 17 24 50 51 61 65
77 52 55 58
53 56 59
54 57 60
Legend
stdyarea_v13b
Has JD_WET code
No JD_WET code
plt_15k_v07 polygon
Polygon Count = 151,901

Sample Jurisdictional Wetland Mapping

The end result is mapping that will look this detailed, with a comparable sample point density (higher in some areas.

Known inlets and outlets will be clearly shown by arcs. The drainage type will ultimately be symbolized by different line patterns to differentiate perennial from intermittent streams.



Three Parameters +

Natural Resource Consulting

But Lots of Laughter & Just Plain Silly Behavior Make Most of Our Days Go By Too Quickly

Major Study Components

Delineation

Based on Criteria and Indicators Found in the 1987 Corps Wetland Delineation Manual & 2006 Interim Regional Supplement for the Alaska Region.

Classify Wetlands and Assess Their Functions

Small Pools Study

Magee Rapid Procedure for Assessing Wetland Functional Capacity (HGM Based)

Consider Wetland Values

Incorporate Subsistence, Recreation, Cultural Resource, and Other "Values" into the Functional Assessment Evaluation

Identify & Evaluate Potential Compensatory Mitigation Projects

Prepare Compensatory Mitigation Plan

Per June 10, 2004 Final Alaska District Compensatory Mitigation Guidelines

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Classify Wetlands and Assess Their Functions

Determine HGM Classification

Collect Key Data (Inlets/Outlets, pH)

Run Models Using Field & Photo Interpreted Data

Multiply Scores of Potentially Impacted Wetlands x Acres Affected

Determine Debits by Function

Magee Holland's Rapid Procedure for Assessing Wetland Functional Capacity

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Magee Method Variables

- Wetland Size
- Ratio of Wetland Area to Watershed Area
- Juxtaposition
- Land Use/Intensity
- Soil Type
- Underlying Surficial Deposit
- Micro-Relief
- Water Regime
- Surface Water Fluctuation
- Overbank Flooding Frequency
- Sedimentation Evidence
- Basin Topography
- Inlets/Outlet Types
- Outlet Restrictions
- Water pH
- Piezometer Data (where available)
- Seeps & Springs
- Vegetation Types
- Vegetation Density/Dominance
- Interspersion
- Species Diversity
- Animal Food Plants
- Islands
- Woody Debris

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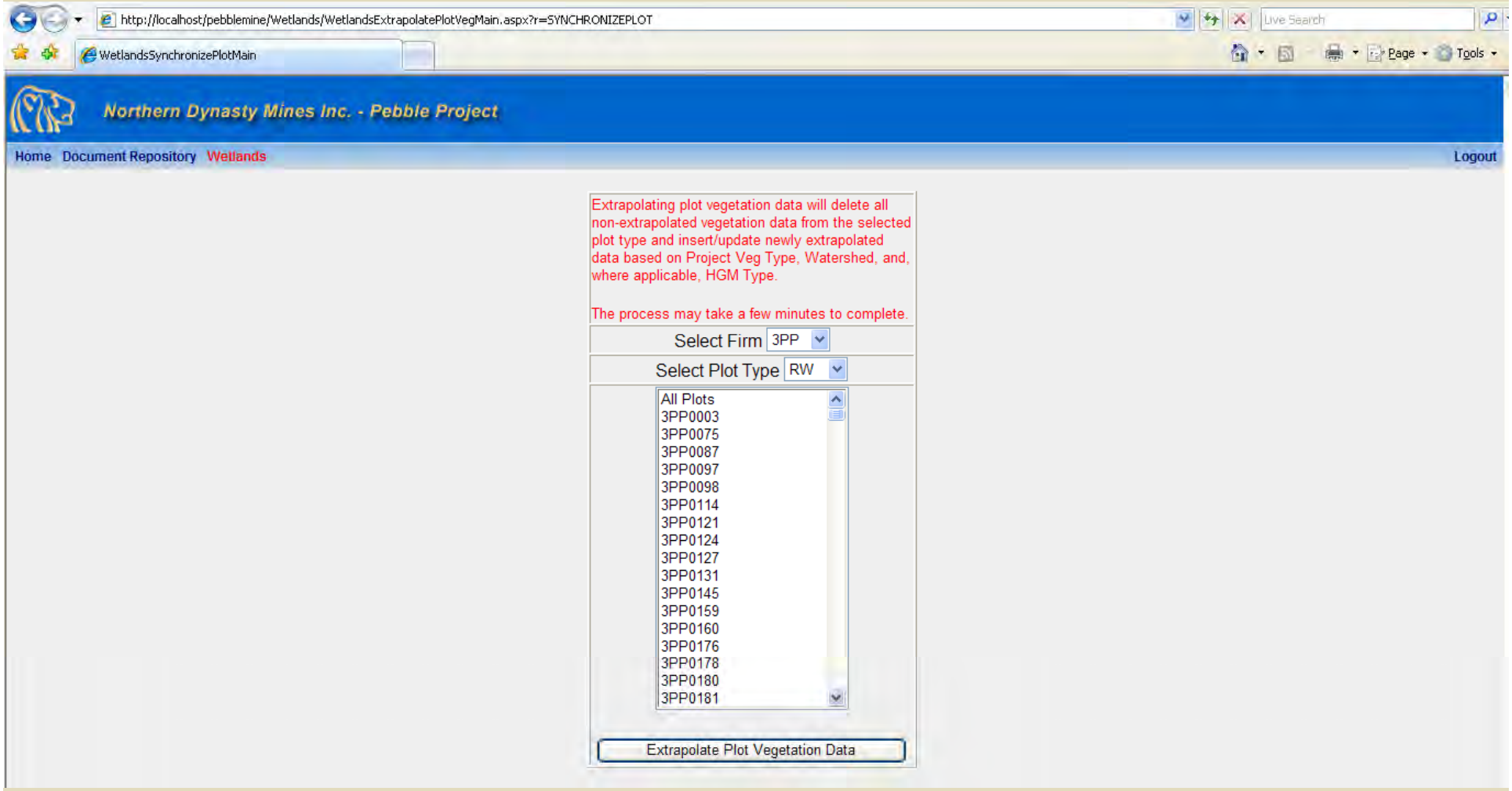
Natural Resource Consulting

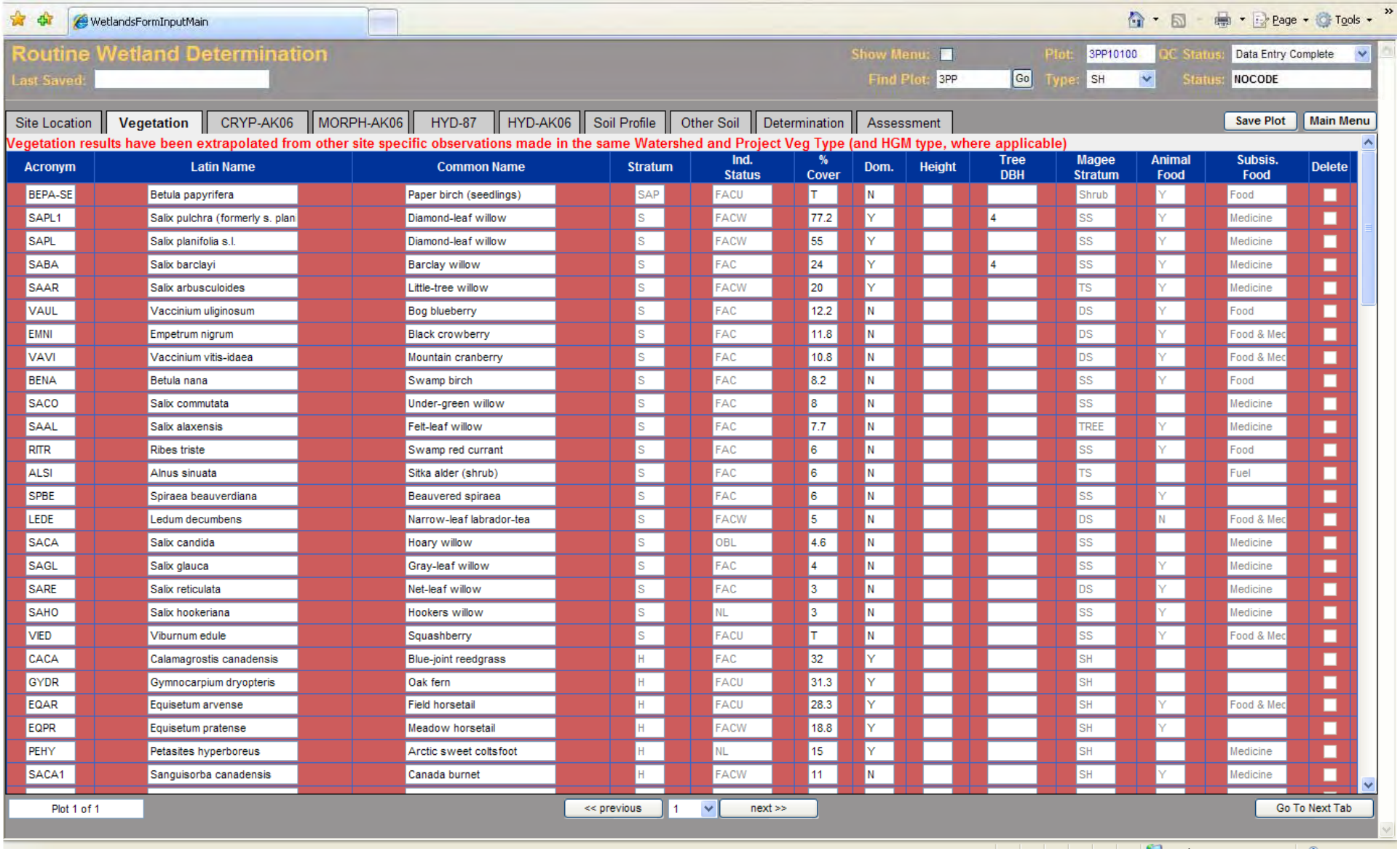
New Database Process to Extrapolate Plant Community Type Summary Data to Plots with the Same Vegetation Type, HGM Class, and in the Same Watershed.



Three Parameters +

Natural Resource Consulting

When Extrapolated Data Are Used it Will Be Clearly Evident



WetlandsFormInputMain

Page Tools

Routine Wetland Determination

Last Saved:

Show Menu: Plot: 3PP10100 QC Status: Data Entry Complete

Find Plot: 3PP Go Type: SH Status: NOCODE

Site Location | Vegetation | CRYP-AK06 | MORPH-AK06 | HYD-87 | HYD-AK06 | Soil Profile | Other Soil | Determination | Assessment

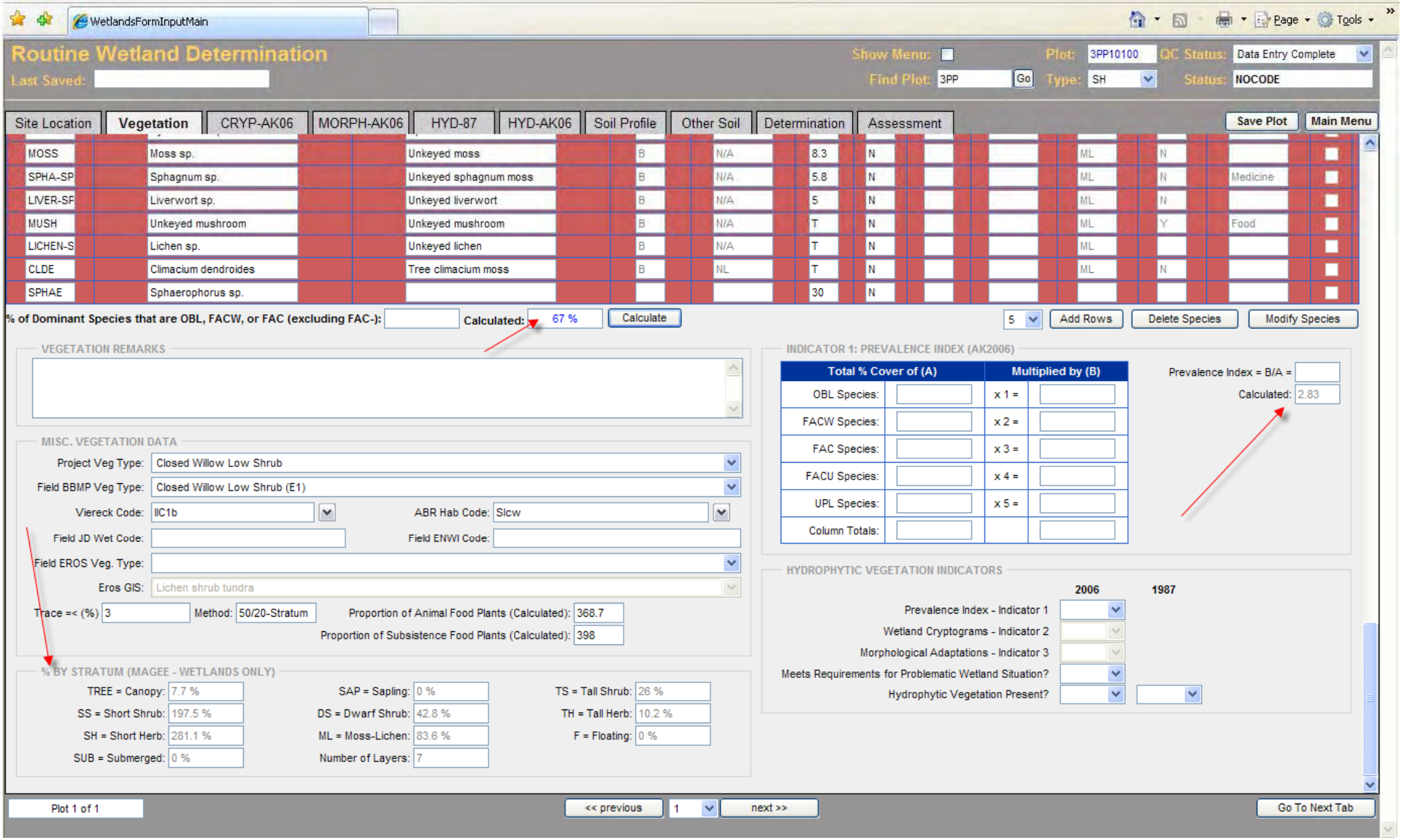
Save Plot | Main Menu

Vegetation results have been extrapolated from other site specific observations made in the same Watershed and Project Veg Type (and HGM type, where applicable)

Acronym	Latin Name	Common Name	Stratum	Ind. Status	% Cover	Dom.	Height	Tree DBH	Magee Stratum	Animal Food	Subsis. Food	Delete
BEPA-SE	Betula papyrifera	Paper birch (seedlings)	SAP	FACU	T	N			Shrub	Y	Food	
SAPL1	Salix pulchra (formerly s. plan	Diamond-leaf willow	S	FACW	77.2	Y		4	SS	Y	Medicine	
SAPL	Salix planifolia s.l.	Diamond-leaf willow	S	FACW	55	Y			SS	Y	Medicine	
SABA	Salix barclayi	Barclay willow	S	FAC	24	Y		4	SS	Y	Medicine	
SAAR	Salix arbusculoides	Little-tree willow	S	FACW	20	Y			TS	Y	Medicine	
VAUL	Vaccinium uliginosum	Bog blueberry	S	FAC	12.2	N			DS	Y	Food	
EMNI	Empetrum nigrum	Black crowberry	S	FAC	11.8	N			DS	Y	Food & Mec	
VAVI	Vaccinium vitis-idaea	Mountain cranberry	S	FAC	10.8	N			DS	Y	Food & Mec	
BENA	Betula nana	Swamp birch	S	FAC	8.2	N			SS	Y	Food	
SACO	Salix commutata	Under-green willow	S	FAC	8	N			SS		Medicine	
SAAL	Salix alaxensis	Felt-leaf willow	S	FAC	7.7	N			TREE	Y	Medicine	
RITR	Ribes triste	Swamp red currant	S	FAC	6	N			SS	Y	Food	
ALSI	Alnus sinuata	Sitka alder (shrub)	S	FAC	6	N			TS		Fuel	
SPBE	Spiraea beauverdiana	Beauvered spiraea	S	FAC	6	N			SS	Y		
LEDE	Ledum decumbens	Narrow-leaf labrador-tea	S	FACW	5	N			DS	N	Food & Mec	
SACA	Salix candida	Hoary willow	S	OBL	4.6	N			SS		Medicine	
SAGL	Salix glauca	Gray-leaf willow	S	FAC	4	N			SS	Y	Medicine	
SARE	Salix reticulata	Net-leaf willow	S	FAC	3	N			DS	Y	Medicine	
SAHO	Salix hookeriana	Hookers willow	S	NL	3	N			SS	Y	Medicine	
VIED	Viburnum edule	Squashberry	S	FACU	T	N			SS	Y	Food & Mec	
CACA	Calamagrostis canadensis	Blue-joint reedgrass	H	FAC	32	Y			SH			
GYDR	Gymnocarpium dryopteris	Oak fern	H	FACU	31.3	Y			SH			
EQAR	Equisetum arvense	Field horsetail	H	FACU	28.3	Y			SH	Y	Food & Mec	
EQPR	Equisetum pratense	Meadow horsetail	H	FACW	18.8	Y			SH	Y		
PEHY	Petasites hyperboreus	Arctic sweet coltsfoot	H	NL	15	Y			SH		Medicine	
SACA1	Sanguisorba canadensis	Canada burnet	H	FACW	11	N			SH	Y	Medicine	

Plot 1 of 1 << previous 1 next >> Go To Next Tab

Results can then contribute to the plot's final JD status and the functional assessment.



Consider Wetland Values

Incorporate Subsistence Use, Recreational Use, Cultural Resources, and Other Values into the Functional Assessment Process

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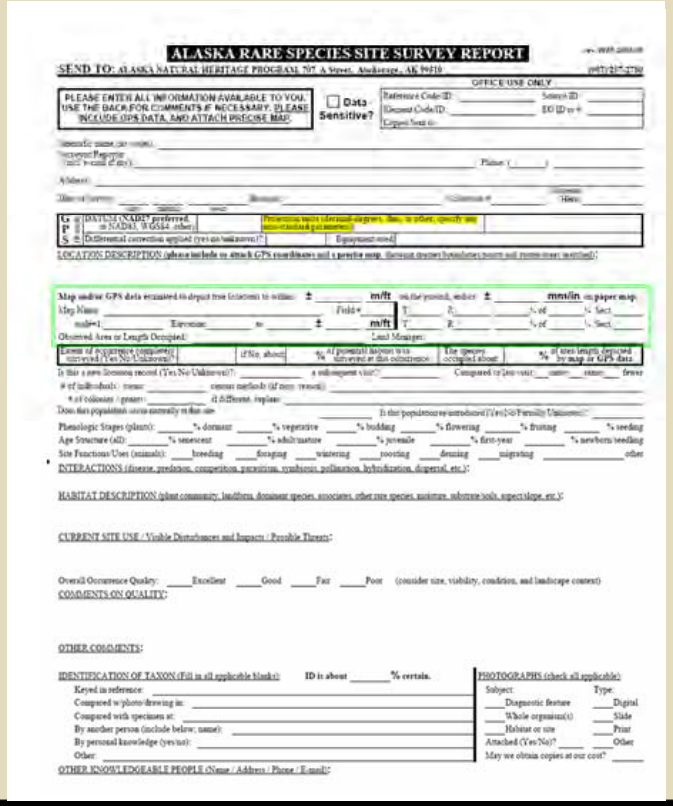
Natural Resource Consulting

Three Parameters +

Currently RDI is in the process of implementing a new data entry page in the wetlands application of the database that mimics the Alaska Natural Heritage Program Alaska Rare Species Site Survey Report.



ALASKA RARE SPECIES SITE SURVEY REPORT

SEND TO: ALASKA NATURAL HERITAGE PROGRAM, 707 A Street, Anchorage, AK 99510

PLEASE ENTER ALL INFORMATION AVAILABLE TO YOU. USE THE BACK FOR COMMENTS IF NECESSARY. PLEASE INCLUDE GPS DATA, AND ATTACH PRECISE MAP.

Data Sensitive?

OFFICE USE ONLY

LOCATION DESCRIPTION (please include or attach GPS coordinates and a precise map.

INTERACTIONS (disease, predation, competition, parasitism, symbiosis, pollination, hybridization, dispersal, etc.):

HABITAT DESCRIPTION (plant community, landform, dominant species, associates, other rare species, moisture, substrate/soils, aspect/slope, etc.):

CURRENT SITE USE / Visible Disturbances and Impacts / Possible Threats:

Overall Occurrence Quality: Excellent Good Fair Poor (consider size, viability, condition, and landscape context)

COMMENTS ON QUALITY:

OTHER COMMENTS:

IDENTIFICATION OF TAXON (Fill in all applicable blanks): ID is about % certain.

Keyed in reference:
Compared w/photo/drawing in:
Compared with specimen at:
By another person (include below: name):
By personal knowledge (yes/no):
Other:

PHOTOGRAPHS (check all applicable)

Subject: Type:
Diagnostic feature Digital
Whole organism(s) Slide
Habitat or site Print
Attached (Yes/No)? Other
May we obtain copies at our cost?

OTHER KNOWLEDGEABLE PEOPLE (Name / Address / Phone / E-mail):

Routine Wetland Determination

Show Menu: Find Plot: 3PP Go

Last Saved:

Site Location | Vegetation | CRYP-AK06 | MORPH-AK06 | HYD-87 | HYD-AK06 | Soil Profile | Other Soil | Determination

Completely Surveyed? Yes if No, about: % of potential habitat surveyed. Species occupied % of area/length

New Location Record? Yes Subsequent Visit? Yes Compared to last visit: More

individuals/stems: census methods:

colonies/genets: if different, explain:

Does this population occur naturally at this site Yes Is this population re-introduced: Yes

Phenologic Stages: % dormant % vegetative % budding %flowering %fruiting %seeding

Age Structure (all): % senescent % mature % juvenile % first-year % newborn/seedling

Site Functions/Uses (animals) Breeding Foraging Wintering Roosting Denning Digital Other

Interactions (disease, predation, competition, parasitism, symbiosis, pollination, hybridization, dispersal, etc.):

Habitat Description (plant community, landform, dominant species, associates, other rare species, moisture, substrate/soils, aspect/slope, etc.):

Current Site Use / Visible Disturbances and Impacts / Possible Threats:

Overall Occurrence Quality: Excellent (consider size, viability, condition, and landscape context)

Comments on Quality:

Other Comments:

Identification of Taxon (Fill in all applicable fields): ID is about % certain.

Keyed in reference:
Compared w/photo/drawing in:
Compared with specimen at:
By another person (include below: name):
By personal knowledge Yes
Other:

Photographs (check all that apply)

Subject: Type:
Diagnostic Feature Digital
Whole organism(s) Slide
Habitat or site Print
Attached Yes Other
May we obtain copies at our cost? Yes

Other Knowledgeable People

Name	Address	Phone	Email

Plot 2594 of 10377 << previous 1 next >>

Mitigate =

Avoid

Minimize

Compensate ←

Identify Potential Compensatory Mitigation Opportunities

THREE PARAMETERS+
Natural Resource Consulting

Mitigate =

Avoid

Minimize

Compensate ←

Prepare Compensatory Mitigation Plan

Per June 10, 2004 Final Alaska District Compensatory Mitigation Guidelines & Pending Rule Changes Published in the Federal Register this Summer

THREE PARAMETERS+
Natural Resource Consulting

Major Study Components

- ☑ Delineation
- ☑ Classify Wetlands & Assess Their Functions
- ☑ Consider Wetland Values
- ☑ Identify & Evaluate Potential Compensatory Mitigation Projects
- ☑ Prepare Compensatory Mitigation Plan

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Natural Resource Consulting

2008 Work Plan

(or as I like to say – let the madness continue…)

Mapping

Data Entry & QC

Lots More Field Work

Continued Well Monitoring for the Small Pools Study

Continue Review of Abandoned Mine Files

HDR Will Prepare EBD Access Corridor Sections

3PPI will Begin Drafting EBD Sections for Mine Site

THREE PARAMETERS+
Natural Resource Consulting